Beliefs About Student Loan Repayment*

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Abstract

Government statements about future actions can influence agents' economic choices today. How do beliefs about future government policy affect households' borrowing, spending and debt paydown behavior? We study this through the lens of student loan forgiveness in the United States, which following electoral promises, was announced in 2022 but never implemented due to judicial rulings. We conduct a customized information provision experiment embedded in a survey eliciting real-time beliefs about future debt forgiveness and repayment, which we link to credit bureau data, employment verification data, and nondurables consumption. Borrowers who are more optimistic about forgiveness reduce payments on student loans and increase non-durable spending, but postpone durable spending while they wait for uncertainty to resolve. Our results provide micro-evidence on the role of policy uncertainty in household decisionmaking, and have implications for government announcements and commitment policy.

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1 Introduction

For most borrowers, student loan forgiveness was a remote possibility before 2020. Policy discussion surrounding student loan forgiveness began to develop during the 2020 election cycle and as part of the COVID policy response. At the time of this study, there continues to be considerable policy uncertainty around broad-based forgiveness. Figure 1 shows the number of news articles in major news outlets related to student loan forgiveness, over the period from 2019 to 2024. We further classify those articles into "Optimistic," "Neutral" and "Pessimistic" using Chat GPT 3.5 turbo. The number of articles peaks around Biden's August 2023 announcement related to broad-based student loan forgiveness. Moreover, throughout this window, there is a mix of optimistic and pessimistic information.

To study how consumer behavior shift as expectations change, we conducted a survey eliciting beliefs about future debt forgiveness and repayment during this period of considerable uncertainty. We then link these beliefs to high-frequency spending data, credit bureau data, and employment information.

Our survey documents wide variation in beliefs about student loan forgiveness. For instance, in mid 2022, the mean belief about 1-year ahead forgiveness was 25 percent, with a standard deviation of 30 percent. We next show that beliefs are sensitive to experimental and actual news shocks. As part of our survey, we conducted information interventions by presenting news articles that were more optimistic or pessimistic about forgiveness. We also ran multiple survey waves over time, which allows us to study the response to major news shocks. Our key findings are as follows: reading an optimistic news article increases forgiveness beliefs by 4 percentage points in our experimental setting. Biden's major student loan announcement in August 2022 moved beliefs by to 22 percentage points. Announcements about court injunctions and the Supreme Court decision in June 2023 saw beliefs fall below their pre-2022 levels. These beliefs do not appear to evolve differentially due to pandemic risk or employment shocks faced during the COVID-19 period.

With our linked credit bureau data, we then document how households act on their beliefs

about forgiveness. Our key finding is that those who are more optimistic about forgiveness/payment moratoriums make fewer payments on their student loans and increase non-durable spending. Over the whole period, we see lower rates of durables spending among those who are more optimistic, even after conditioning on other observable differences, suggestive that those with more optimistic beliefs may delay large durable purchases. These responses appear rational, with some caveats. For example, reductions in payments occur among individuals who appear to be making voluntary payments on student loans in a period when payments were not strictly required, which may occur due to commitment or debt aversion. The reduction in durable purchases is consistent with a literature on investing under uncertainty when it is costly to readjust under the bad state of nature, in our case, if forgiveness were not realized.

We add to several strands of the literature. Given we study student loans, we are related to the growing literature on student loans. With $1.7 trillion in student loans outstanding, they have become the second largest component of household balance sheets in the United States after mortgages. We are most closely related to the student loan literature looking at student loan liquidity and how it is related to non-education activities upon entering repayment (Avery and Turner, 2012; Looney and Yannelis, 2015; Lochner and Monge-Naranjo, 2011, 2016; Goodman, Isen, and Yannelis, 2021; Dinerstein, Yannelis, and Chen, 2024; Dinerstein, Koustas, Yannelis, and Earnest, 2024). Our paper contributes to this literature by being the first paper to examine repayment *beliefs*.

More broadly, we examine consumption and other choices under uncertainty. We are related to the literature on consumption choices and the broader literature on the Permanent Income Hypothesis (PIH). A key prediction from the PIH is that households should make a plan in advance to respond to large expected changes in income. The literature testing the PIH is wide-ranging, examining consumption following unexpected shocks,[1] to expected changes in income.[2] In our work, we explicitly elicit beliefs about the future policy and examine responses

[1]This is a special case of beliefs about future income shocks being 0. Some examples include the lottery (e.g. Golosov, Graber, Mogstad, and Novgorodsky, 2023) or changes in gasoline prices (Gelman, Gorodnichenko, Kariv, Koustas, Shapiro, Silverman, and Tadelis, 2023).

[2]This is a special case of beliefs approaching 1. The literature is mixed, with some papers finding excess

to beliefs.

Finally, we build on and add to the literature on subjective expectations. For decades, economists had largely ignored expectations of households because of the large dispersion in the cross section and their biases in the time series so much that Prescott (1977) famously said "Like utility, expectations are not observed, and surveys cannot be used."[3] Over the course of the following decades, this view has largely changed and methodological advances in survey design and methodology have contributed to this change (Manski, 2004). A recent body of works shows that the dispersion in expectations at any point in time as well as the apparent biases when evaluated against ex-post realizations can largely be explained by the signals consumers use to form their expectations. For example, in the domain of aggregate inflation expectations, D'Acunto, Malmendier, Ospina, and Weber (2021); D'Acunto, Malmendier, and Weber (2021) show that consumers focus on the price changes of goods in their own consumption bundle in line with the Lucas Jr (1972) island model and especially of goods they purchase frequently rather than goods that they spend lots of money on and put more weight on price increases rather than equal-sized price cuts. Together, these features can rationalize the large dispersion but also the upward bias in expectations. But socioeconomic status (Das, Kuhnen, and Nagel, 2020), cognition (D'acunto, Hoang, Paloviita, and Weber, 2023; D'Acunto, Hoang, Paloviita, and Weber, 2019, 2021), and lifetime experiences also play a role (Goldfayn-Frank and Wohlfart, 2020).

Despite their apparent biases, subjective expectations still matter in determining consumers economic choices such as their housing decisions (Armona, Fuster, and Zafar, 2019), their consumption and savings decisions (Coibion, Gorodnichenko, and Weber, 2022), or their portfolio choice (Beutel and Weber, 2023). We build on this work in that we implement a randomized information provision experiment embedded in a customized survey to establish causality

sensitivity to tax refunds (Souleles, 1999), whereas others finding little to no response to expected income (e.g. the Alaska Permanent Fund Hsieh, 2003). In survey evidence, Fuster and Zafar (2023) examine households reported consumption responses to future income and find that households report they will not respond until receipt of income, in violation of the PIH.

[3]There is a related literature on the response of firms to uncertainty. See, e.g. (Bernanke, 1983; Baker, Bloom, and Davis, 2016; Bloom, Floetotto, Jaimovich, Saporta-Eksten, and Terry, 2018).

rather than purely relying on correlations between survey responses and economic decisions. Weber, D'Acunto, Gorodnichenko, and Coibion (2022); D'Acunto, Malmendier, and Weber (2023); D'Acunto and Weber (2024) summarize this literature for inflation expectations, Haaland, Roth, and Wohlfart (2023); Fuster and Zafar (2023) summarize the literature on information provision experiments in economics and provide guidance on how to design them, and Stantcheva (2023) provides best practices on how to design and run a survey. Bachmann, Topa, and van der Klaauw (2022) provides a handbook treatment on the elicitation, patterns, and use of subjective expectations in economics.

This paper is organized as follows: In the next section, we discuss the institutional environment of student loans and forgiveness in our period of study. In Section 3, we present our new survey of beliefs about student loan forgiveness and discuss the main results. Section 4 discusses the individual data linkages between our survey and consumption, credit bureau, and employment data. Section 5 presents our main analysis using these linked data, examining the evolution of outcomes by beliefs over time and around key announcements. Section 6 presents results from our survey experiment. Section 7 outlines a simple model of payment choice and consumption, which we use to understand the welfare consequences of our results. Section 8 concludes.

2 Institutional Details

2.1 Student Lending in the United States

Student loans play an important role in the funding of higher education in the United States, with around half of undergraduate and graduate students in recent years receiving at least some loans as part of aid packages (National Center for Education Statistics, 2023). As of 2020, nearly 43 million individuals held approximately 1.6 trillion in outstanding student loans, which represents the largest source of household debt after mortgages (U.S. Department of Education, 2024; Board of Governors of the Federal Reserve System, 2024).

Student loans can be broadly categorized into federal and private loans, with over 92

percent of outstanding student loan debt being directly held or guaranteed by the federal government.[4] Federal student loans come with several benefits, including fixed interest rates, income-driven repayment plans, and potential loan forgiveness options. The remaining student loan debt is held in private student loans, which also includes federal student loans that have since been refinanced with a private lender, typically at a lower interest rate. Importantly, private student loans are not eligible for any federal student loan relief. Whether federal or private, student loan debt is difficult to discharge in bankruptcy. Delinquency of 270 days or more will typically result in wage garnishment up to 15 percent of disposable income. In the years prior to COVID, over 10 percent of student loan borrowers defaulted within 3 years (U.S. Department of Education, 2019).

2.2 Student Loan Forgiveness

As a result of rising student debt and the perceived burdens, calls for student loan forgiveness have increased in the years preceding the 2020 US Presidential election. While Biden campaigned in part on student loan forgiveness, the 2020 pandemic was a watershed moment for student loan payment relief. Most immediately, student loan payments and interest were paused as part of bipartisan COVID relief in early 2020, resulting in automatic rehabilitation of federal loans in default.[5] The payment pause was then extended on seven separate occasions: Student loans were initially paused as part of the CARES Act, effective March 27, 2020, through September 2020. This was later extended (twice) through September 2021. In August 2021, the payment pause was extended through January 2022. In January 2022, the payment pause was extended through May 2022. In April 2022, the payment pause was extended through August 2022. In August 2022, the payment pause was extended to January 2023. The press release referred

[4] Guaranteed loans were issued under the Federal Family Education Loan Program (FFEL). Under FFEL, private lenders provided the loans, while the federal government guaranteed the loans against default and provided subsidies to lenders. The FFEL program was discontinued in 2010 and replaced with the Direct Loan Program, while extant FFEL loans continued to be serviced by loan servicers. Yet another type of loan is the Perkins loan, issued by participating schools, with funds provided by the federal government and the participating schools. The Perkins loan program was discontinued in 2017.

[5] FFEL loans did not qualify for the repayment pause (Dinerstein, Yannelis, and Chen, 2024).

to this extension as the "final time." Despite this, in November 2022, the payment pause was extended to June 2023. In June 2023, the payment pause was extended again through September 2023. In the end, the initially temporary payment moratorium lasted 3.5 years until October 2023.[6] The extensions after August 2022 were in part motivated by developments related to student loan forgiveness, which we discuss next.

In August 2022, Biden proposed broad-based cancellation of $10,000-$20,000 in student debt in line with a key campaign promise. The higher amount of $20,000 was for prior Pell grant recipients, which are federal grants given to students from low-income households. This proposed plan for forgiveness had an income threshold of $125,000 per year for singles, and $250,000 for married individuals. Initially justified under legal authority granted to the Department of Education during national emergencies, the policy soon encountered political opposition and legal challenges. On November 14, 2022, court injunctions blocked new applications for forgiveness. From this day, prospective borrowers seeking to apply for forgiveness visiting studentaid.gov saw a banner that read: "*Courts have issued orders blocking our student debt relief program. As a result, at this time, we are not accepting applications. We are seeking to overturn those orders. If you've already applied, we'll hold your application.*" Ultimately, a Supreme Court decision on June 30, 2023 declared this plan unconstitutional, and no broad-based forgiveness was issued under this plan.

During this time additional political statements, forgiveness made under other legal authority, and the introduction of new income-driven repayment plans that can lead to forgiveness, have also occurred. Given the popular media and policy attention, many beliefs about forgiveness likely changed dramatically since 2020. We next discuss our novel survey and the link to spending, credit bureau and employment data.

[6]While interest was beginning to accrue again, the Biden administration also announced that there would be no other consequences for non-payment for the next year, including no reporting of a delinquency to credit bureaus. In October 2024, payments paused again for individuals who had enrolled in the new, more generous income-contingent repayment plans, known as SAVE plans.

3 Surveying Beliefs about Student Loan Forgiveness

3.1 Survey Design

The key goal of our survey was to elicit individual beliefs about student loan forgiveness and repayment that we could link to economic outcomes.[7] We asked the following series of questions to borrowers to elicit beliefs: First, "*What is the percent chance AT LEAST SOME of your student loan debt will be forgiven in the next [1,2-5,10] years?*" Below this, we then asked "*What fraction of your student debt do you think will be forgiven in the next [1,2-5,10] years?*" Multiplying this fraction by student loan balances should yield the expected amount of forgiveness, but we also explicitly asked, "*What dollar value of your student loan debt do you think will be forgiven?*" Using a related question, we elicit expectations related to the payment moratorium: "*What is the percent chance the repayment pause will be extended past [DATE LAST ANNOUNCED].*" The survey also included an information experiment showing optimistic and pessimistic news articles about forgiveness. The goal of this treatment was to shift beliefs about the likelihood of forgiveness. These information treatments are shown in Appendix B.

We fielded our survey using two different samples. The first was a survey frame purchased through an anonymous credit bureau, while the second was obtained through a commercial consumption survey. The credit panel sample frame consisted of 1.3 million emails of potential student loan borrowers. These emails were sourced by the credit bureau by looking at nine-digit zipcodes with high rates of student loan borrowers. Separately, we conducted our survey in The Numerator OmniPanel, comprised of consumers using the Receipt Hog app.[8] Our survey responses are then linkable to high-frequency spending data derived from receipts scanned by consumers into the Receipt Hog app; we discuss the Numerator data in more detail in Section 4 below.

We conducted a series of email surveys using Qualtrics. In May - June 2022, we piloted

[7] A copy of our main survey instrument is provided in Online Appendix D. IRB approval to conduct our survey for was given at The University of Chicago under Protocol IRB22-0465.

[8] More information about the Numerator panel can be found at https://www.numerator.com/omnipanels/

the survey, providing lottery prize compensation. We conducted our first main survey waves June to August 2022, using approximately half of our non-Gmail sample frame.[9] Prior to the Supreme Court Decision, we reached out to the remaining sample beginning in April 2023, as well as to resurvey prior respondents. In the end we received 8,417 completed responses from 4,847 unique respondents, which is approximately a 0.6 percent response rate, and a 1.2 percent among non-Gmail email accounts. One survey wave was conducted in July 2023 targeting 3,000 respondents who indicated in a screening question that they had current student loans (the 3,000 sample size target was due to budgetary reasons). In the end, we received 3,024 completed responses in our Numerator panel.

3.2 Raw Survey Results

3.2.1 Beliefs about Forgiveness and Repayment

We briefly describe key survey results here. Additional results from our survey can be found in Appendix C. First, we find that announcements surrounding student loans are highly salient among our respondents. In terms of repayment activity, 91 percent of respondents reported they were aware of the repayment pause, and 71 percent reported not having made a student loan payment since March 2020. Additionally, 18 percent reported making a voluntary payment, while 10 percent reported not having eligible student loans and only 1 percent said the "Didn't know." Following Biden's August 24 announcement, 88 percent reported awareness of the forgiveness plan. 76 percent reported having applied for forgiveness before the November 2022 injunctions. In our surveying in Spring 2023, 86 percent reported an awareness that the Supreme Court might block forgiveness.

The time series of our 1-year ahead forgiveness expectations across all our survey waves are shown in Figure 2. Our first surveys in June 2022 show mean beliefs around 27 percent. Mean

[9] We did not find that response rates were sensitive to providing an incentive. We found substantially lower response rates among individuals with Google-based email addresses which we believe is due to the way the Google email server handles large volume messages being sent via Qualtrics. (Approximately 60 percent of our sample frame emails were a non-Gmail address.)

beliefs jump by approximately 20 percentage points at Biden's August 24 announcement, but are still below 50 percent. In a post announcement follow-up question, we asked about sources of skepticism. 50 percent indicated skepticism about legality, while around one-third indicated uncertainty about individual eligibility, such as income and eligible loan types. By the time of the Supreme Court decision, average beliefs are around 5 p.p. below their pre-announcement mean, but still reasonably large at 22 percent. We next turn to analyzing the distribution of these beliefs. The full distribution of cross-sectional beliefs pre and post the two major announcements are shown in Figure 3.[10] We see considerable variation in beliefs, with mass points at 0, 50 and 100 percent. Appendix Figure A.2 reports the distribution of the fraction of student loans individuals expected to be forgiven at the different horizons, restricted to those with positive beliefs about forgiveness. The median fraction at the 1-year horizon was 27 percent. Only 10 percent of respondents expect all their loans to be forgiven in the next 5 years. Interestingly, beliefs about receiving 100 percent forgiveness nearly double from 10 to 20 percent of respondents between the 2-5 and 10-year horizons.

In Figure 4, we show similar figures for beliefs about the repayment pause. Prior to the penultimate extension of the repayment pause, around half of respondents expected the payment pauses to continue. Prior to the final pause, beliefs had fallen considerably; however 30 percent of respondents still expected a further extension that did not come to pass.

3.2.2 Survey Intentions

In our surveys in 2023, we also asked about consumption and employment intentions if respondents received forgiveness in line with the Biden proposal. In particular, our question asked households to consider: "Suppose you received student loan forgiveness of $10,000." We then prompted households to indicate how much of the $10,000 they would allocate to new spending, such as a house/apartment; a car or other vehicle; a large home appliance or electronics; or all other spending. We also asked about paying off other debts or saving. To briefly summarize

[10]The time series of the standard deviation is provided in Figure A.1. The SD grows after the August 2022 announcement, but then comes back down and remains relatively constant throughout the period at around 0.3.

the results, 15.5% reported they would allocate money to new spending on housing, 14.7% reported they would allocate money to new vehicle spending, 8.4% reported they would allocate money to a large appliance/electronics, and 19% reported increasing other spending. To understand employment intentions, we asked if households would change jobs, increase/decrease hours, or change their job search intensity. In Appendix A.1, we run a regression of consumption survey intentions, on 1-year ahead forgiveness beliefs and indicators for low levels of savings, as reported by respondents. Survey intentions for housing and autos fall with liquidity, pointing to liquidity constraints as one possible story for consumption responses upon realization of forgiveness. Even after controlling for liquidity, the magnitudes of the responses increase with optimism, particularly for housing and cars. We do not see the same relationships for smaller durables or other spending. This provides suggestive survey evidence that those with more optimistic beliefs may be holding back on large durable purchases in particular until forgiveness is realized, a point we will return to below.[11]

4 Data Linkages

This section describes linkages between our survey and credit bureau, employment and spending data.

4.0.1 Anonymous Credit Bureau

We sent completed survey responses to our credit bureau partners via secure transfer.[12] The credit bureau then conducted linkages using email as the identifier. The linked data were anonymized by the credit bureau before being made available to us for analytical purposes. Because the survey frame was also sourced from the credit bureau, the match rate is high

[11] The survey also asked about intentions about work hours and job search. Few respondents reported that they would reduce hours if they achieved forgiveness, but 20 percent reported potentially increasing hours or looking for a job more actively.

[12] Due to legal limitations, including data sharing agreements, we cannot disclose the name of the specific credit bureau from which the consumer credit data was obtained for this analysis.

(>90 percent). We also linked a random sample of 100,000 non-respondents from the survey frame.[13]

We have access to credit bureau outcomes from these credit bureau records from 2013 to the present. These data include standard credit bureau outcomes such as payments, balances, loan inquiries and credit score (Vantage 4.0). Detailed demographic information on age, gender, and educational attainment are also available for >90 percent of our matched respondents, and around half of the credit bureau universe.

