

How Low-Income Expectations Affect Student Loan Repayment Plan Choice: Survey Evidence from College Seniors¹

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Disclaimer: These views are my own and do not represent the views of either the National Science Foundation or the Government Accountability Office.

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Abstract

Income-driven repayment plans lower required payments for student loan borrowers when their income decreases. This helps to reduce student loan defaults. Despite universal availability, only a minority of student loan borrowers in the U.S. are in an income-driven repayment plan. I test whether a student's choice of repayment plan is related to their expectations of earning a low income by fielding a web survey where students are randomly shown one of two types of information about post-college incomes. I use which treatment a student sees as an instrument for their low-income expectations. While the estimates for the full sample are insignificant, I find that increasing low-income expectation decreases the probability a student prefers an income-driven repayment plan. The more tailored income information significantly increases students' low-income expectations but causes insignificant declines in choosing the income-driven repayment plan. I conclude that increasing students' low-income expectations is unlikely to increase take up of income-driven repayment plans.

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I. Introduction and Motivation

Most college students in the United States (U.S.) get loans from the federal government to fund their college education (Woo, Bentz, Lew, Velez, and Smith 2017). The U.S. federal government offers student loan borrowers a choice between two kinds of repayment plans. One type of repayment plan sets payments so that the loan is paid off within a certain period³. The other type of repayment plan sets payments as a function of a borrower's income⁴. The latter kind of plan is referred to as an income-driven repayment plan or IDR plan. IDR plans are preferred over time-based plans by scholars of student loans for their ability to reduce the loan payments of student loan borrowers when their incomes are low (Chapman and Dearden 2017).

Borrowers on IDR plans are more likely to make required on time payments (Herbst 2023) and less likely to default on their student loans⁵ (U.S. Government Accountability Office 2015; Muller and Yannelis 2019). Preventing student loan default is important because defaulting on U.S. government student loans can lead to a variety of negative consequences for the borrower. These consequences include: a reporting of the default to credit bureaus possibly leading to reduced access to private sources of credit, collection fees, wage garnishment, the garnishment of the borrower's tax refund, and the inability to get more U.S. government student loans until the default is resolved. As of Q2 2021, 17 percent of student loan borrowers were in default (Ma and Pender, 2021). Scott-Clayton (2019) finds that the proportion of students who graduated in 1996 who had ever defaulted on their loans continued to increase over the 20 years they had data for. Using that data to forecast defaults in the future, Scott-Clayton projects that 40% of borrowers who graduated

³ The default plan choice for students who get loans from the U.S. federal government sets payments so that the loans are paid off in full if the minimum payment is made every month for 10 years.

⁴ After a certain number of years of making payments on one of these plans, all remaining loan balances are forgiven and required payments decrease to \$0. The income-driven plan that is available to all new borrowers of U.S. government student loans, the Revised Pay as You Earn Plan, offers loan forgiveness after 20 years for undergraduate borrowers and after 25 years for graduate borrowers. See <https://studentaid.gov/manage-loans/repayment/plans/income-driven> for more information.

⁵ The U.S. Department of Education defines student loan default as not making required payments for at least 270 days.

college in 2004 would default on their student loans at some point by 2023. Despite these facts, only 32% of borrowers in FY 2021 were in IDR plans (Ma and Pender, 2021). Given the high default rate on student loans, and the fact that IDR plans are likely to reduce student loan default, it seems as if borrowers' lives could be significantly improved if more of them were on IDR plans.

One reason why there may be both relatively low enrollment in IDR plans, and a high default rate on student loans, is that students have overly optimistic expectations about their future earnings⁶. In terms of reducing required payments, the biggest benefit of being on an IDR plan occurs when a borrower's income is low. If borrowers believe they have an unreasonably low probability of earning a low income, then they may also believe that it is unlikely they will experience reduced payments should they choose an IDR plan instead of a time-based repayment plan. Should a student loan borrower earn a low income after they graduate while being on a time-based repayment plan, their required payments may be such a large proportion of their income that they are unable or unwilling to make them. If this is the case, then presenting students with relevant information about post-college incomes should cause them to: increase the probability that they believe they will earn a low income, be more likely to choose an IDR plan over a time-based repayment plan and reduce the probability that they default on their loans.

The purpose of this research is to learn about the effect that student's expectations of earning a low income have on their choice of student loan repayment plan⁷. To study this, I field an online survey to college seniors at Michigan State University (MSU). Survey respondents are asked about

⁶ Colon (2021) finds that, on average, a sample of undergraduates at The Ohio State University underestimate the mean salary for employed workers in Ohio age 30 to 50 with specific groups of majors. In Cox, Kreisman, and Dynarski (2020) college students who participated in a laboratory experiment expect the typical earnings of the typical graduate to be \$34,500 while the average earnings of 24-year-old graduates in 2015 was about \$22,000. In a survey of NYU students Wiswall and Zafar (2015a) find that when they asked what NYU undergraduates thought 30 years old college graduates with broad categories of majors in the US earned, the average response is statistically significantly above the authors calculations of the actual population earnings. The authors also find substantial heterogeneity in errors, with many students underestimating population earnings. Betts (1996) finds that in a sample of undergraduates at UC San Diego, the mean beliefs about the average salary of BA holders in 1990 is close to correct although the mean salary of BA holders with psychology degrees is statistically significantly below mean beliefs about the salary of psychology graduates.

⁷ Abraham, Filiz-Ozbay, Ozbay, and Turner (2020) and Brownstein (2020) find that the probability a student believes they will earn a low-income 6 months after leaving school is statistically significantly correlated with student loan repayment plan choice.

the probability they expect to earn an income in different income ranges. They are also asked if they would prefer an IDR or non-IDR (time-based) plan if they had \$30,000 in student loan debt. The survey includes an information experiment where respondents are randomly shown either information about the average income of U.S. college graduates (All Graduates Income Treatment), or information about the median earnings of MSU graduates with majors like their own major (Major Specific Income Treatment). The goal of providing this information is to create an exogenous difference in low-income expectations between respondents who saw the two types of income information. Questions about income expectations and repayment plan choice are asked both before and after the income information is shown. To estimate the effect of low-income expectations on repayment plan choice, I use a respondent seeing the Major Specific Income Treatment as an instrument for their low-income expectations. I estimate the model two different ways without and with respondent fixed effects. In the next paragraph, I discuss results from the model with respondent fixed effects. Models without fixed effects have similar results.

Contrary to my expectations, I estimate that a 1 percentage point increase in a student's low-income expectations⁸ is associated with a marginal significant 0.66 percentage point decrease in the probability the respondent chooses the IDR plan. This estimate comes from the Major Specific Income Treatment causing respondents, relative to seeing the All Graduates Income Treatment, to increase their low income expectations by a significant 6.5 percentage points but to be a marginally significant 4.3 percentage points less like to choose the IDR plan. Based on this, and other negative IV point estimates for different subgroups, I conclude that IDR take-up is unlikely to be increased by increasing students' low income expectations and doing so may even decrease IDR take-up.

II. Background on Student Loans and Income-Driven Repayment in the United States

⁸ Low-income expectations in the paper are defined as the respondent believing they will earn between \$0 and \$30,000.

About 92% of all student loan debt in the U.S. is owed to the U.S. Federal Government (Peter G. Peterson Foundation 2021)⁹. Students who attend college apply for federal loans by filling out the Free Application for Federal Student Aid. Loans are offered to students as part of their overall financial aid package for a university. Students can borrow up to the lesser of either the cost of attendance, or a limit that is based on year in school and dependency status (Kirkham 2020). For federal student loans, there are limits both on the amount of borrowing per year and the lifetime amount of borrowing¹⁰. In the academic year 2020-2021, 25 percent of undergraduate students borrowed loans directly from the federal government (Ma and Pender 2021). Ma and Pender also found that 55 percent of students who graduated from public and non-profit 4-year universities in the 2019 – 2020 academic year had student loan debt. They calculate that the average amount of debt among people who graduated with debt that year was \$28,400.

One of the major benefits of IDR plans is that they reduce the probability that borrowers will default on their student loans. Borrowers¹¹ are current on their loans if they make at least the minimum monthly loan payment. The minimum monthly loan payment is generally¹² determined by the repayment plan the borrower is on. Once a borrower misses a payment, they are considered delinquent on that loan. Borrowers who are delinquent on their loans for a period of 90 days have their delinquency reported to the 3 major Credit Reporting Agencies (CRA's)¹³. 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 including: the entire amount of the loan is due

⁹ Every year most new student loan debt is also owed to the U.S. Federal Government. For example, in the 2020 – 2021 academic year, 87% of new student loan debt was owed to the Federal Government (Ma and Pender 2021). The other 13% was owed to private companies.

