Liquidity Constraints and Budgeting Mistakes: Evidence from Social Security Recipients *

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Abstract

In this paper, we use a unique administrative dataset to analyze the impact of income timing on the use of payday loans, a common form of short-term credit. Exploiting quasi-random variation in the disbursement of benefits by the Social Security Administration, we document three patterns that are difficult to explain under the lifecycle / permanent income hypothesis. First, borrowing is procyclical with liquidity over the pay period. Loan volume declines by 47% over the course of a pay period, and increases discontinuously on pay days. Second, borrowing per day is 38% higher during 35-day compared with 28-day pay periods. Third, consumers borrow 3% less if they are assigned to receive income on the fourth Wednesday compared to the second Wednesday of the month, consistent with imperfect planning for recurring expenditure commitments at the beginning of the month. Our results suggest that failures to adjust to predictable variation in income timing account for at least 18% of payday loan volume and lead to $29-41 million in excess costs per year among benefits recipients.

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I Introduction

A large fraction of Americans lack a basic buffer stock of liquid savings for coping with emergencies and budget shortfalls.[1] Liquidity-constrained consumers have high marginal propensities to consume and experience significant intramonth consumption volatility, and their pervasiveness has been difficult to explain using traditional lifecycle models.[2] Alternatively, behavioral models predict both low levels of liquid asset holdings and substantial usage of high-cost unsecured credit (Laibson 1997, Laibson, Repetto and Tobacman 2007). A key implication is that while the availability of credit facilitates consumption smoothing under rational models of lifecycle consumption, borrowing by imperfectly-rational consumers may instead exacerbate their constraints and reduce both long-term asset accumulation and consumer welfare.

Our study exploits predictable variation in the timing of income to estimate the importance of budgeting mistakes as a driver of liquidity constraints, as measured by high-cost credit use. In particular, for a subset of beneficiaries, the Social Security Administration (SSA) quasi-randomly assigns benefits payments to the second, third, or fourth Wednesday of each month based on the day of the month they were born. Wednesdays fall on different days of the month over the calendar year, generating further variation in whether pay cycles have 28 or 35 days. The SSA disbursement schedule thus allows us to disentangle the effects of the income cycle, the calendar month cycle, the length of the pay period, and the timing of pay within the month on credit use. Under the lifecycle / permanent income hypothesis (LCPIH), none of these factors should affect the propensity to borrow.

Using a unique administrative dataset of payday loans taken out by Social Security beneficiaries, we document three key facts. First, borrowing is driven by the income cycle, not the monthly cycle. Contrary to the pattern predicted by consumption smoothing motives, borrowing is greatest just after income receipt, and declines by 47% over the course of a pay period. Although many bill

[1] Lusardi, Schneider and Tufano (2011) find that one quarter to one half of households report being unable to come up with $2,000 within the next month to cope with an unexpected need.

[2] For examples of the literature on marginal propensities to consume and intramonth consumption volatility, see Gross and Souleles (2002), Johnson, Parker and Souleles (2006), Stephens (2006), and Parker, Souleles, Johnson and McClelland (2013). Both permanent-income and buffer-stock consumption models predict that there should be fewer liquidity-constrained consumers than observed empirically (Friedman et al. 1957, Hall 1978, Carroll 1997, Gourinchas and Parker 2002). More recently, Kaplan and Violante (2014) show that transaction costs of accessing illiquid assets can help to explain the prevalence of hand-to-mouth consumers.

payments are due near the first of the month, loan volume is unrelated to calendar month date. The results suggest that consumers defer payments on expenditure commitments in order to avoid borrowing at the end of pay periods. Because the amount and timing of pay are both highly predictable, the discontinuous increase in borrowing on pay dates implies that consumers overestimate the ability of their paychecks to cover their deferred and contemporaneous expenditures.[3]

The second key fact is that borrowing per day is 38% higher during 35-day compared with 28-day pay periods. Although the disbursement calendar is known in advance, consumers do not save enough during 28-day pay periods to smooth liquidity during 35-day pay periods, again consistent with imperfect budgeting. Our third key finding is that consumers borrow less when they are quasi-randomly assigned to receive income later in the month. For every week later a consumer is paid during the calendar month, borrowing per day declines by 2%. Since a large fraction of expenditure commitments occur near the beginning of the month, this result suggests that consumers fail to set aside enough of their paychecks to pay for known, predictable expenditures when there is a lag between income receipt and expenditure due dates.

Together, our findings show that some consumers fail to accurately budget monthly cashflows, even from highly predictable sources of income. Using our regression estimates, we calculate that budgeting mistakes stemming from variation in the length of pay periods and lags between income receipt and bill due dates account for at least 18% of payday borrowing and lead to $29 million per year in interest charges for a subset of Social Security recipients. An additional 6% of loans are deferred from the end of one pay period to the beginning of the next, generating up to $12 million in additional costs from late bill payments. The share of loan volume affected by budgeting mistakes ranges from 36% for consumers in the bottom tercile of benefits income to 20% for those in the top tercile. The results suggest that systematic budgeting mistakes may be one driver of both the low levels of buffer-stock saving and the use of high-cost credit by many households. Any such savings would quickly erode away with the accumulation of intramonth shortfalls by mis-budgeting households. As these households turn to high-cost credit in the absence of a buffer stock, their ability to build savings is further hampered by fees and principal payments.

[3]Deferral of bill payments is not itself evidence of consumer mistakes, since many commitments such as mortgage and rent payments and utility bills can be delayed for short periods at low cost. However, given that there is no resolution of uncertainty at the time of income receipt, borrowing should not increase discontinuously at the beginning of pay periods if consumers have rational expectations.