Appendix Table A.2 compares descriptive statistics between our respondents and non-respondents in the sample frame. There are some differences. Notably, survey respondents have substantially higher student loan balances. The average (median) balance of respondents is $73,100 ($50,800) compared to $49,300 ($29,400) among the full sample frame. One explanation for the higher balances among respondents may be that respondents have greater benefits to gathering information about forgiveness. Differences in other outcomes are small in terms of their economic significance.

4.0.2 Employment Records

Employment information are obtained from a large credit bureau ("employment records").[14] These data are collected for employment verification and income verification purposes, such as when applying for credit or seeking new employment. We have access to employment records available from 2017 to present.[15] These data provide national coverage of employment history and monthly earnings from over 3 million employers, including government and non-profits, with around 50 million active records per month, which is just over 30 percent of total non-farm employment from the BLS establishment survey. Conditional on working full-year, we find that annual earnings closely compare to the CPS ASEC.[16] In total, around 370 million individuals

[13] This includes the non-surveyed Gmail emails

[14] Due to legal limitations, including data sharing agreements, we cannot disclose the name of the specific credit bureau from which the consumer credit data was obtained for this analysis.

[15] Similar data from an earlier period have been previously used to study the effects of minimum wages (Gopalan, Hamilton, Kalda, and Sovich, 2021).

[16] Further details on coverage and comparisons to other employment and earnings data can be found in (Dinerstein, Koustas, Yannelis, and Earnest, 2024).

have at least one employment record, and around 76 percent of individuals with student loans have at least one employment record over the period 2017-2023.

Appendix Table A.2 also reports differences in employment between respondents and the same frame. Respondents are slightly more likely to have an employment match (1.8 percentage points), but have similar monthly earnings conditional on earnings.

4.0.3 Sample Restrictions

We restrict the analysis sample to individuals who have student loans in the credit bureau data. One consequence of our sampling approach is that the person in the household who has student loans may be a different person than whose email we have in our sample frame. For instance, suppose we have the email of a parent who does not have student loans and we emailed this parent. It is possible they forwarded the survey to their child who has student loans. We would then link to the parents credit bureau file. We estimate this issue affects approximately 20 percent of respondents. Restricting to respondents who have student loans in the data effectively deals with this issue. We lose approximately 20 percent of the respondent sample as a result of this restriction.

4.0.4 Non-Durable Spending (Numerator)

Numerator is a provider of consumer-sourced data. A panel of consumers voluntary scan receipts via a smartphone application and/or provides access to their email inbox, which Numerator then scans for receipts. Numerator then cleans and processes these receipts to record detailed item and store level information for every trip. These data therefore capture cash and debit transactions missing in credit bureau data. We currently have access to data from 2017 through June 2023.

5 How Do Households Respond to Beliefs about Forgiveness?

5.1 Descriptive Analysis

We begin by examining raw summary statistics at time of survey among our respondents in Table 1. We report summary statistics by above/below median 1-year ahead forgiveness beliefs at the time of the first survey, which is 19 percent. Those with above and below median beliefs appear similar on student loan balances. However, those with more optimistic beliefs are less likely to make payments and make smaller payments. Those who are more optimistic are on average one year older, but are no more or less likely to be female.

Some of the differences in the raw summary statistics at the time of the survey may reflect differences in the date of the survey (we saw above that beliefs grow and fall over time) as well as other shocks associated with COVID occurring in this time period. We next control for these differences. In particular, we do so by running the following regression:

$$y_i = \sum_{q=2}^{4} \beta_q \mathbf{1}\{\pi_i^1 \in \text{quartile } q\} + \delta' X_i + \epsilon_i \tag{1}$$

In this specification, we discretize 1-year ahead beliefs, π_i^1 into quartiles, and a vector of controls, X_i, for month surveyed, which include: state of residence, whether an individual made any student loan payments in 2019, had any mortgage in 2019, zipcode-level housing price changes between February 2020 and survey date, and county-level COVID cumulative mortality rates at survey date.

Our main focus will be on student loan repayment activity, which will mainly be from voluntary student loan payments in this period. As discussed above, 18 percent of our survey respondents reported making voluntary payments. Figure A.3 shows repayment activity over this period. While it is declining over time, around 5 percent of individuals are making payments in any month without having a payment due.[17] Thus, we think that student loan repayment

[17] Around 20 percent still have payments due, which is a combination of FFEL loans (Dinerstein, Yannelis, and Chen, 2024) and private loans. Even on these loans, borrowers may still have some scope to avoid payments,

decisions are an important choice borrowers can make in this period, and may be affected by beliefs about future forgiveness.

Figure 5, Panel a, plots the β_q coefficients, along with 90 and 95 percent confidence intervals, visualizing the relationship between student loan repayment outcomes and 1-year ahead forgiveness beliefs. We find student loan payment activity declines in beliefs about forgiveness. We cannot reject 1-year ahead beliefs in quartile 2 (4-18 percent beliefs about 1-year ahead forgiveness) are different from quartile 1 (0-3%) at the 5 percent level, although they do differ at the 10% level. Quartiles 3 and 4 (19 percent or more) are significantly different from quartile 1, but not from each other.

We next examine the dynamics of outcomes by beliefs. To do so, we divide the sample into above and below median beliefs, and examine how outcomes evolve over each quarter. In particular, we run the following specification:

$$y_{i,t} = \sum_t \beta_t \mathbf{1}\{\pi_i^1 \geq \text{quartile 3 }\} \times \mathbf{1}\{t \in yq\} + \delta' X_{i,t} + \text{group trends} + \epsilon_{i,t} \tag{2}$$

We omit Q1 2020, so that results are relative to the month prior to the payment pause. The regression also includes controls for state time trends, survey wave time trends, in repayment in 2019 time trends, any mortgage in 2019 time trends, zipcode-level housing prices, and county-level cumulative COVID mortality.[18] Standard errors are clustered on individual.

Figure 5, Panel b, plots the β_t coefficients, along with 90 and 95 percent confidence intervals. We find that individuals who eventually have above-median beliefs start reducing payments on student loans in the quarters after the payment pause, and this grows over time. Prior to the payment pause, there is no difference in repayment trends between those we later measure to have above optimistic beliefs. Much of the level difference shown in panel (a) is accounted for in panel (b) in the period since Q1 2020. Looking back to Figure 1, following the payment pause is a period where news about forgiveness begins to disseminate. So it seems very likely

such as by filing for forbearance.

[18] September 2022 is recoded in 2022:Q4 as the full month occurs post the August 24, 2022 forgiveness announcement.

that household beliefs we measure later are formed in the quarters after the payment pause.

Estimates for a number of additional outcomes are provided in Appendices A.9, A.10 and A.11. Most of the outcomes show no clear differences between those with above versus below median beliefs throughout the window. One exception is mortgage balances, which widen precisely in the period around Biden's first announcement. Combined with our survey evidence on durables purchase intentions, one possible story is that those with above-median beliefs are holding off making home purchases while they wait for uncertainty to resolve.

5.2 Event Studies Around Key Events

The previous analysis found that point-in-time forgiveness beliefs are correlated with repayment activity, and these differences appear beginning in 2020 as forgiveness became part of national discourse. We next focus on *changes* in beliefs, by examining the period around major announcements. To do so, we run event studies around the three key events in our panel: (1) Biden's forgiveness announcement made on August 24, 2022; (2) the Supreme Court decision made on June 30, 2023; and (3) the resumption of payments in November 2023. We stratify by prior beliefs about forgiveness, comparing those with above and below median beliefs. Predictions and estimation differs slightly for each event. We discuss each event and the results in turn.

5.2.1 Key Event #1: 8/22 Forgiveness Announcement

On August 22, 2022, Biden announced $10,000 in forgiveness for most borrowers. This announcement is therefore a shock to those who were pessimistic about forgiveness prior to the announcement. We have two key predictions: pessimists with less than $10,000 in balances should no longer want to make voluntary payments. Those with higher balances may still want to make payments due to commitment. A second key prediction is that pessimists will increase spending in response to increases in expected wealth.

To test these hypotheses, we consider the following event-study specification:

$$y_{i,t} = \sum \beta_k \mathbb{1}\{t \in k\} \times \mathbb{1}\{Pessimist^{pre}\} + \sum \delta_k \mathbb{1}\{t \in k\} \times \mathbb{1}\{Balance^{pre} < \$10k\} + \sum \gamma_k \mathbb{1}\{t \in k\} \times \mathbb{1}\{Pessimist^{pre}\} \times \mathbb{1}\{Balance^{pre} < \$10k\} + \alpha_i + \alpha_t + \epsilon_{i,t} \quad (3)$$

where $Pessimist^{pre}$ is an indicator for below median beliefs, defined in surveys prior to the announcement, and $\mathbb{1}\{Balance^{pre} < \$10k\}$ is an indicator for having pre-announcement balances of \$10,000 or less.

The key event coefficients are plotted in the top row of Figure 6. Panel (a) reports the main γ_k coefficients of interest for pessimists with balances under \$10,000. Panel (b) reports the β_k coefficients, showing effects for pessimists with larger balances relative to optimists with larger balances. Results from a more parsimonious specification pooling the event study coefficients are reported in Table 2a. The first column in Table 2a reports the change in beliefs among the subset of respondents with a second belief observation post announcement in the event window.[19] On average, beliefs about 1-year ahead forgiveness increase 20 percentage points among pessimists compared to optimists. There is no statistically significant difference in the change in beliefs among pessimists with balances below \$10,000. Columns (2)-(4) report changes in student loan repayment activity and balances. We find pessimists with balances under \$10,000 reduce the probability of making a payment by about 7.7 percentage points and make \$40 fewer in payments in the post period, on average. As also evident in panel (b), there is no significant response among pessimists with balances above \$10,000.

Figure 7 and Table 3 report results on spending in the Numerator data. We find that pessimists with lower balances increase non-durable spending by approximately \$100 per month. While this point estimate is greater than the monthly cash flow savings, both estimates are noisy and we cannot reject equality. The spending results are driven by non-food expenditure, suggesting that the increase in spending may come from more discretionary spending categories.

[19] We do not run a regression on changes in beliefs given we only have post-period beliefs for about 10 percent of respondents).

Additional outcomes are shown in Table A.3a. In contrast to Numerator consumption, which largely captures non-durable and semi-durable spending, low balance pessimists appear to *reduce* spending on autos, with about $2,600 in lower balances in the post period. Similar to trends in housing we saw in the lower-frequency analysis above, one explanation could be that households are holding off on durable good purchases while they wait for uncertainty to resolve.

5.2.2 Key Event #2: 6/23 SC Decision

On June 30, 2023, the Supreme Court announced that Biden's broad-based forgiveness plan was unconstitutional. Therefore, this event is a shock to these who were optimistic about forgiveness in the period prior to the announcement. We consider a similar event-study framework, this time comparing the response of optimists relative to pessimists:

$$y_{i,t} = \sum \beta_k \mathbb{1}\{t \in k\} \times \mathbb{1}\{Optimist^{pre}\} + \delta_k \mathbb{1}\{t \in k\} \times \mathbb{1}\{Balance^{pre} < \$10k\} + \sum \gamma_k \mathbb{1}\{t \in k\} \times \mathbb{1}\{Optimist^{pre}\} \times \mathbb{1}\{Balance^{pre} < \$10k\} + \alpha_i + \alpha_t + \epsilon_{i,t} \quad (4)$$

where $Optimist^{pre}$ is now an indicator for above-median beliefs, and is defined in surveys post announcement but prior to the SC decision. For this analysis, we restrict the sample to those who were surveyed after the injunctions in November 2022 and prior to the Supreme Court decision.

Event study coefficients are plotted in the bottom row of Figure 6, and results from a more parsimonious specification pooling the event study coefficients are shown in Table 2b. Column (1) of the table shows that beliefs of optimists fell by 27 percentage points, which is comparable in magnitude to the size of the shock around the announcement. The dynamics in the figure are noisier, but the point estimate for student loan payments for those with balances under $10,000 is positive and comparable to what we saw for the forgiveness announcement. The largest point estimate is the last month in the event window, October 2023, which is when

interest again begins to accrue.

5.2.3 Key Event #3: Resumption of Payment Due

The final event we consider is the resumption of student loan payments in October 2023 after 3.5 years of the payment pause. Appendix Figure A.3 shows that the share making payments doubled around this time, from around 20 percent to 50 percent of student loan borrowers.

To separate out beliefs about future forgiveness from beliefs about the repayment pause, our event study specification examines these beliefs separately:

$$y_{i,t} = \sum \beta_k \mathbb{1}\{t \in k\} \times \mathbb{1}\{OptimistRepayment^{Pre}\} + \sum \delta_k \mathbb{1}\{t \in k\} \times \mathbb{1}\{OptimistForgiveness^{Pre}\} + \gamma_i + \gamma_t + \epsilon_{i,t} \quad (5)$$

where $OptimistRepayment^{pre}$ and $OptimistForgiveness^{pre}$ are indicators for above median beliefs about the repayment pause and forgiveness, respectively. For this analysis, we restrict our sample to those who were surveyed in July 2023 post-announcement, and prior to the repayment pause ending.

Key event study coefficients are plotted in Figure 8, and results are reported from a more parsimonious specification pooling post periods in Table 4. We find that those who are most optimistic about the repayment pause being extended are less likely to make payments (hence more likely to accrue interest). We find no change in behavior for those optimistic about future forgiveness only. Additional outcomes are shown in Appendix Table A.4. Even though optimists are making fewer payments, we see some evidence that they shrink their mortgage balances. This may be because they have more cash flow to make payments on their mortgage.

6 Experimental Variation

As part of our survey, we conducted a series of information treatments. Over the course of our surveying, we presented three sets of optimistic and pessimistic articles: pre- 8/22 Announcement (June-Aug 2022), post injunctions (Nov 2022), pre- Supreme Court decision (April-June 2023). The text of the treatments are shown in Appendix B. Each survey wave randomly assigned respondents to receive an article or to the control group with no article, with 1/3 probability. Some respondents who were resurveyed prior to the Supreme Court decision were treated twice, with both treatments being independent. In Appendix Table B.4, we report a balance table comparing observables between our two treatments and control groups, for the first treatment.

Our first stage regression is shown in Table 5a. We find that the optimistic treatment increased beliefs by around 3.7 percentage points, but find no effect of the pessimistic treatments.[20] We proceed focusing on the optimistic treatment, and pooling the pessimistic treatment with the control. We next examine the effect of our optimistic treatment on outcomes by running separate rolling IV regression around the survey date:

$$y_{it}^{h} = \beta_{IV}^{h} \widehat{\pi^{1}} + \delta^{h} X_i + \epsilon_{it}^{h}$$
$$\pi_{it}^{1} = b_1 \mathbb{1}\{OptiTreat\} + d' X_i + u_{it}$$

where h denotes the time in relation to the survey date; $h = 0$ is the date of the survey, and $h < 0$ are placebo regressions prior to the date of the survey.

The β_{IV} coefficients of making any student loan payment are plotted in Figure 9. Reassuringly, the placebo periods prior to the survey all show zero effects. Following our information intervention providing the optimistic treatment, student loan payments appear to fall in the treatment

[20] This asymmetry is potentially consistent with "motivated beliefs," a theory from behavioral psychology literature which documents a tendency to down-weight negative information. Our event study around the Supreme Court decision did show beliefs fell dramatically, so it could be that people respond differently to pessimistic information that is more uncertain.

group, and the result is marginally significant by the end of the window.

To maximize statistical power, we pool the post outcomes in an IV event-study framework:

$$\begin{aligned} y_{it} =& \beta_{IV} \widehat{\pi^h \times \mathbb{1}\{Post\}} + \beta_2 \mathbb{1}\{Post\} + \alpha_i + \alpha_t + \epsilon_{it} \\ \pi^h_{it} \times \mathbb{1}\{Post\} =& b_1 \mathbb{1}\{Optimistic\} \times \mathbb{1}\{Post\} + b_2 \mathbb{1}\{Post\} + a_i + a_t + u_{it} \end{aligned} \tag{6}$$

where $\mathbb{1}\{Post\}$ is a post survey indicator. We exclude the treamtent month due to partial treatment, and pool 4 periods pre and post to increase power. Standard errors are clustered on individual. Results are reported in Table 5b. We find that a 10 p.p. increase in beliefs reduced the payment propensity by 3.72 percentage points. We also note a post survey effect, which indicates the act of taking our survey possibly increased payments among those in the control group. Results on monthly payments are negative but noisy.[21]

In the first wave of our survey, we also asked about intentions to vote in the November 2022 midterm elections. Results from the IV regression are reported in Columnn (4) of Table 5b. Interestingly, we find that increasing forgiveness beliefs via our optimistic treatments increased voting intentions: A 10 percentage point increase in forgiveness beliefs increases propensity to vote by 11.4 percentage points. Among our respondents, 58 percent reported intending to vote for the Democratic party.

7 Quantification Exercise

In this section we lay out a simple stylized model. The point of the model is to provide an illustration of the welfare consequences of various repayment choices faced by households in our period of study as probabilities of forgiveness change. We seek to answer the question, "How much worse off are households if they chose to continue to make payments during this period, rather than to not make payments, given some probability of forgiveness?"

[21] Results for other credit bureau and employment outcomes are reported in Table A.5. However, results for these outcomes are noisy.

7.1 Model Setup

Assume the household starts life with debt, B_0, subject to interest rate r_b, and the only uncertainty is debt forgiveness amount F, which occurs in the last period T. For simplicity, we assume that the household can afford to pay off this loan and per period income is always greater than the amortized payment:

$$y_t > B_0 \frac{r_b(1+r_b)^T}{(1+r_b)^T - 1}, \quad \forall t. \tag{7}$$

The household also has access to a savings instrument that earns interest r_s.

The household problem is to choose the consumption and a repayment plan $\mathbf{b} = \{b_1, b_2, ..., b_T\}$ to maximize expected lifetime utility:

$$\max_{c_t} \sum_{t=1}^{T} \beta^{t-1} \mathbb{E}_t\big[u(c_t)\big] \tag{8}$$

where u is assumed to be well-behaved (twice-differentiable, concave function), subject to the lifetime budget constraint:

$$\sum_{t=1}^{T} (1+r_s)^{T-t}(y_t - \widetilde{b}_t) = \sum_{t=1}^{T} (1+r_s)^{T-t} c_t. \tag{9}$$

where

$$\widetilde{b}_t = \begin{cases} b_t & \text{if } t < T, \\ \max\{b_t - F, 0\} & \text{if } t = T. \end{cases} \tag{10}$$

Denote the value of all repayments as:

$$B := \sum_{t=1}^{T} (1+r_s)^{T-t} \widetilde{b}_t. \tag{11}$$

It follows from the Euler equations and budget constraint that:

$$\frac{dc_t^*}{dB} < 0, \ \ \forall t. \tag{12}$$

This implies the household is better off under a repayment plan with lower B.

We consider three simple choices for debt repayment: (1) pre pay in the first period, (2) amortized loan in every period, and (3) amortized loan with waiting.

Prepayment. The household has the option to pay the entire loan down with one-period interest accrued in the first period, $B_0(1+r_b)$.[22] Then,

$$B_p = (1+r_s)^{T-1}(1+r_b)B_0. \tag{13}$$

Amortized Loan. This is the case of a standard amortized loan. The household intends to pay down the same amount in every period starting from the first period, $B_0 \frac{r_b(1+r_b)^T}{(1+r_b)^T-1}$. Then,

$$B_a = \frac{(1+r_s)^T-1}{r_s}\frac{r_b(1+r_b)^T}{(1+r_b)^T-1}B_0 - \min\{F, B_0\frac{r_b(1+r_b)^T}{(1+r_b)^T-1}\} \tag{14}$$

Amortized Loan with Waiting. The household can also choose to wait for t^* period (the loan amount then becomes $B_0(1+r_b)^{t^*}$), and then pay down the same amount in rest $T-t^*$ periods, $B_0(1+r_b)^{t^*}\frac{r_b(1+r_b)^{T-t^*}}{(1+r_b)^{T-t^*}-1}$. Then,

$$B_w = \frac{(1+r_s)^{T-t^*}-1}{r_s}\frac{r_b(1+r_b)^T}{(1+r_b)^{T-t^*}-1}B_0 - \min\{F, B_0\frac{r_b(1+r_b)^T}{(1+r_b)^{T-t^*}-1}\} \tag{15}$$

The limiting case is making a balloon payment in period T.

