

A Pilot Survey on Student Loan Repayment Plan Choice

By Joshua Brownstein

Abstract

Income-based student loan repayment provides borrowers with insurance against high repayment obligations relative to their income. Borrowers on income-based repayment rarely default on their loans and there is research which suggests that this is casual. Despite this benefit most students choose to stay on the default 10-year repayment plan. This study investigates whether the specific numerical parameters of the U.S. Federal Government's income-based repayment plans contribute to the low take up of income-based repayment. I do this by piloting a survey experiment to undergraduate students at Michigan State University. The survey provides evidence that students are more or less likely to choose an income-based repayment plan over the standard repayment plan depending on the specific value of the parameters of the income-based repayment plan.

1 Introduction

There is a large and growing amount of student loan debt in the United States (Board of Governors of the Federal Reserve System 2019). This debt is getting more political attention as concern mounts over the effect of this debt on debt holder's life choices including delaying marriage (Menton 2020) and home buying (Noguchi 2019). Growing student loan debt also generates public concern in the United States because of the debt's high default rate. As of Q2 2019 18 percent of student loan borrowers were in default defined as not making required payments for at least 270 days (College Board 2019a). Scott-Clayton (2019) projects that 40% of borrowers could default on their loans by 2023.

One proposal in dealing with the problems associated with high student loan debt is to have student loan debt paid with income-based repayment programs. The standard student loan repayment plan in the United States determines payments as a function of time and the amount of debt a borrower has. This leads to many individuals having high loan payments relative to their income (Chapman and Dearden 2017). Income-based repayment plans by design set payments as a function of income and therefore limit the repayment burden of student loans. Reform proponents hope that having borrowers on income-based repayment plans will reduce the financial and psychological burden of student loans and make borrowers less likely to default on their loans. This prevention of high repayment burdens comes at the cost to the students of increased interest payments and taking longer to pay off the loan.

In the United States student's currently have a choice between a variety of time based and income-based repayment plans. Despite the advantages of income-based plans and the advocacy of these plans among scholars of student loans (Chapman and Dearden 2017), only about 30% of student loan borrowers in the United States are on income-based repayment plans (College Board 2019a). I hypothesize that part of the reason for this the specific design of income-based repayment programs is unappealing to students. I predict that if the income-based repayment plan were more generous, students would be more willing to choose the income-based repayment plan over the standard plan.

As a first step in exploring the above issues I administer a survey to undergraduate students at Michigan State University (MSU). The survey asked students to choose between an income-based repayment plan and a time-based repayment plan in a hypothetical borrowing scenario. Three different parameters of the income-based plan were randomized between two values to see if the values of these parameters affected students' plan choices.

I hypothesize that students will try to minimize their monthly payment and reduce the amount of time they pay back their loan. This is because students do not get any direct utility from sending in a student loan payment. Students also seem to experience a psychological burden from having an outstanding loan which they can stop experiencing if they pay off their loan. This leads to students being more likely to choose the income-based repayment plan with a lower percentage income determining payment, a higher amount of income exempt from payment calculation, and a lower number of years until loan forgiveness.

I find that consistent with my hypotheses decreasing the percent of income determining payment and decreasing the number of years until loan forgiveness increases the probability that students choose the income-based repayment plan. Contrary to my hypotheses, having a higher amount of income exempt from payment made students less likely to choose the income-based repayment plan. This might indicate that students did not understand how payments in the income-based plan were calculated.

2 Background on Student Loans and Income-Based Repayment in the United States

In the United States today most students who borrow to pay for costs associated with attending colleges and universities get their loans from the federal government (College Board 2019b). Students who attend colleges and universities apply for federal loans by filling out the FAFSA (Free Application for

Federal Student Aid). For subsidized¹ and unsubsidized loans, students can borrow the lesser of either the cost of attendance or a yearly limit that is based on year in school and dependency status (Kirkham 2020). The total amount of money students can borrow from the federal government over their lifetime is also capped. If students would like to borrow more than the limits for those loans, their parent's may borrow Parent's PLUS loans² from the federal government up to their cost of attendance. In the academic year 2018-2019 28 percent of undergraduate students got loans directly from the federal government (College Board 2019a). 57 percent of students who graduated from public 4-year³ universities in 2019 had federal student loans. The average amount of debt among people who graduated with debt in 2019 was \$27,200.

Students will be current on their loans if they make at least the minimum monthly loan payment. Students can pay more than their minimum payment without penalty⁴. Students can temporarily lower their monthly payment to zero with either forbearance or deferment. Students can request forbearance if they are experiencing financial difficulties, have incurred large medical expenses, or are unemployed. Under forbearance, students can stop making payments on their loan without going into delinquency or default.⁵ Students must apply for most types of forbearance by contacting their loan servicer. Interest accrues while payments are paused during forbearance and the interest is added to the loan principal at the end of the forbearance period. Deferment can be granted for various reasons including being in

¹ Subsidized loans are only given to students with financial need. Unlike for unsubsidized loans the government pays the interest on the loan until 6 months after a student leaves school and during periods of deferment. See later in this section for details on deferment.

² Parent's PLUS loans are only given to parents without adverse credit histories. The interest rate on Parent's PLUS loans is higher than the interest rate for direct loans at the rate of the 10-year treasury + 4.6 percentage points. An origination fee of 4.236% of the loan amount is charged on Parent's PLUS Loans. Parent's PLUS loans are not eligible for income-based repayment plans unless the loans are consolidated. In that case the loans can be repaid on the Income-Contingent Repayment plan. See <https://www.edvisors.com/college-loans/federal/parent-plus/introduction-to-federal-parent-plus-loans/> for details about Parent's PLUS Loans.

³ 4-year universities offer bachelor's degrees that take 3-7 years to complete. This contrasts with 2-year colleges that offer associates degrees. Most 2-year colleges are community colleges. Associates degrees take an expected 2 years to complete.

⁴ <https://www.edvisors.com/ask/faq/penalties-early-payment/>.

⁵ <https://studentaid.gov/manage-loans/lower-payments/get-temporary-relief/forbearance>

college⁶, having an economic hardship or being treated for cancer. Deferment is like forbearance in that required payments are temporarily lowered to zero. The difference is that in deferment interest does not accrue on subsidized loans⁷. If the student has an unsubsidized loan, then interest will accrue during a deferment. Once a student misses a payment on a student loan, they are considered delinquent on that loan⁸. Students who are delinquent on their loans for a period of 90 days have their delinquency reported to the three major national credit bureaus⁹. This will likely lower the borrower's credit score. If a borrower pays less than the minimum payment for 270 days, then their loan is in default. Default has several negative consequences for the borrower. When a borrower defaults on their student loans, the entire amount of the loan is due immediately. The United States Department of Education (DoEd) reports the default to the three major credit bureaus. A borrower who defaulted is charged for collection costs. If a borrower defaults and they have federal student loan debt outstanding they are prohibited from receiving additional federal student aid. Finally, default allows DoEd to garnish the loan holder's wages, tax refunds and federal benefits to pay for their loan.

The United States federal government first enacted income-based student loan repayment when President Clinton signed the 1998 Higher Education Act. This act created an income sensitive repayment plan for federal student loans. The 2007 College Cost Reduction and Access Act created Income-Based Repayment (Old IBR) for federal student loan borrowers with economic hardships¹⁰. Old IBR calculates minimum payments as 10 percent of discretionary income up to a cap of the minimum payment for the

⁶ This includes being an undergraduate student, being a graduate student and being a student in a professional school such as being a student in law school or medical school.

⁷ <https://studentaid.gov/manage-loans/lower-payments/get-temporary-relief/deferment>

⁸ <https://studentaid.gov/manage-loans/default>

⁹ Businesses that collect information about people's use of credit and sell that information to third parties are Credit Reporting Agencies (CRA) (Irby 2020). Credit Reporting Agencies are defined in the Fair Credit Reporting Act (FCRA). Being defined a CRA subjects the businesses to the regulations in the FCRA. Although there are about 50 different companies that have the CRA designation, three companies (Equifax, Experian, and Transunion) are by far the largest. Together these agencies retain information on 200 million Americans (Irby 2019). Delinquency and default are reported to those 3 CRA's.

¹⁰ Economic hardship is defined as the borrower having lower payments on the income-based repayment plan being considered than on the standard 10-year plan.

borrower under the 10-year repayment plan for their original loan balance. Discretionary income is defined as income¹¹ above 150% of the federal poverty line¹². Old IBR started to be used on July 1, 2009. The Health Care and Education Reconciliation Act of 2010 made IBR more generous. The act lowered payments from 15 percent of discretionary income to 10 percent of discretionary income. It also lowered the number of years until loan forgiveness from 25 years to 20 years. Borrowers who took out their first loan after July 1, 2014 could get on the new more generous IBR plan (New IBR). The Obama administration created the Pay As You Earn (PAYE) repayment plan through a regulatory process. It has the same terms as New IBR. The point of creating the plan was to allow more borrowers to get on a repayment plan with the parameters of New IBR. Borrowers who experienced economic hardship, received loans after September 30, 2007 and continued to borrow after September 30, 2011 could get on the PAYE plan. In 2015 the Obama administration created the Revised Pay as You Earn Plan (REPAYE) through a regulatory process. Minimum payments on REPAYE are equal to 10 percent of discretionary income. All federal student loan borrowers except borrowers who have Parent's PLUS Loans can get on REPAYE (Pant 2017). REPAYE has 20 years until loan forgiveness for borrowers of undergraduate student loans and 25 years of loan forgiveness for borrowers of graduate student loans. REPAYE does not cap payments at the level of payments under the 10-year repayment plan. Under REPAYE 50 percent of interest accrued due to low minimum payments are paid for by the Department of Education. This interest subsidy is 100 percent for subsidized loans for up to 3 years¹³.

¹¹ For REPAYE income is almost always calculated and as the sum of the borrower's income and their spouse's income. For the other income-based repayment plans how income is calculated depends on how the individual files their taxes. If they file as a single individual or as married filing separately then income is equal to the borrower's individual income. However, if the borrower files taxes as married filing jointly then income is the sum of the borrower's income and their spouse's income. This information is from <https://www.nerdwallet.com/blog/loans/student-loans/income-based-repayment-calculated/>.

¹² For all states except Hawaii and Alaska, 150% of the federal poverty line for a single individual in 2020 is \$19,140 and for 2 individuals is \$25,860. See Office of the Assistant Secretary for Planning and Evaluation (2019).

¹³ Most of this information is taken from Lumina Foundation (2018).

Table 1 summarizes the repayment plans that are available to student loan borrowers. Partial financial hardship requirement means that the minimum monthly loan payments under the plan of interest must be lower than the minimum payment under the standard plan at the time the borrower gets on the plan.

Table 1

Plan Name	Percentage of Discretionary Income	Years Until Loan Forgiveness	Partial Financial Hardship Requirement	Minimum Payment Cap
Standard/10-year Repayment Plan	Payment determined by loan amount and interest rate. Payments constant over time.	No loan forgiveness	No	No
Extended Repayment Plan ¹⁴	Payment determined by loan amount and interest rate. Payments constant over time.	No loan forgiveness	No	No
Graduated Repayment Plan (10 years)	Payment determined by loan amount and interest rate. Payments increase every 2 years.	No loan forgiveness	No	No
Revised Pay as Your Earn Plan (REPAY)	10	20 undergraduate borrowers 25 graduate borrowers	No	No
Pay as You Earn Plan (PAYE)	10	20	Yes	Minimum payment on standard plan
New Income-Based Repayment Plan (New IBR)	10	20	Yes	Minimum payment on standard plan

¹⁴ The extended repayment plan is only available for individuals with at least \$30,000 in direct loans. Payments are calculated so the loan is paid off in a certain period up to 25 years. The minimum payments can stay constant for the duration of the plan or like the graduated repayment plan the minimum payments can rise every two years. See <https://studentloanhero.com/featured/extended-repayment-plan-lower-student-loan-payments/> for more information.

Old Income-Based Repayment Plan (Old IBR)	15	25	Yes	Minimum payment on standard plan
Income Contingent Repayment Plan (ICR)	20	25	Yes	Minimum payment for loan to be fully paid off in 12 years ¹⁵

Students get information on the different repayment plans during student loan exit counseling¹⁶. Borrowers complete exit counseling on a website created by DoEd. Individuals who borrow student loans from DoEd must¹⁷ complete exit counseling each time they either: drop below half-time enrollment, graduate, or leave school. During exit counseling students can enter their estimated future income, future expenses, and amount of federal student loans into the website. The website then provides students with an estimated initial monthly payment, an estimated total amount paid, and a repayment period of either the number of years in repayment or the number of years until loan forgiveness for all the available repayment plans. The students get an estimate of the amount of money they can save if they pay accumulating interest during forbearance or deferment. Exit counseling also has a section where students can see estimated savings if they pay more than the minimum amount due. As part of this process they are asked to select a repayment plan from a menu of available repayment plans. The selected plan is sent

¹⁵ <https://studentaid.gov/manage-loans/repayment/plans/income-driven>

¹⁶ <https://studentaid.gov/app/counselingInstructions.action?counselingType=exit>

¹⁷ Must is the language DoEd uses on its student loan exit counseling website. If colleges or universities do not offer exit counseling, they may lose access to federal financial aid (Klepfer et al. 2015). It is unclear how many students complete exit counseling. In a survey of 13,000 high debt borrowers 40% of respondents reported that they did not receive any form of student loan counseling (Whitsett and O’Sullivan 2012). None of the students I interviewed seemed to have had student loan entrance counseling that DoEd also says is required for borrowers. This is partially because there does not seem to be any consequences for students who do not complete counseling. The only consequences for not completing counseling that I have found is that a college or university may place a hold on the transcripts of students who do not complete exit counseling. See <https://www.simpletuition.com/student-loans/federal/exit-counseling/> for more information about exit counseling. MSU policies on exit counseling outlined in an email to me by MSU’s Office of Financial Aid are to inform borrowers at the university about DoEd’s exit counseling website but not to even see if they complete it.

to the student's loan servicer¹⁸, a private company that the United States federal government contracts with to collect federal student loans, to determine if they are eligible for the plan. If students do not go through exit counseling or they do not choose a specific repayment plan at the end of exit counseling, they are put on a 10-year repayment plan. See Appendix C for screenshots of student loan exit counseling. Students can change their repayment plan at any time by contacting their student loan servicer¹⁹ (Lane 2020). A student can change their repayment plan no matter what loan servicer they have.

Besides being on an income-based repayment plan for the amount of time until loan forgiveness, students who have a loan from DoEd can also have their loans forgiven^{20 21} through Public Service Loan Forgiveness (PSLF)²². In order to be eligible for PSLF, borrowers must work full time for a government or non-profit in the United States and make 120 qualifying payments (10 years of payments if all payments are on time and there are no paused payments). While this is, in theory, a generous loan forgiveness program, as of January 2020 only about 1.6% of applications for PSLF that have completed processing have been approved²³. Most applications were rejected because some of the borrower's payments did not count towards PSLF. Applications were also rejected due to having missing information in the PSLF application and having loans that were not eligible for PSLF. PSLF was first established in 2007 (U.S. Government Accountability Office 2019). The first group of borrowers who were eligible for PSLF got their

¹⁸ Students are assigned to one of ten different loan services. See <https://studentaid.gov/manage-loans/repayment/servicers> for more information about student loan servicers.

¹⁹ I was unable to find data on how often borrowers switch their repayment plan. Herbst (2019) studies the effect of income-based repayment on a variety of outcomes using variation in delinquent borrowers switching onto an income-based repayment plan after getting a call from their loan servicer. Herbst reports that the loan servicer he studies contacts all delinquent borrowers and that all contacted borrowers are informed about their repayment options.

²⁰ A final way for students to get their loans forgiven is through applying for Borrower Defense to Repayment. This is a loan forgiveness program for borrowers who attended schools that misled them or violated certain state laws related to student loans or educational services. For more information see <https://studentaid.gov/manage-loans/forgiveness-cancellation/borrower-defense>

²¹ Having loans forgiven through an income-based repayment plan, PSLF, or Borrowers Defense to Repayment will not negatively impact a borrower's credit score.