This paper contributes to the large literature on the effects of income receipt on borrowing and consumption, which tries to explain why a large fraction of consumers behave as if they are liquidity constrained.[4] Our results suggest that budgeting mistakes may be one reason why many consumers are liquidity constrained, have low levels of liquid assets, and can access credit markets only at high interest rates. Consistent with budgeting mistakes, but inconsistent with rational expectations models, we document the novel finding that unsecured debt increases just after income receipt for highly-constrained consumers.[5] One strand of this literature shows that food and instantaneous consumption declines significantly within pay periods for public benefits recipients.[6] We find that loan use is highly procyclical within pay cycles, so short-term credit does not help to alleviate the intramonth consumption volatility documented in this literature.

This paper is closely related to recent work on the consumption and debt responses to a temporary shift in the timing of income caused by the 2013 federal government shutdown (Gelman, Kariv, Shapiro, Silverman and Tadelis 2015, Baker and Yannelis 2015). Consistent with our results, Gelman et al. (2015) show that many consumers defer bill payments in response to the two-week delay in income receipt and that a small shift in the timing of income drives extended indebtedness for a subset of highly-constrained consumers.[7] Zhang (2014) presents a model in which individuals fail to account for predictable mismatches between the timing of their income and expenditures, which is consistent with our finding of greater borrowing during long pay periods.

We also contribute to the literature on the drivers of unsecured credit use and the welfare effects of short-term credit. The LCPIH predicts that credit use should be driven by the lifecycle labor income profile and transitory liquidity shocks. A number of papers suggest that quasi-hyperbolic preferences may also contribute to debt levels (e.g. Laibson (1997), Laibson et al. (2007), and

[4] See Jappelli and Pistaferri (2010) for a review of the theory and evidence.

[5] In a related finding, Aaronson, Agarwal and French (2012) show that secured auto debt increases after minimum wage hikes. However, their setting differs significantly from ours in that it exploits a persistent increase in expected income. In our setting, the levels of income and borrowing capacity remain unchanged, and income receipt is purely a short-term increase in liquidity.

[6] Stephens (2003) finds that Social Security recipients spend more on instantaneous consumption in the days following a benefits payment. Wilde and Ranney (2000) and Shapiro (2005) document a calorie consumption cycle for SNAP recipients based on the receipt of benefits, and Mastrobuoni and Weinberg (2009) document a food consumption cycle among Social Security recipients. Hastings and Washington (2010) further show that the declines in food expenditures among SNAP recipients are neither driven by changes in quality nor prices. Vellekoop (2012) shows that the timing of expenditure commitments contributes to monthly consumption cycles.

[7] In contrast to their study, we analyze anticipated variation in regular income payments whose schedule is announced well in advance. Although government employees faced substantial uncertainty prior around the time of the shutdown, consumers in our sample have adequate opportunity for budgeting.

Meier and Sprenger (2010)). Our study adds to the growing body of evidence that incorrect beliefs, inattention, and decision-making mistakes contribute to observed credit usage patterns.[8] More broadly, the large literature on financial literacy shows that many consumers are unable to answer basic financial questions, and that low literacy is correlated with the use of high-cost credit.[9]

Like this study, the literature on the welfare effects of short-term credit has largely focused on payday loans. The results have been mixed on whether credit helps consumers smooth shocks versus tightens their liquidity constraints. Melzer (2011) and Carrell and Zinman (2014) document that payday loans may exacerbate constraints, making it more difficult to pay bills and worsening job performance. In contrast, Zinman (2010) and Morse (2011) find that payday access is associated with better financial outlook and lower rates of foreclosure and larceny after natural disasters. Bhutta, Skiba and Tobacman (2012) and Carter and Skimmyhorn (2015) show that eligibility for payday loans has no effect on credit scores and few measurable effects on the work performance of servicemembers. Dobridge (2014) finds that payday access lowers consumption during normal times, but mitigates consumption shocks after extreme weather events. Zaki (2013) shows that credit access dampens monthly consumption volatility in military commissaries. In contrast to the literature thus far, our data directly link measures of loan use to the timing of income receipt at the individual level. Consistent with the prediction of Parsons and Van Wesep (2013), we find that in the absence of restrictions on the timing of loan use within pay periods, the pattern of use is inconsistent with intramonth consumption smoothing.

This paper proceeds as follows. Section II describes our dataset and provides an overview of the institutional features of Social Security benefits payments. Section III describes theoretical predictions for the impact of income timing on credit use. Sections IV and V present our empirical approach and results, and Section VI concludes.

[8] A number of studies present theories and evidence of naivete in contract selection, borrowing, refinancing, and repayment decisions, focusing primarily on the credit card market (Ausubel 1991, DellaVigna and Malmendier 2004, Shui and Ausubel 2005, Skiba and Tobacman 2008, Heidhues and Kőszegi 2010, Kuchler 2012). Stango and Zinman (2009a), Stango and Zinman (2011), and Bertrand and Morse (2011) show that consumers systematically underestimate interest rates. Stango and Zinman (2009b), Carter, Skiba and Sydnor (2013), and Stango and Zinman (2014) show that inattention contributes to the likelihood consumers incur payday loan, credit card and bank overdraft charges, and Agarwal, Driscoll, Gabaix and Laibson (2009) show that financial mistakes follow a U-shaped pattern over the lifecycle.

[9] See Hastings, Madrian and Skimmyhorn (2013) and Lusardi and Mitchell (2014) for recent survey articles.