Consider the special case when $r_b = 0$.[23] In this case, it is always optimal for the household

[22] It is common for student loans to have no prepayment penalties.

[23] Like it was during the repayment pause from March 2020 - October 2023 for non-FFEL federal student loans

to wait for payment. In addition, note that

$$B_w = \frac{(1+r_s)^{T-t^*}-1}{(T-t^*)r_s}B_0 - \min\{F, \frac{B_0}{T-t^*}\} \tag{16}$$

is a decreasing function of t^*. Hence, it is optimal to wait.

More generally, we can compare B_p, B_a, and B_w. Since both $\frac{r(1+r)^{T-1}}{(1+r)^T-1}$ and $\frac{(1+r)^T-1}{(1+r)^{T-t^*}-1}$ are increasing in r, we have

$$(1+r_s)^{T-1}(1+r_b)B_0 > \frac{(1+r_s)^T-1}{r_s}\frac{r_b(1+r_b)^T}{(1+r_b)^T-1}B_0 > \frac{(1+r_s)^{T-t^*}-1}{r_s}\frac{r_b(1+r_b)^T}{(1+r_b)^{T-t^*}-1}B_0 \tag{17}$$

if and only if $r_b < r_s$. Together with

$$0 > -\min\{F, B_0\frac{r_b(1+r_b)^T}{(1+r_b)^T-1}\} \geq -\min\{F, B_0(1+r^b)^{t^*}\frac{r_b(1+r_b)^{T-t^*}}{(1+r_b)^{T-t^*}-1}\}, \tag{18}$$

it implies that when $r_b < r_s$, $B_p > B_a > B_w$. When $r_b > r_s$, the optimal decision will depend on $r_b - r_s$ and t^*, the number of periods with waiting.

7.2 Calibration

We calibrate a numerical solution to our stylized model. Appendix E describes the solution method in more detail.

We set the following parameters for our baseline calibration: we assume a standard Coefficient of Relative Risk Aversion (CRRA) utility with CRRA parameter $\rho = 2$, and annual discount factor $\beta = 0.96$. Following what we see in the employment data, income is assumed to be \$68,777 per year. We assume no income uncertainty for simplicity.

In terms of the loan parameters, the number of monthly payments is set to 120 (10-year standard repayment term). The loan amount B_0 is set at \$50,000, which is the median among our respondents. In our baseline calibration, we set the savings rate r_s to 5 percent, and the

annual borrowing rate, r_b also to 5 percent. This borrowing rate results in an amortized annual payment of $6,475 if there was no payment pauses.

On top of this setup, we assume a three-year payment pause at 0 interest in the first three years. While in reality the end of the payment pause was not known, for simplicity we assume no uncertainty in the end date of the repayment pause. We also assume reamortization occurs at the end of the repayment pause. Therefore, there are 7 years of payments at a higher amount, $8,640, to pay of the student loan.

We consider welfare under a number of assumptions about forgiveness: (1) No probability of forgiveness, (2) 100 percent forgiveness of any remaining debt, (3) $10,000 of forgiveness, and (4) $6,250 in forgiveness, which is the median expected 10-year ahead forgiveness in our survey. We also consider what happens when changing around the borrowing rates so that borrowing is more costly, $r_b = 0.065$, or 150 basis points higher than saving rates, and less costly, $r_b = 0.035$.

We consider a number of repayment options: (1) Pre-pay (2) Always make monthly payment (voluntary if payment pause) (3) Make monthly payments only if no payment pause (4) Balloon payment in last period (assumes no other repayment consequences)

As described above, the optimal repayment choice is the choice that maximizes the discounted value of lifetetime utility. Few if any borrowers pre-pay, particularly early in the loan. Moreover, this will not be optimal in most cases with reasonable interest rates and a payment pause with 0 interest. As established above, whenever the household can save at a higher rate than the borrowing rate on the student loan, it will always be optimal for them to delay their payments. However, the balloon payment scenario is not meant to be realistic because this would result in default, which typically has consequences such as wage garnishment. Instead, it is meant to be illustrative as to the welfare consequences of delaying payments, of which balloon payments are the limiting case. Comparing scenarios (2) and (3), "Always make monthly payment" versus "Delay during repayment pause" is the main feasible choices that households faced in our period. We therefore consider scenario (3) as the baseline, and compare welfare under

these alternative scenarios, with the caveat that the balloon payment scenario is not in the feasible set of repayment options.

7.3 Model Result

Results from our model calibration are reported in Table 5. Panel (a) reports *expected* consumption in period T under the various scenarios about expected forgiveness and the borrowing rate. The first observation is because people still need to make payments as if the loan will not be forgiven ($8,640 in annual payments under the payment pause and reamortization scenario), expected consumption in period T is very similar no matter how much forgiveness is expected (beyond the amount of the amortized payment that would be made in period T). Actual consumption in period T will of course jump up or down depending on the forgiveness realization.

In Panel (b), we report the result from an equivalence variation exercise that answers: "What constant percentage of my consumption do I have to give up under the 'make monthly payments only if no payment pause' scenario, to have equivalent utility to the chosen scenario?" A positive equivalence variation indicates the agent is worse off with the alternative choice, and a negative equivalence variation indicates the agent is better off with the alternative choice than scenario (3). Row 1 shows that pre-paying makes the borrower significantly worse off. Since the household can borrow and save at the same rate in columns (1)-(4), this welfare loss occurs because the borrower cannot invest their savings from the payment pause. Row 2 shows the welfare losses are significantly smaller in the borrower just keeps making their standard amortized payment, but at 0 interest in this period. With the median expected forgiveness amount of $6,250, the borrower could instead invest the money and increase annual consumption by 0.3%, or around $195. If $10,000 in forgiveness were expected, the annual consumption loss from continuing to make voluntary payments is twice as high. In our payment pause scenario, we assumed households return to making payments but at a higher rate to stay on a payment schedule. An alternative scenario would be to assume they increase their payment horizon beyond T, and continue to make smaller monthly payments.

If forgiveness were to still happen at T, this would make

In settings with larger amounts of expected forgiveness (Column 2) there are large welfare gains if payment can be delayed as much as possible. These welfare gains as 7.7%, about $5,000 per year, in the limiting case of delaying payments to period T. There are also some modest gains to delaying payments in the Column (6) scenario where the borrowing rate is lower than the savings rate, around 0.4%. However, in scenario (4), with more modest forgiveness beliefs and borrowing rates equal to savings, there is no expected welfare gain from delaying payments.

The main takeaway from this exercise is that the welfare consequences of continuing to make payments during the payment pause are relatively small among those with modest beliefs about forgiveness, who can afford to make payments, and who would still pay off their student loan in the same amount of time.

This analysis was about expected utility. Realizations are another matter. Of course, if forgiveness is realized, making more payments would be a costly mistake for those who had more modest beliefs. Similarly, if forgiveness is not realized, those who did not make payments would have particularly low consumption in T, and large welfare losses.

We also did not take a stand on whether beliefs are rational, and the role of policymakers in shaping these beliefs. If borrowers have mistaken beliefs, this will of course lead borrowers to engage in suboptimal behavior.

8 Concluding Remarks

How households form, and act on, beliefs is important for many economic models. We provide new evidence in the context of student loan repayment. We document wide variation in beliefs and provide new evidence on household consumption and employment responses. We show that households with different beliefs make different debt repayment and consumption decisions. Our evidence suggests credible government communication about future fiscal policy

can change economic behavior—and even civil engagement—in important ways. Moreover, communication or actions that lead to greater misperceptions will lead to larger adjustments at realization and larger welfare losses.

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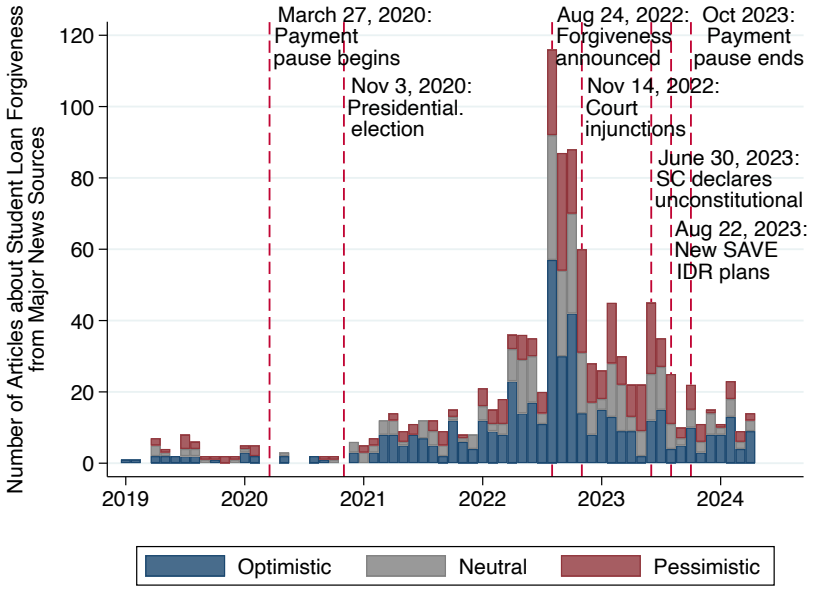
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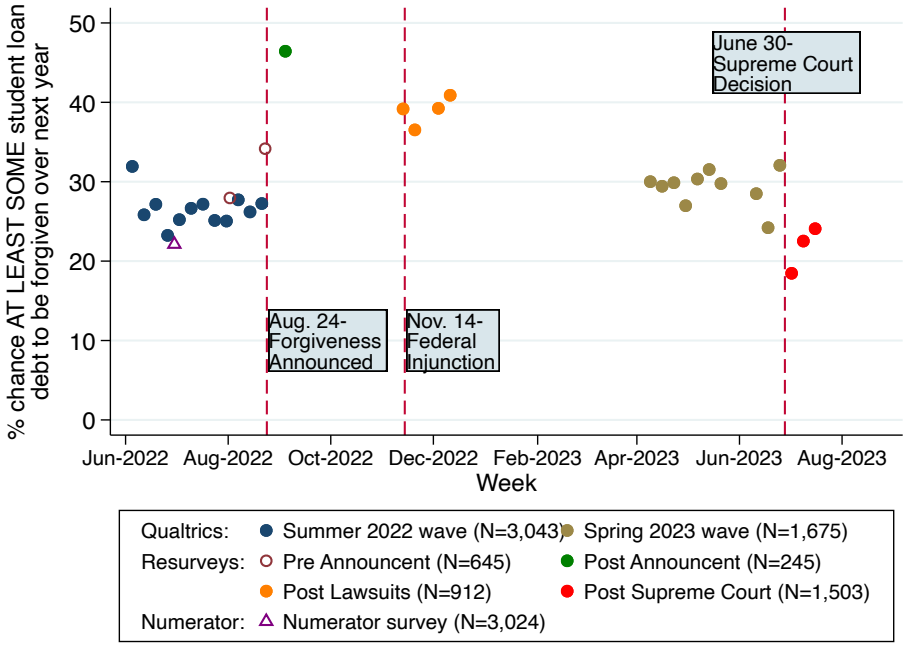
Figures

Figure 1: Key Dates Related to Student Loan Forgiveness



Notes: Figure shows the number and sentiment about news articles from major news sources sourced from UChicago Proquest. Sentiment classified by Chat GPT 3.5 Turbo.

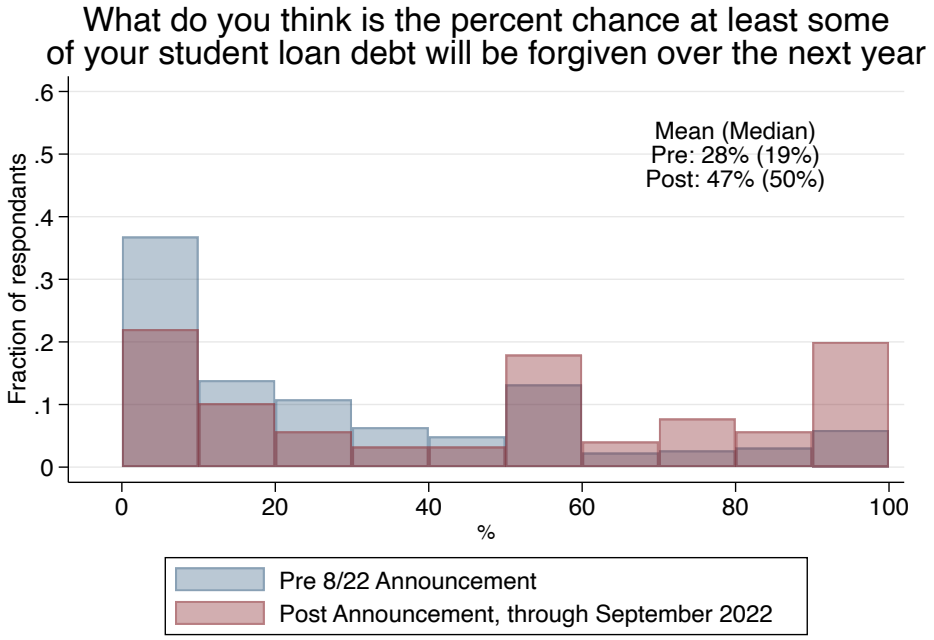
Figure 2: Survey Beliefs About 1-Year Ahead Forgiveness, June 2022-July 2023



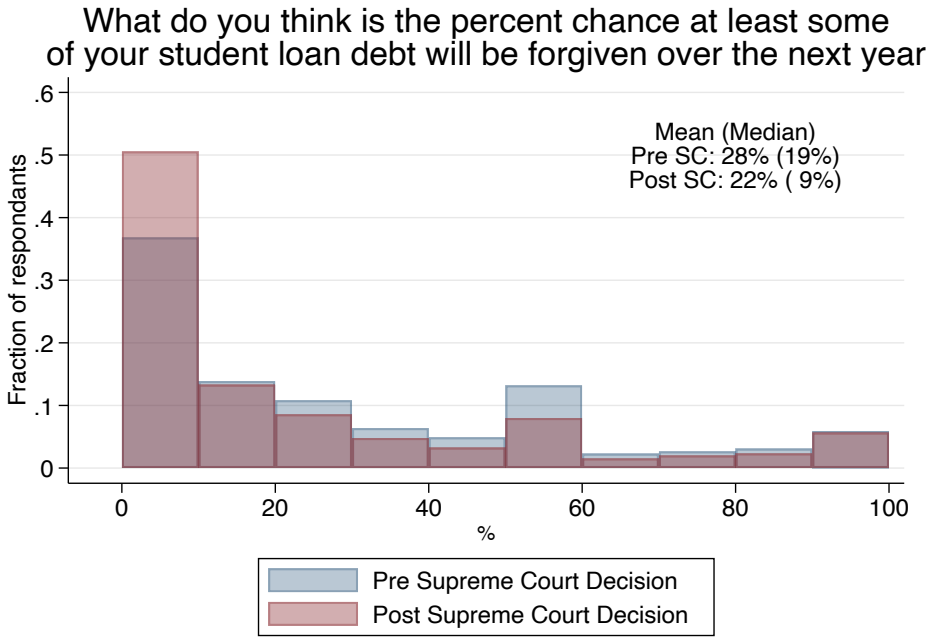
Notes: Figure shows mean beliefs about 1-year ahead forgiveness from our surveys.

Figure 3: Full Distribution of Beliefs, Pre and Post Major News Shocks

(a) Pre/Post 8/22 Announcement



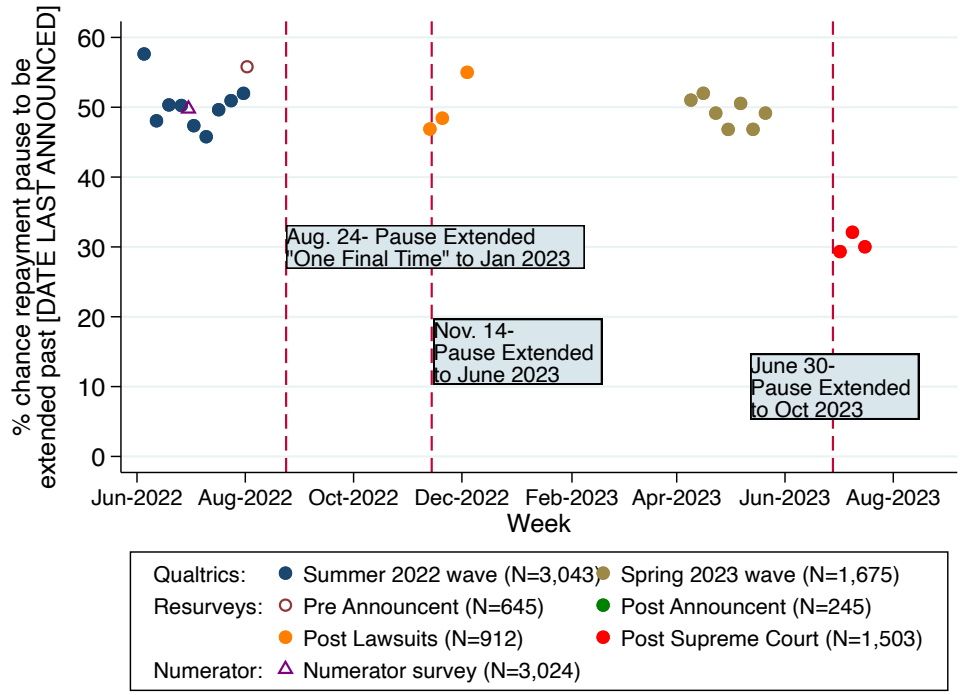
(b) Pre/Post Supreme Court Decision



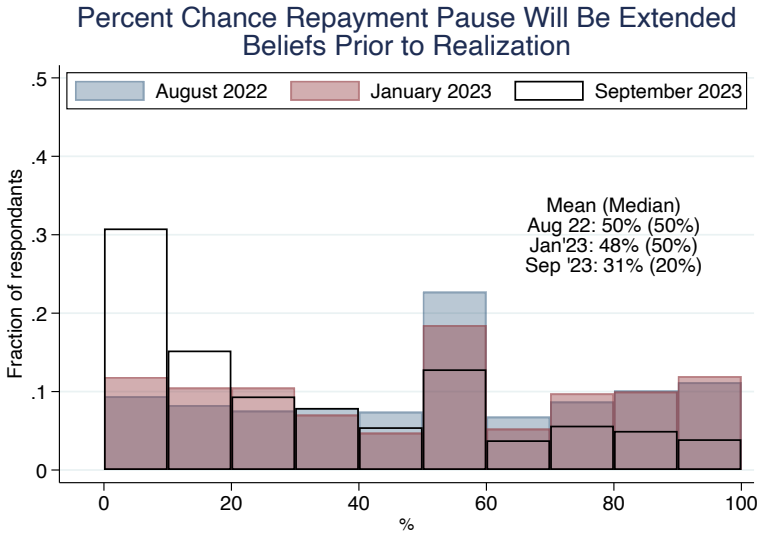
Notes: Figure shows the distribution of beliefs about 1-year ahead forgiveness. Panel (a) shows beliefs through September 2022. Panel (b) is restricted to beliefs collected after November 2022. Source: Qualtrics survey.