²² <https://studentaid.gov/manage-loans/forgiveness-cancellation/public-service>

²³ <https://studentaid.gov/data-center/student/loan-forgiveness/pslf-data>

loans forgiven in 2017 after starting to make payments in 2007. In response to the low percentage of applicants who got PSLF, in 2018 Congress appropriated \$700 million for a program called Temporary Expanded Public Service Loan Forgiveness (TEPSLF). Congress created TEPSLF for individuals who were rejected for PSLF because they were on an ineligible repayment plan²⁴. As of May 2019, only 1 percent of applications for TEPSLF were approved. Most applications for TEPSLF were denied because the applicant had not filed for PSLF first.

3 Literature Review

One strand of literature on student loan repayment consists of using estimated income streams to figure out how much student loan borrowers will pay with different repayment plans, how much this payment compares to their incomes and what proportion of the loans the government will collect from different repayment systems. Chapman and Dearden (2017) compare mortgage-style loans²⁵ and income-contingent loans. They argue that the repayment burden defined as the proportion of a debtor's income required to repay loans is the fundamental issue when considering student loan payment systems. They show that individuals that borrowed \$20,000 would have high repayment burdens if they were in the 10th or 20th quintile of the college graduate earnings distribution. Barr et al. (2019) conducts a similar but much larger modeling exercise that has similar results. In that study repayment burdens for different student loan repayment schemes are calculated for US borrowers. Higgins and Champman (2015) find that extending income-contingent loans to additional parts of the higher education system in Australia would

²⁴ Payments made on the Graduated, Extended, or Consolidated repayment plans counted towards TEPSLF but not towards PSLF. All other repayment plans counted towards both programs (GAO 2019).

²⁵ Mortgage style loans have repayment requirements like the default 10-year repayment plan. The minimum payment is calculated as a function of the amount borrowed and the repayment period rather than as a function of the borrower's income.

come with a subsidy ratio²⁶ as high as 60% if it used the same design as the rest of the Australian income-contingent loan system. Similar modeling of repayment burdens of different student loan repayment plans are done for Brazil (Dearden and Nascimento 2019) China (Cai et al. 2019) Japan (Armstrong et al. 2019) Ireland (Champan and Doris 2019) and Thailand (Champman et al 2010).

Because income-based repayment likely reduces student loan defaults and individuals may consider that when making their choice of repayment plans, I think it is worth exploring which factors are correlated with student loan default. Gross et al. (2009) reviews the literature up to 2007 on the correlates of student loan default. They find that many characteristics such as the amount of debt the borrower has, whether the borrower graduated, and what type of institution the borrower attended are associated with the probability of the borrower defaulting. The findings are similar in Hillman (2014) based on a multivariate analysis of student loan borrowers in the United States. Analyzing data on Canadian borrowers Wright et al. (2013) finds that level of schooling and field of study but not earnings are correlated with the probability of default. Looney and Yannelis (2015) uses administrative data on student loan borrowers in the United States to explain the recent rise in student loan defaults. They find that much of the increase is explained by the increasing number of borrowers attending schools with weak educational outcomes and low post-attendance earnings such as for-profit colleges. Using the same administrative data set Mueller and Yannelis (2019) finds that the decrease in home prices during the Great Recession explains part of the increase in student loan defaults in the years after the recession. Using longitudinal data from a United States credit bureau, Blagg (2018) finds that borrowers who default on student loans generally have other types of debt, low and declining credit scores, and reside in neighborhoods with more people of color and fewer people with B.A. degrees. Scott-Clayton (2019) uses longitudinal data on United States borrowers to conclude that the proportion of students who default on their loans continues to increase up to 20 years after entering repayment.

²⁶ A subsidy ratio is 100 minus the percent of the loan in present value terms that the government expects to collect in payments.

Three studies look at the effect that income-based repayment has on student loan default. Looking at descriptive statistics of borrowers who entered repayment from fiscal year 2010 to 2014 U.S. Government Accountability Office (2015) found that only 0.5% of borrowers in the Income-Based Repayment plan and 0.1% of borrowers in the Pay As You Earn Plan were in default compared to 14% of borrowers in the standard repayment plan. Mueller and Yannelis (2019) finds that income-based repayment reduced the number of student loan borrowers who defaulted on their loans in the years following the great recession²⁷. Herbst (2019) uses panel data of credit bureau records of student loan borrowers and quasi-experimental methodology²⁸ to determine the effect of income-based repayment on various financial outcomes. He finds that for delinquent borrowers having their repayment plan changed from the 10-year repayment plan to an income-based repayment plan substantially reduced the probability they default on their loans.

There are two studies that directly look at factors that influence United States student loan borrowers' repayment plan choices. Abraham et al. (2019) uses a survey of undergraduate students to study the effect of the framing of income-based repayment plans on repayment plan choice. They find that switching from a cost framing to an insurance framing increases the probability students will choose an income-based repayment plan²⁹. They also randomly varied the percent of income that determined

²⁷ The causal identification strategy in this paper was to use a triple difference specification with 3 sources of variation: house prices at the zip-code level, eligibility for Old IBR based on payments under Old IBR being less than payments on the standard plan, and the implementation of Old IBR in 2009.

²⁸ This paper uses data on delinquent borrowers who received calls from a loan servicer to help them deal with their delinquency. Some of the borrowers who received a call switched from the standard plan to an income-based plan at the time of the call. The paper uses a difference in difference specification comparing individuals who switched to an income-based plan to individuals who stayed on the standard plan. Similar pre-trends of switchers and non-switchers makes this identification strategy seem plausible. The author also uses an instrumental variables strategy based on which agent the borrower talked to during the call. Because agents are assigned mostly randomly the specific agent which the borrower talks to provides plausibly exogenous variation to explain why individuals did and did not switch repayment plans.

²⁹ Framing in Abraham et al. (2019) refers to the description of the 10-year and income-based repayment plans that students choose between. The neutral framing has no additional language. The cost framing describes how on the income-based repayment plan a student may end up paying more and for a longer period. In the insurance framing the student is told that the income-based repayment plan protects the student from default and unaffordable payments during periods of low income.

payment in the income-based plan between 15 percent and 20 percent. In their main specification they found that increasing payment as a percent of income by 1 percentage point decreased the probability of choosing the income-based plan by 1.1 percentage points. Cox et al. (2018) uses a laboratory experiment to explore various behavioral influences on student loan repayment plan choice. They find that default plan framing and reducing the number of choices have a significant effect on the proportion of students who choose income-based repayment plans. However, the paper also finds that providing students with additional information about earnings does not have a significant effect on repayment plan choice.

There is also a literature on loan choice in markets other than student loans. Basciano et al. (2008) summarizes the literature on mortgage choice up to 2008 focusing on the choice between a 15-year and a 30-year mortgage. Breuer et al. (2015) finds that individuals in longer-term oriented cultures take out shorter maturity loans while individuals with higher discount factors take out longer maturity loans. Atlas et al. (2015) finds that individuals with greater present bias are more likely to have an adjustable rate mortgage and spend a larger fraction of their income on mortgage payments. Hertzberg et al. (2018) finds evidence for an online lending platform that borrowers who are less likely to default select into shorter maturity loans.

My contribution to the literature is to be the first study to look at how changing the amount of exempt income and the number of years until loan forgiveness affect the probability that students choose an income-based repayment plan over a 10-year repayment plan. I look at different percentages of income than Abraham et al. (2019) do. I also look at the effect of simultaneously changing the percent income, amount of exempt income, and years until loan forgiveness at the same time.

4 Economics of Student Loan Repayment

Consider a student loan borrower who in a single month is deciding how much to pay down their student loan debt. The greater the payment the borrower makes, the faster they can pay off the debt and the less interest accrues on the debt. On the other hand, payments made on student loans is money that

cannot be used for other things such as consumption or saving. If a borrower has more income at a certain period, they will probably be more willing to make a larger student loan payment. This is a consequence of the diminishing marginal utility of income. The higher a person's income, the likelier that the value of reducing the interest accumulated on the loans and the desire to be debt free outweigh the additional consumption or savings that could be gotten from a smaller loan payment.

Now consider that borrower facing the choice about different repayment plans. In the context of federal government student loans, repayment plans determine the minimum level of payment needed to avoid default. Students may pay more than their minimum payment up to the entire value of the loan at any time without penalty. This means that smaller minimum payments strictly dominate larger minimum payments. Borrowers with smaller minimum payments can make the same level of payments as borrowers with larger minimum payments but the borrowers with smaller minimum payments have additional low payment choices. This leads to the prediction that all other things equal, borrowers will prefer the repayment plan with the smallest minimum payment.

In this study I consider income-based repayment plans with different amounts of exempt income and different percentages of non-exempt income determining payment. Let E be the amount of exempt income for an income-based repayment plan. Let P be the percent of non-exempt income determining payment for the same plan. Let I be a borrower's yearly income. You can calculate the minimum monthly payment of the borrower on the income-based repayment plan by using the following formula:

$$\text{Minimum Payment} = \frac{(I - E) * (\frac{P}{100})}{12}$$

Table 2 shows minimum monthly payments for different income-based repayment plans for a borrower with a \$50,000 annual income.

Table 2

Annual Income (I)	Exempt Income (E)	Percentage of Non-Exempt Income (P)	Minimum Payment Calculation	Minimum Monthly Payment
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\$50,000	\$20,000	5%	$\frac{(50,000 - 20,000) * 0.05}{12}$	\$125.00
\$50,000	\$20,000	10%	$\frac{(50,000 - 20,000) * 0.1}{12}$	\$250.00
\$50,000	\$30,000	5%	$\frac{(50,000 - 30,000) * 0.05}{12}$	\$83.33
\$50,000	\$30,000	10%	$\frac{(50,000 - 30,000) * 0.1}{12}$	\$166.67

The table shows that as the percentage of non-exempt income determining payment increases, the minimum payment increases. As the amount of exempt income increases, the minimum payment decreases. Therefore, I have the following hypotheses:

Hypothesis 1: Students will be more likely to choose the income-based repayment plan when the percentage of non-exempt income determining payment (P) in the income-based repayment plan is lower.

Hypothesis 2: Students will be more likely to choose the income-based repayment plan when the amount of income exempt (E) from the calculation to determine payments in the income-based repayment plan is higher.

With time-based repayment plans the entire loan is payed off in the designated period. However, for income-based repayment plans required payments might not cover the interest on the loans and the loans might never be paid off. To address this, income-based plans in the United States offer loan forgiveness after a certain number of years on the plan. If a borrower pays off their loans before the loan forgiveness goes into effect, then they do not get any loan forgiveness.

Like having a lower minimum payment, having a smaller number of years until loan forgiveness strictly dominates having a larger number of years until loan forgiveness. Consider a borrower facing the choice between two income-based repayment plans with different amounts of time until loan forgiveness. Either a borrower would pay off the loan before the smaller number of years until loan forgiveness or the borrower has some balance that is forgiven at the end of the smaller number of years. If the former, then

the number of years until loan forgiveness does not affect the borrower's utility. If the latter, then the borrower benefits from getting loan forgiveness quicker because they must make payments for a shorter period and pay a smaller amount of money overall. Therefore, I have the following hypothesis:

Hypothesis 3: Students will be more likely to choose the income-based repayment plan when the amount of time until loan forgiveness in the income-based repayment plan is lower.

5 Data and Sample

This paper analyzes data from an online survey³⁰ of undergraduate students at MSU³¹. MSU's Office of the Registrar sent an email explaining the survey and containing a link to it to 2000 undergraduate students once on Monday January 13th, 2020. They sent those students the same email again on Thursday January 16th, 2020. See Appendix A for screenshots of the survey. The survey asks students to imagine they have graduated from MSU with \$30,000 in student loan debt and are charged a 5% interest rate. They are also asked to assume that they are not allowed to change repayment plans and that they can pause payments if they attend graduate or professional school. Students are then shown a table with two different repayment plans labeled repayment plan 1 and repayment plan 2 with one plan being the 10-year repayment plan and the other being an income-based repayment plan. The plan that is repayment plan 1 is randomized for each respondent. The 10-year plan is described as follows: "Payments are set such that both the principal and the interest are paid off after 10 years". The income-based repayment plan is described as follows: "Payments are based on your total income last year. If you made less than \$X you pay nothing. If you made more than \$X a year your monthly payment is equal to Y% of

³⁰ The survey was designed and sent out to students using Qualtrics' online survey design software.

³¹ Among full-time beginning undergraduate students at MSU for the 2017-2018 academic year 40% of them took out federal student loans. The average loan amount among students who borrowed was \$5,210. Considering all undergraduate students in 2017-2018 academic year 42% of students took out federal student loans. The average amount that they borrowed was \$6,811. 8,343 former students who took out a federal loan to attend MSU began repayment in 2016. Among those students 3.4% of them defaulted within 3-years of entering repayment. This information is from <https://nces.ed.gov/collegenavigator/?q=Michigan+State+University&s=all&id=171100>.

your income above $\$X$ divided by 12. Any money that is still owed after Z years will be forgiven.” X (exempt income) is randomly chosen to either be 20,000 or 30,000. Y (percent of non-exempt income) is randomly chosen to be either 5 or 10. Z (years until loan forgiveness) is randomly chosen to be either 15 or 20. With two options for each of the three traits and two orders of the repayment plans there are a total of 16 tables i.e. treatments that a respondent could get. See Appendix D for a table of all the treatments.

Students are also asked a series of questions about their expectations. These include questions about their salary conditional on employment in $\$20,000$ intervals: 6 months after they finish school, when they are 30, and when they are 40³². This survey was designed with the idea that these salaries would be used for calculating payments under the hypothetical income-based plan^{33 34} and would therefore affect a respondent’s desire to choose the income-based plan. For those same time horizons students are asked about the probability they will be employed. They are also asked about their probabilities of graduating with an undergraduate degree in six years and ever obtaining a graduate or professional degree conditional on graduating with an undergraduate degree.

To measure risk aversion students are randomly asked 1 of 3 questions asking how much they will pay for a hypothetical lottery ticket that had a $Z\%$ chance of winning $\$W$ with (Z,W) either being $(30,130)$, $(15,45)$, or $(55,170)$ ³⁵. Using their response, I calculate a measure of risk aversion. This measure is the

³² The question which elicits expected income is worded as follows: “Assuming you are employed, how much do you think you will make (in terms of a yearly salary)” followed either by “6 months after you finish school”, “when you are 30 years old”, or “when you are 40 years old”. These questions ask about individual income not household income and so should not have included expected spousal income. The purpose of this question was to practice eliciting expected incomes from students and to be able to see if repayment plan choice was different based on an individual’s future income.

³³ The description of the income-based plan starts with the following line: “Payments are based on your total income last year.” The wording of the plan implies that payments are based solely on the borrower’s income without considering their spouses income if they are married. This means that respondents individual expected future income could have reasonably be expected to determine payment.

³⁴ A survey respondent might not have expected to have their payments based off their expected income conditional on employment because they considered the possibility that they would not be working. These expected incomes would still be what most respondents thought as the most likely basis for calculating payments under the income-based plan given the very high subjective probabilities of being employed at the 3 points in time. See Section 6.2 Table 4.

³⁵ This question was based off a question about risk aversion in Abraham et al. (2019) which asked students how much they would be willing to pay for a lottery ticket that offered a 50 percent chance of winning $\$500$ and a 50

amount of money the student was willing to pay for the lottery divided by the expected value of the lottery. The lower this number is, the more risk averse the student is assumed to be. Students are then asked how much student loan debt they have in intervals of \$5,000 and if they have ever had a Pell Grant³⁶. A final set of questions asks for the student's gender, if they are an international student, the student's race, the student's age, the highest education level of the student's parent or guardian, how many credits the student completed at MSU in intervals of 30 credits, and the college that the student's primary major is in. The survey ends by asking students for their email and signature. Students who completed the survey were sent a \$5 Amazon gift card using the email they entered. The emails informing students about the survey and the consent form at the begging survey informed students about the gift card compensation.

6 Results

6.1 Results Introduction

Out of 2000 students who were emailed, 169 of them submitted completed responses that were used in this paper³⁷. This gives the survey a response rate of 8.45%. The sample only includes first responses to the survey and excludes responses that did not include an email address. In all the figures, I estimate error bars using the normal approximation of the binominal distribution³⁸. Because of the small sample size of this study the percent of students who choose income-based repayment plans in each

percent chance of winning \$1000. The authors of Abraham et al. (2019) report that their lottery question did not yield useable results. Pedroni et al (2017) find that using different methods to elicit risk preferences for the same individuals produce difference absolute and relative measures of risk aversion for those individuals. They conclude individuals do not have a single stable risk preference that can be measured. The explanation of this question and its results are included in the paper for the purpose of describing all questions that were in the survey. If I elicit risk preferences in the future, I will use a different method of doing so.