¹⁰ If students would like to borrow more than the limits for those loans, their parents may borrow Parent PLUS Loans from the federal government up to the cost of attendance.

¹¹ In this paper borrowers is used as a shorthand for U.S. citizens who have gotten student loans from the U.S. federal government.

¹² Borrowers can temporarily lower their minimum monthly payment to \$0 using deferment or forbearance. Deferment and forbearance can be given for a variety of approved circumstances such as getting treated for cancer or serving in the Peace Corps.

¹³ Credit Reporting Agencies (CRA's) are businesses that collect information about people's use of credit and sell that information to third parties (Irby 2020).

immediately, the default is reported to the 3 major CRAs, being charged for collection costs, being prohibited from receiving additional federal student aid until the default is resolved, and sometimes having their wages, tax refunds and federal benefits garnished. To prevent these harms to borrowers, it is a worthwhile goal to reduce student loan defaults.

In the survey, respondents are given the choice between an IDR plan and a non-IDR plan. These plans are based on two¹⁴ of the repayment plans borrowers can choose from when they enter repayment. The non-IDR plan is based on the Standard Repayment Plan. The Standard Repayment Plan sets minimum monthly payments so that the loan would be paid off if the minimum payment is made every month for 10 years. If a borrower does not select a repayment plan before they begin paying back their loans, they are automatically put on the Standard Repayment Plan. The IDR plan is based on the Revised Pay as You Earn Plan (REPAY). Unless a borrower has an FFEL loan, they can get on REPAY¹⁵. REPAY sets minimum payments equal to 10% of discretionary income with loan forgiveness¹⁶ after 20 years of payments for an undergraduate borrower or 25 years of payments for individuals who borrowed for graduate or professional school. Discretionary income is defined as income above 150% of the federal poverty line¹⁷.

IDR plans lower the required payment of student loan borrowers when their income is low. This is the feature of IDR plans that probably lower a borrower's probability of default. Even if this feature does not prevent defaults, it prevents students from losing a high proportion of their income on student loan payments when they most need the money. These benefits of IDR plans

¹⁴ There are currently seven different repayment plans for student loans. Four of those repayment plans set minimum payments as a function of the borrower's income.

¹⁵ <https://fcaa.org/student-loan-repayment-plans/revised-pay-as-you-earn-repaye/>. FFEL stands for Federal Family Education Loan program. These loans, that were available until 2010, were made by private institutions and guaranteed by the federal government.

¹⁶ According to Student Borrower Protection Center (2021), despite the first IDR plan becoming available in the U.S. in 1995, only 32 U.S. student loan borrowers have ever received loan forgiveness because they had been in an IDR plan for a long period of time. Despite this, it is probably the case that loan forgiveness is a salient feature of IDR plans. In Brownstein (2020), I find that decreasing the number of the years until loan forgives for an IDR plan from 20 years to 15 increases the probability surveyed MSU students prefer an IDR plan to a non-IDR plan by about 20 percentage points.

¹⁷ For all states except Hawaii and Alaska, 150% of the federal poverty line for a household with a single individual in 2020 was \$19,140 and for a household with 2 individuals was \$25,860. See Office of the Assistant Secretary for Planning and Evaluation (2019).

should make IDR plans more attractive to borrowers who believe they are more likely to earn a low-income. However, IDR plans are not always better than non-IDR plans. If an IDR plan successfully lower a borrower's payments, they cause the borrower to accrue more interest on their loan¹⁸ and take longer to pay off their loan. If borrowers care more about that than the benefits of lower payments, then they may continue to prefer a non-IDR plan even if they believe they are more likely to earn a low-income.

Borrowers can learn about student loan repayment, including payment amounts and what repayment plans are available, by doing student loan exit counseling. Most exit counseling is done through a website created by the U.S. Department of Education (DoE)¹⁹. The information I provide students in the survey is like the information borrowers get on the exit counseling website. DoE requires colleges to have borrowers complete student loan exit counseling when they leave school²⁰. If colleges do not offer exit counseling, they may lose access to federal financial aid (Klepfer, Ferandez, Fletcher, and Webster 2015). Exit counseling provides information on loan balances, repayment obligations, and which repayment plans are available to the borrower. During exit counseling borrowers can enter their estimated future income, future expenses, and how much in student loans they borrowed from the federal government. 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. As part of this process, borrowers are asked to select a repayment plan from a menu of available repayment plans. The selected plan is sent to the borrower's loan servicer²¹ to determine if they are eligible

¹⁸ A borrower may make lower total interest payments when making lower monthly payments if the borrower makes payments long enough for a significant proportion of their loan balance to be forgiven.

¹⁹ <https://studentaid.gov/app/counselingInstructions.action?counselingType=exit>. Schools can do other things to fulfill the requirement to provide exit counseling. However, anyone can use the U.S. Department of Education's website and most schools (including MSU) refer their students to the website for exit counseling.

²⁰ It may be the case that a large proportion of borrowers do not complete exit counseling. In a survey of 13,000 high debt borrowers, 40% of respondents reported they did not receive any form of student loan counseling (Whitsett and O'Sullivan 2012).

²¹ A loan servicer is a private company that the U.S. federal government contracts with to collect federal student loan payments.

for the plan. If borrowers 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 The Standard Repayment Plan. Students can change their repayment plan at any time by contacting their student loan servicer (Lane, 2020).

III. Literature Review

There are many studies that look at the effect of providing students with information about what they can expect to earn after college on decisions related to college. Wiswall and Zafar (2015a) look at how U.S. students change their income expectations after being informed about the earnings of different groups of individuals. Treatments included being shown information about the average income of all college graduates and the average income of college graduates conditional on gender and major. They find that students change their earnings expectations and intended major based on the information they see. In a companion paper, Wiswall and Zafar (2015b) use the same data to study how changes to major-specific earnings expectations caused by seeing major specific earnings information changed students' expectations of what they would major in. They find that while expected earnings impact major choice, tastes for majors unrelated to earnings are more important in what students choose to major in. Baker, Bettinger, Jacob, and Marinescu (2018) study the impact of income information on major choice for community college students. They find that community college students believe salaries are higher than they are and find a significant effect of expected salary on major choice. Hastings, Neilson, and Zimmerman (2018) find that Chilean student loan applicants who receive information about college- and major-specific incomes of past Chilean college graduates are less likely to attend and believe they would earn less if they enrolled in programs whose graduates earned low incomes. Bleemer and Zafar (2018) find that providing information to U.S. household heads about the expected returns to

college increase the probability that respondents said they wanted to attend college. Hurwitz and Smith (2018) look at the effect of the release of a large amount of information about the income of college graduates in the College Scorecard. They find that after the information was released colleges with higher reported median incomes had more students send their SAT scores to them. Conlon (2021) finds that students are more likely to choose a major that they received income information about in an online survey. The above research shows that college students change their expectations and behaviors in response to seeing information on post-college incomes.

Another group of studies uses experiments to see what affects student loan repayment plan choice. Abraham, Filiz-Ozbay, Ozbay, and Turner (2020) study how the description of IDR plans affects repayment plan choice. They find that students are statistically significantly more likely to choose the IDR plan when the description of the plan emphasizes its benefits. Cox, Kreisman, and Dynarski (2020) have college students participate in an incentivized laboratory experiment that involve students choosing between time-based and IDR repayment plans. Students click through a website modeled after the U.S Department of Education online student loan exit counseling. Some students are randomly provided information related to the earnings of recent graduates at age 24 including what typical graduates earn and the level of earnings at each earnings decile. A repayment plan is choice is framed as the default by having the choice appear at the top of the list of choices and already being selected when students are asked to pick a repayment plan. They find that: being shown information about the incomes of recent college graduates causes students to decrease what they expect their income to be, that being shown that information did not change student's choice of repayment plans, and that students are statistically significantly more likely to select the repayment plan framed as the default plan. In Brownstein (2020) I field a small online survey to students at MSU where they choose either an IDR or non-IDR student loan repayment

plan. Although many of my results are not statistically significant, I find that students were more likely to choose the IDR plan when: the amount of income not considered when calculating payments is lower, the percent of non-exempt income determining payment is lower²², and the number of years until loan forgiveness is lower. Muller and Yannelis (2019b) study a field experiment where borrowers are randomly sent or not sent pre-populated applications to enroll in an IDR plan. They find that individuals who receive the applications have much higher enrollment in IDR plans, lower loan payments, and a lower probability of failing to make a required loan payment.