Figure 4: Expectations about the Resumption of Student Loan Payments

(a) Time-Series Means



(b) Pre/Post Supreme Court Decision

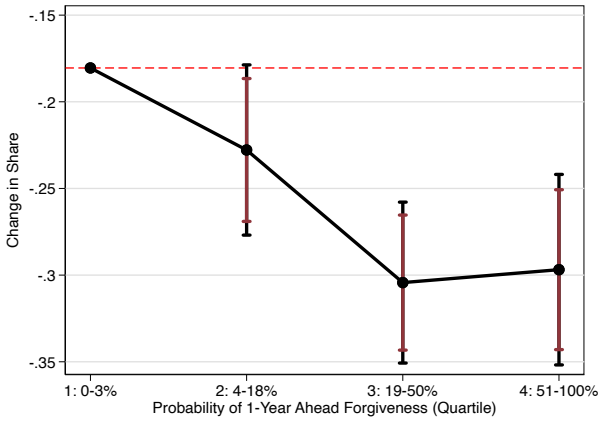


Notes: Figure shows beliefs about the repayment pause being extended past the previously announced end date. Panel (a) reports mean beliefs over time, and panel (b) plots the distribution of beliefs prior to three separate extensions observed in our sample period. Source: Qualtrics survey.

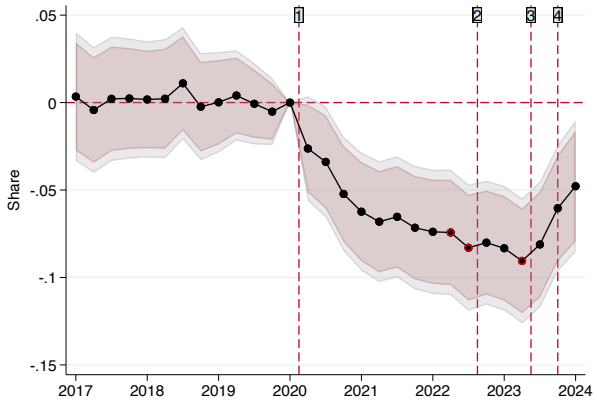
Figure 5: Evolution of Student Loan Payment Outcomes, By 1-Year-Ahead Forgiveness Beliefs

Any Student Loan Payment in Month

(a) At Time of Survey, Change Since Feb 2020

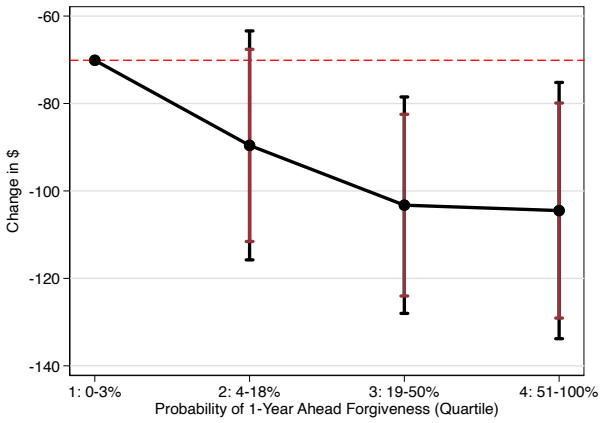


(b) Evolution, Above v. Below Median Beliefs

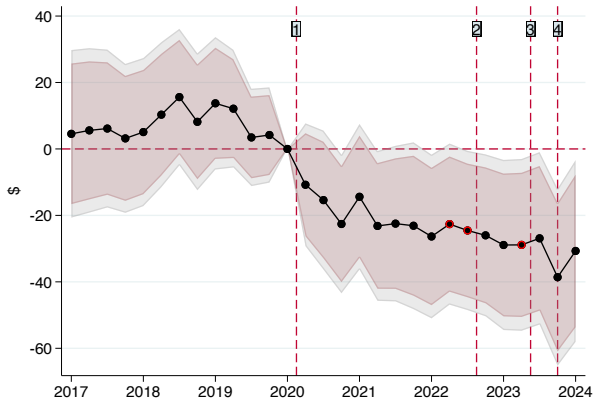


Monthly Student Loan Payment ($)

(c) At Time of Survey, Change Since Feb 2020



(d) Evolution, Above v. Below Median Beliefs

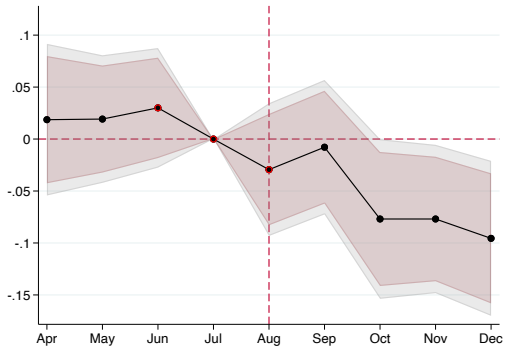


Notes: Left-hand panel reports the *change* in the given outcome at the time of first survey and Feb 2020, by quartiles of beliefs. Outcomes are regression adjusted to controls for month surveyed, state, whether an individual made any student loan payments in 2019, had any mortgage in 2019, zipcode-level housing price changes between February 2020 and survey date, and county-level COVID cumulative mortality rates at survey date. 95 (black) and 90 (maroon) percent confidence intervals are shown. Right-hand panel plots coefficients from a regression of quarterly time dummies interacted with an indicator of above-median one-year ahead forgiveness beliefs at time of survey. Coefficients are relative to 2020:Q1. Red circles denote main survey waves: June-Aug. 2022, and Apr.-June 2023. Regression also includes controls for state time trends, survey wave time trends, in repayment in 2019 time trends, any mortgage in 2019 time trends, zipcode-level housing prices, and county-level cumulative COVID mortality. September 2022 is recoded in 2022:Q4 as the full month occurs post the August 24, 2022 forgiveness announcement. Standard errors clustered on individual. Shading denotes 95 (gray) and 90 (maroon) percent confidence intervals. Key events indicated in vertical lines: (1) Payment pause begins (2) broad-based forgiveness announced (3) Supreme Court decision finds broad-based forgiveness unconsitutional (4) repayment begins.

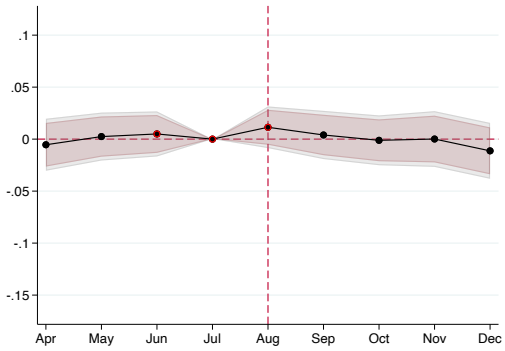
Figure 6: Any Student Loan Payment Around Major Forgiveness Announcements

August 2022 Forgvieness Announcement, Pessimists About Forgiveness Relative to Optimists

(a) Balances Under 10k

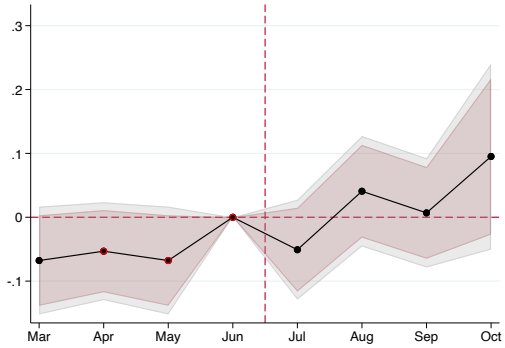


(b) Balances Over 10k

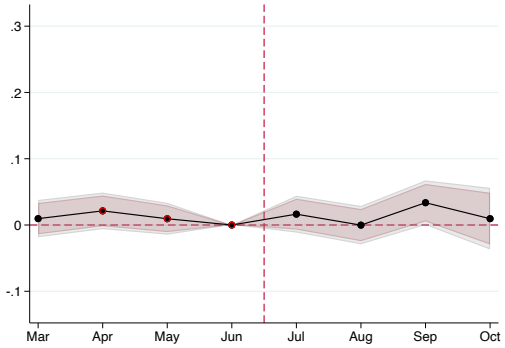


June 2023 Supreme Court Decision, Optimists About Forgiveness Relative to Pessimists

(c) Balances Under 10k



(d) Balances Over 10k



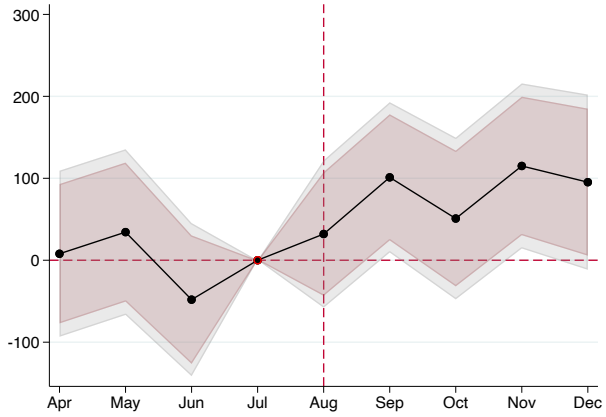
Notes: Figure plots β_k coefficents from estimating:

$$y_{i,t} = \sum \beta_k \mathbb{1}\{t \in k\} \times \mathbb{1}\{Beliefs^{pre}\} + \alpha_i + \alpha_t + \epsilon_{i,t}$$

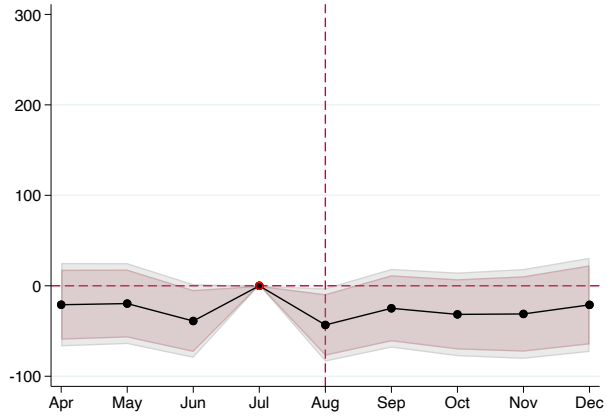
where $Beliefs^{pre}$ is either an indicator for having below-median 1-year ahead forgiveness beliefs prior to the August 2022 forgiveness announcement (top panel), or above-median beliefs prior to the Supreme Court decision (bottom panel). Left-hand panel shows results for borrowers with pre-period balances of \$10,000 or less, and right-hand panel shows results for borrowers with pre-period balances greater than \$10,000. Standard errors clustered on individual. Shading denotes 95 (gray) and 90 (maroon) percent confidence intervals. Source: credit data.

Figure 7: Numerator Spending Around August 2022 Forgiveness Announcement, Pessimists About Forgiveness Relative to Optimists

(a) Balances Under 10k



(b) Balances Over 10k



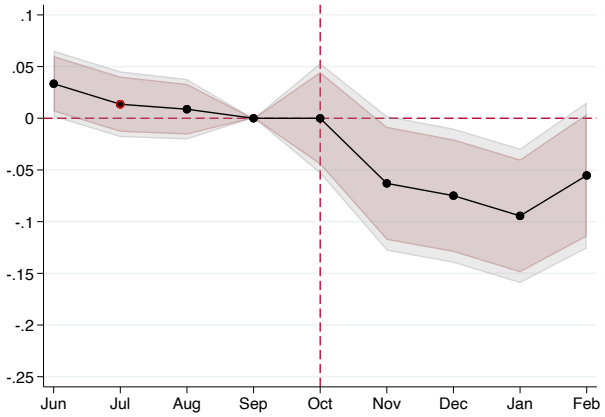
Notes: Figure plots β_k coefficents from estimating:

$$y_{i,t} = \sum \beta_k \mathbb{1}\{t \in k\} \times \mathbb{1}\{Beliefs^{pre}\} + \alpha_i + \alpha_t + \epsilon_{i,t}$$

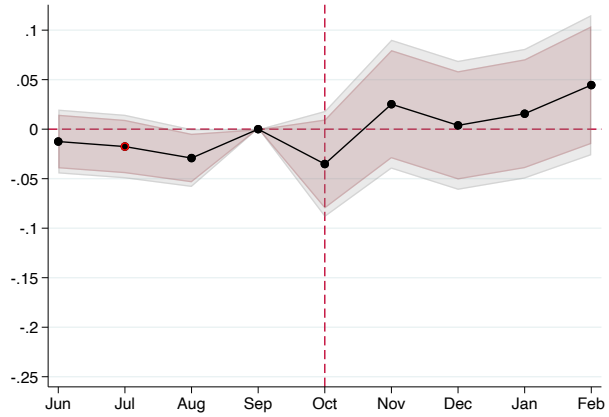
where $Beliefs^{pre}$ is an indicator for having below-median 1-year ahead forgiveness beliefs prior to the August 2022 forgiveness announcement. Left-hand panel shows results for borrowers with pre-period balances of $10,000 or less, and right-hand panel shows results for borrowers with pre-period balances greater than $10,000. Standard errors clustered on individual. Shading denotes 95 (gray) and 90 (maroon) percent confidence intervals. Source: Numerator data.

Figure 8: Any Student Loan Payment Around End of Payment Pause in October 2022, Optimists Relative to Pessimists

(a) Optimists about Payment Pause Extension



(b) Optimists about Forgiveness



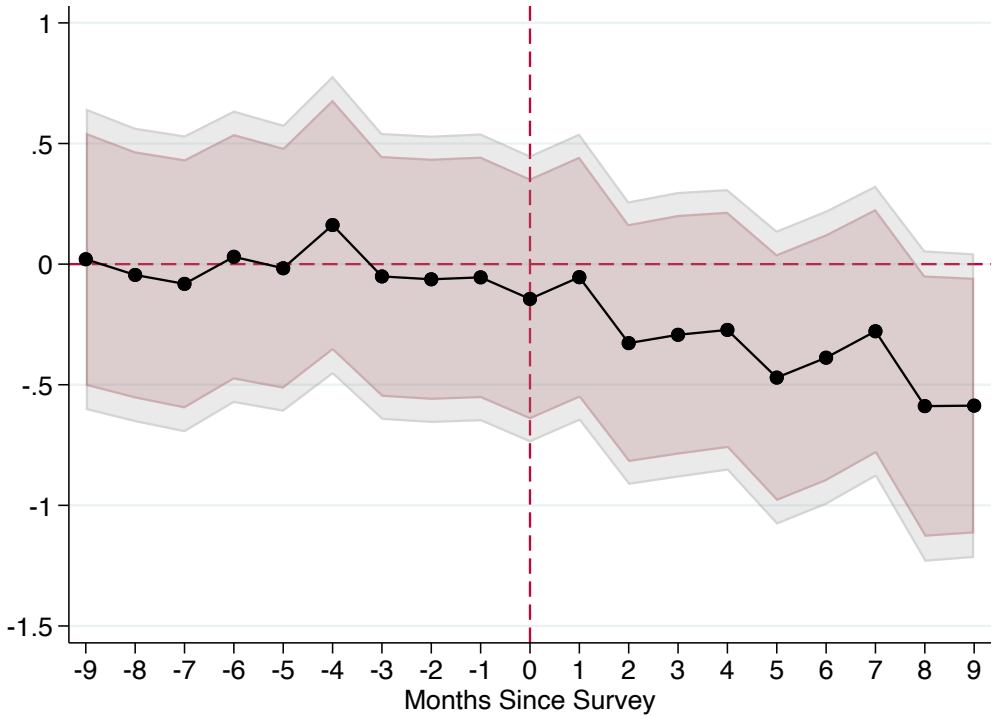
Notes: Figure plots β_k coefficents from estimating:

$$y_{i,t} = \sum \beta_k \mathbb{1}\{t \in k\} \times \mathbb{1}\{BeliefsRepayment^{Pre}\} +$$

$$\sum \delta_k \mathbb{1}\{t \in k\} \times \mathbb{1}\{BeliefsForgiveness^{Pre}\} + \gamma_i + \gamma_t + \epsilon_{i,t}$$

where: $BeliefsRepayment^{pre}$ and $BeliefsForgiveness^{pre}$ are indicators for above median beliefs about the repayment pause being extended beyond October 2023, and about 1-year ahead forgiveness, respectively, surveyed in July 2023. Standard errors clustered on individual. Shading denotes 95 (gray) and 90 (maroon) percent confidence intervals. Source: credit data.

Figure 9: Any Student Loan Payment and Beliefs, Instrumental Variable Estimates



Notes: Figure reports the effect of a 1 percentage point increase in beliefs on the propensity to make a student loan payment. Figure plots separate IV estimates from running the following IV regression, where the outcome is defined as a different month around the date of the information treatment:

$$y_{it}^{h} = \beta_{IV}^{h} \widehat{\pi^{1}} + \delta^{h} X_i + \epsilon_{it}^{h}$$
$$\pi_{it}^{1} = b_1 \mathbb{1}\{OptiTreat\} + d' X_i + u_{it}$$

In all regressions, the control group received no information treatment or the pessimistic treatment. Some individuals are in multiple independent treatments in the event studies. Standard errors clustered on individual in parentheses. * p <0.1, ** p<0.05, *** p<0.01. Source: credit data.

Tables

Table 1: Summary Statistics, by Above/Below Median Beliefs

	(1) "Pessimistic" Beliefs∈[0,18]	(2) "Optimistic" Beliefs ∈[19,100]	(3) Difference (2)-(1)
Student Loan Outcomes			
Mean balance	70,021.52	72,148.61	2,127.08
Median balance	46,605.00	49,768.00	3,163.00
Newest, age in years	6.43	6.10	-0.33
Any deferred	0.31	0.34	0.03
Any delinquent	0.06	0.06	0.00
Any monthly payment	0.49	0.43	-0.05***
Mean monthly payment if >0	410.50	361.26	-49.24*
Other Credit and Employment Outcomes			
Any revolving balance	0.84	0.82	-0.01
Mean revolving balance if >0	10,909.25	10,824.99	-84.26
Any auto balance	0.60	0.61	0.01
Mean auto balance if >0	19,284.78	19,340.18	55.40
Any mortgage balance	0.41	0.44	0.03*
Mean mortgage balance if >0	194,959.21	176,556.62	-18,402.59***
Vantage 4.0 Credit Score	665.79	657.11	-8.68**
Any Employment	0.315	0.316	0.001
Gross monthly income if >0	7,112.48	6,571.41	-541.07
Borrower Characteristics			
Age	45.56	46.78	1.22***
Female	0.59	0.57	-0.02
Married	0.48	0.48	-0.01
Has children	0.50	0.46	-0.04*
Zipcode and County Characteristics			
Zipcode AGI (2019)	67,443.59	64,980.32	-2,463.27**
Zipcode ZHVI Home prices (Feb 2020)	252,294.54	245,803.48	-6,491.06
Zipcode Δln(ZHVI), Dec 2023-Feb 2020	0.34	0.33	-0.00
County COVID mortality cumul. per 100k	312.58	319.62	7.04*
N	1467	1427	

Notes: Table shows summary statistics comparing those with below median to above median beliefs about 1-year ahead forgiveness as measured at the time of first survey. Restricted to those with balance reported in credit bureau data as of survey month. Outcomes shown for February 2020 (pre-COVID payment pause) unless otherwise specified. Stars denote statistical significance of differences in means using robust standard errors, $*$ p<0.1, $**$ p<0.05, $***$ p<0.01. Source: Zipcode AGI from IRS Tax Stats; ZHVI from Zillow Research; COVID mortality from Opportunity Insights. Other outcomes from credit and employment data.