³⁶ A Pell Grant is a grant given by DoEd to help low-income students pay for school. The grant amount is the difference between a student's estimated Cost of Attendance and their Expected Family Contribution. Having a Pell Grant can be thought of as a proxy for the student coming from a low-income family. See Protopsaltis and Parrott (2017) for more information.

³⁷ A 170th student submitted a response after the rest of the data were cleaned and analyzed. That student was sent a \$5 Amazon gift card, but their response is not included in the analysis in this paper.

³⁸ <https://www.statisticshowto.datasciencecentral.com/binomial-confidence-interval/>

subsample has large standard errors with confidence intervals ranging from about 20 percentage points to about 40 percentage points depending on the specific subsample in question. This makes most of the subsample proportions of respondents who chose an income-based repayment plan statistically indistinguishable from each other. Despite this, I will highlight interesting differences for the pilot study.

6.2 Sample Summary

Table 3 shows some summary characteristics of the sample and compares them to the undergraduate student population at MSU based on information from the College Navigator³⁹ and to the population of students in colleges and universities in the United States.

Table 3

	Percentage of Students in Sample	Percentage of Undergraduate Students at MSU	Percentage of College and University Students in the United States ⁴⁰
Female	65%	51%	57%
White	68%	68%	53%
Black or African American	12%	7%	13%
Hispanic or Latino	0%	5%	18%
Asian	14%	6%	7%
International Student	4%	9%	6%
25 and Over	2%	3%	37%
Receiving Pell Grant	46%	21% ⁴¹	31% ⁴²

The table shows several ways that the sample is not representative of the MSU undergraduate population. The sample has a significantly higher proportion of female, black or African American, Asian,

³⁹ <https://nces.ed.gov/collegenavigator/?q=Michigan+State+University&s=all&id=171100>

⁴⁰ https://nces.ed.gov/fastfacts/display.asp?id=372#College_enrollment. The data is for the fall 2019 semester. Accessed March 12, 2020

⁴¹ This statistic is for “Full-time Begging Undergraduate Students” where “Beginning students are those who are entering postsecondary education for the first time”. See <https://nces.ed.gov/collegenavigator/?q=Michigan+State+University&s=all&id=171100>

⁴² This number is for undergraduate students for the 2018 – 2019 academic year. The statistic comes from <https://research.collegeboard.org/trends/student-aid/figures-tables/pell-grants-recipients-maximum-pell-and-average-pell>.

and Pell Grant receiving students. The sample also has no Hispanic students while Hispanic students are 5% of the MSU undergraduate population. The sample has similar percentages of white students and students 25 and over as the MSU undergraduate population. The unrepresentativeness of the sample does not change the internal validity of the study. However, the unrepresentativeness of the sample and especially the much higher percentage of Pell Grant receiving students may mean that the MSU undergraduate population in general will respond to hypothetical changes in income-based repayment plans differently than the sample in this paper.

Comparing the sample population to the entire population of college and university students in the United States, the biggest discrepancy is in the proportion of students who are 25 and over. Only 2% of the sample population is 25 and over while 37% of the population of college and university students in the United States is 25 and over⁴³. Another large discrepancy between the survey population and the population of college and university students in the United States is in the proportion of Hispanic or Latino students. While Hispanics/Latinos are 18% of the population of college and university students in the United States, the sample does not have any responses from Hispanic or Latino students. Because of these differences the results in this paper may not generalize to the population of college and university students in the United States.

Table 4

	Mean	Standard Deviation	Minimum	Maximum
Employment Probability 6 Months After Graduating	75	23	5	100
Employment Probability when 30 Years Old	90	14	10	100

⁴³ The population of students is all students who are enrolled in a degree-granting postsecondary institution. Based on this description I believe the sample includes both undergraduate and graduate students. See https://nces.ed.gov/programs/digest/d18/tables/dt18_303.40.asp

Employment Probability when 40 Years Old	92	13	5	100
Probability that Respondent will Graduate	94	16	0	100
Probability Respondent will go to Graduate or Professional School	63	27	0	100
Age	20	2	18	34
Risk Aversion	0.64	0.90	0	6.67
N (Sample Size)	169			

Table 4 shows summary statistics for continuous covariates. While most people surveyed are very confident that they will be employed when they are 30 and 40 years old, there are at least a few individuals who do not expect to be employed at those times. There is significantly less confidence that respondents will be able to find employment 6 months after they graduate with only an average of 75% chance of employment and a relatively large standard deviation. Most individuals seem certain they will graduate from MSU with a 94% average graduation probability. The very low minimum values for all the probabilistic questions indicate that there are students in the sample with very different expectations about the future than the average respondent.

Table 5 summarizes the proportion of the sample who gave specific answers to various categorical questions in the survey.

Table 5

Variable	Answers	Percent of Sample Who Gave Corresponding Answer ⁴⁴
Expected Salary 6 Months after Graduation Conditional on Employment	\$0 - \$19,999	7%
	\$20,000 - \$39,999	27%
	\$40,000 - \$59,999	29%
	\$60,000 - \$79,999	31%
	\$80,000 - \$99,999	5%
	\$100,000 - \$119,999	2%

⁴⁴ The percent of respondents who gave specific answers to a question may not add up to 100 because of rounding.

	At least \$120,000	0%
Expected Salary when 30 Years Old Conditional on Employment	\$0 - \$19,999	1%
	\$20,000 - \$39,999	2%
	\$40,000 - \$59,999	20%
	\$60,000 - \$79,999	24%
	\$80,000 - \$99,999	25%
	\$100,000 - \$119,999	17%
	At least \$120,000	9%
Expected Salary when 40 Years Old Conditional on Employment	\$0 - \$19,999	0%
	\$20,000 - \$39,999	1%
	\$40,000 - \$59,999	12%
	\$60,000 - \$79,999	18%
	\$80,000 - \$99,999	25%
	\$100,000 - \$119,999	21%
	At least \$120,000	24%
Amount of Student Debt	\$0 - \$4,999	39%
	\$5,000 - \$9,999	13%
	\$10,000 - \$14,999	15%
	\$15,000 - \$19,999	8%
	\$20,000 - \$24,999	7%
	\$25,000 - \$29,999	5%
	\$30,000 - \$34,999	5%
	\$35,000 - \$39,999	2%
	At least \$40,000	6%
Highest Education Level of either Parent or Guardian	Did not complete high school	4%
	GED	2%
	High School Graduate	14%
	Some College	21%
	Associates Degree	5%
	Bachelor's degree	30%
	Some Graduate or Professional School	4%
	Completed Graduate or Professional School	20%
Number of Credits at MSU	0 – 29	18%
	30 – 59	24%
	60 - 89	20%
	90 – 119	26%
	120 – 149	9%
	At least 150	3%

College of Primary Major	Agriculture and Natural Resources	9%
	Arts and Letters	3%
	Communication Arts and Sciences	6%
	Education	8%
	Eli Broad College of Business	14%
	Engineering	19%
	James Madison ⁴⁵	1%
	Lyman Briggs ⁴⁶	4%
	Music	1%
	Natural Sciences	13%
	Nursing	5%
	Social Science	16%

Based on the table, the individuals in the sample have a variety of salary expectations, parents' education level, number of credits at MSU, and college of primary major. For example, looking at parent's education level indicates a variety of experiences from parents that could have informed students' educational and borrowing choices. For 14 percent of the sample the highest education level their parent received was a high school degree. For 20 percent of the sample at least one parent had completed graduate or professional school. The distribution of expected salaries shifts rightward (increases) as the students age indicating that the students expect to earn more over time.

Table 6 shows the number of respondents who saw either a specific parameter value or a specific combination of parameter values. Approximately the same number of individuals saw the higher and lower value of each parameter. Approximately the same number of individuals saw each combination of values of percent income, exempt income, and years until loan forgiveness. In the table, A% \$BK CY means respondents were shown an income-based repayment plan where payments were A% of their income above B thousand dollars and that any remaining balances would be forgiven after C years.

⁴⁵ James Madison offers undergraduate majors in Comparative Cultures and Politics, International Relations, Political Theory and Constitutional Democracy, and Social Relations and Policy. Students at MSU who want to work for the government or in policy advocacy generally do one of those majors.

⁴⁶ Lyman Briggs offers majors in the biological sciences, the environmental sciences, mathematics, computational sciences, and the physical sciences.

Table 6

Treatment	Number of Respondents
Percent Income: 5%	85
Percent Income: 10%	84
Exempt Income: \$20,000	88
Exempt Income: \$30,000	81
Years Until Loan Forgiveness: 15	85
Years Until Loan Forgiveness: 20	84
10% \$20K 20Y	22
5% \$20K 20Y	22
10% \$30K 20Y	20
5% \$30K 20Y	20
10% \$20K 15Y	21
5% \$20K 15Y	23
10% \$30K 15Y	21
5% \$30K 15Y	20

6.3 Balance Tests

One threat to the internal validity of this study is that factors that influence student’s choice of repayment plan might not be balanced across the higher and lower value of each parameter. To examine this, Appendix B contains tables that show the proportion or average value of the covariates by parameter value. They also show p-values for tests of a significant difference in proportion or average value by parameter value. See Appendix B for details about how p-values were calculated. 72 variables were tested for each parameter. For percent of non-exempt income determining payment the only variables that were

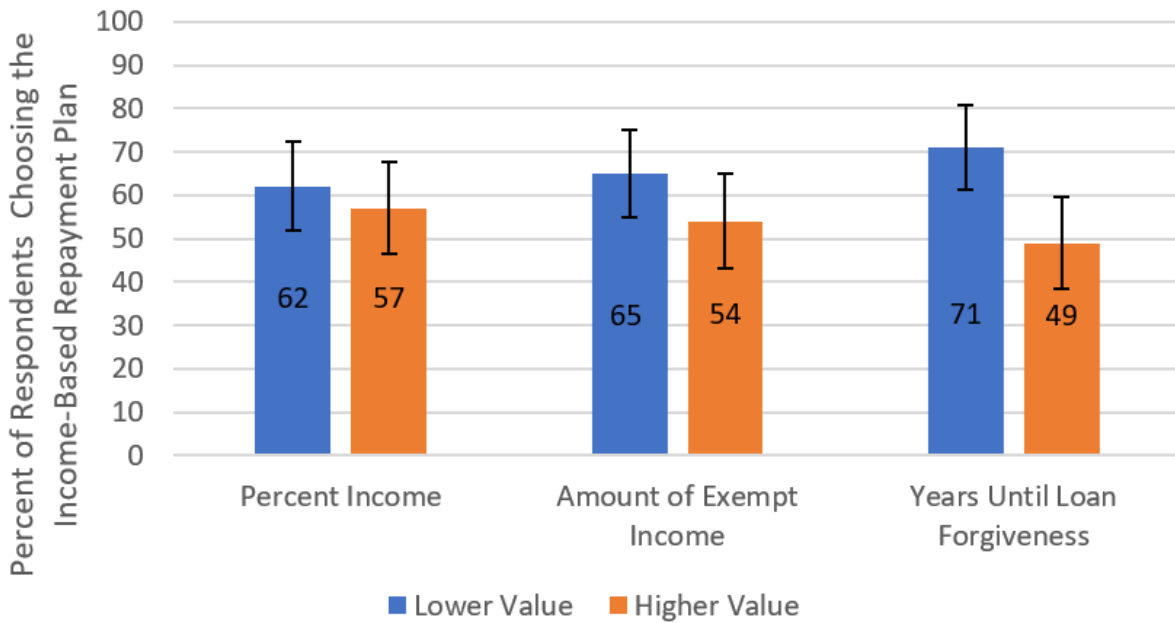
significantly different were Expected Salary 6 Months After Graduation: \$40,000 - \$59,999, Expected Salary 30 Years Old: \$80,000 - \$99,999, Expected Salary 30 Years Old: At Least \$120,000, and Student Debt Amount: \$0 - \$4,999. For amount of exempt income, the only variables that were significantly different were Expected Salary 30 Years Old: \$40,000 - \$59,999 and Employment Probability 6 Months After Graduation. For number of years until loan forgiveness the only variables that were significantly different were Expected Salary 40 Years Old: \$40,000 - \$59,999, MSU College: Arts and Letters, and Risk Aversion. With so many variables tested even if the covariates were distributed randomly by parameter value you would expect 5% of the variables or about 4 covariates to be significantly different for each parameter. This is approximately the number of significant covariates that I have for each parameter which is consistent with the parameter values being randomly assigned. The large difference in risk aversion by years until loan forgiveness may affect the results for that parameter. Risk aversion measures the ratio of how much a survey respondent would pay to play a hypothetical lottery compared to the expected value of the lottery. Students who saw an income-based repayment plan with loan forgiveness after 15 years paid had an average risk aversion measure about twice as high as students who saw an income-based repayment plan with loan forgiveness after 20 years. This might indicate that students who saw income-based repayment plans with loan forgiveness after 15 years were significantly less risk averse than the individuals who saw an income-based repayment plan with loan forgiveness after 20 years. If so, then former individuals might be more likely to choose the standard repayment plan than the latter individuals as the standard plan is more risky due to the lack of protection against low income.

6.3 Results Separate Parameters

Figure 1 shows the percent of respondents who chose the income-based repayment plan when they were shown an income-based repayment plan with either the higher or lower value of the parameter of interest.

Figure 1

Separate Parameters Results



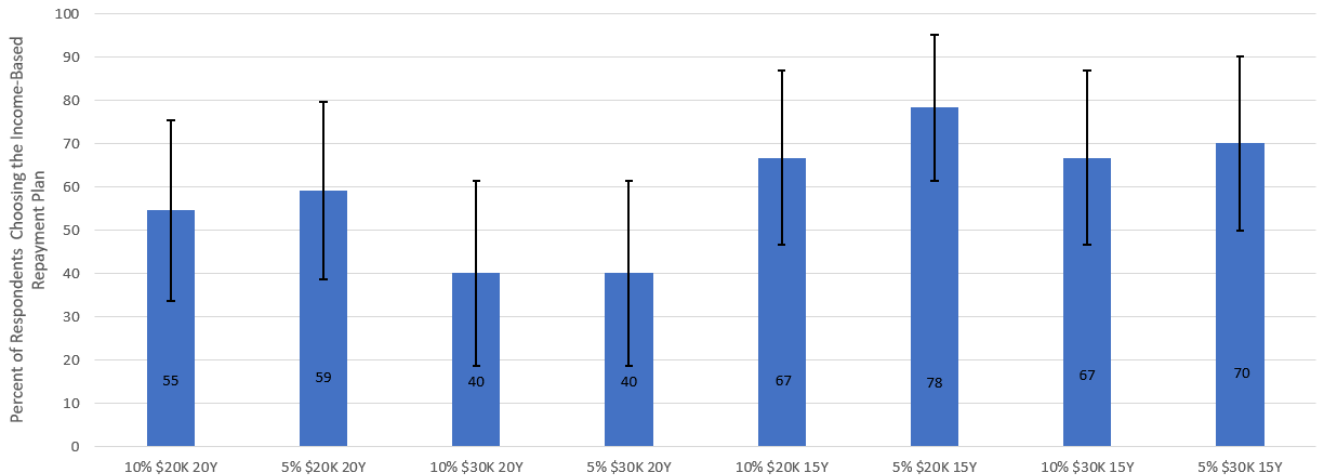
In my sample having a higher percent of non-exempt income determining payment, having a higher amount of exempt income, and having a higher number of years until loan forgiveness was associated with a decrease in the probability of choosing the income based repayment plan by 5, 11, and 22 percentage points respectively. Looking at the error bars, the only difference that is significant is the difference for loan forgiveness. The results for percent income and years until loan forgiveness are consistent with Hypothesis 1 and Hypothesis 3. However, the results for having a higher amount of exempt income are inconsistent with Hypothesis 2. That result means people are more likely to choose an income-based repayment plan that has a lower amount of exempt income. This might be due to students not understanding the relationship between exempt income and minimum payments.

6.4 Results 8 Treatments

Figure 2 shows the percent of respondents who chose an income-based repayment plan when they were shown a specific combination of percent of non-exempt income determining payment, exempt income, and years until loan forgiveness. In the chart, A% \$BK CY means respondents were shown an

income-based repayment plan where payments were A% of their income above B thousand dollars and that any remaining balances would be forgiven after C years.