II Data and Background on Social Security Benefits Payments

II.A Payday Loan Dataset

Payday loans are a common form of short-term credit used by low- and middle-income consumers.[10] Principal amounts typically range between $300 and $500, and costs range from $10-20 per $100 borrowed. To obtain a payday loan, borrowers submit a pay stub to the lender and provide either a post-dated check or electronic debit authorization for the principal plus fee amount, due on an upcoming payday.[11] Although the duration of a typical loan is only 14-30 days, it is very common for borrowers to roll over or reborrow within a few days of the due date, leading to longer-term debt sequences.[12]

In our analysis, we use a unique multi-lender administrative dataset of payday loans that was collected by the Consumer Financial Protection Bureau.[13] The dataset includes several large payday lenders, and covers information on all payday loans extended by each lender over periods of at least 12 months between 2010 and 2012.[14] For each loan, we observe the principal and fee amounts, origination date, payment due date, and actual payment date. An anonymized customer identifier allows us to identify all loans made by a given lender to the same consumer during the sample period.[15]

Because borrowers must present a pay stub in order to obtain credit, lenders are able to observe both the source and level of income. Several lenders in our dataset include these variables in their administrative records. We limit our analysis to the set of lenders that provide data on both income level and income source, and also restrict to borrowers who report income from Social Security benefits when applying for loans.[16] We observe 12 months of loans for each issuer in the subsample used in this analysis. One limitation of the data is that income information is

[10] About 5% of U.S. households report ever having used a payday loan (Current Population Survey, June 2013).

[11] Most loans are due on the borrower's next payday. Loans made just prior to payday are often due on the following payday.

[12] See CFPB (2013) and Burke, Lanning, Leary and Wang (2014) for more details on payday loans, borrowing patterns, and our dataset.

[13] Because the data are Confidential Supervisory Information, this paper only presents results that are aggregated and do not identify specific lenders. As a further precaution, we do not reveal how many lenders are included in the analysis.

[14] Only payday loans extended via storefront establishments are included in the dataset. Online loans are excluded.

[15] The data used in this analysis contain no direct consumer identifiers, such as names or addresses.

[16] As reported in CFPB (2013), 18% of borrowers in the underlying dataset report income from public assistance and benefits payments, the majority of which is comprised of Social Security payments.

typically only recorded the first time a borrower applies for a loan, so it may be less accurate for consumers who have been borrowing from the same lender for an extended period of time. We also cannot observe whether borrowers have more than one income source individually or within their households. Nonetheless, we are able to achieve a high degree of accuracy in measuring income timing due to the stable nature of Social Security benefits.

Our setting offers several advantages for studying high-frequency responses to income timing. Payday loans (as the name suggests) are almost always due on a borrower's pay date or within 1-2 days before or after. As we discuss in detail below, we are able to combine information on borrower income source and loan due dates with the SSA disbursement calendar to precisely identify each borrower's pay dates. Our administrative dataset thus provides precise information about both the timing of income and the timing and amount of credit use at the daily level. Another advantage is that unlike employment income, the timing and level of Social Security benefits can be anticipated with near certainty, allowing us to study the effects of predictable variation in income timing.

Because of the prevalence of roll-overs or renewals of payday loans (Skiba and Tobacman (2008), Carter et al. (2013), Burke et al. (2014)), we limit our analysis to "fresh" loans. Renewal loans are typically both originated and due on pay dates, and result in little to no new funds to borrowers. Thus, renewals are uninformative about the timing of liquidity needs with respect to income timing. We define fresh loans as those to borrowers who have gone at least one pay cycle without borrowing.[17] Overall, we observe several hundred thousand fresh loans taken out by several hundred thousand borrowers who report income from Social Security benefits in our sample.[18]

Table 1 shows summary statistics for our sample of benefits recipients. Panel A presents summary statistics for loan terms at origination for fresh loans. Mean loan principal is $305 and the mean fee is $47, for an average total repayment amount of $352. The mean cost per one hundred dollars borrowed is $16 and the mean contract duration is 21 days, resulting in typical APRs around 350%. Panel B describes borrower income and annual loan usage. The average net monthly income from benefits is $962. Borrowers take out an average of seven loans per year, consisting of a single fresh loan followed by six renewals. Total fresh credit measures the amount of credit taken out

[17] Most renewals occur within seven days of repayment of the previous loan, with much of the variation in the timing of reborrowing driven by state laws that impose cooling-off-periods between loans. Alternative definitions of fresh loans based on borrowers not having a prior loan within the previous 30 or 60 days yield very similar results.

[18] Exact numbers have been shrouded to protect the confidentiality of lender identities.

that is not used to repay a prior loan, i.e. that is available for consumption. For each borrower, total fresh credit is calculated as the sum of the loan principal amounts of the largest loan in each loan sequence.[19] The average amount of fresh credit is $427, on which borrowers pay $370 in fees. The borrower-level statistics show that many payday loan sequences extend over multiple months, and total annual fees average more than one third of a month's net benefits income. Thus, factors that influence the initial borrowing decision, the focus of our study, can have substantial economic effects on borrowers.

II.B Social Security Benefits Timing

Borrowers in our dataset who report income disbursed by the Social Security Administration include individuals receiving Social Security benefits (i.e., retirement, survivors, or disability benefits) and/or Supplemental Security Income (SSI) benefits. The SSA categorizes recipients into five groups whose benefits are disbursed according to a pre-determined schedule each month. Figure 1 shows the Social Security disbursement schedule for 2011. The payment dates reflect both the timing of direct deposits and, for beneficiaries who have not signed up for direct deposit, the date checks should arrive in the mail.[20] For ease of exposition, we refer to benefits payments as "paychecks" and disbursement dates as "paycheck dates" in the remainder of the paper. Our sample period also covers parts of 2010 and 2012, and the disbursement calendar follows similar patterns in each of these years.