Table 2: Student Loan Payment Outcomes Around Forgiveness Announcements

(a) August 2022 Forgiveness Announcement

	(1)	(2)	(3)	(4)
	Prob Forgive	Student Loans		
		Any Pay	Pay ($)	Bal ($)
Pess× Post	0.202***	-0.00137	1.489	-96.28
	(0.0690)	(0.00925)	(4.935)	(766.7)
Post× Bal< 10k	0.0869	0.00897	6.409	-928.7
	(0.128)	(0.0163)	(8.633)	(1295.7)
Pess× Post× Bal< 10k	-0.0694	-0.0775***	-38.47**	-417.7
	(0.176)	(0.0274)	(16.15)	(1730.9)
Pre mean	0.21	0.22	80.25	75,876.21
N	143	1776	1776	1776
NxT	286	14208	14208	14208
Ind FE	X	X	X	X
Time FE	X	X	X	X

(b) June 2023 Supreme Court Decision

	(1)	(2)	(3)	(4)
	Prob Forgive	Student Loans		
		Any Pay	Pay ($)	Bal ($)
Opti× Post	-0.267***	0.00474	-5.388	-823.1
	(0.0277)	(0.0130)	(8.629)	(1435.8)
Post× Bal< 10k	-0.0584**	0.00877	-11.22	-138.3
	(0.0257)	(0.0254)	(9.954)	(814.0)
Opti× Post× Bal< 10k	0.0907	0.0654*	13.89	-327.2
	(0.152)	(0.0376)	(11.46)	(1654.6)
Pre mean	0.26	0.24	89.44	72932.89
N	332	944	944	944
NxT	664	7545	7545	7545
Ind FE	X	X	X	X
Time FE	X	X	X	X

Notes: Table reports coefficients from estimating:

$$y_{i,t} = \beta_1 Beliefs^{pre} \times Post_t + \beta_2 \mathbb{1}\{Balance^{pre} < \$10k\} \times Post_t + \beta_3 Beliefs^{pre} \times \mathbb{1}\{Balance^{pre} < \$10k\} \times Post_t + \alpha_i + \alpha_t + \epsilon_{i,t}$$

In column (1) for both panels, regression is restricted to individuals in a post-event resurvey of beliefs. Panel A. Estimation window from April 2022-December 2022, excluding August 2022 (partial treatment). $Post_t$ refers to period from September 2022, the first full month following the 8/24/2022 forgiveness announcement. $Beliefs^{pre}$ is an indicator for having below-median beliefs prior to the announcement, denoted *Pess* in the table. Panel B: Estimation window from March 2023-October 2023. $Post_t$ refers to period from July 2023, following the June 30 Supreme Court decision, and $Beliefs^{pre}$ is an indicator for having above-median beliefs prior to the Supreme Court decision, denoted $Opti$ in the table. Standard errors clustered on individual in parentheses. $*$ p<0.1, $**$ p<0.05, $***$ p<0.01. Source: credit and employment data

Table 3: Spending Responses Around August 2022 Forgiveness Announcement

	(1) Total Spend	(2) Food	(3) All Other	(4) Ln Total	(5) Ln Food
Pess× Post	-7.476	-5.013	1.046	-0.0160	-0.0103
	(15.21)	(5.781)	(12.90)	(0.0167)	(0.0225)
Post× Bal< 10k	-54.24**	1.295	-47.74**	-0.0658**	0.0312
	(26.66)	(9.641)	(23.16)	(0.0315)	(0.0435)
Pess× Post× Bal< 10k	100.5***	4.868	83.82**	0.118***	0.00114
	(37.29)	(13.87)	(32.54)	(0.0425)	(0.0590)
Pre mean	1113.04	323.60	783.25	6.75	5.39
N	5493	5493	5493	5493	5394
NxT	43557	43557	43557	43556	39539
Ind FE	X	X	X	X	X
Time FE	X	X	X	X	X

Notes: Table reports coefficients from estimating:

$$y_{i,t} = \beta_1 Beliefs^{pre} \times Post_t + \beta_2 \mathbb{1}\{Balance^{pre} < \$10k\} \times Post_t + \beta_3 Beliefs^{pre} \times \mathbb{1}\{Balance^{pre} < \$10k\} \times Post_t + \alpha_i + \alpha_t + \epsilon_{i,t}$$

Estimation window from April 2022-December 2022, excluding August 2022 (partial treatment). $Post_t$ refers to period from September 2022, the first full month following the 8/24/2022 forgiveness announcement. $Beliefs^{pre}$ is an indicator for having below-median beliefs prior to the announcement, denoted *Pess* in the table. Standard errors clustered on individual in parentheses. $*$ p<0.1, $**$ p<0.05, $***$ p<0.01. Source: Numerator data.

Table 4: Student Loan Payment Outcomes Around End of Payment Pause

	(1) Any Pay	(2) Pay ($)	(3) Bal ($)
Opti Repayment× Post	-0.0714***	-40.32***	197.3
	(0.0274)	(12.36)	(754.6)
Opti Forgiveness× Post	0.0256	1.630	-119.9
	(0.0274)	(12.47)	(747.0)
Pre mean	0.22	89.47	77149.15
N	773	773	773
NxT	6956	6956	6956
Ind FE	X	X	X
Time FE	X	X	X

Notes: Table reports coefficients from estimating:

$$y_{i,t} = \beta_1 \mathbb{1}\{OptimistRepayment^{Pre}\} \times Post_t + \beta_2 \mathbb{1}\{OptimistForgiveness^{Pre}\} \times Post_t + \gamma_i + \gamma_t + \epsilon_{i,t}$$

Estimation window from June 2023-February 2024. $Post_t$ refers to the period from October 2023 when payments were again due. Sample is restricted to student loan borrowers with beliefs surveyed post the June 30 Supreme Court Decision. Standard errors clustered on individual in parentheses. $*$ p<0.1, $**$ p<0.05, $***$ p<0.01.

Table 5: Effect of Information Treatment on Beliefs and Student Loan Payments

(a) First Stage

	(1) Prob Forgive	(2) Prob Forgive	(3) Prob Forgive	(4) Prob Forgive	(5) Prob Forgive
Opti Treat	0.0365***	0.0375***		0.0434***	0.0411***
	(0.00877)	(0.0100)		(0.0111)	(0.0118)
Pessi Treat		0.00195			
		(0.00978)			
Opti Treat-1			0.0337***		
			(0.0106)		
Opti Treat-2			0.101		
			(0.0795)		
Opti Treat-3			0.0288*		
			(0.0163)		
Opti Treat × Bal <10k					0.0187
					(0.0340)
Bal <10k					-0.0107
					(0.0205)
N	5128	5128	5128	3226	3226
R^2	0.0298	0.0298	0.0293	0.0360	0.0361
F-stat	17.32	8.683	4.881	15.45	5.245
Survey Year-Month FE	X	X	X	X	X
Pre Balance>0				X	X
Federal Loans Only				X	X

Notes: Regression of 1-year ahead forgiveness beliefs, on the experimental information treatment indicated in the rows. The text of the information treatment is provided in Appendix B. In all regressions, there is a control group which received no information treatment. Some individuals are in multiple independent treatments. Standard errors clustered on individual in parentheses. * p <0.1, ** p<0.05, *** p<0.01.

(b) Instrumental Variable Estimates

	(1)	(2)	(3)	(4)
	Student Loans			Prob Vote
	Any Pay	Pay ($)	Bal ($)	≥ 0.5
Prob Forgive × Post Treat	-0.372**	-220.1	-1755.3	
	(0.170)	(179.2)	(20053.2)	
Post Treat	0.122**	67.63	2669.0	
	(0.0545)	(56.92)	(6354.5)	
Prob Forgive				1.143**
				(0.558)
NxT	25791	25791	25791	2359
Individual FE	X	X	X	
Year-Month FE	X	X	X	X
Pre Balance>0	X	X	X	X
No Payment Required	X	X	X	X

Notes: Columns (1)-(3) report results from an IV event-study framework:

$$y_{it} = \beta_{IV} \widehat{\pi^1 \times \mathbb{1}\{Post\}} + \beta_2 \mathbb{1}\{Post\} + \alpha_i + \alpha_t + \epsilon_{it}$$
$$\pi^1_{it} \times \mathbb{1}\{Post\} = b_1 \mathbb{1}\{OptiTreat\} \times \mathbb{1}\{Post\} + b_2 \mathbb{1}\{Post\} + a_i + a_t + u_{it}$$

where $\mathbb{1}\{Post\}$ is a post survey indicator, π^1 are one-year ahead beliefs about forgiveness, $\mathbb{1}\{OptiTreat\}$ is an indicator for receiving the optimist information treatment, and α_i and α_t are individual and time fixed effects. The event window is 4 months around the survey month, excluding the survey month due to partial treatment. Column (4) examines the simple IV regression, restricting only to the survey month:

$$y_{it} = \beta_{IV} \widehat{\pi^1} + \alpha_t + \epsilon_{it}$$
$$\pi^1_{it} = b_1 \mathbb{1}\{OptiTreat\} + a_t + u_{it}$$

In all regressions, the control group received no information treatment or the pessimistic treatment. Some individuals are in multiple independent treatments in the event studies. Standard errors clustered on individual in parentheses. * p <0.1, ** p<0.05, *** p<0.01.

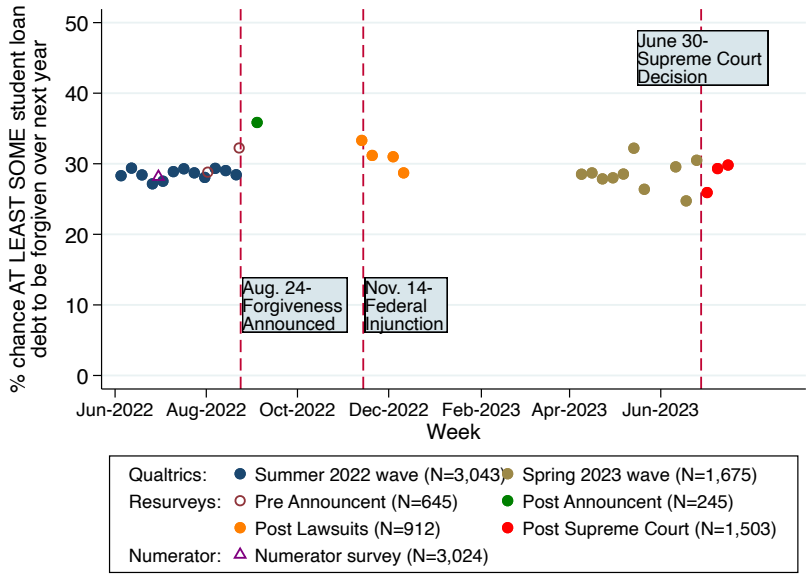
Table 5: Model-Based Consumption and Equivalence Variation Under Alternative Repayment Scenarios

	(1)	(2)	(3)	(4)	(5)	(6)
Expected forgiveness	0	100%	$10,000	$6,250	$6,250	$6,250
$r_s = 0.05,\ r_b =$	0.05	0.05	0.05	0.05	0.065	0.035
a. Expected Consumption in Period T						
0. Make monthly payments only when no payment pause	64,425	65,126	65,126	64,932	64,618	65,238
b. Equivalence Variation of Alternative Repayment Options						
1. Pre-pay	0.009	0.020	0.020	0.017	0.012	0.021
2. Always make monthly payment (voluntary if payment pause)	0.002	0.006	0.006	0.003	0.001	0.005
3. Balloon payment in last period (assumes no other consequences)	0.000	-0.077	-0.002	0.000	0.004	-0.004

Notes: Model calibration assumes 10 year horizon, CRRA utility with coefficient of relative risk aversion of $\rho = 2$ and annual discount factor $\beta = 0.96$. Forgiveness occurs in period $T = 10$. Annual income and loan balances of the median respondent, $68,777 and $50,000 respectively. The forgiveness amount in Columns (4)-(6) is the median expected forgivness amount (including 0s). Panel a. reports consumption under the scenario where no payments are made during a 3-year repayment pause. Panel b. reports the equivalent variation, answering the question, "What constant share of my consumption would I have to give up to have utility equivalent to the 'Make monthly payments only when no payment pause scenario.' "

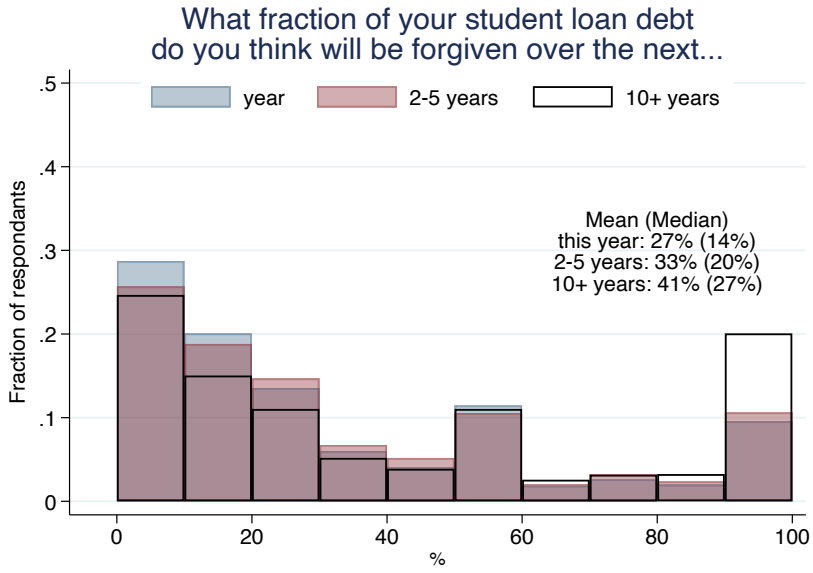
A Appendix Figures and Tables

Figure A.1: Standard Deviation of Survey Expectations Over Time



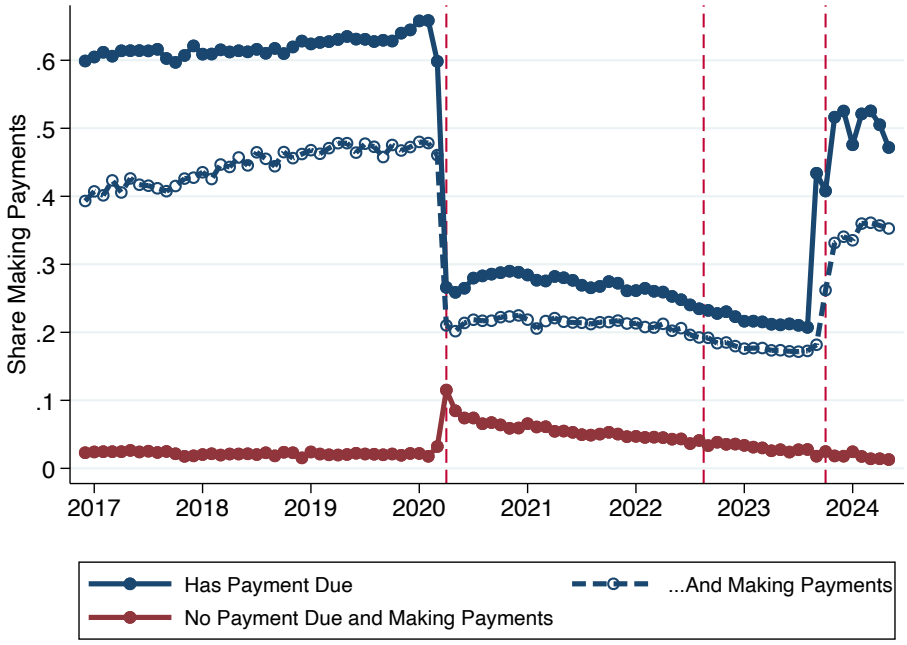
Notes: Figure shows cross-sectional standard deviation of beliefs about 1-year ahead forgiveness from our survey.

Figure A.2: Fraction of Student Loan Debt Expected to Be Forgiven (Positive Beliefs)



Notes: Figure shows the fraction of student loan debt respondents expect to be forgiven, among respondents with positive beliefs about forgiveness.

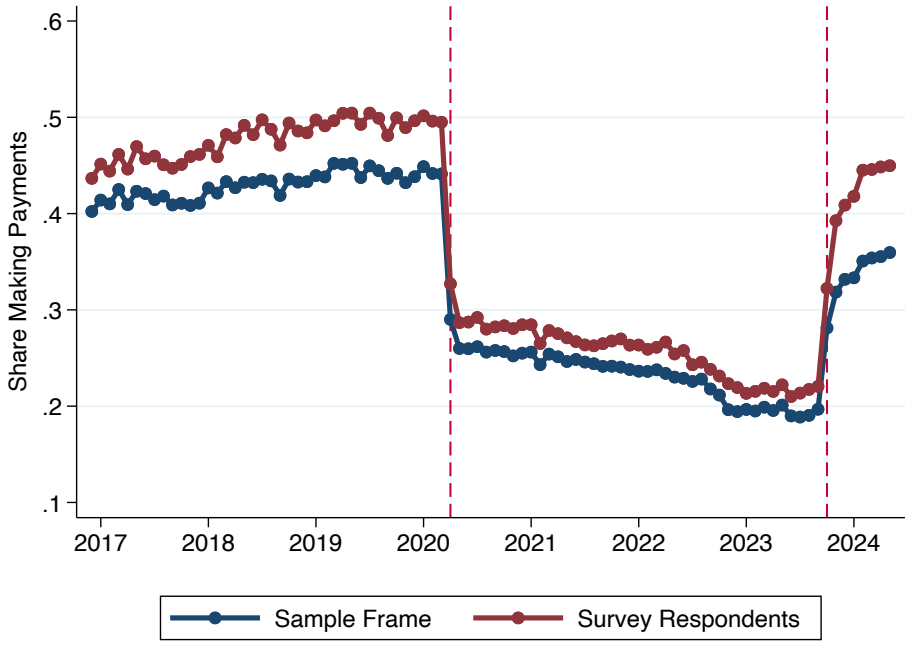
Figure A.3: Share Making Any Student Loan Payment or Refi-Respondents



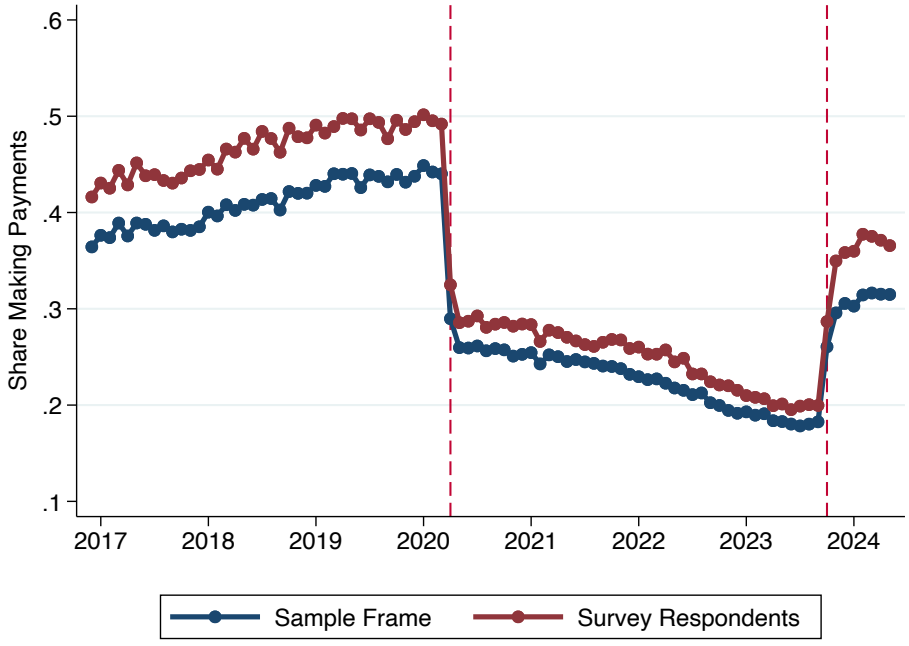
Notes: Figure shows the share of borrowers making a payment on student loans, conditional on having an open balance in February 2020. Vertical lines indicate April 2020, the start of the payment pause, August 2022 Biden's Forgiveness Announcement, and October 2023, the month the payment pause ended. Source: Credit data.