The method for eliciting distributional income expectations used in this study comes from Delavande and Rohwedder (2008). They find that, compared to eliciting expectations by asking for points on the cumulative distribution function, eliciting expectations by asking respondents to place balls in bins representing ranges of the probability distribution leads to a statistically significantly higher percentage of respondents with valid probability distributions. Delavande, Giné, and McDenzie (2011) find that using this method to elicit income expectations in developing countries provides reasonable responses that are predictive of future economic behavior. Orr (2020) uses this method to elicit the subjective expectations of college students, including questions about expected GPA conditional on a certain amount of studying, and questions about income conditional on graduating with a certain GPA.

IV. Description of Survey

This paper analyzes data from a web survey of MSU college seniors²³. MSU's Office of the Registrar sent out emails that I wrote on October 19th, October 22nd, and October 25th, 2021. The

²² Income driven repayment plans calculate payments as a function of income above a certain amount such as 10% of income above 150% of the federal poverty line in the case of the Revised Pay as You Earn Plan. The results in Brownstein (2020) suggest that if the amount of exempt income was decreased, such as to 125% of the federal poverty line, that more borrowers would choose to be on the Revised Pay as You Earn Plan.

²³ MSU's Office of Financial Aid defines a senior as an undergraduate student who has completed at least 88 credits.

emails described the survey and had a URL that could be used to take the survey. The emails also informed students that if they completed the survey, they could be sent \$10 using either Venmo or Paypal. The 3 emails were sent to the same 7,000 students. The survey was closed on October 27th, 2021. Screenshots of the emails are available upon request. Before any data was analyzed, incomplete survey responses and any response after the first response by the same person were removed²⁴. After that 1,581 responses were left. The survey has a response rate of 22.6%. The median time it took students in the sample to complete the survey is 9 minutes and 56 seconds.

Survey respondents are asked about their income expectations in the form of a statistically valid probability distribution. Survey respondents allocate 10 balls to the following income ranges: \$0 - \$30,000, \$30,000 - 60,000, \$60,000 - \$90,000, \$90,000 - \$120,000, and greater than \$120,000. Each ball they allocate to an income range represents a 10-percentage point probability that they expect to earn an annual income in that range. Survey respondents are asked about what income they expect to receive 5 years after graduating with an undergraduate degree from MSU²⁵. Survey respondents are asked not to count any time in graduate or professional school as part of those 5 years²⁶.

Each time after they are asked for their income expectations, survey respondents are asked to choose between two different repayment plans. They are asked to assume they have graduated from MSU with \$30,000 in student loan debt, and the debt has an interest rate of 5%. Repayment Plan 1 is an IDR plan like the widely available Revised Pay as You Earn Plan. Repayment Plan 2

²⁴ In cases where 2 or more responses had the same Venmo account name or email for Paypal, all responses except for the response with the earliest recorded date were deleted. 4 completed responses had neither a Venmo account nor an email for Paypal and therefore could not be checked against other responses.

²⁵ Arcidiacono, Hotz, Maurel, and Monamo (2020) survey students at Duke University about their major and occupation specific earnings expectations in 2009. In 2015 they collect data on the survey respondent's actual earnings. They find that a student's earnings expectations are informative about future earnings and that students sorted into occupations based on expected earnings. Wiswall and Zafar (2021) find that college students' beliefs about future income are significant related to realized income 6 years later and that mean expected income is almost identical to mean realized income.

²⁶ This was for two reasons. First, individuals in graduate or professional school have an unusually low income given their level of education. Second, borrowers who are in graduate or professional school can get a deferment and temporarily lower their required loan payment to \$0.

is a time-based repayment plan like the Standard Repayment Plan. Information about the repayment plans is shown in three tables. The first table describes the two repayment plans. The other tables have estimates of minimum monthly payments, estimated length of time making payments, and total amount paid over the course of the loan. These estimates are given for the two repayment plans for starting post-college incomes of between \$10,000 and \$90,000 in \$10,000 increments²⁷.

After being asked about their income expectations and choice of repayment plan for the first time, survey respondents are randomly shown one of the two information treatments described below.

One information treatment contains information on the average yearly incomes of individuals in the U.S. with a college degree²⁸. I refer to this treatment as the All-Graduates Income Treatment. This statistic is calculated using the American Community Survey 2015 – 2019 IPUMS file (Ruggles, Flood, Goeken, Grover, Meyer, Pacas, and Sobek 2020). This information is intended to be a placebo treatment in that it would not change a survey respondent's income expectations. I expected that students would think that information about the incomes of college graduates of all ages is too general to affect their earnings expectations²⁹. The purpose of including a treatment like this is to deal with issues related to the Hawthorne effect and to have a control group without letting survey respondents know that they are in the control group³⁰.

²⁷ See Appendix A for screenshots from survey. Total amount paid and length of time making payments are calculated assuming simple daily interest and income increasing at 5% on January 1st of each year. Additional details about those calculations are available upon request.

²⁸ I calculated the average income to be \$53,268.

²⁹ The income of college graduates varies depending on a student's major. Using the data from the College Scorecard I describe in the next paragraph, median first year incomes for MSU graduates vary from \$18,200 to \$74,700 depending on the graduate's major. Income also varies by age. In Chart 2 Abel and Deitz (2014) estimate that, controlling for worker characteristics, the incomes of college graduates increase from about \$40,000 when they are in their 20's to about \$80,000 when they are in their 50's.

³⁰ It may be the case that, contrary to my expectations, respondents' earnings expectations are influenced by the All Graduates Income Treatment. For the 403 respondents in my analysis sample who see the treatment, the percent chance they believe they will earn between \$0 to \$30,000 decrease from 15% to 12% and the percent chance they believe they will earn between \$30,000 and \$60,000 increase from 28% to 33% after seeing the treatment. Respondents may think they are more likely to earn an income close to the income they saw in the treatment.

The other treatment shows survey respondents the median yearly earnings of MSU graduates with majors similar to the respondent's primary major. I call this treatment the Major Specific Income Treatment. The median earnings data is from the U.S. Department of Education's College Scorecard³¹. The College Scorecard has data on median earnings for students of either a single major or a group of related majors. The median earnings statistic that a student who received the Major Specific Income Treatment sees is based on the survey respondent's reported primary major. The statistics shown are for median earnings during the first year after students have graduated from MSU. Only students who got federal financial aid are included in the sample to calculate the medians.

My hypothesis is that the major specific earnings data would increase the probability students expected to earn a low income, and that this would cause them to be more likely to choose the IDR plan. Cox, Kreisman, and Dynarski (2020) study student loan repayment plan choice by randomly providing or not providing students with information related to their future income. In that study, about half of college students who participated in a laboratory experiment are provided information on the distribution of earnings of 24-year-old bachelor's degree holders. Those who see the information expect themselves and their peers to earn statistically significantly less than experiment participants who are not provided with that information. Based on this, I expect that providing students with information about the earnings of recent BA holders would shift their expected income distribution to center around lower incomes. This in turn would increase students' subjective probability that they would earn a low income. In my survey, given the hypothetical borrowing amount, available plans, and interest rate, borrowers whose annual income is less than

³¹ The data was taken from the following URL in October of 2020: <https://collegescorecard.ed.gov/school/fields/?171100-Michigan-State-University>. The data matched the median salary 1 year after graduation (EARN_MDN_HI_1YR) for 2015-2016 and 2016-2017 classes that can be downloaded from the College Scorecard's data website (<https://collegescorecard.ed.gov/data/>).

\$58,184 would have lower required monthly payments on the IDR plan described in the survey than if they were on the non-IDR plan described in the survey.

After being shown one of the treatments, respondents are then again asked the same questions related to income expectations and repayment plan choice. Then survey respondents are asked four questions to test their understanding of the two repayment plans. See Appendix A for screenshots of these questions. The survey ends with a series of questions related to the survey respondent's demographics and their college financial aid. This section includes questions about the survey respondent's gender, race, and age. The survey respondents are also asked how much student loan debt they have³².