The schedule of payments is determined by the following rules for the five disbursement groups, which we refer to as the "SSI group", the "mixed group" and the three "Wednesday groups":

- SSI group: Includes individuals who only receive SSI income. Payments are on the 1st of the month or the last prior non-holiday weekday if the 1st falls on a weekend or holiday.
- Mixed group: Includes Social Security beneficiaries who began receiving benefits prior to May 1, 1997, and individuals who receive both Social Security and SSI benefits. Payments are on

[19] A loan sequence is defined as a set of consecutive loans taken out within one pay period of the due date of the previous loan.

[20] Most benefits are disbursed through direct deposit or prepaid card. According to Congressional testimony by the SSA, as of September, 2012, 94% of Social Security benefits payments and 82% of SSI payments were made through direct deposit. Payday borrowers are required to have a bank account in order to obtain credit so it is likely that most receive benefits through direct deposit.

the 3rd of the month or the last prior non-holiday weekday if the 3rd falls on a weekend or holiday.

- Wednesday groups: Includes Social Security beneficiaries who began receiving benefits on May 1, 1997 or later. The timing of benefits is based on the recipient's date of birth. Individuals born between the 1st-10th, 11th-20th, and 21st-31st are assigned to the second, third, and fourth Wednesday of each month.

We match payday borrowers to one of the five disbursement groups based on their loan maturity dates. We find that 75% of all loans made to borrowers who report Social Security income are due exactly on a benefits disbursement date. The vast majority of the remainder fall within three days before or after a disbursement date. By using the modal disbursement group for the due dates of each borrower's loans, we are able to categorize 97% of all borrowers who report Social Security income into one of the five disbursement groups.[21] The remaining 3% of borrowers typically have only a single loan in the sample, and we exclude them from the analysis. Figure 2 shows the estimated borrowing propensity for benefits recipients in each disbursement group based on our sample.[22]

Figure 3 describes the income distributions of benefits recipients according to our classification method, which confirm that we accurately assign borrowers to disbursement groups. The SSI group shows distinct peaks consistent with the structure of benefits, and the Wednesday groups show a wider range of income consistent with the wide distribution of retirement and disability benefits. The three Wednesday groups have identical income distributions, and the mixed group distribution is a mix between the SSI and Wednesday group distributions.

[21] Using the modal group also disambiguates the SSI and mixed groups. In most months, payment dates are unique to each of the disbursement groups, but in 2011 there were two months in which the SSI group and the mixed group received benefits on the same day.

[22] To estimate borrowing propensity, we first scale the number of payday borrowers in each disbursement group in our sample by the market share of firms in our sample in 2010 using estimates from Stephens (2011). We then divide the estimated number of payday borrowers by the total number of recipients in each disbursement group in the states in our sample using exact counts provided by the SSA.

III Theoretical Background

Our setting allows us to test the responsiveness of debt to the receipt of a predictable, recurring source of income that occurs on a monthly basis. Unlike studies of other anticipated sources of income such as government stimulus payments, there are no changes to permanent income in our setting. While income receipt increases short-term liquidity, the levels of expected and realized income, and hence the capacity to borrow, remain completely unchanged. Under these conditions, the LCPIH yields a stark prediction that borrowing should exhibit no patterns based on the income cycle. Deviations from the LCPIH generate varying predictions about the existence and sign of four income timing effects we are able to estimate. We summarize the classes of theories and their predictions in Table 2, and discuss them in detail below.

For consumers who are liquidity constrained, prior work shows that consumption exhibits cyclical declines after benefits payments and that debt levels respond to both the announcement and receipt of income.[23] Thus, one potential reason debt use would respond to income timing is that consumers use credit to smooth intra-month consumption volatility. Consistent with the use of credit for short-term consumption smoothing, Agarwal and Qian (2014) and Baugh et al. (2014) find that unsecured debt increases when consumers receive information about a future transitory income shock. Based on prior evidence of declines in consumption over the pay cycle, consumption smoothing motives predict that borrowing should increase over the pay period.

Because liquidity mechanically decreases over the pay cycle, a number of other theories yield the same prediction that loan use should increase over the pay cycle. If unanticipated expenditure shocks are uniformly distributed and must be paid immediately, we should observe constant or increasing loan use over the pay period.[24] Quasi-hyperbolic discounting and overconfidence about monthly cashflows, which would lead to overconsumption early in the pay period, would exacerbate the mechanical decline in liquidity and reinforce the pattern of increased borrowing. More generally, any theory or combination of theories that predicts a negative correlation between loan use and

[23] See Hastings and Washington (2010), Shapiro (2005), Stephens (2003), and Wilde and Ranney (2000) on consumption cycles, and Aaronson et al. (2012), Agarwal, Liu and Souleles (2007), Agarwal and Qian (2014), Baugh, Ben-David and Park (2014), and Gelman et al. (2015) on the relationship between debt and income receipt.

[24] Even if shocks occur early in the pay period, they may not lead to expenditure shortfalls until later in the pay period when liquidity runs out. Shocks that occur early in the pay period may also lead to less borrowing overall, since consumers can reduce discretionary consumption over the rest of the pay period to smooth these shocks.

liquidity would lead to an upward-sloping credit profile over the income cycle.

A second class of explanations suggests that consumers employ a pecking order of approaches to cope with liquidity shortfalls over the income cycle (Lusardi et al. 2011). Even though liquidity is lowest at the end of pay periods, consumers may prefer to cut down on consumption or defer payments on expenditure commitments instead of borrowing. The costs of these tactics may decrease the closer consumers are to their next paycheck, generating a downward-sloping profile of loan use as consumers substitute away from formal credit. This hypothesis is supported by recent work by Gelman et al. (2015) and Herkenhoff and Ohanian (2012), who document a high prevalence of late payments on rent and mortgage commitments by liquidity-constrained consumers.