Figure A.4: Share Making Any Student Loan Payment-Respondents v Survey Frame

(a) Conditional on Open balance in Month



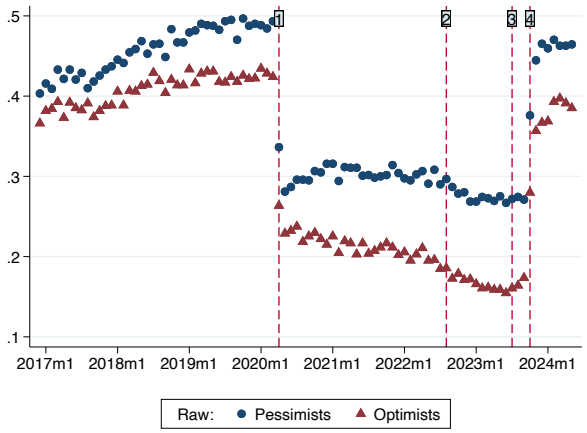
(b) Conditional on Balance in Feb 2020



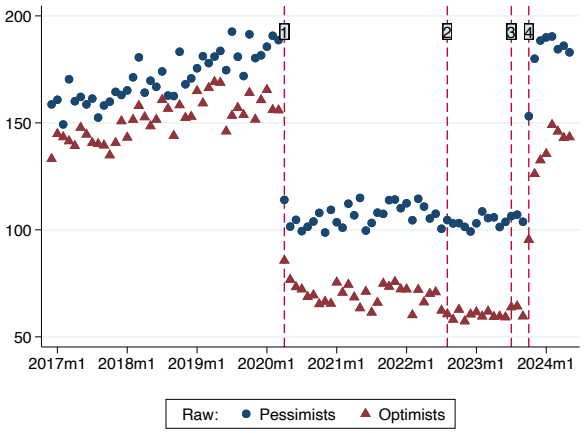
Notes: Figure shows the share of borrowers making a payment on student loans. Vertical lines indicate April 2020, the start of the payment pause, and October 2023, the month the payment pause ended. Source: Credit data.

Figure A.5: Raw Means of Student Loan Outcomes, Above v. Below Median Beliefs

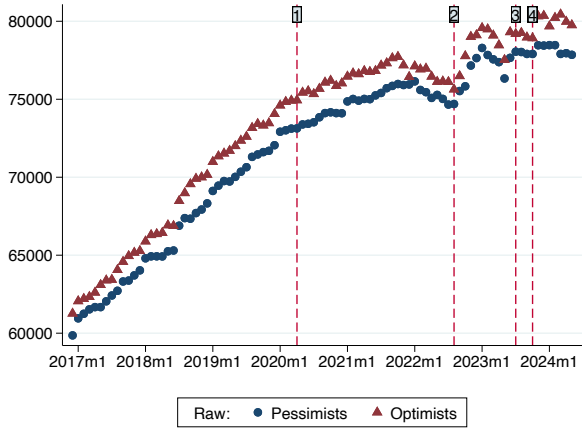
(a) Any Payment



(b) Payment ($)



(c) Balances ($)

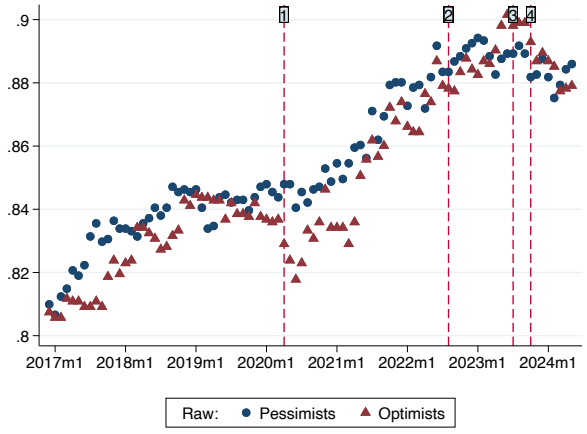


Notes: Raw means by above/below median beliefs at time of survey. Source: credit data.

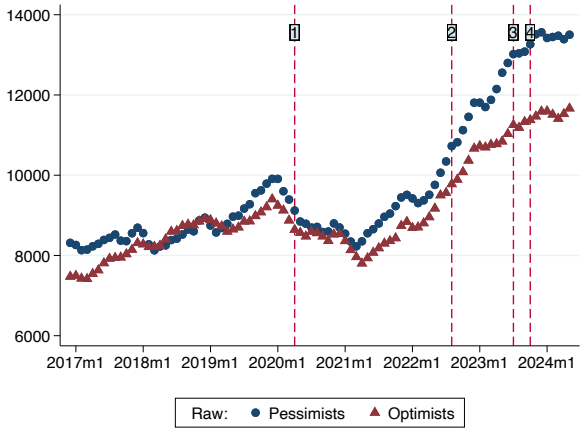
Figure A.6: Raw Means of Credit Outcomes, Above v. Below Median Beliefs

Revolving Balances

(a) Any Balance

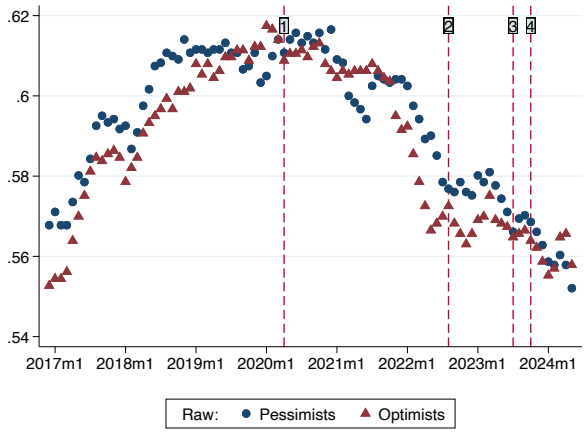


(b) Balances ($)

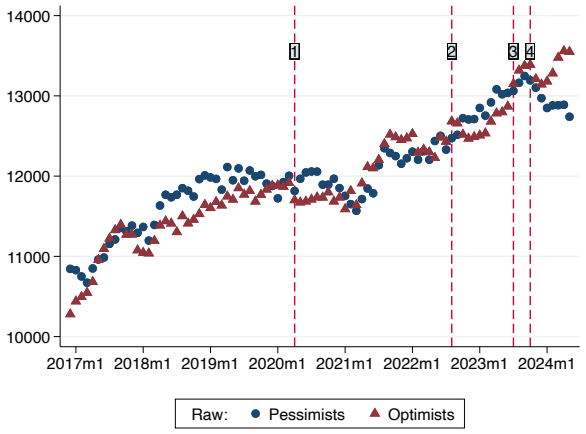


Auto Balances

(c) Any Balance

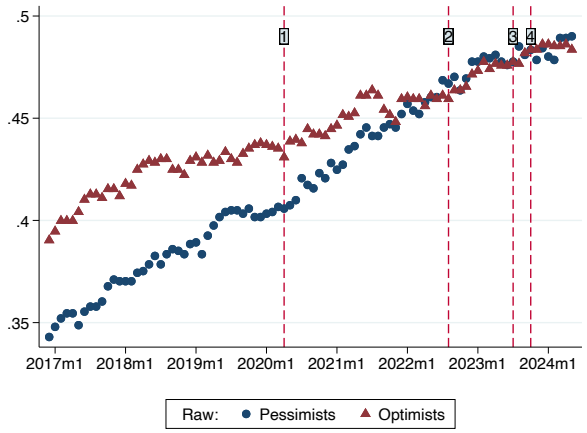


(d) Balances ($)

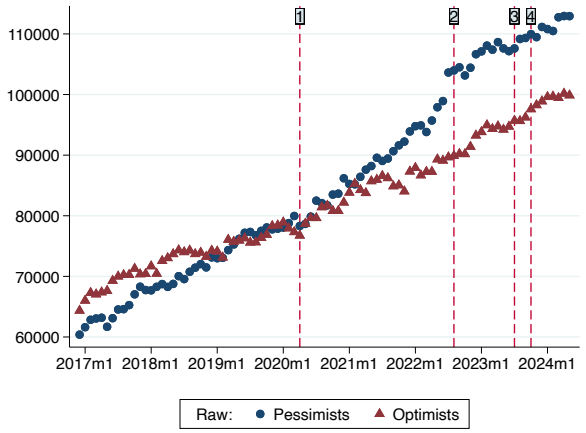


Mortgage Balances

(e) Any Balance



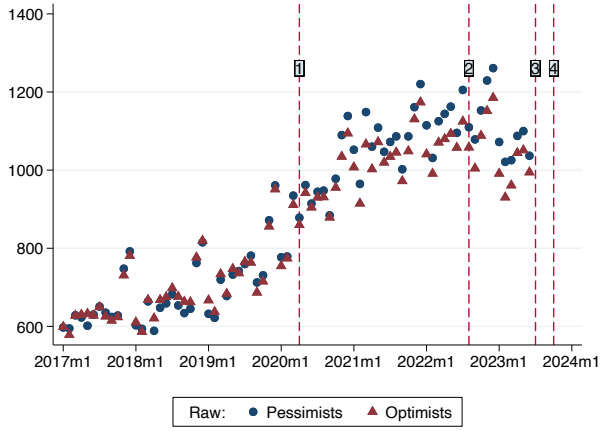
(f) Balances ($)



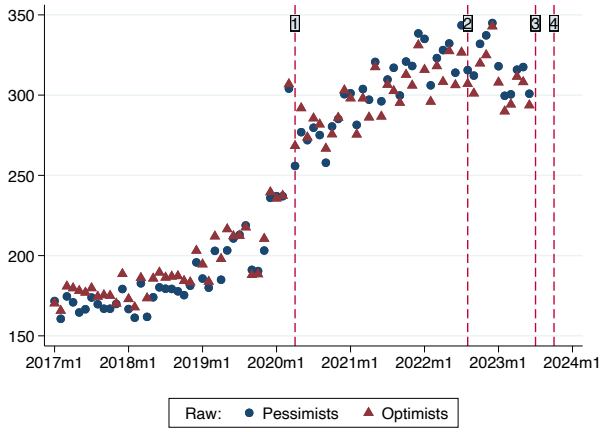
Notes: Notes: Raw means by above/below median beliefs at time of survey. Source: credit data. Source: credit data.

Figure A.7: Raw Means of Numerator Spending Outcomes, Above v. Below Median Beliefs

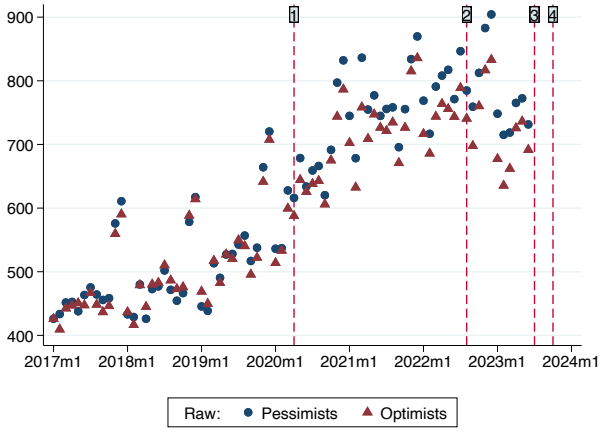
(a) Total Spending



(b) Food Spending



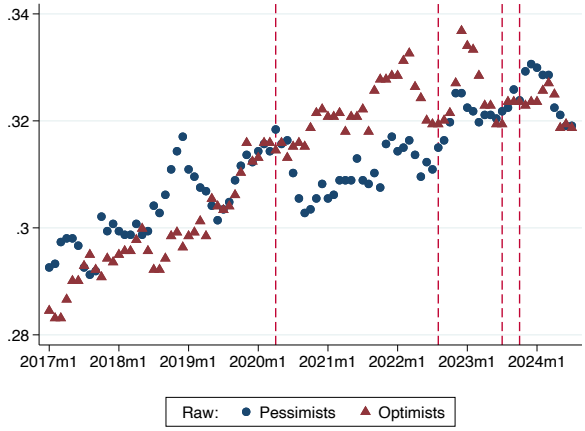
(c) Other Spending



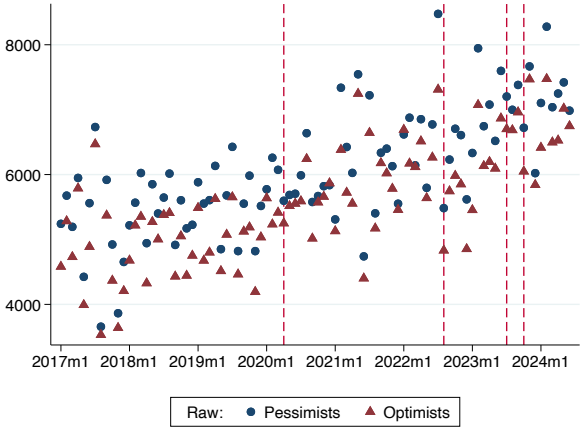
Notes: Notes: Raw means by above/below median beliefs at time of survey. Source: credit data. Source: Numerator.

Figure A.8: Raw Means of Employment Outcomes, Above v. Below Median Beliefs

(a) Any Employment



(b) Gross Monthly Earnings if > 0 ($)

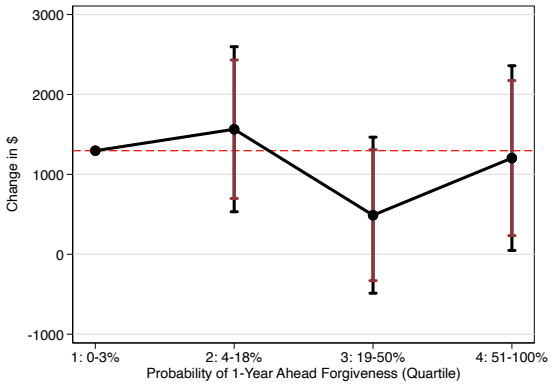


Notes: Notes: Raw means by above/below median beliefs at time of survey. Source: credit data. Source: Employment data.

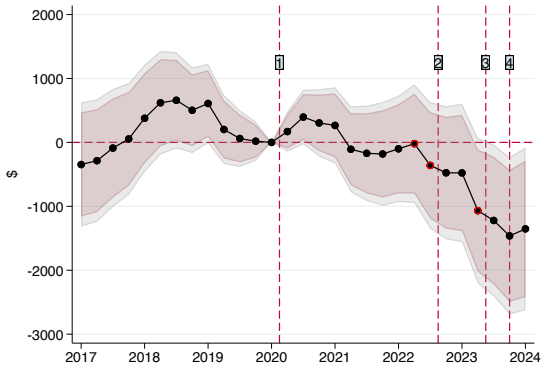
Figure A.9: Evolution of Credit Outcomes, By 1-Year Ahead Forgiveness Beleifs

Revolving Balances ($)

(a) At Time of Survey, Change Since Feb 2020

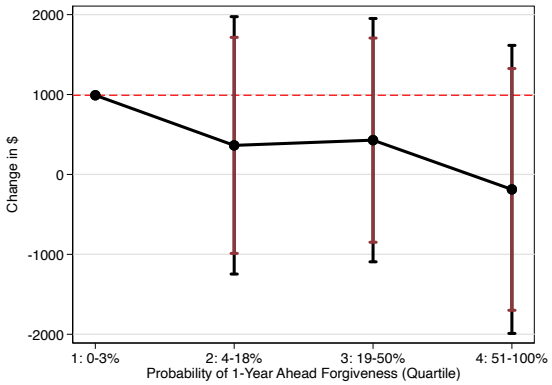


(b) Evolution, Above v. Below Median Beliefs

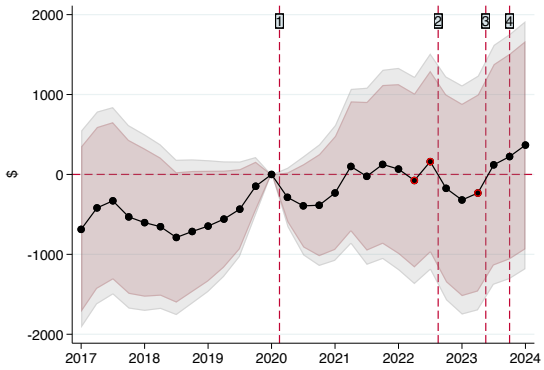


Auto Balances ($)

(c) At Time of Survey, Change Since Feb 2020

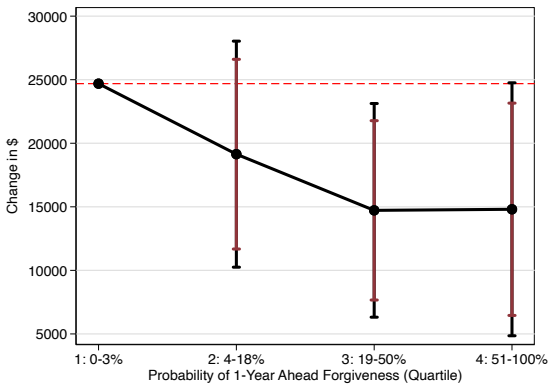


(d) Evolution, Above v. Below Median Beliefs

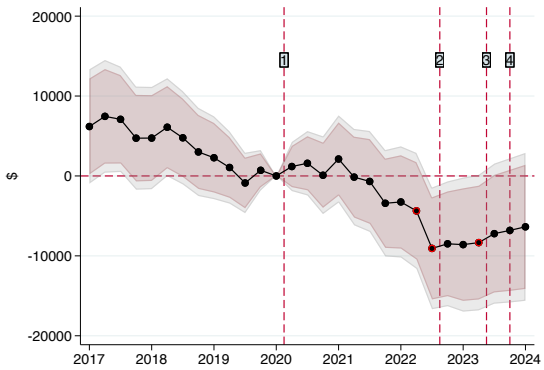


Mortgage Balances ($)

(e) At Time of Survey, Change Since Feb 2020



(f) Evolution, Above v. Below Median Beliefs

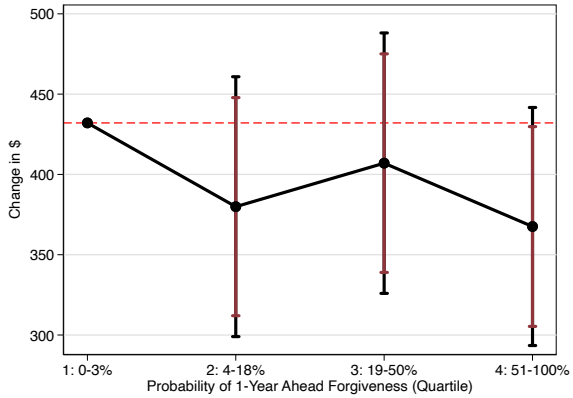


See notes for Figure 5. Source: Credit data.