Figure 2
8 Treatments Results



Several things stand out in this chart. One is that different parameter values are associated with large differences in the probability a student chose the income-based repayment plan. Almost twice the percent of respondents who saw the 5% \$20K 15Y income-based plan chose that plan compared to the percent of respondents who saw either the 10% \$30K 20Y or 5% \$30K 20Y plan and chose those plans. Looking only at the plans with loan forgiveness after 15 years, the percent of respondents choosing the income-based repayment plan stayed in a relatively narrow range varying only from 67% to 78%. The difference between the plans with 20 years until loan forgiveness are much greater with a range of the percentage of respondents choosing income-based repayment almost twice as large (19% vs 11%). The plans with 15 years until loan forgiveness have a noticeably higher proportion of respondents choosing the income-based repayment plan consistent with findings from the last section. In some cases, changing a single parameter was associated with little to no change in the percent of individuals who chose the income-based repayment plan. The same percent of individuals chose the income-based repayment plan for 10% \$30K 20Y and for 5% \$30K 20Y. The same percentage of respondents also chose the income-based plan for 10% \$20K 15Y and 10% \$30K 15Y. The confidence intervals on this chart are about 40 percentage

points wide so the only difference that is likely significant is the difference between 5% \$20K 15Y and either 5% \$30K 20Y or 10% \$30K 20Y.

6.5 Robustness Check: Removing International Students

There were 6 international students in the paper who were ineligible for DoEd loans because of their citizenship status. As a robustness check Appendix E reproduces the separate treatments results and the 8 treatments results with the international students removed. The results are very similar to the full sample results.

6.6 Heterogeneity: Pell Grants

Appendix F contains figures that show the percent of respondents who chose an income-based repayment plan based on both a specific parameter value and if the student had a Pell Grant. I had no expectations prior to doing the analysis about if and how students who had a Pell Grant made repayment plan choices differently from students who did not have a Pell Grant. The point of this analysis is to see if the high proportion of students in the sample who have a Pell Grant compared to both the population of undergraduate students at MSU and the population of college and university students in the United States would by itself prevent the findings in this paper from generalizing to those broader populations.

For students who did not have a Pell Grant increasing the percent of income that determined payment was only associated with decreasing the probability of choosing an income-based repayment plan by one percentage point. For respondents who had a Pell Grant, decreasing the percentage of income that determined payment was associated with increasing the probability of choosing the income-based repayment plan by 12 percentage points. Decreasing the amount of exempt income from \$30,000 to \$20,000 was associated with decreasing the probability of choosing an income-based repayment plan for students with Pell Grants by two percentage points. For respondents without a Pell Grant this change was associated with increasing the probability the respondent chooses an income-based repayment plan by 12 percentage points. For years until loan forgiveness, decreasing the number of years until loan forgiveness was associated with increasing the probability a respondent will choose an income-based

repayment for respondents with and without a Pell Grant. The increase was 13 percentage points for respondents without a Pell Grant and almost three times as large an increase of 33 percentage points for students with a Pell Grant. The different response to the parameter changes for students with and without a Pell Grant provides evidence that the results from this sample with a high percentage of respondents with Pell Grants will likely not generalize to the MSU undergraduate population or the population of college and university students in the United States.

6.7 Heterogeneity: Salary Expectation

Appendix G contains figures exploring the different effects of changing the parameters of the income-based repayment plan for different salary expectations. I define the respondent as high salary if they selected an expected salary 6 months after graduation conditional on employment of greater than or equal to \$60,000 and I define them as low salary otherwise. This cutoff was chosen to split the sample as evenly as possible. 39% of the sample has a high salary and 61% of the sample has a low salary.

This heterogeneity analysis was done to see if changing the parameters of the income-based plan would affect the ability of individuals who chose the income-based plan to pay their loans. Knowing this would be important for trying to design cost neutral plan changes. The lower the salary of individuals who are induced to choose the income-based plan because of a parameter change, the higher the cost the change will be to the government. Individuals with lower salaries while in income-based plans have lower required minimum payments and are more likely to have balances that are never repaid because they get loan forgiveness.

Changing the percent of income determining payment will change the required minimum payment for the income-based plan by the same proportion regardless of an individual's income. Therefore, I do not expect changing this parameter to differentially effect high and low salary individuals.

An increase in the amount of exempt income matters less for high salary individuals than low salary individuals because this change causes the minimum payment to decrease by a higher proportion

for low salary individuals compared to high salary. See Appendix G for the algebra behind this relationship. Therefore, I predict that low salary individuals will change their behavior more when the amount of exempt income is changed than high salary individuals will.

Low salary individuals are likely to have balance left to be forgiven at the end of the designated time period regardless of how long that time period is. In contrast high salary individuals are more likely to only get loan forgiveness if the number of years until loan forgiveness is smaller. Therefore, I predict that high salary individuals will change their behavior more when the amount of exempt income is changed than low salary individuals will.

Figures G1, G2, and G3 all show that individuals with a high salary were less likely to choose an income-based repayment plan than individuals with low salary. Figure G1 shows that reducing the percent of income determining repayment from 10% to 5% was associated with increasing the percent of respondents choosing the income-based repayment plan by 10 percentage points for low salary individuals but only by 6 percentage points for high salary individuals. The difference in point estimates is consistent with my hypothesis that low and high salary individuals should respond to this parameter the same way. Figure G2 shows that increasing the amount of exempt income from \$20,000 to \$30,000 was associated with decreasing the percent of low salary individuals who chose an income-based repayment plan by 3 percentage points. This change for high salary individuals was 22 percentage points. This is the opposite of the pattern I predicted based on the proportion change in minimum payments by salary. Like the main analysis it is also the case that both low and high salary individuals are more likely to choose an income-based plan with an amount of exempt income that increases their minimum payment. Figure G3 shows that increasing the number of years until loan forgiveness from 15 years to 20 years decreased the percent of low salary individuals who chose the income-based plan by 17 percentage points. For high salary individuals the decrease was 29 percentage points. This larger change for high salary individuals is consistent with my prediction.

6.8 Heterogeneity: Gender

Appendix H contains figures that show the percent of respondents who chose an income-based repayment plan based on both a specific parameter value and if the student was either male or female. I had no expectations prior to doing the analysis about if and how male and female students made repayment plan choices differently from each other. The point of this analysis is to see if the high proportion of female students in the sample compared to both the population of undergraduate students at MSU and the population of college and university students in the United States would by itself prevent the findings in this paper from generalizing to those broader populations. For all the results in Appendix H the two respondents who reported their gender as “other” were dropped. In Appendix H 65% of the respondents were female and 35% were male.

All the figures in Appendix H show that females are somewhat more likely than males to choose the income-based repayment plan. The charts also show that the effect of changing the parameters is similar for both genders. Figure H1 shows that decreasing the percent income that determines the borrower’s minimum payment decreases is associated with increasing the percent of respondents who choose the income-based repayment plan by 4 percentage points for males and 5 percentage points for females. Figure H2 shows that increasing the amount of exempt income is associated with decreasing the percent of respondents who choose income-based repayment by 13 percentage points for males and by 9 percentage points for females. Figure H3 shows that decreasing the number of years until loan forgiveness decreases is associated with increasing the percent of respondents choosing the income-based repayment plan by 17 percentage points for males and by 23 percentage points for females. All this indicates at most mild levels of generalizability issues due to the high proportion of women in the sample.

7 Conclusion

7.1 Summary of Paper

This study asks whether the parameters of income-based repayment plans influence student's repayment plan choice. Using a survey experiment fielded to undergraduate students at MSU I find suggestive evidence that parameter values affect repayment plan choice. The study provides suggestive evidence that changing the amount of exempt income, the percent of non-exempt income that determines payment, and the number of years until loan forgiveness in the income-based plan will change how many students choose income-based repayment plans. The direction of the change was consistent with my hypotheses for the percent of non-exempt income determining payment and the number of years until loan forgiveness. However, the change was the opposite of my hypothesis for exempt income. When the amount of exempt income was increased respondents were less likely to choose the income-based repayment plan even though that change reduced minimum student loan payments.

7.2 What I Did and Did not Learn Doing this Research

Things I learned doing this research include:

That fielding a survey experiment to undergraduate students at MSU is possible by requesting that the Office of the Registrar send out the survey.

That survey questions should not be asked simply because they were asked in another article or because it is easy for the student to give the researcher the information. Instead, survey questions should be asked to answer specific research questions such as being a theoretically important covariate or to allow the researcher to do a specific heterogeneity analysis that they think will be significant. Extra information takes time to process and present in papers with little additional insight.

That it is much easier to work with continuous data and understand results those data compared to having responses in intervals. Therefore, I think continuous data should be asked for whenever possible.

That a short description of an income-based repayment plan is not enough for testing how individuals respond to changes in the parameters of an income-based repayment plan. The counter intuitive result for amount of exempt income might be due to misunderstanding the plan. A future survey should include both a clear description of the plans including examples of payments over time and questions to make sure individuals understand the plans.

That using emails at MSU to get a sample of voluntary responses will have biases such as over representation of females and students with Pell Grants.

That a question asking if students have any loans when they take the survey should be asked because changing the design of the income-based repayment plan can only affect students who take out student loans. Those students are different from students who do not have student loans. Asking such a question will allow me to see if the response to changing the income-based repayment plan is different based on whether the respondent has loans.

That income-based repayment plan parameters likely affect repayment plan choice

Things I did not learn doing this research include:

If my findings apply to broader populations such as all undergraduate students at MSU because the sample is not representative of even the broader MSU population

If my findings apply when students face a choice of repayment plan for their own student loans with actual stakes attached. It might be the case that students will act very differently when responding in a hypothetical situation compared to facing a situation with long term consequences⁴⁷.

If my findings apply to different descriptions of the income-based repayment plan.

⁴⁷ See Loomis (2011) for a discussion of hypothetical bias in the case of stated preference valuation studies.

If the amount of money a student borrowed affects how they respond to different income-based repayment plan parameters.

If students respond differently to changes in the parameters of income-based repayment plans based on whether or not the student graduated from college.

If my results are due to random chance rather than a causal effect of the plan change.

This is because my sample was small especially when considering the 8 treatments separately or when looking for heterogenous treatment effects.

7.3 Future Work: Interviews

The next project I want to do to build off this research is to interview students who took the pilot survey. During the interview I want to ask the students about why they answered the questions the way that they did. I want to do this to learn if students understood the questions. I also want to learn how the students thought about answering the questions so I can create a better survey for future research projects. I especially want to understand how students responded to my description of the standard and income-based repayment plans and how their answers might change if I changed which details I included about the plan (such as saying students could switch plans later) or included more information about the plan (such as estimated minimum payment amounts and estimated time to pay off the loan). I plan on doing this by sending emails to all the students who took the survey saying I am looking for 10 students to interview about their answers. Students who complete the interview will be sent a \$15 Amazon gift card.

7.4 Future Work Idea 1: Low Income Expectations and Repayment Plan Choice

One way to conceptualize income-based repayment is as insurance against large repayment burdens. Students do not know what their future incomes are. Some students have incomes that are much lower than they expect, and this makes it hard for them to repay their student loan debt. Income-based repayment ensures that repayment burdens will be manageable when the student has a low income. One

reason individuals may not choose income-based repayment plans is that they have overly optimistic assumptions about the probability they will have a low income. If they were informed about this, students might be more likely to choose an income-based repayment plan.

In order to test this I could randomly provide survey respondents with information on the historical probability that individuals with their major have had a low income⁴⁸. I could calculate this by looking at panel data that contains information on respondent's majors such as the Panel Study of Income Dynamics. I could also use a cross-sectional survey such as the American Community Survey to inform students about what proportion of individuals with their major made below a certain income⁴⁹. I could then ask respondents to choose between an income-based repayment plan and a 10-year repayment plan. I could also ask all respondents about their expectations that they will have low incomes to see if informing them about the probability of low income changes their low-income expectations. I could then ascribe all the changes in repayment plan choice between the treatment and control group to the changes that the information made with regards to low income expectations.

7.5 Future Work Idea 2: Income-Based Repayment and Short-Term Moral Hazard

Income-based repayment provides borrowers with insurance against low incomes relative to their student loan debt. Does income-based repayment involve moral hazard i.e. do students change their behavior in response to this protection provided by either having higher student debt levels or lower future incomes⁵⁰?

⁴⁸ The definition of low income is one of the things I would want to get feedback on from my advisors. Some ideas I have defining low income are income below a certain salary such as 150% of the poverty line for a family of two and an income equal to 50% of the median income of graduates with a given major.

⁴⁹ Altonji et al. (2014) use data from the National Survey of College Graduates and the American Community Survey to look at earnings differentials by college major. Wiswall and Zafar (2015) use the National Survey of College Graduates to estimate average earnings by college major at age 30. Abraham et al (2019) calculate distributions of earnings in broad major categories using data from the American Community Survey.

⁵⁰ The only study I am aware of that looks at the effect of income-based repayment on student behavior is Evans and Boatman (2019). In that paper high school seniors were randomly given information about federal student loans which included information on the advantages of income-based repayment. They found that the information reduced treated student's aversion to borrowing. Using classroom level variation, they also found suggestive but not

I propose studying the short-term effect of income-based repayment on the behavior of college students. To do this I propose doing an information experiment on freshmen borrowers at MSU. I propose informing all the borrowers of some basic information about DoEd student loans such as what the interest rate is, what delinquency is, and what the consequences of default are. 1/3rd of the sample would only receive this information and be the control group. I propose informing 2/3rds of the sample about the variety of income-based repayment plans that the federal government offers. I propose informing half of the individuals informed of income-based repayment why income-based repayment is beneficial including walking them through example payments under income-based repayment given hypothetical income streams with spells of unemployment. I propose following these students for as long as I can. I think students make a variety of decisions that might be influenced by knowledge of income-based repayment including major choice, level of borrowing, amount of time spent working, and amount of credits taken a semester. Ideally, I would collect administrative data on these students from MSU. To the extent that was not possible or to collect data on things the university did not keep track of I could have the MSU Office of the Registrar send emails out to freshmen asking them to participate in the study. If students who participated gave me their emails, I could reach out to them at the beginning of every semester. I could incentivize them to continue participating in the study using Amazon gift cards.

7.6 Future Work Idea 3: Repayment Plans as Providing a Lower Bound on a Choice Set

One key feature of DoEd student loans is that there is no penalty for pre-payment. The result of this is that repayment plans only set a minimum level of payment borrowers need to make to avoid default. Although I have had a hard time figuring out what is the frequency of students paying off their loans early, one report by the Consumer Financial Protection Bureau (Consumer Financial Protection Bureau Office of Research 2017) suggests that a large proportion of students pay off their loans within 10

statistically significant evidence that treated students were more likely to enroll in any college, more likely to enroll in a 4-year college, and less likely to enroll in a 2-year college.

years of entering repayment. The only way students on the standard plan could pay off their loans in less than 10 years is by making more than the minimum payment. Minimum payments are also capped at the level of the 10-year repayment plan except for REPAYE which has no minimum payment cap or ICR which caps minimum payments such that the loan is paid off in 12 years. Much of the modeling of student loan repayment plans assumes that individuals only make the minimum payment on their loans. If this is largely untrue then the budgetary effects of different student loan parameters especially the interest rate may be very different from those in the models. My conversations with students suggest that unless they are prompted students do not think about the ability to pay off their loans early without penalty when making a choice between different repayment plans. If their attention was drawn to this, they may change what repayment plan choices they make.

I propose exploring these issues by surveying students about their repayment plan choices. Like the pilot survey students would be given a choice between a 10-year repayment plan and an income-based repayment plan. Half of the sample would be told that there is a penalty for making payments larger than the minimum payment. The other half of the sample would be told that payment levels are only minimum payments and that there is no penalty for making payments above the minimum payment on their chosen repayment plan. Students who were told this would be asked if they would make payments above the minimum. Students who said they would make payments above the minimum would be asked questions about under what circumstances would they make payments above the minimum and what level of payments they would make. Any difference between the treatments in the proportion of respondents who chose the income-based plan could be attributed to the different information about pre-payment penalty. Both samples would also be asked questions about their income expectations. This would allow me to calculate the budget costs of the loans of the individuals in the two samples and to see how it would change with the early payment of the loans.

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Appendix A: Survey Screenshots

Student Loan Repayment Pilot Survey Consent Form

You are being asked to participate in a research study about student loan repayment plan choice.