V. Empirical Framework

A. Introduction

I am interested in how a person's beliefs about earning a low-income relate to their preference for an income driven repayment plan. Regressing observation data on low-income expectations on repayment plan choice may lead to biased coefficients if low-income expectations are correlated with other factors, such as risk aversion or a person's general level of optimism or pessimism, that determine repayment plan choice. To address this, I use which treatment a survey respondent receives as an instrument for their low-income expectations. The idea is that by creating a difference in income expectations unrelated to other factors, I can isolate the effect of income-expectation on repayment plan choice. I estimate this effect with models using two different frameworks for thinking about the survey.

B. Model Type 1: RCT Focus 1-Observation per Respondent

³² Past research that compares how much student loan debt students say they have in surveys to university administrative records of student loan debt has found that many students do not correctly report how much student loan debt they have (Akers and Chingos, 2014; Andruska, Hogarth, Fletcher, Robes, and Wohlgemuth 2014). I use data on student loan debt only to categorize survey respondents who do and do not have student loans. Unfortunately, even this categorization likely has measurement error. Andruska, Hogarth, Fletcher, Robes, and Wohlgemuth (2014) find that 62 of 165 students in their study who reported in a survey they had no student loan debt had student loan debt in administrative records.

In this series of models, I consider each respondent to have one observation with an emphasis on how the respondents answered the income expectations and repayment plan choice questions after they saw the income information. During this one period students are assigned to either the All Graduates Income Treatment Group or the Major Specific Income Treatment Group. For these models I use the following second stage estimating equation

$$(1) \text{ChooseIDR}_i = \beta_0 + \beta_1 \text{LowIncomeExpectations}_i + \beta \mathbf{X}_i + \epsilon_i.$$

With a reduced form and first stage equation of

$$(2) \text{Outcome}_i = \beta_0 + \beta_1 \text{MajorSpecificIncomeTreatment}_i + \beta \mathbf{X}_i + \epsilon_i.$$

In the first stage, Outcome_i is $\text{LowIncomeExpectations}_i$. That variable is equal to the percent chance the student believes they would earn \$0 to \$30,000 5 years after getting their undergraduate degree from MSU. It is modeled as a function of $\text{MajorSpecificIncomeTreatment}_i$ which is equal to 1 if the student sees the major specific income information while taking the survey and 0 if the student sees the information on the average income of all graduates while taking the survey. The coefficient of interest is β_1 which is the effect of seeing the major specific income information on the respondent's low-income expectations relative to their expectations if they had seen the all graduates income information.

In the reduced form equation Outcome_i is ChooseIDR_i . The variable is equal to 1 if the respondent chose the IDR plan after seeing the income information and 0 if the respondent chose the non-IDR plan. The coefficient of interest is β_1 which is the effect of seeing the major specific income information on the percent chance a respondent chose the IDR plan after the treatment relative to their probability of choosing the IDR plan if they had seen the all graduates income information.

In the second stage, I MajorSpecificIncomeTreatment_{*i*} is an instrument for LowIncomeExpectations_{*i*}. The coefficient of interest is β_1 which is how much a 1 percentage point increase in low-income expectations increases (if positive) or decreases (if negative) the percent chance a respondent will choose the IDR plan.

In both equations *i* represents the respondent. I estimate the equations 3 different ways. One way is estimating the model without covariates. Another is with \mathbf{X}_i containing two variables: the student's low-income expectations before seeing the income information and the student's repayment plan choice before seeing the income information. These variables are similar to LowIncomeExpectations_{*i*} and ChooseIDR_{*i*} except that their values are based on the student's pre-treatment survey responses. A third model includes the above covariates and additional covariates related to the student's gender, if they have had a Pell Grant, the number of majors the student has, either of their parent's highest level of education, their age, and the percent chance the student believes they would attend graduate school in the next 20 years.

C. Model Type 2: Difference in Difference Focus 2 Observations per Respondent

Another way I conceptualize the survey is having 2 observations per respondent with all observations before the treatment happening at time period $t = 0$ and the other happening at time $t = 1$. In between these time periods approximately half the students are treated with the major specific income treatment. This lets me estimate the effect of the Major Specific Income Treatment on low-income expectations using a difference in difference framework. I then think of that estimate as a first stage of a two-stage equation where having seen the Major Specific Income Treatment is an instrument for a respondent's low-income expectations.

For these models the second stage estimating equation is

$$(3) \text{ChooseIDR}_{it} = \beta_0 + \beta_1 \text{LowIncomeExpectations}_{it} + \beta_2 \text{AfterTreatment}_t + \theta_i + \epsilon_{it}$$

And the first stage and reduced form estimating equation is

$$(4) Outcome_{it} = \beta_0 + \beta_1 SawMajorSpecificIncome_{it} + \beta_2 AfterTreatment_t + \theta_i + \epsilon_{it}.$$

In the first stage $Outcome_{it}$ is $LowIncomeExpectations_{it}$. It has the same definition as $LowIncomeExpectations_i$ in Model Type 1 expect that there are two observations for each respondent i : one for $t = 0$ before seeing the income information and another for $t = 1$ after seeing the income information. Similarly in the second stage $Outcome_{it}$ is $ChooseIDR_{it}$. Like with low-income expectations this has the same definition as in Model Type 1 except that each respondent has an observation before and after seeing the income information. $sawMajorSpecificIncome_{it}$ is equal to 1 only when $t = 1$ and only for the students who saw the Major Specific Income Treatment. For both periods for students who saw the All Graduates Income Treatment and when $t = 0$ for students who saw the Major Specific Income Treatment $sawMajorSpecificIncome_{it}$ equals 0. $AfterTreatment_t$ is 1 if $t = 1$ and 0 if $t = 0$. θ_i is a student fixed effect³³. Equation 3 is estimated by two-stage least squares where $sawMajorSpecificIncome_{it}$ is an instrument for $LowIncomeExpectations_{it}$. For all equations the coefficients of interest in β_1 and each equation (first stage, reduced form, second stage) has the same interpretation as it does for Model Type 1.

D. Heterogeneity Estimating Equation

To look at heterogeneity for different respondents, I build off Model Type 2 with a second stage estimating equation of:

$$(3) ChooseIDR_{it} = \beta_0 + \beta_1 LowIncomeExpectations_{it} + \beta_2 LowIncomeExpectations_{it} InSubgroup_i + \beta_3 AfterTreatment_t + \beta_4 AfterTreatment_t InSubgroup_i + \theta_i + \epsilon_{it}$$

³³ No covariates are included in the regression because any student specific covariates, like the education level of the student's parents, would be colinear with the fixed effect and therefore cannot be included in the regression. Only covariates that changed from one time period to the next could be included with the student fixed effect. Because the time periods were very close together (reviewing the information probably took at most a couple of minutes) it is unlikely that anything could be included as a covariate that was not affected by the income information.

And the first stage and reduced form estimating equation of

$$(4) Outcome_{it} = \beta_0 + \beta_1 SawMajorSpecificIncome_{it} + \beta_2 SawMajorSpecificIncome_{it} InSubgroup_i + \beta_3 AfterTreatment_t + \beta_4 AfterTreatment_t InSubgroup_i + \theta_i + \epsilon_{it}.$$

InSubgroup_i is 1 if the respondent is a member of the subgroup and 0 otherwise. I look at three subgroups: respondents with Pell Grants, respondents who are in a low earning major, and respondents who before seeing a treatment have a low subjective percent chance of earning a low income. To determine who has a low income major, I assigned all respondents a major income of the income they would have seen if they had seen the Major Specific Income Treatment³⁴. All students who have a below median major income have a low-income major. All students who believed they had a below median percent chance of earning a low-income before seeing the income information have a low belief in earning a low income. Because 42% of my sample believed they had a 0% chance of earning a low-income before seeing the income information, having below income belief means believing you have a 0% chance of earning a low income.

Similar to Model Type 2 in the first stage Outcome_{it} is LowIncomeExpectations_{it} and is ChooseIDR_{it} for the reduced form equation. In both equations I am interested in β_1 , β_2 and $\beta_1 + \beta_2$. β_1 is the effect of seeing the Major Specific Income Treatment on the outcome for individuals who are not members of the subgroup. $\beta_1 + \beta_2$ is that same treatment effect for members of the subgroup. β_2 is the difference between the two treatment effects.

In the second stage SawMajorSpecificIncome_{it} and SawMajorSpecificIncome_{it}InSubgroup_i are instruments for LowIncomeExpectations_{it} and LowIncomeExpectations_{it}InSubgroup_i. In the second stage I am interested in β_1 , β_2 and $\beta_1 + \beta_2$. β_1 is the effect of a one percentage point increase in the percent chance a respondent who is not a member of the subgroup believes they will earn a

³⁴ This is the median earnings of MSU graduates who had a similar major to the student and who received federal financial aid.

low income on the percent chance that respondent will choose the IDR plan. $\beta_1 + \beta_2$ is that same treatment effect for members of the subgroup. β_2 is the difference between the two treatment effects.