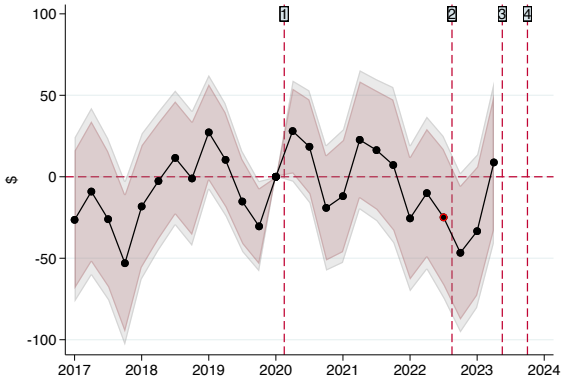
Figure A.10: Evolution of Numerator Spending Outcomes, By 1-Year Ahead Forgiveness Beleifs

Total Spending ($)

(a) At Time of Survey, Change Since Feb 2020

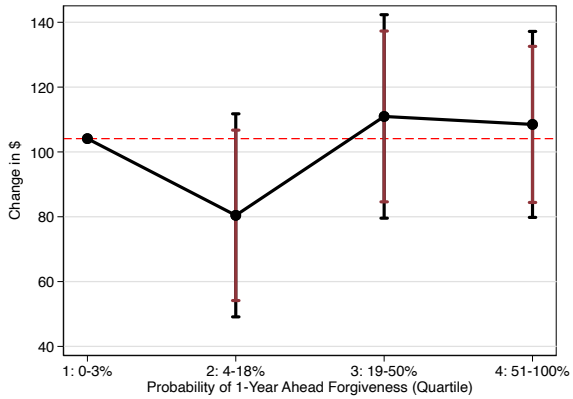


(b) Evolution, Above v. Below Median Beliefs

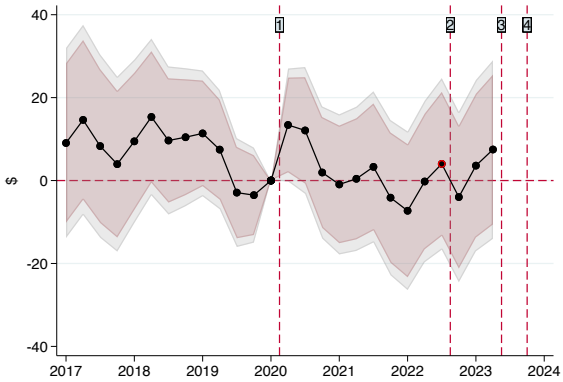


Food Spending ($)

(c) At Time of Survey, Change Since Feb 2020

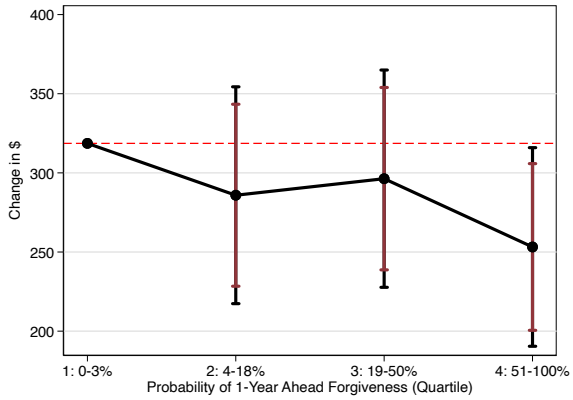


(d) Evolution, Above v. Below Median Beliefs

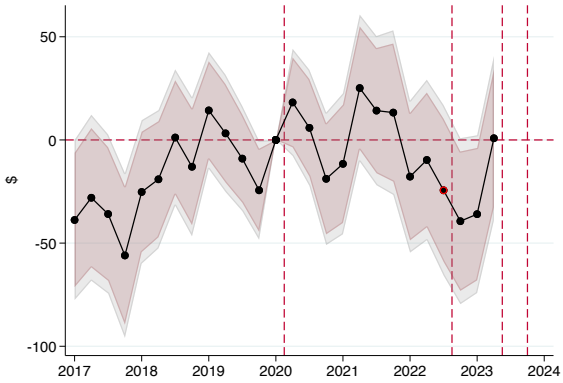


Other Spending ($)

(e) At Time of Survey, Change Since Feb 2020



(f) Evolution, Above v. Below Median Beliefs

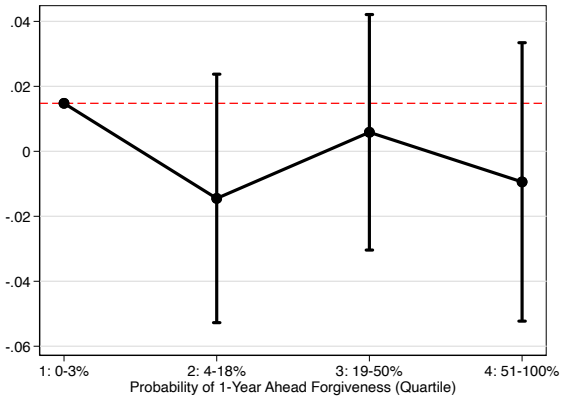


See notes for Figure 5. Source: Numerator.

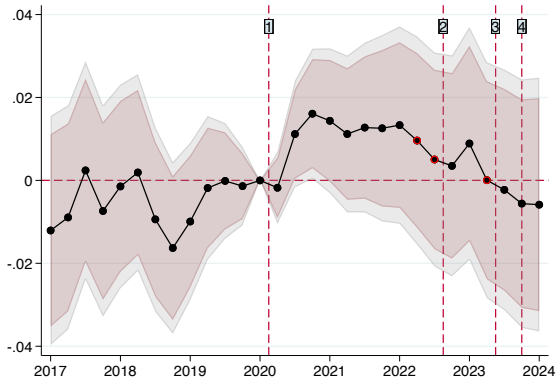
Figure A.11: Evolution of Employment Outcomes

Any Employment

(a) At Time of Survey, Change Since Feb 2020

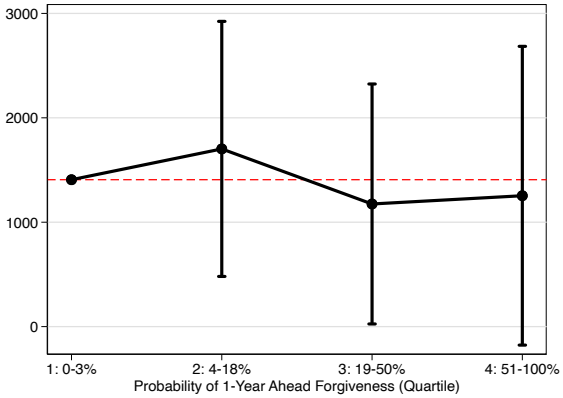


(b) Evolution, Above v. Below Median Beliefs

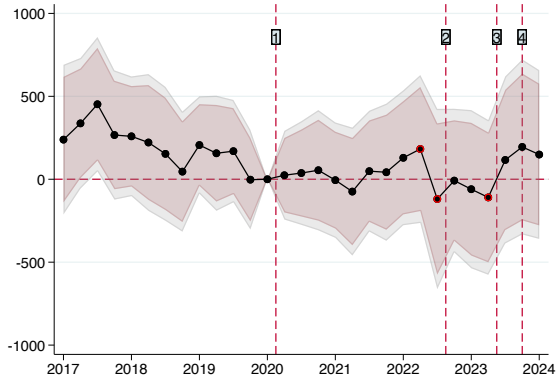


Gross Monthly Earnings if > 0 ($)

(c) At Time of Survey, Change Since Feb 2020



(d) Evolution, Above v. Below Median Beliefs



Notes: See notes for Figures 5. Source: Employment data.

Table A.1: Consumption Survey Intentions, By Optimism and Liquidity

	(1) Spend House	(2) Spend Car	(3) Other Durables	(4) Other Spend
Prob 1-Yr Forgive	0.0593*	0.0226	0.00922	0.00600
	(0.0328)	(0.0335)	(0.0265)	(0.0369)
Savings: $1-$5k	-0.0446*	-0.0492**	0.00164	0.0129
	(0.0229)	(0.0234)	(0.0185)	(0.0258)
Savings: $5k+	-0.0231	-0.0575**	-0.00754	0.00935
	(0.0259)	(0.0265)	(0.0210)	(0.0292)
Constant	0.148***	0.183***	0.0887***	0.186***
	(0.0200)	(0.0204)	(0.0162)	(0.0225)
N	1430	1430	1432	1432

Notes: Standard errors clustered on individual in parentheses. $*$ p<0.1, $**$ p<0.05, $***$ p<0.01.

Table A.2: Summary Statistics, Survey Respondents v. Sample Frame

	(1) Respondents	(2) Sample Frame	(3) Difference (2)-(1)
Student Loan Outcomes			
Mean balance	73,104.25	49,311.30	-23,792.95***
Median balance	50,776.00	29,435.00	-21,341.00
Newest, age in years	6.30	6.28	-0.02
Any deferred	0.33	0.33	-0.00
Any delinuqent	0.05	0.08	0.03***
Any monthly payment	0.50	0.45	-0.05***
Mean monthly payment if >0	390.52	351.80	-38.73**
Other Credit and Employment Outcomes			
Any revolving balance	0.84	0.78	-0.07***
Mean revolving balance if >0	11,202.09	10,356.58	-845.51**
Any auto balance	0.61	0.59	-0.02**
Mean auto balance if >0	19,333.12	19,892.85	559.73
Any mortgage balance	0.45	0.41	-0.05***
Mean mortgage balance if >0	184,149.61	186,894.47	2,744.86
Vantage 4.0 Credit Score	666.99	650.85	-16.14***
Any Employment	0.315	0.297	0.018**
Gross monthly income if >0	5,731.45	5,658.16	73.30
Borrower Characteristics			
Age	46.44	43.67	-2.77***
Female	0.58	0.51	-0.06***
Married	0.48	0.49	0.01
Has children	0.49	0.49	0.01
Zipcode and County Characteristics			
Zipcode AGI (2019)	65,864.02	66,196.98	332.96
Zipcode ZHVI Home prices (Feb 2020)	247,341.50	242,818.82	-4,522.68
Zipcode Δ ln(ZHVI), Dec 2023-Feb 2020	0.33	0.34	0.00
County COVID mortality cumul. per 100k	316.38	326.19	9.81***
N	2,603	26,604	

Notes: Table shows summary statistics comparing survey respondents to non-respondents. Restricted to those with balance reported in credit bureau data as of February 2020. Outcomes shown for February 2020 (pre-COVID payment pause) unless otherwise specified. Stars denote statistical significance of differences in means using robust standard errors, $*$ p<0.1, $**$ p<0.05, $***$ p<0.01. Source: Zipcode AGI from IRS Tax Stats; ZHVI from Zillow Research; COVID mortality from Opportunity Insights. Other outcomes from credit and employment data.

Table A.3: Credit and Employment Outcomes Around Forgiveness Announcements

(a) August 2022 Forgiveness Announcement

	(1) Revolving Bal ($)	(2) Auto Bal ($)	(3) Mortgage Bal ($)	(4) Employment Any
Pess× Post	83.91	700.8*	-1363.1	0.0035
	(302.0)	(392.0)	(2386.3)	(0.0098)
Post× Bal< 10k	-411.1	1352.1	1491.2	0.0048
	(537.7)	(1083.3)	(4344.6)	(0.01245)
Pess× Post× Bal< 10k	-422.5	-2601.7**	606.7	-0.0078
	(720.0)	(1171.5)	(6782.8)	(0.0248)
Pre mean	9,620.04	12,245.57	100444.95	0.3185
N	1776	1776	1776	1776
NxT	14208	14208	14208	14208
Ind FE	X	X	X	X
Time FE	X	X	X	X

(b) June 2023 Supreme Court Decision

	(1) Revolving Bal ($)	(2) Auto Bal ($)	(3) Mortgage Bal ($)	(4) Employment Any
Opti× Post	-179.4	138.3	-2280.6	0.0045
	(370.9)	(475.3)	(2211.1)	(0.0114)
Post× Bal< 10k	1099.0	1272.0	261.9	-0.0004
	(1186.1)	(990.3)	(4882.7)	(0.0197)
Opti× Post× Bal< 10k	-888.1	-1981.6*	1093.9	-0.0037
	(1277.8)	(1140.5)	(5604.6)	(0.0296)
Pre mean	10389.02	12863.14	88247.79	0.3153
N	944	944	944	944
NxT	7545	7545	7545	7545
Ind FE	X	X	X	X
Time FE	X	X	X	X

Notes: Table reports coefficients from estimating:

$$y_{i,t} = \beta_1 Beliefs^{pre} \times Post_t + \beta_2 \mathbb{1}\{Balance^{pre} < \$10k\} \times Post_t + \beta_3 Beliefs^{pre} \times \mathbb{1}\{Balance^{pre} < \$10k\} \times Post_t + \alpha_i + \alpha_t + \epsilon_{i,t}$$

Panel A. Estimation window from April 2022-December 2022, excluding August 2022 (partial treatment). $Post_t$ refers to period from September 2022, the first full month following the 8/24/2022 forgiveness announcement. $Beliefs^{pre}$ is an indicator for having below-median beliefs prior to the announcement, denoted *Pess* in the table. Panel B: Estimation window from March 2023-October 2023. $Post_t$ refers to period from July 2023, following the June 30 Supreme Court decision, and $Beliefs^{pre}$ is an indicator for having above-median beliefs prior to the Supreme Court decision, denoted $Opti$ in the table. Standard errors clustered on individual in parentheses. $*$ p<0.1, $**$ p<0.05, $***$ p<0.01. Source: Credit and employment data

Table A.4: Credit and Employment Outcomes Around End of Payment Pause

	(1) Revolving Bal ($)	(2) Auto Bal ($)	(3) Mortgage Bal ($)	(4) Employment Any
Opti Repayment× Post	-446.7	-134.2	-5898.0**	-0.0151
	(344.3)	(455.0)	(2843.4)	(0.0115)
Opti Forgiveness× Post	-7.690	-490.7	2060.7	0.0028
	(345.9)	(455.7)	(2904.9)	(0.0116)
Pre mean	11109.17	12424.29	95602.30	0.306
N	773	773	773	773
NxT	6956	6956	6956	6956
Ind FE	X	X	X	X
Time FE	X	X	X	X

Notes: Table reports coefficients from estimating:

$$y_{i,t} = \beta_1 \mathbb{1}\{OptimistRepayment^{Pre}\} \times Post_t + \beta_2 \mathbb{1}\{OptimistForgiveness^{Pre}\} \times Post_t + \gamma_i + \gamma_t + \epsilon_{i,t}$$

Estimation window from June 2023-February 2024. $Post_t$ refers to the period from October 2023 when payments were again due. Sample is restricted to student loan borrowers with beliefs surveyed post the June 30 Supreme Court Decision. Standard errors clustered on individual in parentheses. $*$ p<0.1, $**$ p<0.05, $***$ p<0.01.

Table A.5: Effect of Information Treatment on Credit and Employment Outcomes, Instrumental Variable Estimates

	(1) Revolving Bal ($)	(2) Auto Bal ($)	(3) Mortgage Bal ($)	(4) Employment Any
Prob Forgive × Post Treat	4877.8	-6262.7	-61072.0	0.0453
	(5582.1)	(6704.9)	(40200.6)	(0.1563)
Post Treat	-1634.0	2227.4	19813.2	-0.0106
	(1800.3)	(2145.9)	(13051.9)	(0.0482)
Prob Forgive				
NxT	25791	25791	25791	25791
Individual FE	X	X	X	X
Year-Month FE	X	X	X	X
Pre Balance>0	X	X	X	X
No Payment Required	X	X	X	X

Notes: Table report results from an IV event-study framework:

$$y_{it} = \beta_{IV} \widehat{\pi^1 \times \mathbb{1}\{Post\}} + \beta_2 \mathbb{1}\{Post\} + \alpha_i + \alpha_t + \epsilon_{it}$$
$$\pi^1_{it} \times \mathbb{1}\{Post\} = b_1 \mathbb{1}\{OptiTreat\} \times \mathbb{1}\{Post\} + b_2 \mathbb{1}\{Post\} + a_i + a_t + u_{it}$$

where $\mathbb{1}\{Post\}$ is a post survey indicator, π^1 are one-year ahead beliefs about forgiveness, $\mathbb{1}\{OptiTreat\}$ is an indicator for receiving the optimist information treatment, and α_i and α_t are individual and time fixed effects. The event window is 4 months around the survey month, excluding the survey month due to partial treatment. In all regressions, the control group received no information treatment or the pessimistic treatment. Some individuals are in multiple independent treatments in the event studies. Standard errors clustered on individual in parentheses. * p <0.1, ** p<0.05, *** p<0.01.

B Experimental Design

B.0.1 May-June 2022

Table B.1: Treatments, May-June 2022

Optimistic	Pessimistc
"President Biden signaled to House Democrats that he is seriously considering taking action to forgive student-loan debt on a large scale, according to congressional aides and others familiar with the discussions. Following a meeting with the president at the White House, members of the Congressional Hispanic Caucus said they felt confident that Mr. Biden is warming to calls from progressive Democrats to take executive action to erase at least some of the debt held by borrowers with federal student loans. The president told the lawmakers that he was weighing the timing of any announcement." —WSJ, 4/26/2022	"President Biden would be on shaky legal ground if he were to pursue broad-based student debt cancellation by executive action, President Barack Obama's former top Education Department lawyer wrote in a legal analysis. Using executive action to cancel debts for student borrowers without tying relief to their individual needs and using regulatory procedures would put the Biden administration at risk of having its plan overruled in court, according to a legal analysis prepared by Charlie Rose, who served as the top lawyer in the Education Department under President Obama from 2009 to 2011." —WSJ, 5/4/2022

B.0.2 Nov-Dec 2022

Table B.2: Treatments, Nov-Dec 2022

Optimistic	Pessimistc
"Federal courts delivered two wins for President Joe Biden's student loan forgiveness plan. Supreme Court Justice Amy Coney Barrett rejected a challenge to the program brought by a Wisconsin taxpayers group. And on the same day, a federal district court judge rejected a separate lawsuit brought by six Republican-led states. Student loan cancellations, worth up to $20,000 per eligible borrower, could show up on borrowers' accounts soon." *Edited for brevity and readability.*	"A federal judge in Texas struck down the Biden administration's student-debt forgiveness plan, imperiling a key administration priority that would have canceled up to $20,000 in student loans for tens of millions of borrowers. The Biden administration's plan is an "unconstitutional exercise of Congress's legislative power" that also failed to go through normal regulatory processes, Judge Mark Pittman of the Northern District of Texas wrote in a 26-page opinion." *Edited for brevity and readability.*

B.0.3 April-June 2023

Table B.3: Treatments, April-June 2022

Optimistic	Pessimistc
"Is it a good idea for the government to cancel $400 billion in student loans? That is not the question that the Supreme Court confronted, though you could be forgiven for thinking it was. Tuesday's cases involved not the wisdom of loan relief but its legal merits—and, perhaps more importantly, the plaintiffs' right to challenge the program in the first place. Defying predictions of doom for the Biden administration, the arguments went much better than expected... The Biden administration rooted the program in the HEROES Act, which Congress enacted in 2003 to replace a previous statute that granted loan relief to people affected by 9/11. It allowed the education secretary to "waive or modify" student debt held by borrowers affected by any national emergency—not just terrorism. And it expressly let the secretary forgive many, many loans in one fell swoop, rather than "case-by-case." Initially set to expire in 2005, the HEROES Act was extended by Congress for another two years. Then, in 2007, Congress made the act permanent. By its plain text, the HEROES Act authorizes Biden's plan." *Edited for brevity and readability.*	"The Supreme Court's conservative majority signaled deep skepticism about President Joe Biden's plan to wipe out $400 billion in student loan debt for tens of millions of Americans, suggesting the president overstepped his powers under the law. In one of a series of troubling signs for the plan, Chief Justice John Roberts questioned a central premise of Biden's argument: that the president has authority to cancel student loans without explicit authority from Congress.." *Edited for brevity and readability.*

Table B.4: Experiment Balance

	(1) Control	(2) Optimistic Treat	(3) Pessimistic Treat	(4) Difference (2)-(1)	(5) Difference (3)-(1)
Student Loan Outcomes					
Mean balance	68,517.71	71,850.39	72,837.92	3,332.68	4,320.21
Median balance	48,725.00	49,173.00	45,740.00	448.00	-2,985.00
Newest, age in years	6.26	6.27	6.28	0.01	0.02
Any deferred	0.32	0.33	0.33	0.01	0.01
Any delinuqent	0.07	0.07	0.05	-0.00	-0.02
Any monthly payment	0.46	0.48	0.45	0.02	-0.01
Mean monthly payment if >0	389.56	382.48	391.19	-7.08	1.63
Other Credit and Employment Outcomes					
Any revolving balance	0.83	0.83	0.83	-0.00	-0.01
Mean revolving balance if >0	10,784.00	11,084.57	10,734.16	300.57	-49.84
Any auto balance	0.60	0.62	0.60	0.02	-0.00
Mean auto balance if >0	20,163.92	18,842.81	18,944.21	-1,321.11	-1,219.70
Any mortgage balance	0.43	0.43	0.42	-0.00	-0.01
Mean mortgage balance if >0	187,791.61	188,864.95	179,787.47	1,073.34	-8,004.14
Vantage 4.0 Credit Score	660.95	659.75	663.83	-1.21	2.87
Borrower Characteristics					
Age	46.14	46.20	46.16	0.06	0.02
Female	0.58	0.58	0.58	0.00	-0.00
Married	0.47	0.47	0.50	0.00	0.03
Has children	0.48	0.47	0.50	-0.01	0.02
Zipcode and County Characteristics					
Zipcode AGI (2019)	65,856.78	66,417.83	66,412.26	561.04	555.48
Zipcode ZHVI Home prices (Feb 2020)	245,608.34	251,427.05	250,235.12	5,818.70	4,626.78
Zipcode Δln(ZHVI), Dec 2023-Feb 2020	0.34	0.33	0.33	-0.00	-0.01*
County COVID mortality cumul. per 100k	319.57	310.28	318.33	-9.29**	-1.24
N	963	967	964		

Notes: Table shows summary statistics comparing those in the control group with the optimistic and pessimistic treatment groups. Outcomes shown for February 2020 (pre-COVID payment pause) unless otherwise specified. Stars denote statistical significance of differences in means using robust standard errors, $*$ p<0.1, $**$ p<0.05, $***$ p<0.01. Source: Zipcode AGI from IRS Tax Stats; ZHVI from Zillow Research; COVID mortality from Opportunity Insights. Other outcomes from credit and employment data.