The study is part of the researcher's (Joshua Brownstein) dissertation research. This research is being supervised by Michigan State University (MSU) economics professor Scott Imberman.

You are being asked to answer questions in an online pilot survey related to: student loan repayment plans, expectations about future employment earnings, educational experiences, and demographic information

Your answers will help the researchers design a survey which they are planning on administering to undergraduate students at MSU

No identifiable information about you will be used or published in this study

The survey should take less than 15 minutes to complete

In order to participate in this research, you must be at least 18 years old.

Participation in this research project is completely voluntary. You have the right to say no. You may change your mind at any time and withdraw. In order to get to the next page of the survey you must answer all the question on the current page of the survey. You may stop taking the survey at any time.

Upon successful completion of the survey you will be asked to type in your MSU email. This email will be used to email you a \$5 Amazon gift card. The gift card will be emailed to you within 4 weeks of the completion of the survey.

If you have any questions or concerns about this study please contact one of the following people

Joshua Brownstein (Graduate Student Researcher): brown740@msu.edu, 352-213-9125, or with a letter to Joshua Brownstein sent to 486 W. Circle Drive, 110 Marshall-Adams Hall, East Lansing, MI 48824 (This is the address for the MSU economics department.)

Scott Imberman (Faculty Supervisor): imberman@msu.edu, 517-355-4667, or 486 W. Circle Drive, 25D Marshall-Adams Hall, East Lansing, MI 48824

By selecting I Consent below, you agree that you are over 18 years of age, you agree to the stipulations outlined above, and you consent to continuing with the survey.

I Consent

Imagine the following scenario.

You have just graduated from MSU with \$30,000 in debt.

You are now required to pick one of the following repayment plans.

The interest rate for both repayment plans is 5%.

Payments for both plans are due the first day of each month.

You can not change repayment plans once one is picked.

If you attend either graduate or professional school you may pause payments under either plan.



Repayment Plan 1	Repayment Plan 2
Payments are set such that both the principal and the interest and paid off in 10 years	Payments are based on your total income last year. If you made less than \$30,000 you pay nothing. If you made more than \$30,000 a year your monthly payment is equal to 10% of your income above \$30,000 divided by 12. Any money that is still owed after 20 years will be forgiven.

Which repayment plan would you choose?

Repayment Plan 1

Repayment Plan 2

Assuming you are employed, how much do you think you will make (in terms of a yearly salary) 6 months after you finish school?

- \$0 - \$19,999
- \$20,000 - \$39,999
- \$40,000 - \$59,999
- \$60,000 - \$79,999
- \$80,000 - \$99,999
- \$100,000 - \$119,999
- At least \$120,000



What is the probability in percent (15 means 15 out of 100) that you are employed 6 months after you finish school?

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

Probability



Assuming you are employed, how much do you think you will make (in terms of a yearly salary) when you are 30 years old?

- \$0 - \$19,999
- \$20,000 - \$39,999
- \$40,000 - \$59,999
- \$60,000 - \$79,999
- \$80,000 - \$99,999
- \$100,000 - \$119,999
- At least \$120,000



What is the probability in percent (15 means 15 out of 100) that you are employed when you are 30 years old?

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

Probability



Assuming you are employed, how much do you think you will make (in terms of a yearly salary) when you are 40 years old?

\$0 - \$19,999

\$20,000 - \$39,999

\$40,000 - \$59,999

\$60,000 - \$79,999

\$80,000 - \$99,999

\$100,000 - \$119,999

At least \$120,000

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What is the probability in percent (15 means 15 out of 100) that you are employed when you are 40 years old?

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

Probability



What is the probability in percent (15 means 15 out of 100) that you will graduate with a bachelors degree in the next 6 years?

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

Probability



Assuming you graduate with a bachelors degree, what is the probability in percent (15 means 15 out of 100) that you will obtain a graduate or professional degree?

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

Probability



Suppose that you were able to buy a lottery ticket that had a 15% of winning and that the prize was \$45 (if you do not win you get nothing). How many dollars would you be willing to pay for the ticket?

0 2.5 5 7.5 10 12.5 15 17.5 20 22.5 25 27.5 30 32.5 35 37.5 40 42.5 45

Dollars



How much student loan debt do you currently have?

\$0 - \$4,999

\$5,000 - \$9,999

\$10,000 - \$14,999

\$15,000 - \$19,999

\$20,000 - \$24,999

\$25,000 - \$29,999

\$30,000 - \$34,999

\$35,000 - \$39,999

At least \$40,000

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Have you ever gotten a Pell Grant?

Yes

No

What is your gender?

Male

Female

Other

Are you an international student?

Yes

No

What is your race?

White

Black or African American

American Indian or Alaska Native

Asian

Native Hawaiian or Pacific Islander

Other

What is your age?

0 5 10 15 20 25 30 35 40 45 50 55 60

Age in Years



What was the highest level of education your parent(s) or guardian(s) have (has) achieved?

Did not complete high school

GED

High school graduate

Some college

Associates Degree

Bachelors Degree

Some graduate or professional school

Completed graduate or professional school

How many credits have you completed at MSU?

0 - 29

30 - 59

60 - 89

90 - 119

120 - 149

At least 150

Which college is your primary major in?

Agriculture and Natural Resources

Arts and Letters

Communication Arts and Sciences

Education

Eli Broad College of Business

Engineering

Human Medicine

James Madison

Lyman Briggs

Music

Natural Sciences

Nursing

Social Science

Thank you for completing the survey. As compensation you have earned a \$5 Amazon gift card. Please enter your MSU email below. Your giftcard will be emailed to you in the next couple of weeks.

MSU Email

Signature: Please sign your name or initials below



Appendix B: Balance Tests

For categorical variables I calculated p-values by regressing an indicator for the higher parameter value on an indicator for having the trait being considered. For example, the p-value for Female for Percent Income was calculated by regressing an indicator for seeing an income-based repayment plan with a minimum payment equal to 10% of non-exempt income on an indicator for the student being a female. The idea is to see if being a female predicts having seen an income-based repayment plan with a minimum payment equal to 10% rather than 5% of non-exempt income when the student made their plan choice. The p-value is the p-value which test if the coefficient on the covariate's indicator variable is different from 0. The regression did not use robust standard errors to make it more likely that the covariate would significantly predict being shown a specific parameter value.

For continuous variables the p-value is from a two-sided t-test of the hypothesis that the mean values of the continuous variable are equal for both values of the parameter.

For both types of variables, a star (*) indicates that the difference in the samples for each parameter is significant at the 5% level.

Table B1 Percent Income Determining Payment Categorical Variables

Covariate	Percent of Respondents who saw the parameter value		Difference in Percentage Points	P-Value
	5%	10%		
Female	67%	62%	5	0.49
Male	32%	37%	-5	0.49
Other Gender	1%	1%	0	0.99
White	66%	70%	-4	0.55
Black or African American	12%	12%	0	0.98
Asian	16%	11%	5	0.28
American Indian or Alaska Native	0%	1%	-1	0.32
Other Race	6%	6%	0	0.99
International Student	4%	4%	0	0.99
Has Pell Grant	44%	48%	-4	0.60

Expected Salary 6 Months After Graduation: \$0 - \$19,999	8%	5%	3	0.36
Expected Salary 6 Months After Graduation: \$20,000 - \$39,999	31%	23%	8	0.24
Expected Salary 6 Months After Graduation: \$40,000 - \$59,999	19%	40%	-21	0.00*
Expected Salary 6 Months After Graduation: \$60,000 - \$79,999	33%	30%	3	0.66
Expected Salary 6 Months After Graduation: \$80,000 - \$99,999	6%	4%	2	0.48
Expected Salary 6 Months After Graduation: \$100,000 - \$119,999	4%	0%	4	0.08
Expected Salary 30 Years Old: \$0 - \$19,999	1%	1%	0	0.99
Expected Salary 30 Years Old: \$20,000 - \$39,999	2%	2%	0	0.99
Expected Salary 30 Years Old: \$40,000 - \$59,999	20%	20%	0	0.97
Expected Salary 30 Years Old: \$60,000 - \$79,999	28%	20%	8	0.23
Expected Salary 30 Years Old: \$80,000 - \$99,999	16%	35%	-17	0.01*
Expected Salary 30 Years Old: \$100,000 - \$119,999	16%	18%	-2	0.81
Expected Salary 30 Years Old: At Least \$120,000	15%	4%	11	0.01*
Expected Salary 40 Years Old: \$20,000 - \$39,999	1%	0%	1	0.32

Expected Salary 40 Years Old: \$40,000 - \$59,999	13%	11%	2	0.66
Expected Salary 40 Years Old: \$60,000 - \$79,999	14%	21%	-7	0.22
Expected Salary 40 Years Old: \$80,000 - \$99,999	27%	23%	4	0.51
Expected Salary 40 Years Old: \$100,000 - \$119,999	20%	23%	-3	0.68
Expected Salary 40 Years Old: At Least \$120,000	25%	23%	2	0.75
Student Debt Amount: \$0 - \$4,999	31%	48%	-17	0.02*
Student Debt Amount: \$5,000 - \$9,999	13%	13%	0	0.98
Student Debt Amount: \$10,000 - \$14,999	20%	11%	9	0.10
Student Debt Amount: \$15,000 - \$19,999	8%	7%	1	0.79
Student Debt Amount: \$20,000 - \$24,999	9%	5%	4	0.24
Student Debt Amount: \$25,000 - \$29,999	4%	6%	-2	0.46
Student Debt Amount: \$30,000 - \$34,999	7%	4%	3	0.32
Student Debt Amount: \$35,000 - \$39,999	4%	0%	4	0.08
Student Debt Amount: At Least \$40,000	5%	7%	-2	0.51
Parents Education Level: Did not complete high school	4%	5%	-1	0.69
Parents Education Level: GED	1%	1%	0	0.99

Parents Education Level: High School Graduate	18%	11%	7	0.20
Parents Education Level: Some College	21%	21%	0	0.97
Parents Education Level: Associates Degree	4%	7%	-3	0.30
Parents Education Level: Bachelor's Degree	26%	35%	-9	0.22
Parents Education Level: Some graduate or professional school	5%	2%	3	0.42
Parents Education Level: Completed graduate or professional school	22%	18%	4	0.47
Credits at MSU: 0 - 29	15%	20%	-5	0.40
Credits at MSU: 30 - 59	21%	26%	-5	0.45
Credits at MSU: 60 - 89	19%	21%	-2	0.68
Credits at MSU: 90 - 119	31%	21%	10	0.18
Credits at MSU: 120 - 149	12%	7%	5	0.31
Credits at MSU: At least 150	2%	4%	2	0.64
MSU College: Agriculture and Natural Resources	8%	11%	-3	0.59
MSU College: Arts and Letters	1%	5%	-4	0.17
MSU College: Communication Arts and Sciences	7%	5%	2	0.53
MSU College: Education	12%	5%	7	0.10
MSU College: Eli Broad College of Business	13%	15%	-2	0.64
MSU College: Engineering	18%	21%	-3	0.54
MSU College: James Madison	1%	0%	1	0.32
MSU College: Lyman Briggs	4%	5%	-1	0.69

MSU College: Music	0%	1%	-1	0.32
MSU College: Natural Sciences	13%	13%	0	0.98
MSU College: Nursing	5%	6%	-1	0.72
MSU College: Social Science	19%	13%	6	0.31

Table B2 Percent Income Determining Payment Continuous Variables

Covariate	5%	10%	Difference in Means	P-Value
Employment Probability 6 Months After Graduation	75%	75%	0	0.92
Employment Probability when 30 Years Old	89%	92%	-3	0.12
Employment Probability when 40 Years Old	90%	94%	-4	0.13
Probability of Graduating from MSU	95%	93%	2	0.40
Probability of Attending Graduate or Professional School	66%	60%	6	0.11
Age	20	20	0	0.37
Risk Aversion	0.68	0.61	0.07	0.60

Table B3 Exempt Income Categorical Variables

Covariate	Percent of Respondents who saw the parameter value		Difference in Percentage Points	P-Value
	\$20,000	\$30,000		
Female	61%	68%	-7	0.38
Male	36%	32%	4	0.56
Other Gender	2%	0%	2	0.17
White	70%	65%	5	0.49
Black or African American	13%	11%	2	0.78
Asian	10%	17%	-7	0.18
American Indian or Alaska Native	1%	0%	1	0.34
Other Race	6%	6%	0	0.89
International Student	2%	5%	-3	0.35
Has Pell Grant	45%	46%	-1	0.98
Expected Salary 6 Months After Graduation: \$0 - \$19,999	8%	5%	3	0.43
Expected Salary 6 Months After	20%	33%	-13	0.06

Graduation: \$20,000 - \$39,999				
Expected Salary 6 Months After Graduation: \$40,000 - \$59,999	34%	23%	11	0.13
Expected Salary 6 Months After Graduation: \$60,000 - \$79,999	32%	31%	1	0.90
Expected Salary 6 Months After Graduation: \$80,000 - \$99,999	5%	5%	0	0.91
Expected Salary 6 Months After Graduation: \$100,000 - \$119,999	1%	2%	-1	0.52
Expected Salary 30 Years Old: \$0 - \$19,999	1%	1%	0	0.95
Expected Salary 30 Years Old: \$20,000 - \$39,999	3%	1%	2	0.36
Expected Salary 30 Years Old: \$40,000 - \$59,999	14%	27%	-13	0.03*
Expected Salary 30 Years Old: \$60,000 - \$79,999	24%	25%	-1	0.90
Expected Salary 30 Years Old: \$80,000 - \$99,999	21%	30%	-9	0.20
Expected Salary 30 Years Old: \$100,000 - \$119,999	19%	15%	4	0.44
Expected Salary 30 Years Old: At Least \$120,000	9%	10%	-1	0.86
Expected Salary 40 Years Old: \$20,000 - \$39,999	1%	0%	1	0.34
Expected Salary 40 Years Old: \$40,000 - \$59,999	10%	14%	-4	0.50
Expected Salary 40 Years Old: \$60,000 - \$79,999	14%	22%	-8	0.15

Expected Salary 40 Years Old: \$80,000 - \$99,999	28%	21%	7	0.27
Expected Salary 40 Years Old: \$100,000 - \$119,999	24%	19%	5	0.40
Expected Salary 40 Years Old: At Least \$120,000	23%	25%	-2	0.77
Student Debt Amount: \$0 - \$4,999	42%	36%	6	0.41
Student Debt Amount: \$5,000 - \$9,999	11%	15%	-4	0.51
Student Debt Amount: \$10,000 - \$14,999	17%	14%	3	0.54
Student Debt Amount: \$15,000 - \$19,999	8%	7%	1	0.90
Student Debt Amount: \$20,000 - \$24,999	3%	11%	-8	0.05
Student Debt Amount: \$25,000 - \$29,999	7%	2%	5	0.19
Student Debt Amount: \$30,000 - \$34,999	7%	4%	3	0.37
Student Debt Amount: \$35,000 - \$39,999	0%	4%	-4	0.07
Student Debt Amount: At Least \$40,000	5%	7%	-2	0.43
Parents Education Level: Did not complete high school	2%	6%	-4	0.21
Parents Education Level: GED	1%	1%	0	0.95
Parents Education Level: High School Graduate	14%	15%	-1	0.83
Parents Education Level: Some College	18%	25%	-7	0.31
Parents Education Level: Associates Degree	6%	5%	1	0.83

Parents Education Level: Bachelor's Degree	34%	26%	8	0.25
Parents Education Level: Some graduate or professional school	2%	5%	-3	0.35
Parents Education Level: Completed graduate or professional school	23%	17%	6	0.38
Credits at MSU: 0 - 29	23%	12%	11	0.08
Credits at MSU: 30 - 59	20%	27%	-7	0.31
Credits at MSU: 60 - 89	22%	19%	3	0.62
Credits at MSU: 90 - 119	24%	28%	-4	0.51
Credits at MSU: 120 - 149	8%	11%	-3	0.49
Credits at MSU: At least 150	3%	2%	1	0.72
MSU College: Agriculture and Natural Resources	11%	7%	4	0.38
MSU College: Arts and Letters	2%	4%	-2	0.59
MSU College: Communication Arts and Sciences	5%	7%	-2	0.43
MSU College: Education	7%	10%	-3	0.47
MSU College: Eli Broad College of Business	14%	15%	-1	0.83
MSU College: Engineering	17%	22%	-5	0.40
MSU College: James Madison	1%	0%	1	0.34
MSU College: Lyman Briggs	7%	1%	6	0.07
MSU College: Music	1%	0%	1	0.34
MSU College: Natural Sciences	13%	14%	-1	0.84
MSU College: Nursing	7%	4%	3	0.37
MSU College: Social Science	16%	16%	0	0.98