E. Issues Related to the IV Estimate

The second stage estimate of the effect of low-income expectations on repayment plan choice attributes all changes in repayment plan choice caused by the assignment to treatment to the respondent's change in their low-income expectations. However, there are other things that might be changing that could also explain the change in repayment plan choice.

Because the sum of beliefs in earning different levels of income always equal 100 percent, it is impossible to increase a person's low-income expectations without decreasing the percent chance of believing they will earn a higher income. For example, if you increase the percent chance you believe you will earn less than \$30,000, you must decrease the percent chance you believe you will earn above \$30,000 by an equal amount. Conceptually this means that my estimates are the combined effect of a change in low-income beliefs and equal and opposite change in high income beliefs. While this complicates the interpretation, I do not think it invalidates the model.

A second issue is that respondents do not just have income expectations at a single point in time, in this case 5 years after graduating from MSU. They have income expectations related to different years relative to graduating, like 10 years after graduating and 1 year after graduating, and they have income expectations conditional on different events such as income expectations 5 years after leaving MSU without graduating. The interpretation of the IV estimates as being only caused by the low-income expectations holds only if either the type of income expectations I am measuring are the only income expectations that affect repayment plan choice or if the treatments do not change any other income expectations that the respondent has. Because there is nothing

special about an individual's income 5 years after graduating compared to other years and other situations, it is unlikely both the treatment only affects the belief related to that time and circumstance or that the analyzed income expectation is the only one that impacts repayment plan choice. Therefore, the IV is likely attributing to the change in this particular low-income expectation all of the post-treatment change in repayment plan choice when seeing the treatments change other kinds of income expectations the student has that also affect repayment plan choice. Without gathering and analyzing additional data on income expectations it is impossible to know which other income expectations are associated with repayment plan preferences and how much of the magnitude of the second stage coefficient is due to changes in other kinds of income expectations.

A third issue is that my instrument may violate the monotonicity condition (Imbens and Angrist 1994) needed for the IV estimate to be a local average treatment effect. In this case monotonicity means compared to seeing the All Graduates Income Treatment, seeing the Major Specific Income Treatment would cause all respondents to either not decrease or not increase their low-income expectations. However, depending on a respondent's major the income a respondent would see if they saw the All Graduates Income Treatment may be higher or lower than the income a student would see if they saw the Major Specific Income Treatment³⁵. If students respond based on what number they are shown rather than not reacting to the All Graduates Income Treatment³⁶, then the relative effect of the Major Specific Income Treatment compared to seeing the All Graduates Income Treatment may be different signs depending on if the Major Specific Income

³⁵ Out of 776 respondents in my analysis sample, 182 (23%) would see a higher typical income if they are shown the Major Specific Income Treatment then if they are shown the All Graduates Income Treatment. Respondents who see the All Graduates Income Treatment see that the average income of all college graduates is \$53,268.

³⁶ Out of 403 respondents in my analysis sample who saw the All Graduates Income Treatment, 137 (34%) change their low-income expectations after they see the treatment. For those students, it could either be the case that being asked the question about income expectations twice causes them to change their low-income expectations, or it could be the case that seeing the All Graduates Income Treatment causes them to change their low-income expectations.

Treatment typical income is higher or lower than the All Graduates Income Treatment typical income.

Despite these issues, I continue to present the IV results because doing so is consistent with the way I originally conceived of this study and because the IV gives me a way to test if the low-income expectations I measure are statistically significantly related to repayment plan choice.

VI. Results

A. Analysis Sample

Before any data is analyzed, incomplete survey responses and any response after the first response by the same person are removed³⁷. After that, 1,581 responses are left. The survey has a response rate of 22.6%. I remove international students from the sample because only U.S. citizens are eligible for student loans from the U.S. government. I remove students from the sample who I was missing major specific income information on³⁸. I remove from individuals who according to their survey responses were not seniors or were under the age of 18. I also remove students who according to their responses did not have any student loans. This leaves an analysis sample of 776 survey respondents³⁹.

B. Summary Statistics and Balance Test

Table 1 shows the mean and standard error of various traits of the respondents in the analysis sample, for respondents in the analysis sample who saw the All Graduates Income Treatment, and for respondents in the analysis sample who saw the Major Specific Income

³⁷ In cases where 2 or more responses had the same Venmo account name or email for Paypal, all responses except for the response with the earliest recorded date were deleted. 4 completed responses had neither a Venmo account nor an email for Paypal and therefore could not be checked against other responses.

³⁸ These individuals are removed from the analysis because, based on their primary major, if they are selected to receive the Major Specific Income Treatment, they would see a median income of Data Not Available. For many of these majors, there would be a major or group of majors in the College Scorecard dataset that was like a particular MSU major. However, in the College Scorecard dataset the median earnings for MSU graduates for the major or group of majors was listed as unavailable. A list of which majors were or were not in the analysis sample is available upon request.

³⁹ Out of the 1,581 respondents 38 are international students, 102 are not seniors, 151 are missing income information, 1 is under the age of 18 and 644 do not have student loans. Note that some students are in multiple groups which explains why $1,581 - 38 - 102 - 151 - 1 - 644 = 645$ is less than the 776 respondents in my analysis sample.

Treatment. In the right most column I test for the difference in the mean trait between the two treatments using a two-sample t test with unequal variances.

Before the treatment students believed they had an average of a 16% chance of earning a low-income and 62% of respondents chose the IDR plan. Both percents are similar for each treatment group. For both variables the Major Specific Income Treatment group has values 1 percentage point higher and the difference is not statistically significant.

Overall, the analysis sample is 63% female and 80% white. 88% of respondents had a single major, 41% received a Pell Grant, 67% had at least one parent who graduated from college⁴⁰, and 47% had a low-income major. These percents are similar for respondents who saw the All Graduates Income Treatment and the Major Specific Income Treatment with no difference being statistically significant at the 5% level. The difference in the percent of students who have a single major is different at the 10% level with respondents who saw the Major Specific Income Treatment being 4 percentage points more likely to have a single major. Based on the results in the table, I conclude respondents for each treatment group are similar on observable characteristics. Therefore, I believe the treatment is randomly assigned and any differences post treatment are due to how the respondents responded to the information they saw.

C. *Estimated Payment Outcomes if on the IDR Plan*

Table 2 shows summary statistics related to what respondent in my analysis sample could expect repayment to be like if they choose the IDR plan under the hypothetical borrowing scenario described in the survey. The statistics are calculated using each respondent's pretreatment income

⁴⁰ As part of the survey, I also asked students if they were first generation college students. I decided not to use this variable because for some students their answers to that question are inconsistent with their answers to the parent's highest level of education question. Out of 195 students in my analysis sample who said they are a first generation college students 16 of them, 8%, also responded that at least one parent had a college degree making them by definition not a first-generation college student. Out of 581 respondents in the analysis sample who answered they are not a first-generation college student, 76 of them (13%) also said that neither of their parents had a college degree. For those students either a more distant relative (grandparent, great grandparent) went to college while their parent did not, or they should have put that they are a first generation college student.

expectations. They are calculated assuming above \$120,000 is the probability students earn between \$120,000 and \$150,000 and that respondents have a 0% chance of earning above \$150,000 right after graduating. They assume that respondent's income grows 5% every 12 months, and they make the minimum payment each month while they have a positive loan balance. These are the same assumptions used to calculate starting repayment and months in payment by income for each plan for a table respondents see when they choose a repayment plan in the survey.

Rows 1 and 2 of the table show across sample statistics related to the expected value of starting payment. The average across sample expected value of the starting payment on the IDR plan is \$409.35. This is higher than the \$318.20 payment they would make if they were on the non-IDR plan. However, there is a lot of variability across the sample in expected starting payment with a standard deviation of \$201.72 and a range of \$0 (if a student believes they have a 100% chance of earning \$0 – \$30,000) to \$958.33. There is also lot of variability in expected payment for the typical individual in the sample. The average (across sample) standard deviation (for an individual) payment is \$194.52 with a range of \$0 (if an individual believes they have 100% chance of earning any of the 5 ranges of income) to \$372.68.