Bill payments can often be delayed at little or no cost, so it may be rational for consumers to use these tactics before turning to high-cost credit. However, since the receipt of income conveys no new information in our setting, borrowers with rational expectations who defer their expenditure commitments should not increase borrowing discontinuously at the beginning of the pay cycle. In contrast, overconfidence about the ability of an upcoming paycheck to cover both deferred and current expenditures would generate such a discontinuity.

Two findings from the psychology literature support the notion that consumers may be overly optimistic about their ability to cover deferred expenses with their next paycheck. First, several studies show that consumers underestimate their expenditures over short future time periods (Ülkümen, Thomas and Morwitz 2008, Peetz and Buehler 2009, Peetz and Buehler 2011). Consumers are particularly likely to underestimate expenditures when they are motivated to spend less and when they are focused on narrow concerns rather than thinking broadly about how much they usually spend. Second, Berman, Tran, Lynch Jr. and Zauberman (2015) show that consumers overestimate their future financial slack because they fail to fully account for future expenses, including their own stated expectations of future expenses. Although we are not able to identify whether these particular psychological mechanisms lead to the borrowing patterns we observe, both are consistent with an increase in borrowing when consumers receive their paychecks after they have deferred large expenditure commitments from the previous pay period.

In addition to the income cycle pattern, our setting allows us to examine the effects of pay cycle length and the timing of pay within the calendar month. Since all of the variation in income timing

is known in advance, the LCPIH again suggests that neither of these factors should impact loan use. In our setting, pay periods vary in length between 28 and 35 days. Since the interest rates on payday loans are much higher than that for savings, forward-looking consumers should save during short pay periods to smooth liquidity over long pay periods over the course of the calendar year. In contrast, behavioral theories that generate over-consumption from cash on hand predict that consumers undersave, leading to more liquidity shortfalls and borrowing during 35-day pay periods.[25]

The timing of pay within the calendar month could influence borrowing because of the interaction between liquidity patterns based on the income cycle and those generated by large monthly expenditures. Theories of spending out of cash on hand predict that consumers who are paid shortly before lumpy expenditure commitments are due are less likely to have budget shortfalls than those who have a longer lag between income receipt and the due dates of commitments. Although we are not able to observe the due dates of each consumer's expenditure commitments, previous studies document that large expenditure commitments disproportionately cluster near the beginning of the month (Evans and Moore 2012, Vellekoop 2012). Using the calendar month to proxy for expenditure cycles, cash on hand theories predict that consumers paid on or just before the beginning of the month should be less likely to experience liquidity shortfalls and less likely to borrow than those paid in the middle of the month.

Throughout the paper, we use the term "budgeting failures" to describe the class of theories that generate discontinuous increases in borrowing on the date of income receipt, higher borrowing rates during long pay periods, and greater borrowing among consumers with a greater lag between payday and the first of the month.

IV Descriptive Patterns in Loan Volume and Loan Terms

We begin our analysis with descriptive evidence on the relationship between loan volume and the pay cycle. Our main measure of loan volume is the total dollar value of fresh loans made each day,

[25] In addition to quasi-hyperbolic preferences and overconfidence about cashflows, a tradition of macro models starting with Campbell and Mankiw (1989) assume that a fraction of consumers set consumption equal to income based on a rule of thumb. Zhang (2014) presents a model in which households budget based on typical monthly income, but ignore predictable deviations from the typical schedule.

summed across all lenders,[26] and we measure the timing of borrowing by the number of days since the borrower's last paycheck. Figure 4 shows the percent of total loan volume originated on each day of the pay cycle for the SSI and mixed groups. The graph for the SSI group in Panel A shows both a clear monthly cycle and evidence of weekly cycles.

Paycheck dates for the SSI group fall disproportionately on Fridays, and the payday loan stores in our data are closed on Sundays, so loan volume dips in seven-day cycles starting three days after income receipt. Loan volume also tends to be higher on Fridays compared with other days in the week, so the graph also shows peaks in seven-day cycles starting with the paycheck date. Underlying the weekly cycles, loan volume declines steadily across the pay cycle. While 6% of all loans occur on the paycheck date, fewer than 2% are made on the same day of the week four weeks later in the pay cycle. Both the monthly and weekly patterns are very similar for the mixed group in Panel B.

One potential explanation is that the decrease in loan volume across the pay cycle is caused not by underlying patterns in consumer decision-making and liquidity, but by institutional features of payday loans and payday lenders. First, if loans are always due on a borrower's next pay date, then consumers may rationally decide to forgo consumption or borrow from other sources rather than pay a flat $15 per $100 fee to take out a payday loan lasting only a few days. However, as noted above, state law and lender practice generally limit very short-duration loans that would result in extremely high implied interest rates.[27] Second, many payday lenders also offer check-cashing services. Borrowers bringing their benefits checks to a check casher that offers payday loans may be more likely to take out a loan at the same time. As noted above, however, most social security recipients receive their benefits electronically rather than as paper checks. The pattern in borrowing is also fairly flat over the first half of the pay cycle before declining late in the cycle, and it is unlikely that beneficiaries sufficiently in need of funds to take out a payday loan would wait for a week to ten days before cashing their benefits checks.

Figure A-1 shows how contract duration and the annual percentage rate (APR) vary for loans

[26] Patterns are very similar for the total number of loans.