Table B4 Exempt Income Continuous Variables

Covariate	\$20,000	\$30,000	Difference in Means	P-Value
Employment Probability 6 Months After Graduation	79%	71%	8	0.03*
Employment Probability when 30 Years Old	90%	90%	0	0.99
Employment Probability when 40 Years Old	91%	92%	-1	0.61
Probability of Graduating from MSU	94%	95%	-1	0.65
Probability of Attending Graduate or Professional School	66%	60%	6	0.13
Age	20	20	0	0.89
Risk Aversion	0.53	0.77	-0.23	0.09

Table B5 Years Until Loan Forgiveness Categorical Variables

Covariate	Percent of Respondents who saw the parameter value		Difference in Percentage Points	P-Value
	15 Years	20 Years		
Female	64%	65%	-1	0.79
Male	34%	35%	-1	0.96
Other Gender	2%	0%	2	0.16
White	62%	74%	-12	0.11
Black or African American	12%	12%	0	0.98
Asian	18%	10%	8	0.13
American Indian or Alaska Native	0%	1%	-1	0.32
Other Race	8%	4%	4	0.20
International Student	5%	2%	3	0.42
Has Pell Grant	44%	48%	-4	0.60
Expected Salary 6 Months After Graduation: \$0 - \$19,999	6%	7%	-1	0.74
Expected Salary 6 Months After	26%	27%	-1	0.83

Graduation: \$20,000 - \$39,999				
Expected Salary 6 Months After Graduation: \$40,000 - \$59,999	32%	26%	4	0.43
Expected Salary 6 Months After Graduation: \$60,000 - \$79,999	31%	32%	-1	0.83
Expected Salary 6 Months After Graduation: \$80,000 - \$99,999	5%	5%	0	0.99
Expected Salary 6 Months After Graduation: \$100,000 - \$119,999	1%	2%	-1	0.56
Expected Salary 30 Years Old: \$0 - \$19,999	0%	2%	-2	0.15
Expected Salary 30 Years Old: \$20,000 - \$39,999	4%	1%	3	0.32
Expected Salary 30 Years Old: \$40,000 - \$59,999	16%	24%	-8	0.24
Expected Salary 30 Years Old: \$60,000 - \$79,999	27%	21%	6	0.40
Expected Salary 30 Years Old: \$80,000 - \$99,999	25%	26%	-1	0.83
Expected Salary 30 Years Old: \$100,000 - \$119,999	18%	17%	1	0.87
Expected Salary 30 Years Old: At Least \$120,000	11%	8%	3	0.62
Expected Salary 40 Years Old: \$20,000 - \$39,999	1%	0%	1	0.32
Expected Salary 40 Years Old: \$40,000 - \$59,999	7%	17%	-10	0.05*
Expected Salary 40 Years Old: \$60,000 - \$79,999	19%	17%	2	0.72

Expected Salary 40 Years Old: \$80,000 - \$99,999	24%	26%	-2	0.69
Expected Salary 40 Years Old: \$100,000 - \$119,999	24%	19%	5	0.48
Expected Salary 40 Years Old: At Least \$120,000	26%	21%	5	0.50
Student Debt Amount: \$0 - \$4,999	45%	33%	12	0.13
Student Debt Amount: \$5,000 - \$9,999	16%	10%	6	0.18
Student Debt Amount: \$10,000 - \$14,999	7%	24%	-17	0.00
Student Debt Amount: \$15,000 - \$19,999	6%	10%	-4	0.38
Student Debt Amount: \$20,000 - \$24,999	6%	8%	-2	0.54
Student Debt Amount: \$25,000 - \$29,999	5%	5%	0	0.99
Student Debt Amount: \$30,000 - \$34,999	8%	2%	6	0.09
Student Debt Amount: \$35,000 - \$39,999	2%	1%	1	0.57
Student Debt Amount: At Least \$40,000	5%	7%	-2	0.51
Parents Education Level: Did not complete high school	4%	5%	-1	0.69
Parents Education Level: GED	2%	0%	2	0.16
Parents Education Level: High School Graduate	15%	13%	2	0.68
Parents Education Level: Some College	25%	18%	7	0.28
Parents Education Level: Associates Degree	5%	6%	-1	0.72

Parents Education Level: Bachelor's Degree	32%	29%	3	0.65
Parents Education Level: Some graduate or professional school	1%	6%	-5	0.10
Parents Education Level: Completed graduate or professional school	16%	24%	-8	0.24
Credits at MSU: 0 - 29	21%	14%	7	0.24
Credits at MSU: 30 - 59	15%	32%	-17	0.01
Credits at MSU: 60 - 89	15%	25%	-10	0.12
Credits at MSU: 90 - 119	31%	21%	10	0.18
Credits at MSU: 120 - 149	13%	6%	7	0.12
Credits at MSU: At least 150	5%	1%	4	0.18
MSU College: Agriculture and Natural Resources	6%	13%	-7	0.11
MSU College: Arts and Letters	6%	0%	6	0.02*
MSU College: Communication Arts and Sciences	4%	8%	-4	0.19
MSU College: Education	6%	11%	-5	0.26
MSU College: Eli Broad College of Business	14%	14%	0	0.98
MSU College: Engineering	24%	15%	9	0.19
MSU College: James Madison	0%	1%	1	0.32
MSU College: Lyman Briggs	5%	4%	1	0.71
MSU College: Music	1%	0%	1	0.32
MSU College: Natural Sciences	13%	13%	0	0.98
MSU College: Nursing	4%	7%	-3	0.30
MSU College: Social Science	19%	13%	6	0.31

Table B6 Years Until Loan Forgiveness Continuous Variables

Covariate	15 Years	20 Years	Difference in Means	P-Value
Employment Probability 6 Months After Graduation	74%	76%	-2	0.57
Employment Probability when 30 Years Old	89%	92%	-3	0.12
Employment Probability when 40 Years Old	91%	93%	-2	0.26
Probability of Graduating from MSU	95%	93%	2	0.43
Probability of Attending Graduate or Professional School	63%	63%	0	0.93
Age	20	20	0	0.19
Risk Aversion	0.84	0.45	0.39	0.01*

Appendix C: Student Loan Exit Counseling Screenshots

Your Income

Projected Annual Income	<input type="text" value="50000"/>
Estimated Federal Withholding * ?	\$9,850
Other Withholding (%) ?	<input type="text" value="0"/>
Net Annual Income ?	\$40,150

Your Monthly Income [?](#)

\$3,346

Other Monthly Expenses

Rent/Housing	<input type="text" value="800"/>	Entertainment	<input type="text" value="40"/>
Utilities	<input type="text" value="40"/>	Transportation	<input type="text" value="40"/>
Groceries	<input type="text" value="400"/>	Emergency	<input type="text" value="0"/>
Insurance	<input type="text" value="0"/>	Other	<input type="text" value="100"/>
Medical Insurance & Expenses ?	<input type="text" value="0"/>	Visit HealthCare.gov . You may qualify for lower costs on health coverage, and many people can get coverage for less than \$100 per month.	
Credit Card Debt	<input type="text" value="0"/>		

Your Other Monthly Expenses

\$1,420

Your Estimated Future Monthly Loan Payment

Use Your Loans

Use Average Loan Balances

Family Size

State of Residence










Loan Balance \$30,000

MICHIGAN [v](#)

Projected Interest Rate 5%

[View or Add Your Loans](#)

[Which Loans Are Included?](#)

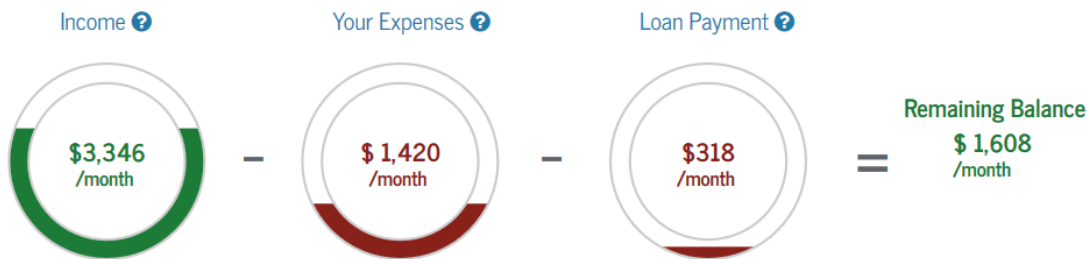
	Initial Monthly Payment	Total Amount Paid	Repayment Period	
<input checked="" type="radio"/> Standard	\$ 318	\$ 38,184	10 years	See Payment Guidelines 
<input type="radio"/> Graduated	\$ 180	\$ 40,294	10 years	See Payment Guidelines 
<input type="radio"/> Extended, Fixed	Extended only available for amounts greater than \$30,000.	Extended only available for amounts greater than \$30,000.	25 years	See Payment Guidelines 
<input type="radio"/> Extended, Graduated	Extended only available for amounts greater than \$30,000.	Extended only available for amounts greater than \$30,000.	25 years	See Payment Guidelines 
<input type="radio"/> Revised Pay As You Earn	\$ 261	\$ 38,461	20 years	See Payment Guidelines 
<input type="radio"/> Pay As You Earn	\$ 261	\$ 39,032	20 years	See Payment Guidelines 
<input type="radio"/> Income-Based Repayment	You're not eligible for this plan based on the information entered above.	You're not eligible for this plan based on the information entered above.	25 years	See Payment Guidelines 
<input type="radio"/> IBR for New Borrowers	\$ 261	\$ 39,032	20 years	See Payment Guidelines 
<input type="radio"/> Income-Contingent Repayment	\$ 256	\$ 40,568	25 years	See Payment Guidelines 

*These estimated monthly payments are based on your inputs and may not be exact. Contact your loan servicer to see if you qualify for an income-driven repayment plan.

Financial Summary



Based on what you entered, you will have enough funds to pay your expenses.



Estimated Student Loan Debt Burden

Suggested Minimum Gross Income \$47,700

To maintain a low [student loan debt burden](#), the Consumer Financial Protection Bureau (CFPB) suggests your estimated loan payments should not exceed 8% of your [gross income](#).

Estimated Student Loan Debt Burden

Based on your projected annual income, your student loan debt burden will be: **low**

Consider selecting a plan with a lower monthly payment, such as an income-driven repayment plan.

High
Medium
Low

10-year public service loan forgiveness - If you work full-time in public service and have reduced payments under a qualifying plan the balance remaining after 120 qualifying payments could be forgiven. For more information about Public Service Loan Forgiveness, visit [StudentAid.gov](#).

Interest Savings Calculator

Paying interest during your grace period or periods of deferment/forbearance will save you money. Unpaid interest will be capitalized (added to your principal) on unsubsidized loans, PLUS loans, and subsidized loans that have lost interest subsidy.

Outstanding Balance¹: **\$30000** Interest Rate: **5 %**

Pay interest for the next months during your grace period or period of deferment/forbearance.

Potential Savings: **\$ 954.59**

[More Information](#)

Repayment Tips *

You can reduce how much you pay overall using the repayment tips below.

- Pay extra per month
- Sign up for automated payments (lowers your interest rate by 0.25%)
- Reduce your loan balance by

Selected Repayment Plan from above

Initial Student Loan Payment	Total Payment Amount	Interest Paid	Repayment Period (months)
\$318	\$38,184	\$8,184	120

Select a Repayment Tip

Initial Student Loan Payment	Total Payment Amount	Interest Paid	Repayment Period (months)
\$368	\$36,726	\$6,726	100

Your Savings

Initial Student Loan Payment	Total Payment Amount	Interest Paid	Repayment Period (months)
-\$50	\$1,457	\$1,457	20

* Repayment Tips only work if you select the Standard, Graduated, or Extended plans. Remember you can use all of these repayment tips for all plans including Income-Driven Repayment Plans.

Appendix D: List of Treatments

Which Repayment Plan is Plan 1	Amount of Exempt Income	Percent of Non-Exempt Income Determining Payment	Number of Years Until Loan Forgiveness
Income-based plan	\$20,000	5	15
10-year plan	\$20,000	5	15
Income-based plan	\$30,000	5	15
10-year plan	\$30,000	5	15
Income-based plan	\$20,000	10	15
10-year plan	\$20,000	10	15
Income-based plan	\$20,000	5	20
10-year plan	\$20,000	5	20
Income-based plan	\$30,000	10	15
10-year plan	\$30,000	10	15
Income-based plan	\$30,000	5	20
10-year plan	\$30,000	5	20
Income-based plan	\$20,000	10	20
10-year plan	\$20,000	10	20
Income-based plan	\$30,000	10	20
10-year plan	\$30,000	10	20

Appendix E: Results without International Students

Figure E1

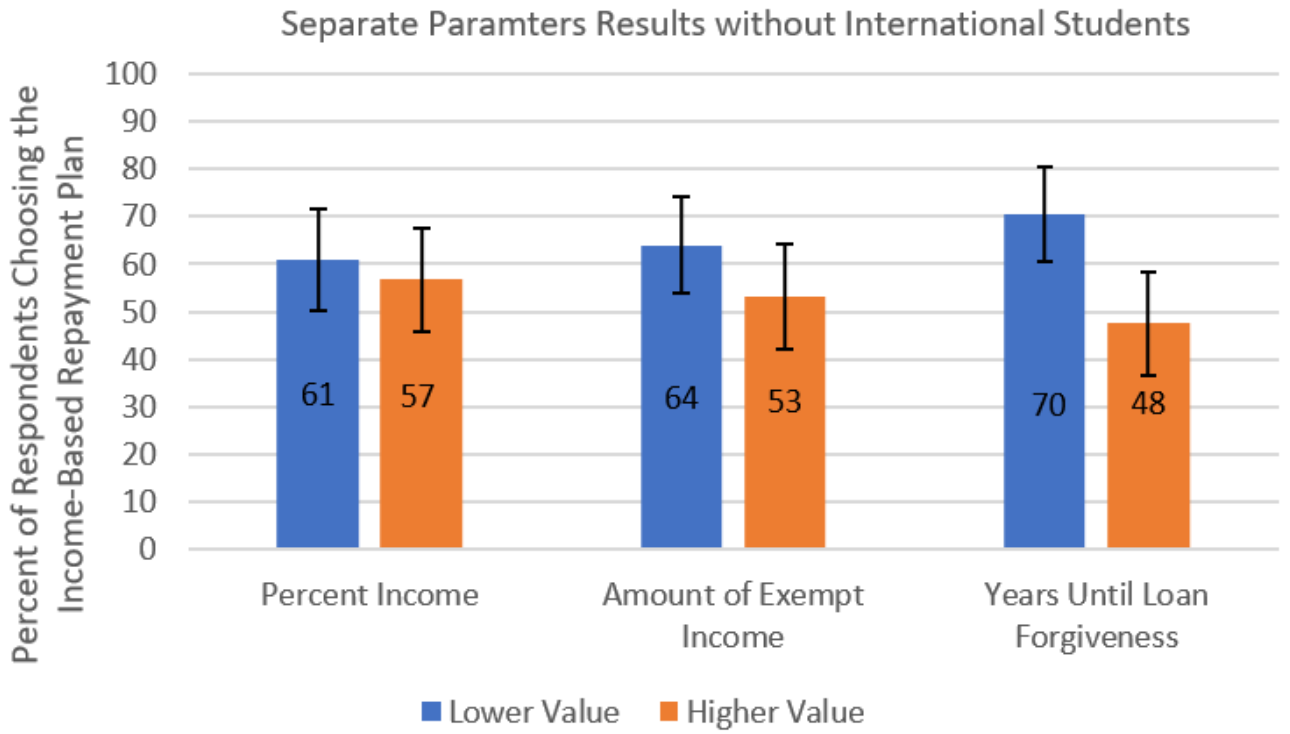
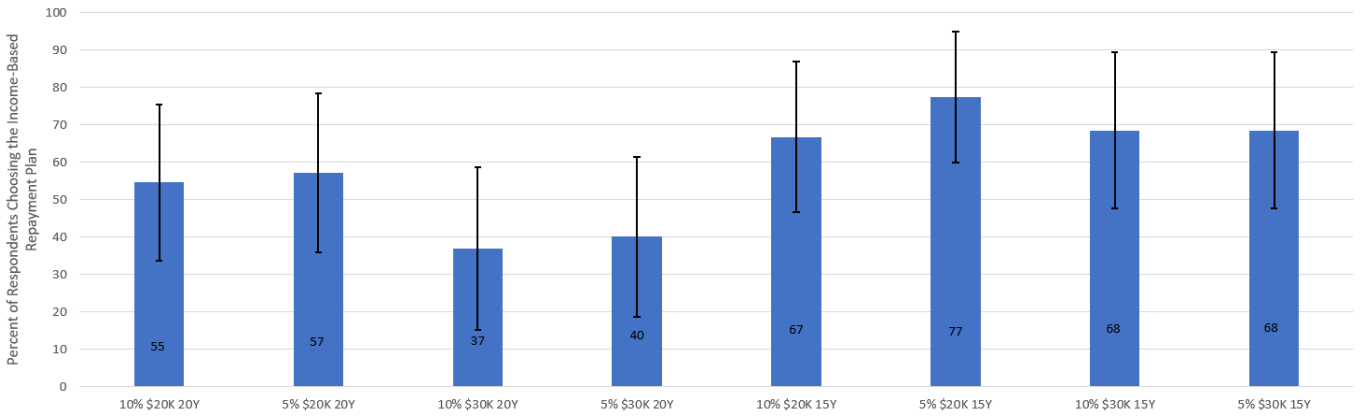