C Additional Survey Results

Figure C.1: Beliefs about the Supreme Court Decision (Surveyed April-June 2023)

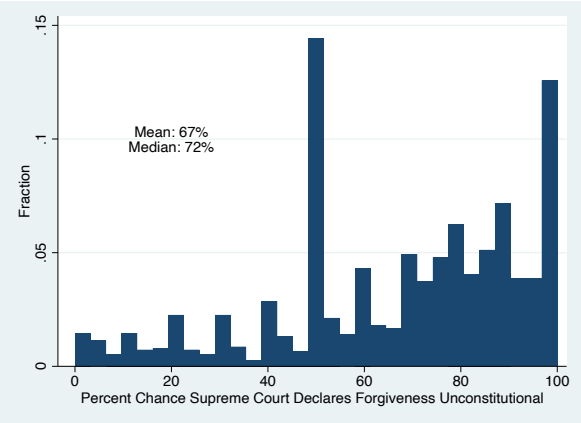


Figure C.2: Expected Sources of Forgiveness (Post SC Decision)

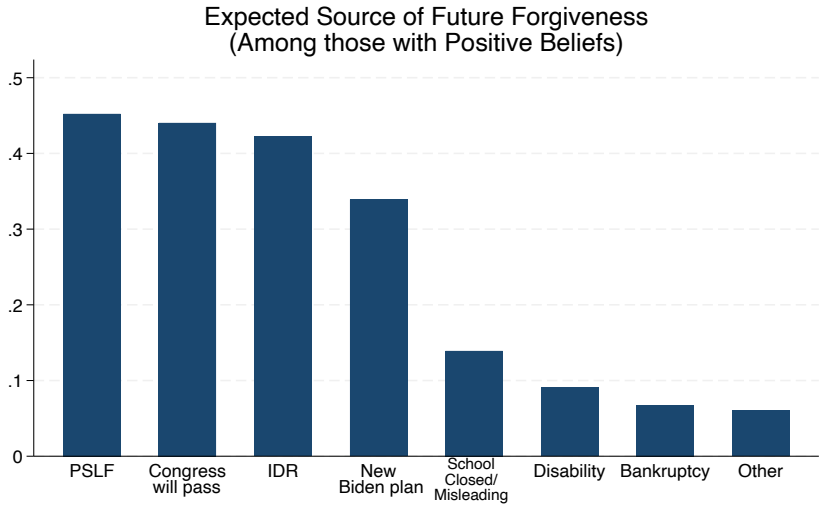
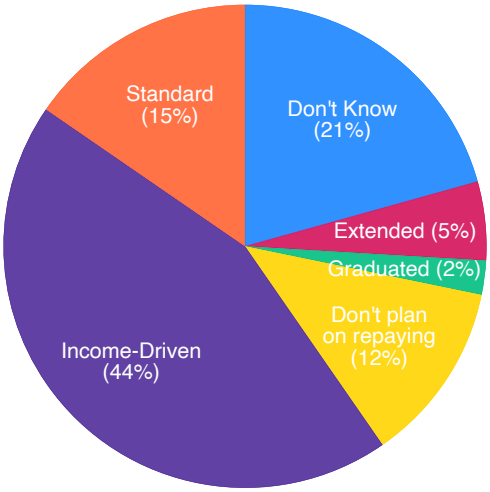


Figure C.3: Intended Plan Enrollment at Repayment



D Survey Instrument

D.1 Main Survey, June-Aug 2022

Thank you very much for your interest in our survey, which involves academic research. The purpose of the research is to better understand the pros and cons of several proposed reforms regarding debt forgiveness. There is no right or wrong answer. Answers are only right if they truly reflect your own views and opinions, as opposed to those of somebody else.

We do not foresee any type of risk or discomfort from this survey. Participation is entirely voluntary, and you will be able to leave the survey at any time you want if you faced unknown risks. Withdrawal from participation will not hinder you from learning about the economic reforms and provide your opinions about them.

For the analysis, the researchers need to merge your record with credit bureau data. Your answers will be analyzed in aggregation with the answers of all other respondents. All your answers will be confidential. The researchers who will evaluate the data will have no access to any identifiable information about you.

If you agree with these conditions, and are willing to participate in the survey, please check the box below:

I consent to the conditions to participate in the survey.

- ○ Yes
- ○ No

Have you ever taken out a student loan to help pay for your own education? This would exclude loans you took out for any other person (e.g. ParentPLUS loans).

- ○ Yes
- ○ No
- ○ Don’t know

What is your approximate amount of all your student loans, both federal and/or private student loans, for both your undergraduate and/or graduate education, that you owe for your own education as of today?

- ○ Student loan balance ($) _____
- ○ Don’t know

If “Don’t know”:

Which of the following categories best describes the approximate amount of all your student loans, both federal and/or private student loans, for both your undergraduate and/or graduate education, that you owe for your own education as of today?

- ○ None ($0)
- ○ $1-4,999
- ○ $5,000-9,999
- ○ $10,000-14,999
- ○ $15,000-19,999
- ○ $20,000-29,999
- ○ $30,000-39,999
- ○ $40,000-49,999
- ○ $50,000-99,999
- ○ $100,000 or more
- ○ Don’t know

In February 2020, prior to the start of the COVID-19 pandemic, do you remember what kind of repayment plan you were enrolled in?

- ○ None, I was still in school
- ○ Standard Repayment Plan: Make the same payment amount every month for 10 years
- ○ Graduated Repayment Plan: Payment amounts start low and increase every two years. Loans are paid off within 10 years
- ○ Extended Repayment Plan: Make a payment amount every month for longer than 10 years (up to 30 years)
- ○ Income-Driven Repayment Plan (IDR): Monthly payment amounts are tied to your income and family size
- ○ None, Loans were in default
- ○ Don't know

In March 2020, the federal government announced that federal student loan payments and interest would be temporarily paused for most borrowers as part of the pandemic assistance efforts and this "payment pause" is still in place.

Prior to this taking this survey, were you aware that the federal government paused payment for most federal student loans?

- ○ Yes
- ○ No

During the payment pause related to the COVID-19 pandemic, have you continued to make payments on your federal student loan(s)?

- ○ Yes, I am still required to make monthly payments
- ○ Yes, I voluntarily make full payments each month
- ○ Yes, I voluntarily make partial or full payments when I can, but not every month
- ○ No, I haven't made any payments since payments were paused
- ○ Don't know

What kind of repayment plan are you currently enrolled in?

- ○ Standard Repayment Plan: Make the same payment amount every month for 10 years
- ○ Graduated Repayment Plan: Payment amounts start low and increase every two years. Loans are paid off within 10 years
- ○ Extended Repayment Plan: Make a payment amount every month for longer than 10 years (up to 30 years)
- ○ Income-Driven Repayment Plan (IDR): Monthly payment amounts are tied to your income and family size
- ○ Don't know

The current payment pause is expected to end in August 2022.

To what extent do you agree with the following statement: When student loan payments start again in September 2022, I will be able to afford the same monthly amount that I was paying prior to the payment pause related to the COVID-19 pandemic.

- ○ Strongly Agree
- ○ Agree
- ○ Neither agree nor disagree
- ○ Disagree
- ○ Strongly disagree

On the next page, you will be shown a short article that features a statement about the likelihood of student loan forgiveness. Then you will be asked some questions about the article you were shown.

If Treatment 1:

President Biden signaled to House Democrats that he is **seriously considering taking action to forgive student-loan debt on a large scale**, according to congressional aides and others familiar with the discussions.

Following a meeting with the president at the White House, members of the Congressional Hispanic Caucus said they felt confident that Mr. Biden is warming to calls from progressive Democrats to take executive action to erase at least some of the debt held by borrowers with federal student loans. The president told the lawmakers that he was weighing the timing of any announcement.

Edited for brevity and readability

If Treatment 2:

President Biden would be on **shaky legal ground if he were to pursue broad-based student debt cancellation** by executive action, President Barack Obama's former top Education Department lawyer wrote in a legal analysis.

Using executive action to cancel debts for student borrowers without tying relief to their individual needs and using regulatory procedures would put the Biden administration at risk of having its plan overruled in court, according to a legal analysis prepared by Charlie Rose, who served as the top lawyer in the Education Department under President Obama from 2009 to 2011.

Edited for brevity and readability

In the following questions, we will ask you to think about the percent chance of something happening in the future.

Your answers can range from 0 to 100, where 0 means there is absolutely no chance, and 100 means that it is absolutely certain.

For example, numbers like: 2 and 5 percent may indicate "almost no chance" 18 percent or so may mean "not much chance" 47 or 52 percent chance may be a "pretty even chance" 83 percent or so may mean a "very good chance" 95 or 98 percent chance may be "almost certain"

What do you think is the percent chance that the repayment pause will be extended again beyond August 2022?

	0 10 20 30 40 50 60 70 80 90 100
%	

What do you think is the percent chance that **AT LEAST SOME of your** student loan debt will be forgiven.

	0 10 20 30 40 50 60 70 80 90 100
% in the next year?	
% in the next 2-5 years?	
% in the next 10+ years?	

Which fraction of your student loan do you think will be forgiven?

	0 10 20 30 40 50 60 70 80 90 100
% over the next year?	
% over the next 2-5 years?	
% over the next 10+ years	

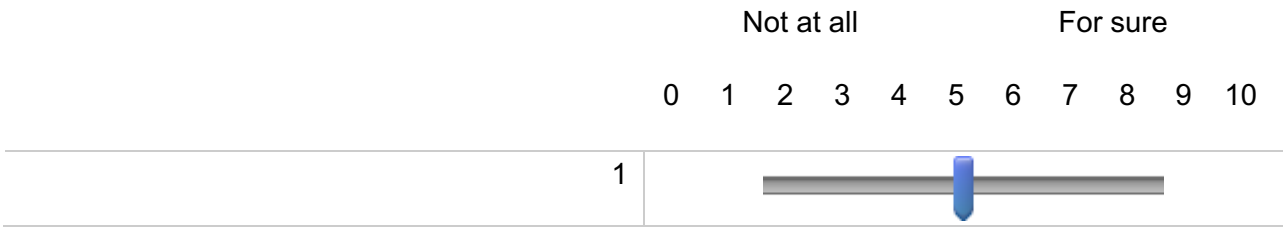
If student loan forgiveness is announced, what dollar value of student loans do you think will be forgiven?

- ○ Dollars ($) _____
- ○ Don't know

Approximately how much savings do you have available in your bank accounts?

- ○ None ($0)
- ○ $1-4,999
- ○ $5,000-9,999
- ○ $10,000-14,999
- ○ $15,000-19,999
- ○ $20,000-29,999
- ○ $30,000-39,999
- ○ $40,000-49,999
- ○ $50,000-99,999
- ○ $100,000 or more
- ○ Don’t know

How likely are you to vote in the midterm elections in November 2022?



In the Congressional elections in November 2022, which party are you likely to vote for?

- ○ Democrat
- ○ Republican
- ○ Not sure

D.2 Survey Intentions, April-July 2023

Display This Question:

If If What is your approximate amount of all your student loans, both federal and/or private student lo... Text Response Is Greater Than or Equal to 10000

Suppose you received student loan forgiveness of $10,000 in July 2023. How many dollars would you allocate to each of the following this year?
To pay off debts: : _____ (1)
To new spending: A house/ apartment : _____ (2)
A car or other vehicle : _____ (6)
A large home appliance or electronics : _____ (5)
All other spending: : _____ (4)
Amount saved: : _____ (3)
Total : _____

Display This Question:

If If What is your approximate amount of all your student loans, both federal and/or private student lo... Text Response Is Less Than 10000

Suppose your student loans are completely forgiven in July 2023. How many dollars would you allocate to each of the following this year?
Pay off debts: : _____ (1)
New spending this year: A house/apartment : _____ (2)
A car or other vehicle : _____ (3)
A large home appliance or electronics : _____ (4)
All other spending: : _____ (5)
Amount saved: : _____ (6)
Total : _____

Are you currently employed?

- ○ Yes, full time (1)
- ○ Yes, part-time, but want full-time (2)
- ○ Yes, part-time by choice (3)
- ○ Student and not employed, or employed part-time (4)
- ○ No, unemployed and looking for work (5)
- ○ No, not employed, not a student, and not looking for work (6)

Display This Question:

If Are you currently employed? = Yes, full time

Or Are you currently employed? = Yes, part-time, but want full-time

Or Are you currently employed? = Yes, part-time by choice

Or Are you currently employed? = Student and not employed, or employed part-time

If up to $10,000 in your student loans are forgiven in July 2023, would you change work hours in your current job(s) or possibly a new job?

- ○ No, I would not change my hours or job (1)
- ○ I will try to increase my work hours in my current job (2)
- ○ I will try to decrease my work hours in my current job (3)
- ○ I will look for a new job more actively (4)
- ○ I will look for a new job with about the same effort (5)
- ○ I will look for a new job less actively (6)

Display This Question:

If Are you currently employed? = No, unemployed and looking for work

Or Are you currently employed? = No, unemployed and looking for work

If up to $10,000 in your student loans are forgiven in July 2023, would you change your effort in looking for a job?

- ○ I will look for a job more actively (1)
- ○ I will look for a job with about the same effort (2)
- ○ I will look for a job less actively (3)

E Numerical solution method

In this appendix, we describe the numerical solution method. In total, we consider four payment scenarios: (i) pre-pay in the first period (*Pre-pay*); (ii) making voluntary payments during the zero-interest rate period (*Voluntary*); (iii) resuming payments after the zero-interest rate period (*Delay*); (iv) postponing all payments until the last period (*Last-period*).

First, we set the household's utility function $u(\cdot)$ and other parameters, including the number of periods T, the income flow vector $\mathbf{y} = (y_1, ..., y_T)$, the initial student loan amount B_0, household expected forgiveness vector $\mathbf{F} = (F_1, ..., F_T)$, the interest rate of the student loan r_b, the intertemporal saving (and potential borrowing) rate r_s, and the time preference β. We also set the indicator vector for the zero-interest rate period.

For each payment scenario, the code begins with calculating the payment flow vector $\mathbf{b} = (b_1, ...b_T)$. Under *Pre-pay*, the household pays the sum of the initial loan amount and the interest accrued in the first period and makes no payment afterward. We only consider this scenario if the first-period income y_1 is larger than the pre-paid amount.

For the other three payment scenarios, in each period, if the forgiveness amount is larger than the remaining balance plus the interest accrued, then no payment will be made in this period and afterward. If payment is still needed, we adjust the balance after the forgiveness but before payment as the previous-period balance plus the interest accrued and minus the expected forgiveness: $B_{t^-} = B_{t-1} \cdot (1 + r_b \times 1[t \notin \text{zero-interest rate period}]) - F_t, \forall t \in [1, ..., T]$. During the zero-interest rate period, no interest is accrued and only the household under *Voluntary* payment scenario keeps on paying the loan: if the zero-interest rate period starts at $t^* = 1$, then the voluntary payment in period t is set as the minimum of the amortized payment $B_0 \frac{r_b(1+r_b)^T}{(1+r_b)^T - 1}$ and the balance B_{t^-}; if $t^* > 1$, then it is set as the minimum of b_{t^*-1} and B_{t^-}. Outside the zero-interest rate period, when the household needs to pay down the loan as the corresponding payment scenario suggests, the payment in period t is calculated in an amortized manner: $b_t = B_{t^-} \frac{r_b(1+r_b)^{T-t}}{(1+r_b)^{T-t+1} - 1}$. Finally, we update the balance after the payment as $B_t = B_{t^-} - b_t$.

Having the payment flow vector in hand, the code proceeds to get the optimal consumption under each scenario. If we do not allow intertemporal borrowing, we enumerate the binding budget constraint set $BC = \{k_0, k_1, ..., k_n\}$, where $0 = k_0 < k_1 < k_2 < ... < k_n = T$ and the household consumes everything available in period $k_i, 1 \leq i \leq n$. Since any period $1 \leq t < T$ can be either in or not in the set, there are in total 2^{T-1} cases to be considered. For each BC, we (i) calculate the optimal consumption by solving

$$\sum_{\tau=k_{i-1}+1}^{k_i} (1+r_s)^{k_i-\tau} (u')^{-1} \left(\frac{u'(c^*_{k_{i-1}+1})}{(\beta(1+r_s))^{\tau-k_{i-1}-1}} \right) = \sum_{\tau=k_{i-1}-1}^{k_i} (1+r_s)^{k_i-\tau} (y_\tau - b_\tau)$$

using the SLSQP method from the package scipy.optimize.minimize with the constraint $c_{k_{i-1}+1} > 0$, and calculating the consumption in other periods following

$$c^*_\tau = (u')^{-1} \left(\frac{u'(c^*_{k_{i-1}+1})}{(\beta(1+r_s))^{\tau-k_{i-1}-1}} \right), \ \forall \tau \in [k_{i-1}+2, k_i]$$

for any $1 \leq i < n$; (ii) check if the budget constraints are indeed satisfied under the optimal consumption vector $\mathbf{c}^* = (c^*_1, ..., c^*_T)$: if

$$\sum_{\tau=1}^{t} (1+r_s)^{t-\tau} \left(y_\tau - b_\tau - c^*_\tau \right) < 0$$

for any $1 \leq t \leq T$, then we loop directly to the next BC set without calculating the utility; if the budget constraint is satisfied for every period, then we calculate the lifetime utility $\sum_{t=1}^{T} \beta^{t-1} u(c_t^*)$. Finally, we compare the utilities across each case and determine the optimal consumption that results in the largest utility.

If we allow intertemporal borrowing at the rate r_s, we set $BC = \{0, T\}$ and get the optimal consumption as above without the need to check the budget constraint in each period.