[27] For example, Texas limits the minimum loan duration to seven days, so a borrower who takes out a loan six days before her next pay date would receive a loan that's about one month longer than one who entered seven days before her next pay date. Carter et al. (2013) analyze the impact of this source of variation in loan durations on rollover rates using a regression discontinuity design, and find that loan duration and the number of paychecks a borrower receives before the due date of the first loan has no effect on rollover probability.

originated at different points in the pay cycle. As shown in Panel A, contract duration decreases close to linearly over most of the pay cycle as origination dates draw closer to the next pay date. But starting about three weeks into the pay cycle, durations increase sharply as more loans become due two paydates after origination instead of one. Since fees on payday loans are charged as a percentage of principal regardless of duration, implied APRs are mechanically driven by contract duration and consequently decline at the end of pay cycles. The declines in loan volume over the pay period show no such reversals, so they are unlikely to be driven by variation in loan duration or price across the pay cycle.[28]

Another concern with interpreting the pay cycle pattern is that benefits are disbursed very close to the beginning of the month for both the SSI and mixed groups, so the pay cycle and calendar month cycle are highly collinear. In particular, as noted above, Evans and Moore (2012) and Vellekoop (2012) show that rent and mortgage payments, which are the largest monthly expenditure commitments for many households, disproportionately cluster near the first of the month.[29] Thus, high levels of borrowing at the beginning of the month could be driven by the timing of recurring bills instead of the income cycle.

To distinguish the effects of the income cycle and the monthly cycle, we next turn to the Wednesday groups. Panel A of Figure 5 presents loan volume distributions for the three Wednesday groups by day of the month, showing no common pattern across the three groups. Counter to the notion that borrowing coincides with the timing of expenditure commitments, we find no consistent peaks in loan volume around the first of the month or declines over the calendar month. Instead, the graph shows clear peaks in the middle of the month that track the approximate timing of pay dates for the three groups. Panels B and C confirm that when loan volume is normalized to the income cycle as opposed to the monthly cycle, a very consistent pattern emerges across all three groups.[30] Consistent with the patterns for the SSI and mixed groups, the Wednesday groups exhibit

[28]This assumes, however, that consumers know that payday loans have minimum lengths. If consumers believe that payday loans are always due on the next payday, they may systematically over-estimate the effective costs of loans taken out late in a pay cycle.

[29]Vellekoop (2012) finds that 16% of rent payments and 9% of mortgage payments occur on the first of the month, with subsequent declines across the first two weeks of the month. Evans and Moore (2012) find that half of households who made mortgage or rent payments did so between the last day of the month and the seventh day of the month. Since the Consumer Expenditure Survey, which was used for both papers, records the dates payments are made and not the dates they are due, these numbers may under-estimate the fraction of payments due near at beginning of the month.

[30]Since pay dates always fall on the same day of the week, the graphs show stark weekly patterns with no borrowing

significant declines in loan volume during both 28-day and 35-day pay cycles.

Our findings contradict the idea that loans are used to smooth intramonth consumption volatility driven either by the income cycle or by monthly expenditure commitments, and are inconsistent with both rational and behavioral theories that generate a negative relationship between liquidity and loan use within a pay period. Instead, we document large declines in loan volume over the income cycle regardless of when in the calendar month pay dates fall, and across individuals receiving several different types of benefits (SSI, disability and retirement). This pattern is consistent with substitution to non-credit forms of liquidity adjustment discussed in Section III. The large increases in borrowing at the beginning of pay cycles further suggest that consumers are overconfident about the ability of predictable income payments to satisfy deferred consumption needs. To more precisely quantify the effects of income timing on credit use, we next turn to regression analysis focusing on the Wednesday groups.

V The Drivers of Loan Use for Wednesday Groups

V.A Identifying Variation and Econometric Model

As described in Section II, Social Security beneficiaries who started receiving benefits after May 1, 1997 are quasi-randomly assigned to pay dates on one of three Wednesdays each month based on their date of birth. The variation in pay timing generated by these Wednesday groups allows us to identify four separate effects: the income cycle, the calendar month cycle, the length of the pay period, and the timing of pay within the month.

The income cycle and calendar month cycle are identified by variation in the calendar dates of paydays both within and across the Wednesday groups. The pay dates across groups span a 14-day period each month. Because most months do not contain an even number of weeks, pay dates also span a seven-day range across days of the month within each Wednesday group. Pay dates for the three Wednesday groups thus have coverage between the 8th and 28th of the month.

While assignment across the Wednesday groups is quasi-random, a threat to our identification is that the within-group variation in paycheck timing is correlated with other drivers of loan volume.

on Sundays.

Such correlation could arise if, for instance, months in which the Wednesdays occur earlier happen to have more or fewer days, or happen to fall earlier or later in the year. However, the calendar in Figure 1 shows that these patterns do not appear to exist. In 2011, the second Wednesday occurs early in the month (on the 8th or 9th) in February, March, June, and November, which have 28, 31, 30, and 30 days. Early pay dates occur in different months in 2010 and 2012, with no systematic pattern by length of the month or time of year. To explicitly control for seasonality and secular trends, our regression specifications include both year and calendar month fixed effects.

The third income timing effect we consider is the length of the pay cycle. The payment schedule leads to four pay cycles in each calendar year which last for 35 days, while the remaining eight pay cycles contain 28 days. An identification threat related to the one described above is that long pay cycles are correlated with long months or seasonal trends. However, the disbursement calendar shows that the months with long pay cycles occur at different times of the year for each of the years in our dataset.[31] While long pay cycles by definition begin when the first Wednesday falls relatively early in the month, this variation is not collinear with the variation in payment date.[32]

The final income timing effect is the timing of pay dates within the month (i.e. whether pay dates occur early or late in the calendar month). Because both the lengths of months and pay cycles vary independently as described above, we could in theory separately estimate the effect of each pay date between the 8th and 28th of the month. However, such a test would be under-powered because each year only has 36 pay dates, many of which occur on the same day of the month. Instead, we estimate the magnitude of this effect in two ways: by using dummy variables for the Wednesday groups and by imposing the simplifying assumption of linearity over pay dates relative to the calendar month.