Rows 3 and 4 of the table contain across sample statistics related to how long respondents can expect to be making payments on the IDR plan. The average expected months on the IDR plan is 103 months, less than the 120 months individuals would be making payments on the non-IDR plan. Like the starting payment, there is a lot of variation in expected months making payments both for a single respondent and across respondents within the sample. The sample of expected months in payment has a standard deviation of 45 months with the within respondent standard

deviation ranging from 32 months to 240 months⁴¹. The average standard deviation of a single respondent of months in repayment is 44 months with a range of 0 months⁴² to 88.54 months.

These calculations show that IDR plans cause people of different incomes to have a wide variety of payment levels and times in repayment. This may cause different people to respond differently to IDR plans depending on their expected earnings. It may also deter people from choosing the IDR plan as it causes a lot of uncertainty about their level of payment and number of months in debt.

D. Effect of Low-Income Expectations on Repayment Plan Choice Model Type 1

Table 2 shows results related to the two-staged least squares estimates of the effect of low-income expectations on repayment plan choice using model type 1. First looking at the effect of the Major Specific Income Treatment on low-income expectations (first stage), I find that the Major Specific Income Treatment causes respondents to believe they have a 9 – 10 percentage point higher chance of earning a low income compared to if they had seen the All Graduates Income Treatment. This effect is highly significant in all models. It is also a proportionally large 56 – 63% increase in beliefs in earning a low-income compared to a pretreatment mean of 16 percentage points. Next looking at the reduced form results, I find that seeing the Major Specific Income Treatment causes respondents to have a 2 – 4 percentage point lower chance of choosing the income driven repayment plan. It is surprising to me that the point estimate is negative although in no model is the estimate significant at even the 10% level. The models with controls have a standard error of 3 percentage points meaning I could detect effects as small as 6 percentage points. Between the negative point estimate and 3 percentage point standard error it is unlikely that the

⁴¹ Because all loans are forgiven after 240 months, no one can be on the IDR plan for more than 240 months.

⁴² Respondents who believe they have a 100% chance of earning an income in one of the five income ranges have no variance in their months in repayment as a function of their income.

true effect of the Major Specific Income Treatment is increasing the present chance of choosing the IDR plan by more than 4 percentage points. Given a pre-treatment percent chance of choosing the IDR plan of 62%, both the negative point estimate and the highest positive estimate in the 95% confidence interval are proportionally small at less than 10% of the treatment mean especially compared to the very large percent increase in low-income expectations. Finally looking at the second stage results, I estimate that a 1 percentage point increase in low-income expectations causes respondents to be 0.3 – 0.5 percentage points less likely to choose the IDR plan. For all the models the estimates are insignificant at the 10% level. Based on these results, I do not have evidence to reject the null hypothesis that on average low-income expectations do not affect repayment plan choice

E. Effect of Low-Income Expectations on Repayment Plan Choice Model Type 2

Table 3 shows first stage, reduced form, and two-staged least squares estimates of the effect of low-income expectations on repayment plan choice for Model Type 2. For this model type respondents have two observations and the model type include individual fixed effects. Results using Model Type 2 are like those using Model Type 1. Compared to seeing the All Graduates Income Treatment, seeing the Major Specific Income Treatment causes students to have low-income expectations that are 7 percentage points higher. However, the treatment causes the respondents to be 4 percentage points less likely to choose the IDR plan leading to an estimate of an increase in low-income expectations of 1 percentage point causing a decrease in choosing the IDR plan of 0.7 percentage points. While the first stage estimate is significant at the 1% level, the reduced form and IV estimate are only significant at the 10% level. Compared to using Model Type 1 the effect of the treatment on income expectations using Model Type 2 is lower and the effect on repayment plan choice is similar. Overall, evidence from using Model Type 2 suggests

that increasing low-income expectations is more likely to have a negative rather than a positive effect on repayment plan choice although no effect is consistent with the results.

F. Heterogeneity by Receiving a Pell Grant

Table 5 shows the results for students with and without a Pell Grant. The first row is the coefficient for students without a Pell Grant, the 3rd row is the effect for students with a Pell Grant, and the 2nd row is the difference between the two effects. For students without a Pell Grant, the Major Specific Income Treatment caused them to have low-income expectations 6 percentage points higher and to be 3 percentage points (not statistically significant) less likely to choose the IDR plan leading to an estimated effect of low-income expectation on repayment plan choice of 0.55. On the other hand, for Pell Grant students the effect of the Major Specific Income Treatment was an increase in low-income expectations of 11 percentage points and a 11-percentage point lower percent chance of choosing the IDR plan leading to an estimated effect of low-income expectations on repayment plan choice of -1. None of the differences in the coefficients between students with and without a Pell Grant are statistically significant at the 5% level. Even so, the results are consistent with increases in low-income expectations decreasing the probability some respondents choose the IDR plan.

G. Heterogeneity by Income of Major

To look at the difference in the effect of the treatment and of low-income expectations by the income of student's major, I assign each student a major income equal to the income they would have seen if they saw the Major Specific Income Treatment. This is the median income of MSU graduates with majors similar to their major. Students with an income of less than \$36,200 (not adjusted for inflation) are low-income major students. I define the rest of the students as high-

income major students. The cutoff is chosen to split the analysis sample into 2 roughly equal groups.

Table 6 shows the results of this analysis. High-income major students who see the Major Specific Income Treatment have no change in low-income expectations but are still 10 percentage points less likely to choose the IDR plan. On the other hand, low-income major students who see the Major Specific Income Treatment have low-income expectations that are 15 percentage points higher, but they are only an insignificant 1 percentage point more likely to choose the IDR plan leading to an estimated 0 effect of low-income expectations on repayment plan choice. These results are consistent with the Major Specific Income Treatment significantly changing low-income expectations for some students, but low-income expectations having no impact on repayment plan choice.

H. Heterogeneity by Initial Income Expectations

The goal of this analysis is to compare two roughly equal sized groups of students with different pre-treatment income expectations. 42% (325 students) believe they have a 0% chance of earning a low-income before seeing the treatments. Another 25% (192 students) believed they have a 10% chance of earning a low-income before the treatment. Because of this, I decide to compare the effect of the treatment and of low-income expectations for students who do and do not believe they have a 0% chance of earning a low-income before the treatment.

Table 7 shows the results of this analysis. For students who believe they have a non-zero chance of earning a low-income before seeing a treatment (row 1), seeing the Major Specific Income Treatment causes the students to increase their low-income expectations by 8 percentage points, and to decrease their probability of choosing the IDR plan by an insignificant 3 percentage points. I estimated that for this group every 1 percentage point increase in low-income expectations

increases a student's percent chance of choosing the IDR plan by an insignificant 0.36 percentage points. By contrast, for zero percent low-income students, the Major Specific Income Treatment increases their low-income expectations by an insignificant 4 percentage points and decreases the percent chance of choosing the IDR plan by an insignificant 5 percentage point. This leads to an estimate, significant at the 10% level, that a 1 percentage point increase in low-income expectations decreases repayment plan choice by 1.29 percentage points. None of the differences in coefficients between the 0 and above 0 percent low-income groups are statistically significant at the 5% level. Consistent with all the analysis except the income of major analysis, higher low-income expectations are associated with an insignificantly lower probability of choosing the IDR plan.

VII. Discussion

One consistent finding of the results is that information about future income can change (at least in the short term) students' beliefs about what they expect their incomes to be and that in general students increase their beliefs that they will earn a low-income. The Major Specific Income Treatment significantly increases low-income expectations on average, for students who never received a Pell Grant, for students who had received a Pell Grant, for students with a low-income major, and for students who prior to the treatment believed they had a non-0 chance of earning a low-income. For high-income major students and zero-percent low-income students the point estimate is positive but insignificant. This was consistent with my initial expectations.

In contrast the effect of seeing the Major Specific Income Treatment on the probability students choose the IDR plan is very different from what I expected. For the full analysis sample both Model Type 1 and Model Type 2 had negative IDR point estimates with the Model Type 2 point estimate being significant at the 10% level. Students who never received a Pell Grant, zero-percent

low-income students, and above-zero-percent low-income students also have negative insignificant point estimates. On the other hand, high-income major students and students who received a Pell Grant had significant point estimates of at less than or equal to -10 percentage points suggesting that some students respond to the information by being less likely to choose the IDR plan. For only one subgroup (low-income major students) is the point estimate positive and it is close to 0. On the whole, there seems to be no evidence that the Major Specific Income Treatment increases the probability of choosing the IDR plan and some evidence that the treatment made the IDR plans less appealing for some students.