Figure E2

8 Treatments Results without International Students



Appendix F: Heterogeneity Pell Grant

Figure F1
Percent Income Results by Having a Pell Grant

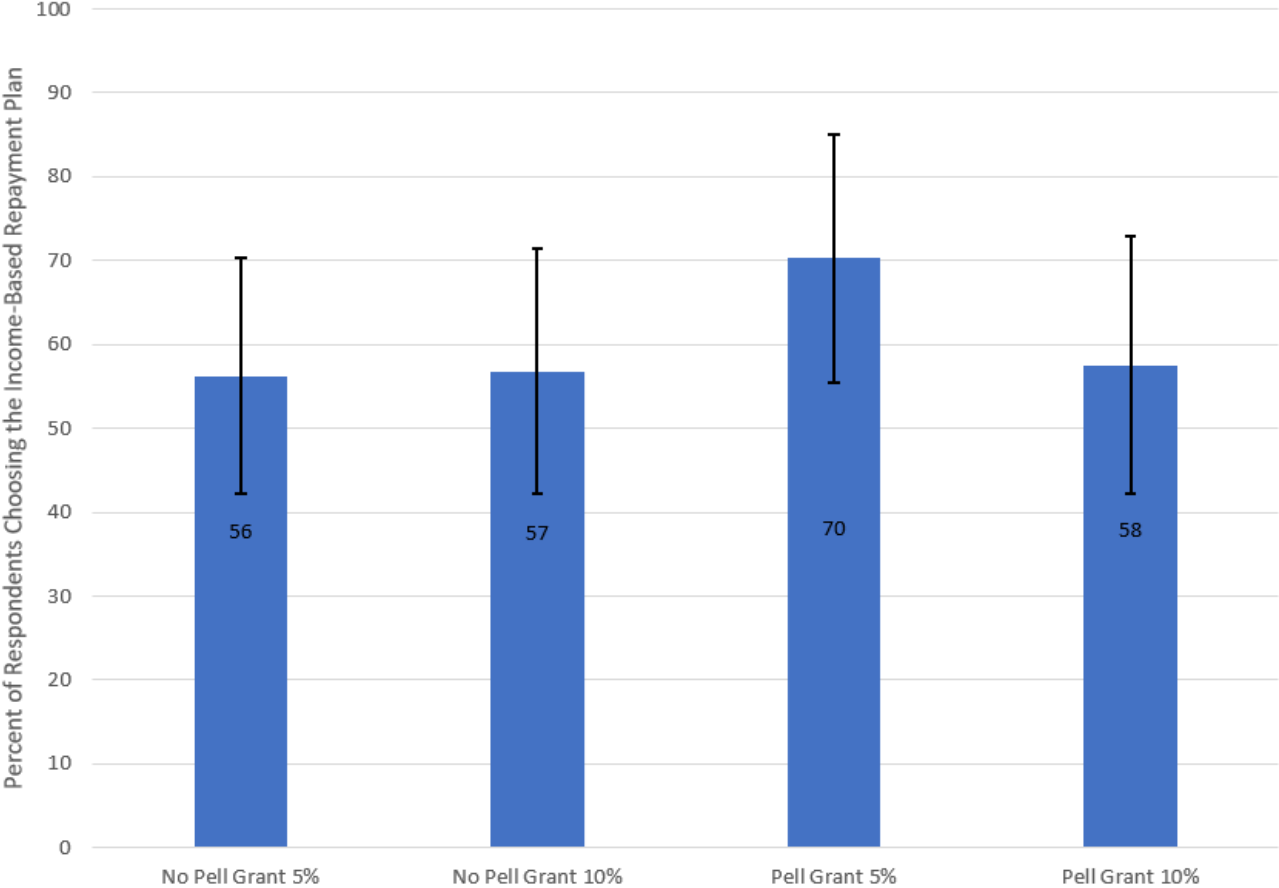


Figure F2

Exempt Income Results by Having a Pell Grant

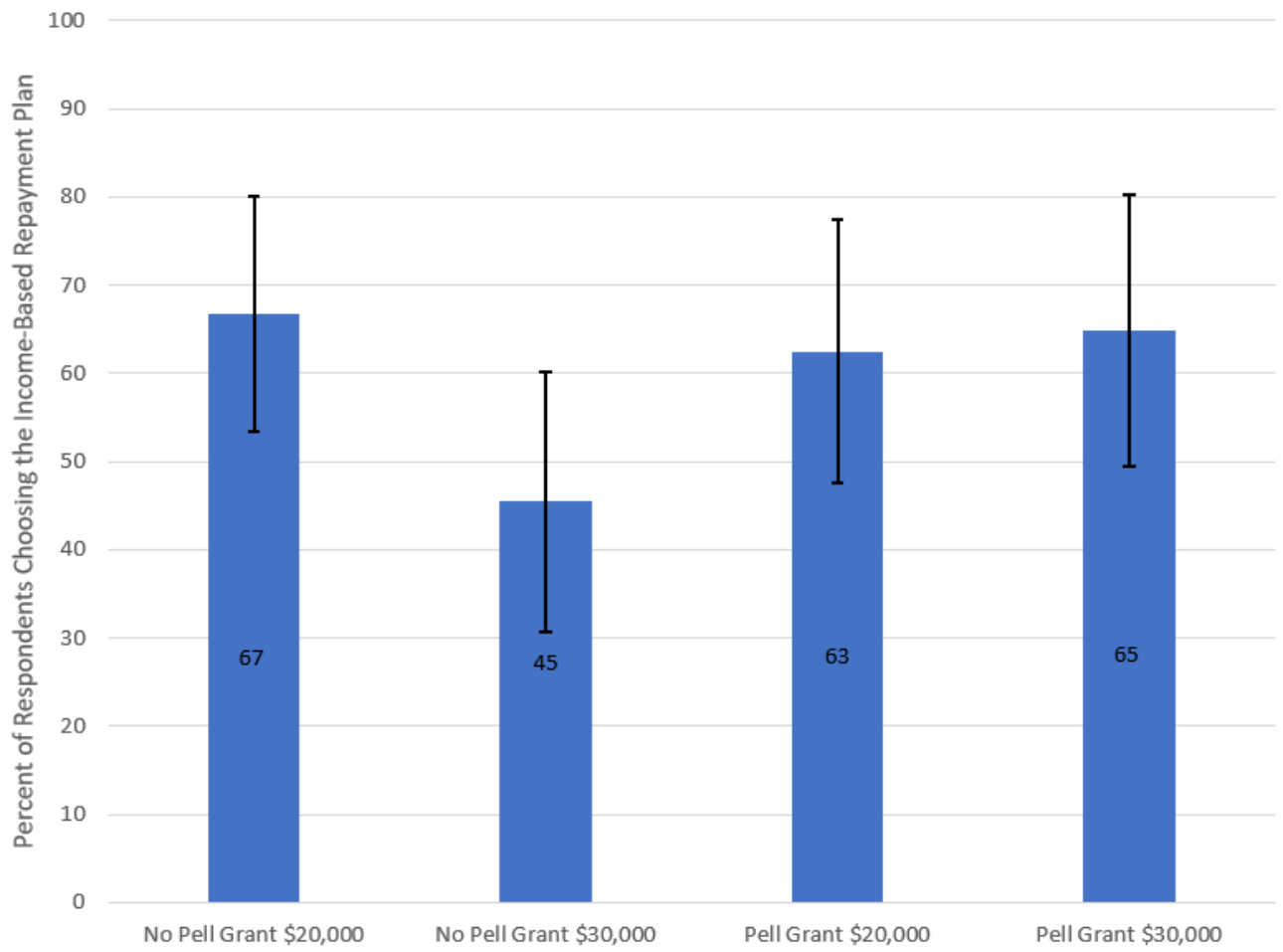
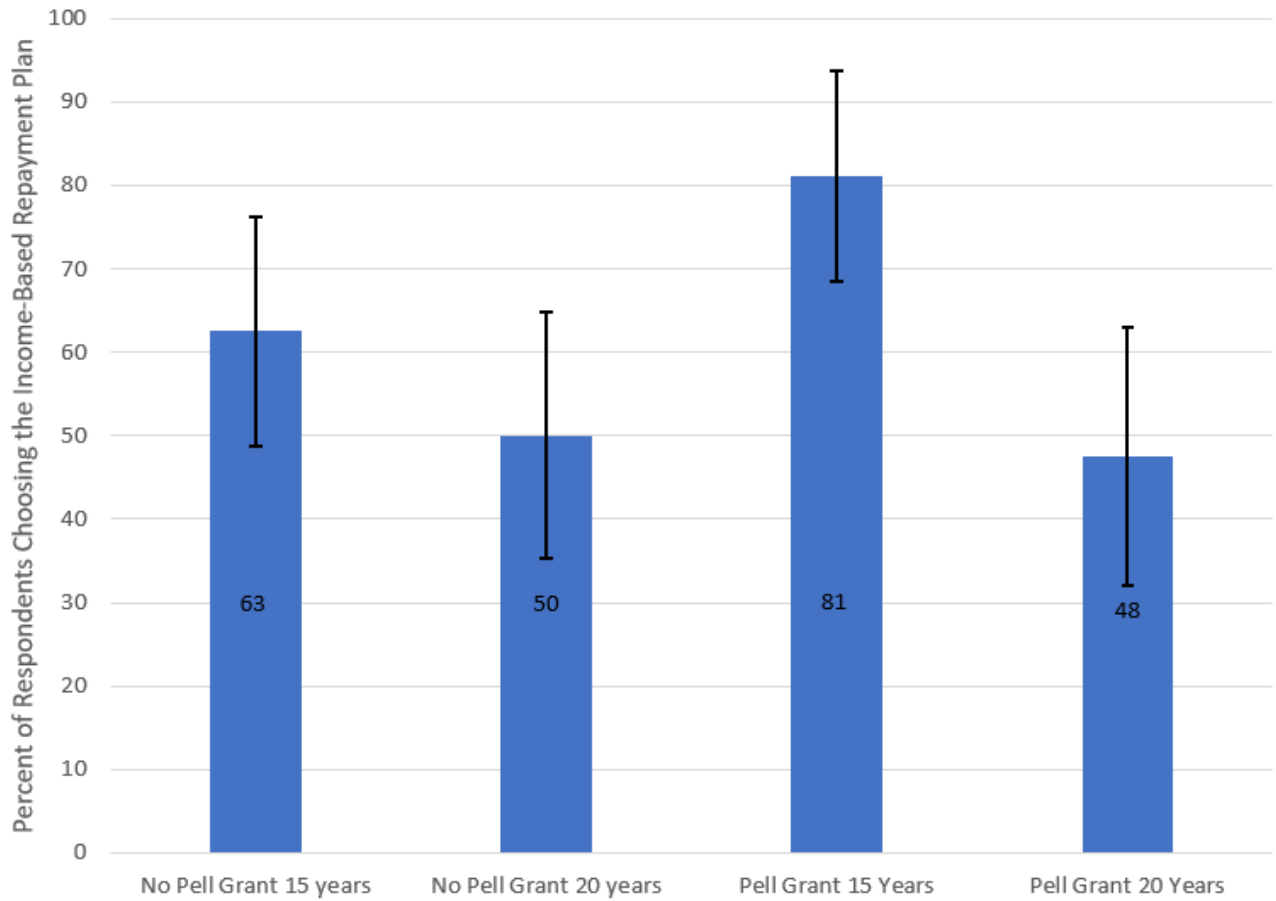


Figure F3

Number of Years Until Loan Forgiveness Results by Having a Pell Grants



Appendix G: Heterogeneity Salary

The exact percent decrease in minimum payment due to an increase from \$20,000 in exempt income to \$30,000 in exempt income depends on the borrower's income. Below is the equation for the percent decrease in income for going from \$20,000 in exempt income to \$30,000 in exempt income holding income (I) and percent of non-exempt income that determines payment (P) fixed.

$$\begin{aligned} & \frac{\frac{(I - 20,000) * \frac{P}{100}}{12} - \frac{(I - 30,000) * \frac{P}{100}}{12}}{\frac{(I - 20,000) * \frac{P}{100}}{12}} * 100 \\ &= \frac{(I - 20,000) * P - (I - 30,000) * P}{(I - 20,000) * P} * 100 \\ &= \frac{(I - 20,000) - (I - 30,000)}{I - 20,000} * 100 \\ &= \left(\frac{10,000}{I - 20,000} \right) * 100 \end{aligned}$$

The final equation depends on I and decreases as I increases. This means that the percent change in minimum payments due to the change in the amount of exempt income is larger for individuals with lower incomes.