We estimate the effects of income timing using variations of the following specification:

$$\begin{aligned} LogLoanVol_{igt} = \alpha_i + \beta_1 PayCycle_{gt} + \beta_2 MonthlyCycle_{gt} + \beta_3 Long_{gt} \\ + \beta_4 CheckDate_{gt} + \gamma X_{gt} + \epsilon_{igt} \end{aligned} \quad (1)$$

[31] Long pay periods begin in March, June, September, and December of 2010; March, June, August, and November of 2011; and February, May, August, and October of 2012.

[32] For example, the payment dates are on the 9th, 16th, and 23rd of the month for both February and March of 2011, but only the March pay cycles have 35 days. Because each pay cycle spans two different calendar months, the three Wednesday groups also help to separate the effect of pay cycle length from seasonal trends.

where $LogLoanVol_{igt}$ is either the log of fresh loan originations in dollars or in number of loans for lender i and recipient group g on day t, normalized by the log number of recipients in group g. Lender fixed effects are denoted by α_i, and X_{gt} is a vector of controls. $PayCycle_{gt}$ and $MonthlyCycle_{gt}$ are vectors of dummies for days since last paycheck and day of month, and $Long_{gt}$ and $CheckDate_{gt}$ are indicators for long pay cycles and the timing of the check date within the calendar month. The β's represent the set of coefficients of interest, corresponding to the magnitudes of the four effects described above. Under the LCPIH, the values of all four β terms should be zero.

V.B Main Results

Table 3 presents our main results. Panel A shows the results for total loan volume in dollars, and Panel B shows results for number of loans. The first four columns test for the explanatory power of pay cycles versus monthly cycles on daily loan volume. To provide a baseline, column (1) includes only fixed effects for lender, month, and year. The results show that differences in the size of lenders and seasonality explain 88-89% of the variation in loan volume. Columns (2) through (4) alternately add dummies for each day of the income cycle, each day of month, long pay period, and each Wednesday group to the specification in column (1). The semi-partial correlations (the percentage change in R^2's) show that the income cycle explains much more of the variation in loan volume than the monthly cycle, accounting for 17% of all of the remaining variation beyond specification (1) compared with 2-4% for the day of month, long pay period, and group dummies.

Column (5) shows the results of our main specification, which includes all four income timing effects: indicators for days since last paycheck and day of the month pooled across the three Wednesday groups, a dummy for 35-day pay periods, and dummies for the third and fourth Wednesday groups. All four effects together explain 25% of the daily variation in loan volume, suggesting that income timing has significant explanatory power for credit use, contrary to the prediction of the LCPIH.

Figures 6A and B graph the coefficient estimates for the pay cycle and monthly cycle effects from column (5)A. Consistent with the descriptive results presented above, Panel A shows a clear trend of decreasing loan volume over the pay period. Since this specification pools the effects across

long and short pay periods, the indicators for days since check are censored at 27. The coefficient for days 27 through 34 is -0.63 log points and highly significant, indicating a 47% decline in loan volume relative to the first day of the pay cycle. In contrast, Panel B shows that the coefficients for day of the month are much smaller in magnitude and individually insignificant, with no clear pattern over the calendar month.

The regression results confirm our findings from Section II that loan volume falls dramatically over the pay cycle but shows no consistent pattern over the calendar month. The results support the hypothesis that consumers substitute away from credit use as the pay cycle progresses by reducing or deferring expenditures, but that they also over-estimate the ability of their income payments to cover both deferred and current expenses, causing them to subsequently borrow more in the days after income receipt. The large magnitude of the income cycle pattern suggests that both of these responses are widespread within the subset of benefits recipients who use payday loans.

Going back to Table 3, we next examine the effects of pay period length on borrowing. Constraining the pay cycle patterns to be the same across long and short pay periods but estimating a level shift in borrowing per day, the coefficient estimate for long pay periods from column (5)A is 0.3. This indicates that on average, loan volume is 38% higher per day during 35-day compared with 28-day pay periods.

To examine the differences between long and short pay periods in more detail, we repeat the specification from column (5)A but estimate the effects for each day of long and short pay periods separately. Figure 6C plots the results of this regression. The pay date for short pay periods is the omitted group, so all coefficients can be interpreted as differences relative to that date. The income cycle effects for long pay periods are more noisily estimated than those for short pay periods. However, the point estimates show that borrowing is greater during long pay periods on almost every day, with the gap widening over the course of the pay cycle. While borrowing declines by 1.4 log points (75%) between the first and last day of short pay periods, it declines by only 0.4 log points (34%) over long pay periods. The unreported coefficients for the monthly cycle remain very similar in this specification compared to that shown in Figure 6B.

The results suggest that some consumers do not save enough over the course of the year to smooth liquidity in anticipation of predictable variation in the lengths of pay periods. The patterns

in Figure 6C show that borrowing is higher throughout the whole pay period during long pay cycles, not just during the last week. Thus, while consumers may undersave over an annual horizon, they are partially forward-looking, and are aware of when their next paycheck will arrive. The smaller decline in borrowing over long pay periods suggests that substituting away from credit is more costly when consumers are further away from their next paycheck, and that substitution becomes more difficult when liquidity is lower.