As for the IV estimates, most of them are negative and insignificant, with the effect for low-income major students being positive but insignificant and close to 0 while the effect for Pell Grant students is statistically significant and close to 1. The most perplexing results related to low-income and high-income major students. For high income major students, a near 0 change in low-income expectations occurs with a significant decline in choosing the IDR plan. For low-income major students a large increase in low-income expectations occurs with a near 0 change in the probability a student chooses the IDR plan. It seems like these results are inconsistent with higher low-income expectations making students more likely to choose the IDR plan. Beyond that, it may be the case that low-income expectations either have no effect on repayment plan choice or higher low-income expectations make some students less likely to choose the IDR plan. Either way if the goal is to get more students into IDR plans, making them believe they are more likely to earn a low-income will probably not accomplish that goal.

One issue that I have not addressed so far is the issue of income volatility. Being on an IDR plan can help individuals not just with a permanently low-income, but those who have a temporarily low-income. To the extent that respondents are not considering the possibility that

their otherwise high income might become temporarily much lower and that in that case they would benefit from the reduced payments on an IDR plan, respondents may be undervaluing the benefits of the IDR plan.

Rather than interpreting the income distributions as probabilities of being on different income trajectories based on first jobs, they could be interpreted as beliefs related to income volatility around a single income trajectory. The information I provide respondents relates to median or average earnings, so I think it makes more sense that the treatment shifts the entire probability distribution of expected earnings rather than changing beliefs about income volatility while leaving the center of the distribution fixed. Also, in either interpretation it seems like if borrowers are concerned about not having the required payment be a high percentage of their income, then IDR plans would still be more desirable if they are more likely to earn a low-income.

VIII. Conclusion

In this paper I test the hypothesis that a student's subjective probability of earning a low income is a causal factor in if they prefer an IDR or non-IDR student loan repayment plan. I predict that students who had an exogenously higher subjective probability of earning a low income would be more likely to choose an IDR plan. I test that hypothesis using data from a web survey emailed to undergraduate seniors at MSU. The survey randomizes the type of information about post-college incomes survey respondents are shown to create two groups of survey respondents with exogenously different probabilities of earning a low income. I find seeing the Major Specific Income Treatment causes survey respondents to believe they have a statistically significantly higher probability of earning a low-income compared to survey respondents who see the All-Graduates Income Treatment. Despite this, seeing Major Specific Income Treatment does not cause respondents to have a statistically significantly different probability of choosing the IDR

plan than survey respondents who see the All-Graduates Income Treatment. This pattern is similar looking at a variety of sub samples such as survey respondents who had and had not received a Pell Grant, survey respondents with lower and higher earning majors, and survey respondents who before they see the treatments believe they are more likely and less likely to earn a low income.

I conclude that in general changing a student loan borrower's expectation of earning a low income will either not change their repayment plan choice or make them a bit less likely to choose an IDR plan. This fits with some other studies where providing students with information related to student loans has at best null and at worse negative effect for the college students they are attempting to help (Darolia and Harper 2018; Marx and Turner 2020; Barr, Bird, and Castleman 2021). Attempts to increase take-up of IDR plans may have more success focusing on other changes to student loan repayment plan choice such as emphasizing the benefits of IDR plans (Abraham, Filiz-Ozbay, Ozbay, and Turner, 2020) or making an IDR plan the default repayment plan choice (Cox, Kreisman, and Dynarski, 2020).

Future research could explore what borrowers in general, and students in particular, most care about when paying back their loans. Do they care about minimizing required payments, the total amount their loans cost, how long they have any debt, or some combination of the above? How do borrowers in general, and students in particular, balance the tradeoffs between lower monthly payments and increased amount of time having debt? If students had more choices related to how they repaid their student loans, such as having more control over the length of time they had to pay back their student loans on the non-IDR plan, or how payments are calculated as a function of their annual income on an IDR plan, how would they design their repayment plan?

A second line of future research to expand on this research might be digging deeper into student's expectations of their futures. How do students expect their income to change over time?

How do students expect their incomes to change if they attend graduate or professional school?

How accurate are students' beliefs related to how likely they are to attend graduate or professional school? What do students think they will be doing if they earn different ranges of income?

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Appendix: Data Source and Variable Descriptions

The data used for this paper comes from a web survey I designed in Qualtrics. The survey was emailed to 7,000 college seniors at Michigan State University in October 2021. The data can be accessed on OPEN ICPSR at <https://www.openicpsr.org/openicpsr/project/186081/version/V4/view>. Final_Survey_Data.csv contains the raw data for all 1,581 complete responses.

Table 1 - Summary Statistics Honors and Non-Honors Students

| Variable | Full Sample | All Graduates Income Treatment | Major Specific Income Treatment | Difference |
|--------------------------------------|-----------------|--------------------------------------|---------------------------------------|------------------|
| Pre-Treatment Low- Income Percent | 15.56 (0.75) | 15.04 (0.98) | 16.14 (1.15) | -1.10 (1.51) |
| Pre-Treatment Choose IDR Plan | 62.37 (1.74) | 62.03 (2.42) | 62.73 (2.51) | -0.70 (3.48) |
| Percent Female | 62.50 (1.74) | 62.03 (2.42) | 63.00 (2.50) | -0.97 (3.48) |
| Percent White | 80.03 (1.44) | 78.66 (2.04) | 81.50 (2.01) | -2.84 (2.87) |
| Percent Single Major | 87.76 (1.18) | 85.61 (1.75) | 90.08 (1.55) | -4.47* (2.34) |
| Percent Ever Received Pell Grant | 41.24 (1.77) | 39.95 (2.44) | 42.63 (2.56) | -2.68 (3.54) |
| Percent College Graduate Parent | 67.14 (1.69) | 67.49 (2.34) | 66.76 (2.44) | 0.74 (3.38) |
| Percent Low- Income Major | 47.29 (1.79) | 45.41 (2.48) | 49.33 (2.59) | -3.92 (3.59) |
| N | 776 | 403 | 373 | 776 |

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ for the difference between difference from 0. Significance tests are 2 sample t-tests with unequal variance. The table shows the standard error below the mean. Difference is the mean for All Graduates Income Treatment respondents minus the mean for the Major Specific Income Treatment respondents. Low-Income Expectations are the percentage chance a respondent believes they will \$0 to \$30,000 a year. Choose IDR Plan is 100 if the respondent chooses the IDR and 0 otherwise. Low-Income Major is defined as the typical income the respondent would have seen if they were in the Major Specific Income Treatment being less than \$36,200.

Table 2 – Means and Variances Starting Payment and Standard Deviation of Payments

| Variable | Minimum | Maximum | Mean | Standard Deviation |
|--|---------|---------|--------|--------------------|
| Expected Starting Payment if on IDR Plan | 0.00 | 958.33 | 409.35 | 201.72 |
| Standard Deviation of Starting Payment if On IDR Plan | 0.00 | 372.68 | 191.52 | 90.99 |
| Expected Months Making Payments if on IDR Plan | 32.00 | 240.00 | 103.32 | 45.44 |
| Standard Deviation of Months Making Payments on IDR Plan | 0 | 88.54 | 44.16 | 24.70 |

Notes: N = 776. Expected values and standard deviations are calculated given each respondent's pre-treatment income expectations. The statistics shown in the table summarize the distribution of those statistics across respondents. Calculations assume that the percent chance a student believes they will earn above \$120,000 is the percent chance they will earn between \$120,000 and \$150,000. The IDR plan is the same one in the survey with required minimum monthly payments being 10% of income above \$20,000 divided by 12 or \$0 if income is below \$20,000. No one can pay for more than 240 months because loans are forgiven after 240 months (20 years). To calculate the time making payments on the IDR plan I assume the respondent's income grows 5% after every 12 months and that the respondent makes the required minimum payment every month while they still have a positive loan balance.