Figure G1

Percent Income Results by Salary

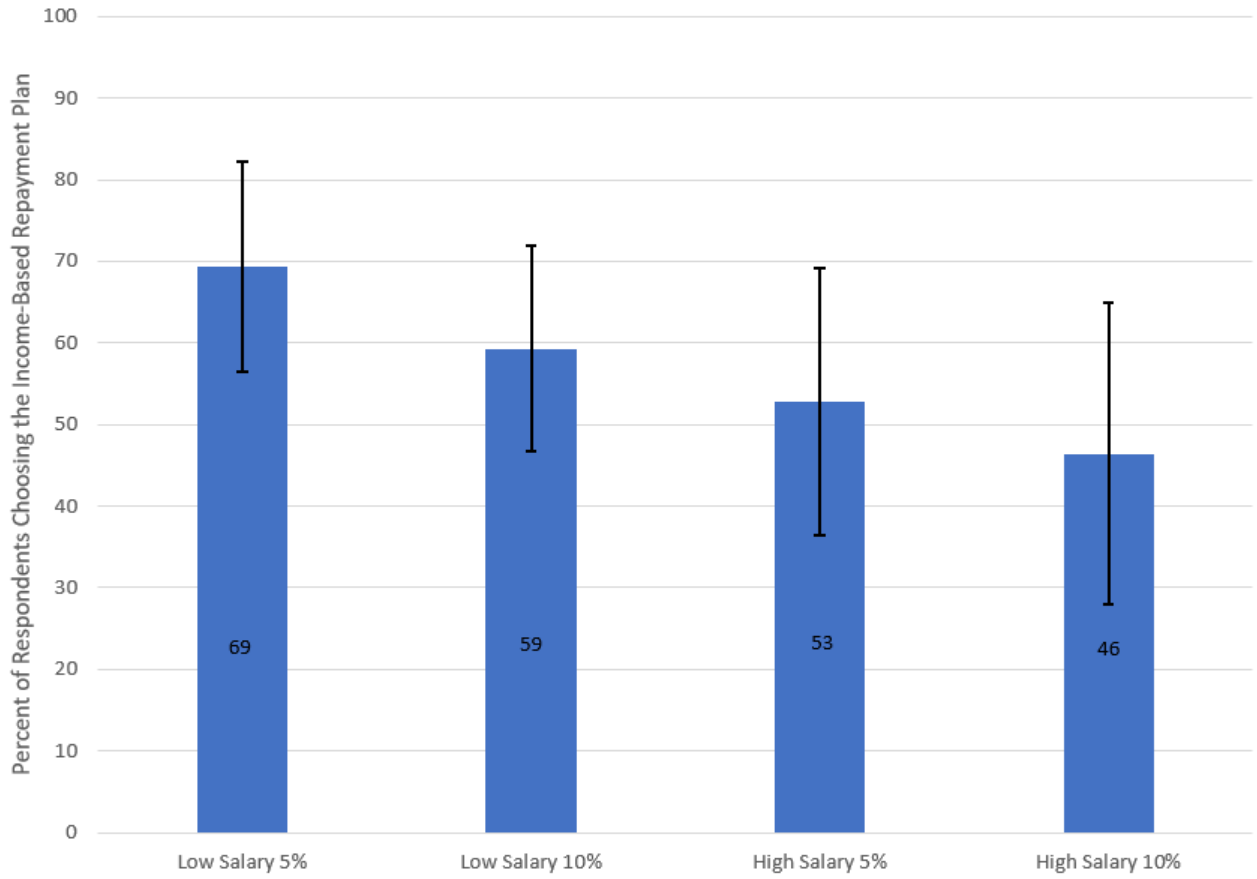


Figure G2

Exempt Income Results by Salary

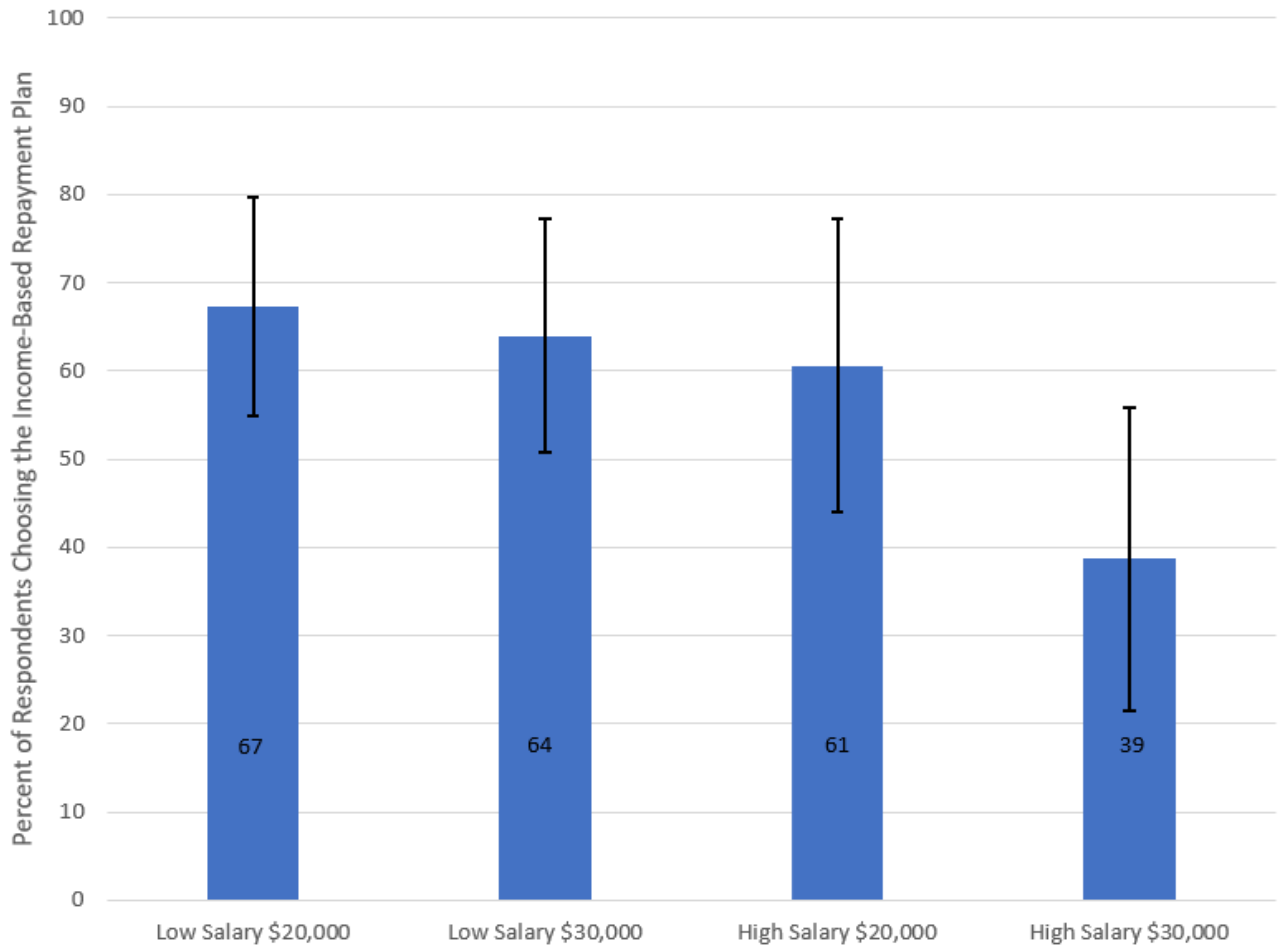
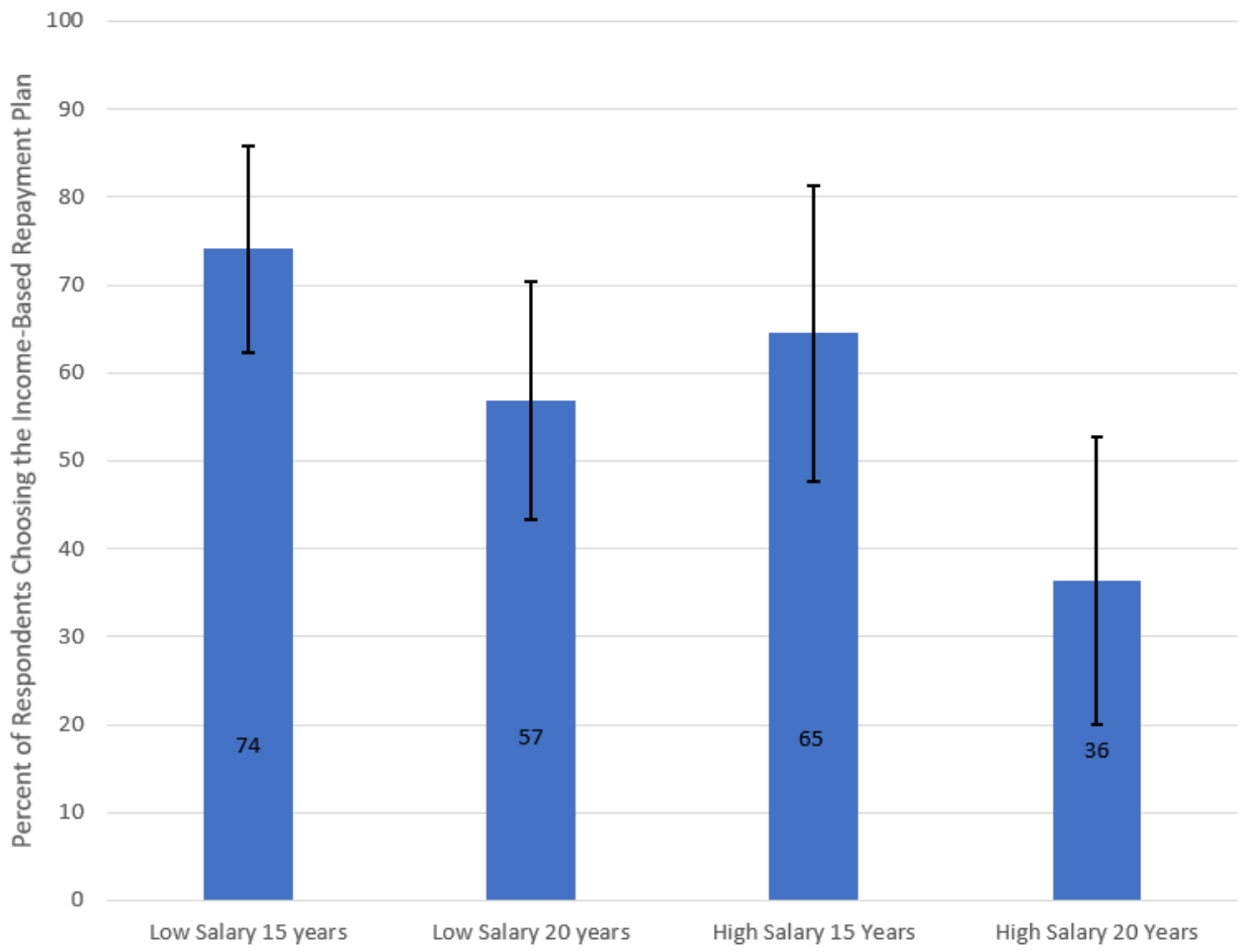


Figure G3

Number of Years Until Loan Forgiveness Results by Salary



Appendix H: Heterogeneity Gender

Figure H1
Percent Income Results by Gender

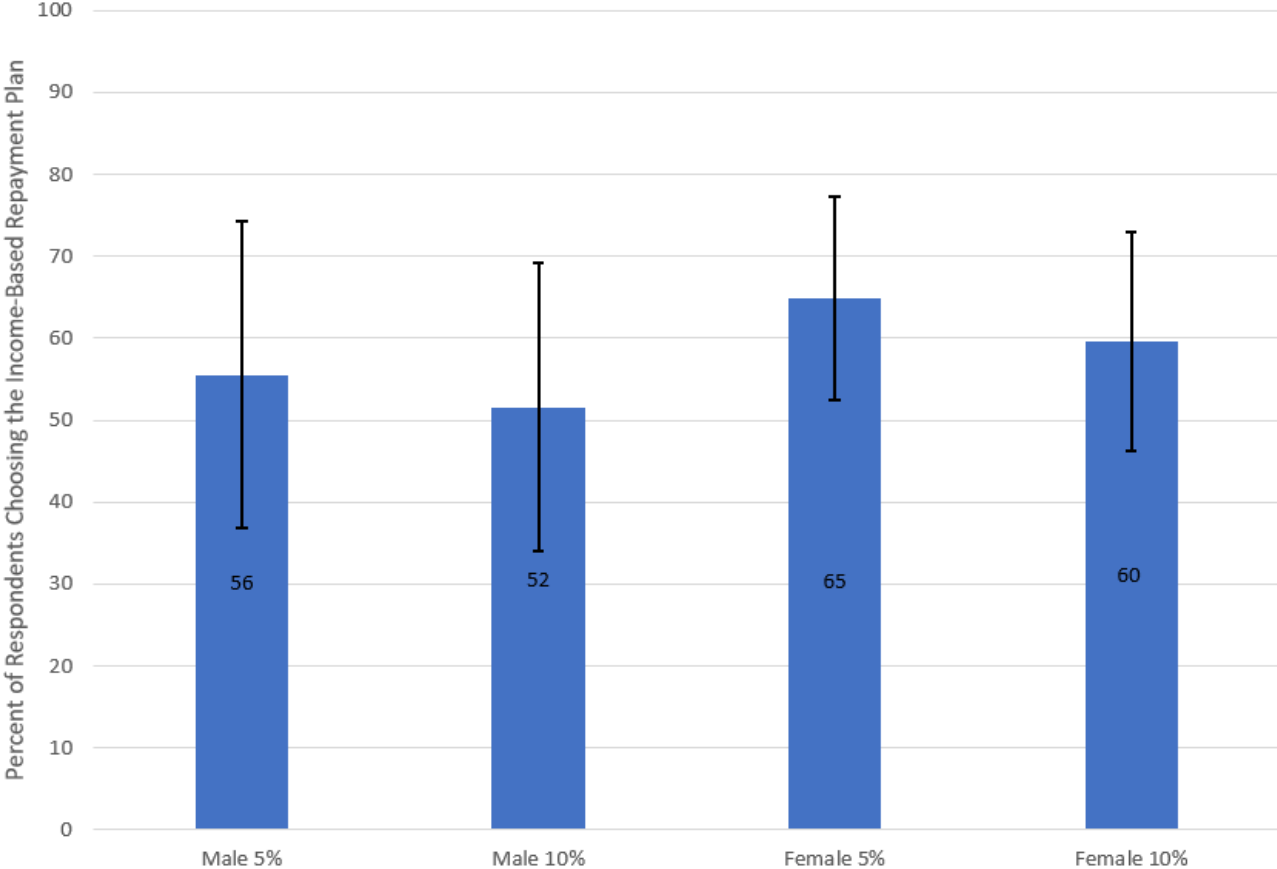


Figure H2

Exempt Income Results by Gender

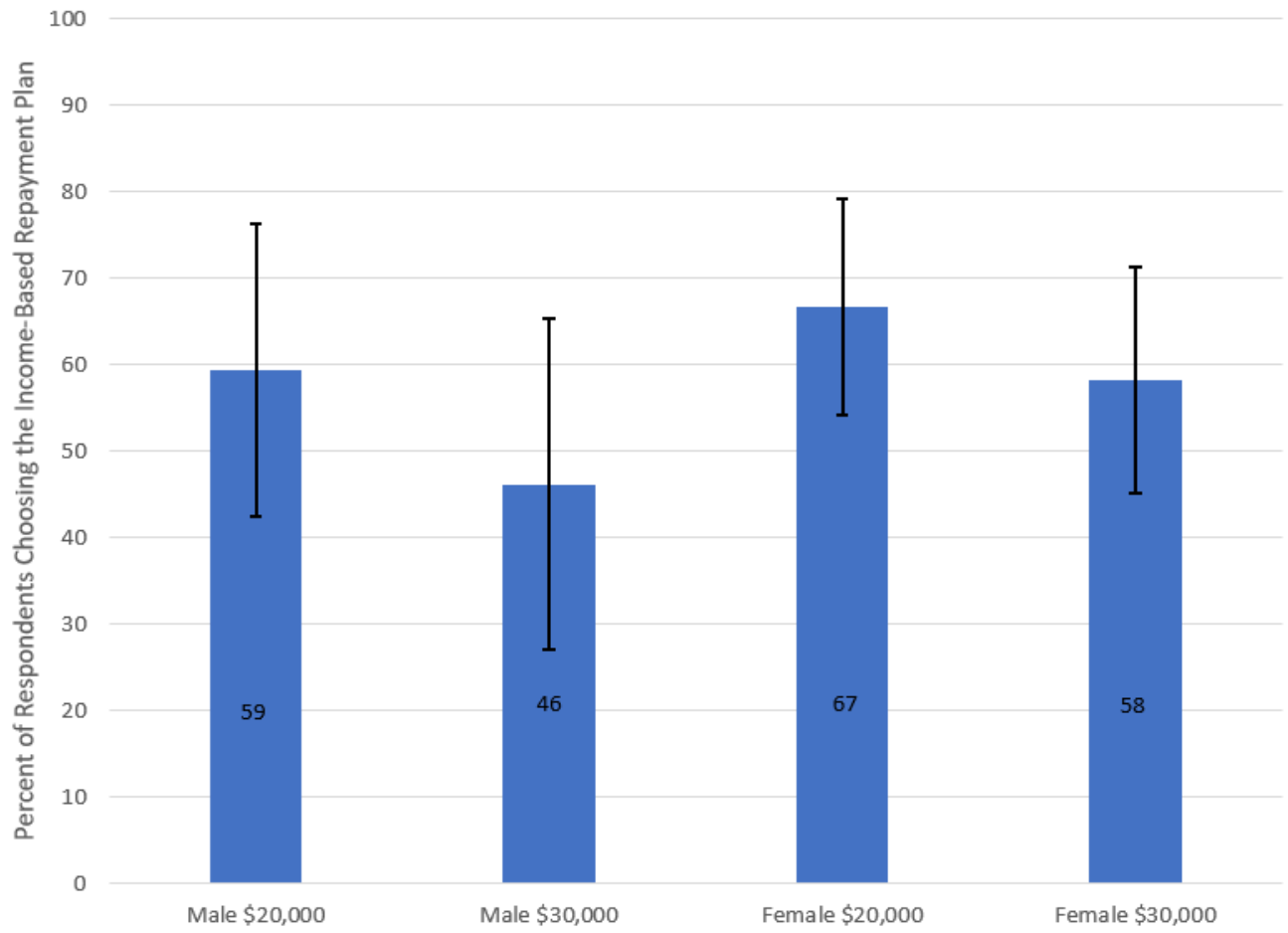


Figure H3

Number of Years Until Loan Forgiveness Results by Gender