Table 3 – Effect of Low-Income Expectations on Repayment Plan Choice Model Type 1

| | Low-Income Expectations | Low-Income Expectations | Low-Income Expectations |
|-------------------------------------|----------------------------|----------------------------|----------------------------|
| Major Specific Income Treatment | 10.37*** (1.76) | 9.48*** (1.24) | 9.18*** (1.31) |
| Controls for Pre-Treatment Outcomes | N | Y | Y |
| Other Covariates | N | N | Y |
| Mean Pre-Treatment Outcome | 15.56 | 15.56 | 15.56 |
| | Choose IDR Plan | Choose IDR Plan | Choose IDR Plan |
| Major Specific Income Treatment | -4.09 (3.52) | -4.43 (2.91) | -2.48 (3.00) |
| Controls for Pre-Treatment Outcomes | N | Y | Y |
| Other Covariates | N | N | Y |
| Mean Pre-Treatment Outcome | 62.37 | 62.37 | 62.37 |
| | IV: Choose IDR Plan | IV: Choose IDR Plan | IV: Choose IDR Plan |
| Low-Income Expectations | -0.39 (0.34) | -0.47 (0.31) | -0.27 (0.32) |
| Controls for Pre-Treatment Outcomes | N | Y | Y |
| Other Covariates | N | N | Y |
| Mean Pre-Treatment Outcome | 62.37 | 62.37 | 62.37 |

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. $N = 776$. Standard errors are robust to heteroskedasticity. Low-Income Expectations are the percentage chance a respondent believes they will \$0 to \$30,000 a year. Choose IDR Plan is 100 if the respondent chooses the IDR and 0 otherwise. The dependent variables in the regressions were measured after the treatment. The IV models are two stage least squares models where seeing the Major Specific Income Treatment in an instrument for the respondent's low-income expectations. Pre-Treatment Outcomes are the respondent's low-income expectations before the treatment and a 100/0 variable for if they chose the IDR plan before the treatment. Other covariates include information about the respondent's gender, their race, if they ever had a Pell Grant, how many majors they had, the highest level of education their parents had, their age, and the percentage chance the respondent believed they would attend graduate school.

Table 4 – Effect of Low-Income Expectations on Repayment Plan Choice Model Type 2

| | Low-Income Expectations | Choose IDR Plan |
|-------------------------------------|-------------------------|------------------|
| Saw Major Specific Income Treatment | 6.54*** (1.07) | -4.29* (2.42) |
| Student Fixed Effects | Y | Y |
| After Treatment Indicator Variable | Y | Y |
| Mean Pre-Treatment Outcome | 15.56 | 62.37 |
| | IV: Choose IDR Plan | |
| Low-Income Expectations | -0.66* (0.37) | |
| Student Fixed Effects | Y | |
| After Treatment Indicator Variable | Y | |
| Mean Pre-Treatment Outcome | 62.37 | |

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. $N = 1,552$. Each of the 776 respondents has two observations: one before the treatment and one after the treatment. Standard errors for the non-IV regressions are clustered at the respondent level. Low-Income Expectations are the percentage chance a respondent believes they will \$0 to \$30,000 a year. Choose IDR Plan is 100 if the respondent chooses the IDR and 0 otherwise. The IV models are two stage least squares models where saw Major Specific Income Treatment in an instrument for the respondent's low-income expectations.

Table 5 – Effect of Major Specific Income Treatment Heterogeneity by Ever Receiving a Pell Grant

| | Low-Income Expectations | Choose IDR Plan |
|--|----------------------------|--------------------|
| Saw Major Specific Income Treatment | 5.98*** (1.28) | -3.27 (3.33) |
| Saw Major Specific Income Treatment * Ever Received Pell Grant | 4.61* (2.51) | -7.98 (5.98) |
| Sum of Above Coefficients | 10.59*** (2.17) | -11.25** (4.97) |
| Student Fixed Effects | Y | Y |
| After Treatment Indicator Variable | Y | Y |
| After Treatment and Ever Received Pell Grant Indicator Variable | Y | Y |
| Mean Pre-Treatment Outcome | 15.56 | 62.37 |
| | IV: Choose IDR Plan | |
| Low-Income Expectations | -0.55 (0.55) | |
| Low-Income Expectations * Ever Received Pell Grant | -0.52 (0.75) | |
| Sum of Above Coefficients | -1.06** (0.51) | |
| Student Fixed Effects | Y | |
| After Treatment Indicator Variable | Y | |
| After Treatment and Ever Received Pell Grant Indicator Variable | Y | |
| Mean Pre-Treatment Outcome | 62.37 | |

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. $N = 1,552$. Each of the 776 respondents has two observations: one before the treatment and one after the treatment. Standard errors for the non-IV regressions are clustered at the respondent level. Low-Income Expectations are the percentage chance a respondent believes they will \$0 to \$30,000 a year. Choose IDR Plan is 100 if the respondent chooses the IDR and 0 otherwise. Ever Received Pell Grant is 1 if the respondent ever received a Pell Grant and 0 otherwise. The IV models are two stage least squares models where saw Major Specific Income Treatment and Saw Major Specific Income Treatment * Ever Received Pell Grant are instruments for Low-Income Expectations and Low-Income Expectations * Ever Received Pell Grant.

Table 6 – Effect of Major Specific Income Treatment Heterogeneity by Income of Major

| | Low-Income Expectations | Choose IDR Plan |
|---|----------------------------|---------------------|
| Saw Major Specific Income Treatment | 0.32 (1.03) | -10.05*** (3.31) |
| Saw Major Specific Income Treatment * Low-Income Major Indicator | 15.13*** (2.38) | 11.14* (6.00) |
| Sum of Above Coefficients | 15.45*** (2.14) | 1.08 (5.00) |
| Student Fixed Effects | Y | Y |
| After Treatment Indicator Variable | Y | Y |
| After Treatment and Low-Income Major Indicator | Y | Y |
| Mean Pre-Treatment Outcome | 15.56 | 62.37 |
| | IV: Choose IDR Plan | |
| Low-Income Expectations | -31.67 (66.78) | |
| Low-Income Expectations * Low- Income Major Indicator | 31.73 (66.81) | |
| Sum of Above Coefficients | 0.07 (1.97) | |
| Student Fixed Effects | Y | |
| After Treatment Indicator Variable | Y | |
| After Treatment Low-Income Major Indicator | Y | |
| Mean Pre-Treatment Outcome | 62.37 | |

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. $N = 1,552$. Each of the 776 respondents has two observations: one before the treatment and one after the treatment. Standard errors for the non-IV regressions are clustered at the respondent level. Low-Income Expectations are the percentage chance a respondent believes they will \$0 to \$30,000 a year. Choose IDR Plan is 100 if the respondent chooses the IDR and 0 otherwise. Low-Income Major Indicator is 1 if the income the respondent would have seen if they were in the major specific income treatment was \$36,200 and 0 otherwise. The IV models are two stage least squares models where Saw Major Specific Income Treatment and Saw Major Specific Income Treatment * Low-Income Major Indicator are instruments for Low-Income Expectations and Low-Income Expectations * Low-Income Major Indicator.

Table 7 – Effect of Major Specific Income Treatment Heterogeneity by Starting Low-Income Expectations

| | Low-Income Expectations | Choose IDR Plan |
|--|----------------------------|--------------------|
| Saw Major Specific Income Treatment | 7.76*** (1.63) | -2.80 (3.30) |
| Saw Major Specific Income Treatment * Zero-Percent Low-Income | -3.45* (2.04) | -2.28 (5.54) |
| Sum of Above Coefficients | 4.30 (1.22) | -5.08 (4.44) |
| Student Fixed Effects | Y | Y |
| After Treatment Indicator Variable | Y | Y |
| After Treatment and Zero-Percent Low-Income | Y | Y |
| Mean Pre-Treatment Outcome | 15.56 | 62.37 |
| | IV: Choose IDR Plan | |
| Low-Income Expectations | -0.36 (0.41) | |
| Low-Income Expectations * Zero- Percent Low-Income | -0.93 (0.85) | |
| Sum of Above Coefficients | -1.29* (0.75) | |
| Student Fixed Effects | Y | |
| After Treatment Indicator Variable | Y | |
| After Treatment Zero-Percent Low- Income | Y | |
| Mean Pre-Treatment Outcome | 62.37 | |

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. $N = 1,552$. Each of the 776 respondents has two observations: one before the treatment and one after the treatment. Standard errors for the non-IV regressions are clustered at the respondent level. Low-Income Expectations are the percentage chance a respondent believes they will \$0 to \$30,000 a year. Choose IDR Plan is 100 if the respondent chooses the IDR and 0 otherwise. Zero-Percent Low-Income is 1 if the income the respondent believed that had a 0% chance of earning between \$0 and \$30,000 before seeing a treatment and 0 otherwise. The IV models are two stage least squares models where saw Major Specific Income Treatment and Saw Major Specific Income Treatment * Zero-Percent Low-Income are instruments for Low-Income Expectations and Low-Income Expectations * Zero-Percent Low-Income.