We now turn to the effects of the timing of pay within the month. Our primary hypothesis about why this effect should matter is that calendar date within the month is a proxy for the timing of expenditure commitments, which in turn impact liquidity independently from the income cycle. Although commitments tend to be due close to the beginning of the month for a large fraction of households, we are not able to measure the exact timing and amount of actual expenditure commitments for the individuals in our sample, so we expect our results to be significantly attenuated.[33]

Our main source of variation comes from assignment across the Wednesday groups, so a non-parametric approach to estimate this effect is to compare the coefficients on the dummy variables for the Wednesday groups. One complication is that the Wednesday groups are of different size,[34] so the coefficients on the dummy variables would include both the effects of group size and potential timing effects in specifications with just loan volume as the dependent variable. To correct for group size, the dependent variable in each regression is constructed by subtracting the log number of Social Security recipients in each group from log loan volume.[35]

Since assignment to a Wednesday group is quasi-random, the only factor that should affect loan volume across groups is the timing of income within the month. We omit the dummy for the second Wednesday group, so the coefficients on dummies for the third and fourth Wednesday groups capture this effect relative to the second Wednesday group. The estimates from column (5) indicate that while loan volume for the third Wednesday group is not significantly different from

[33]Our estimates of how lag time between income receipt and expenditure due dates affect borrowing would also be biased downward if consumers adjusted the timing of their expenditure commitments to correspond with their pay dates. Since pay dates fluctuate over the year, such adjustments are unlikely to be perfect. Nonetheless, to the extent that they are made, they would reduce the magnitude of our estimates.

[34]While the birth date ranges for assignment to the second and third Wednesday groups include 10 days each, the range for the fourth Wednesday group includes 11 days.

[35]We are grateful to Mark Sarney and others from SSA for providing tabulations of the number of recipients in each group.

that of the second Wednesday group, individuals assigned to the fourth Wednesday group borrow 3% less per day. As shown below, this effect is highly significant for low-income consumers, but the main specification in column (5) is only marginally significant at the 10% level.[36] Comparing the results between Panels A and B, the effects of income timing are similar for both total dollar loan volume and number of loans, suggesting that the effects operate almost entirely through the extensive margin.

V.C Economic Costs of Budgeting Mistakes

We estimate the economic costs associated with budgeting mistakes by using the regression coefficients from our main specification to simulate the reduction in borrowing and expenditure deferral costs in the absence of these mistakes. Among the effects we document, the excess borrowing during long pay periods and for borrowers paid earlier in the month can most obviously be attributed to budgeting mistakes. In particular, if consumers accumulated a small amount of savings during 28-day pay periods in anticipation of greater liquidity needs during 35-day pay periods, then we would see no differential borrowing in long pay periods. Similarly, if consumers accurately budgeted their cashflows regardless of the timing of their income within the calendar month, then we would observe no differences in loan usage across the Wednesday groups. Since the interest rates on payday loans far exceed reasonable discount rates, such budgeting exercises would likely improve consumer welfare by avoiding loan use.

We simulate counterfactual loan volumes by assuming that in the absence of these mistakes, borrowing rates would be constant across long and short pay cycles, and would be as if all borrowers were paid on the last day of each month. Specifically, we calculate counterfactual loan volume $\widetilde{LoanVol_{igt}}$ for each observation by reducing loan volume on each day of long pay periods by 0.3 log points and reducing it by 0.002 log points for every day between that period's check date and the last day of the calendar month, based on the coefficient estimates for long pay periods and group dummies from column (5) of Table 3. The share of loans due to budgeting mistakes can then be calculated by comparing total counterfactual and actual loan volume. These calculations

[36] A regression replacing the Wednesday group dummies with a linear term for the day of the week of the check yields an estimate that loan volume decreases by 0.2% for every day later in the month that a consumer is paid. This specification uses variation in the timing of pay dates both within and across Wednesday groups, and yields a very similar daily effect compared with the coefficient for the fourth Wednesday group.

are summarized in Equations 2a and 2b below. Based on this simulation, fresh loan volume in our sample would be 18% lower if consumers budgeted for long pay periods and for lags between check dates and the first of the month.

It is more difficult to quantify the costs of budgeting errors associated with the decline in borrowing over the pay cycle. The decline and subsequent jump on paydays suggest that consumers defer expenditures until payday, but then borrow anyway when they find that their paycheck is unable to cover both deferred and contemporaneous expenditures. Even if such behavior does not generate an overall increase in payday borrowing, consumers with imperfect expectations would incur both the costs of expenditure deferral and the costs of payday borrowing, while under rational expectations they would only incur the costs of payday borrowing. Delaying the payment of rent, mortgage, and other bills may incur direct monetary costs, as well as increase the chances of adverse events such as eviction, foreclosure, and shutoff of utilities. A reasonable assumption is that the costs of expenditure deferral are bounded above by the costs of payday borrowing, i.e. that the costs of deferring one loan (which we assume would be taken out anyway in the next pay period) are weakly lower than the costs of borrowing in the first place.[37] To account for expenditure deferral costs, we calculate the increase in loan volume at the end of pay periods that would create a uniform distribution within pay periods while keeping overall loan volume constant.

As shown in Figure 6, loan volume systematically declines starting on day 15 of the pay cycle, so our calculation assumes that the decline in loans made after day 15 are due to expenditure deferral. Equation 2c shows our calculation for the share of deferred loans $\widetilde{ShareDeferred}$ using the estimated coefficients for each day of the pay cycle from specification (5) of Table 3. Since the day of pay cycle coefficients are estimated jointly with the long pay period and Wednesday group effects, and loan deferral is assumed to leave overall volume unchanged, this calculation can be done independently of the counterfactual simulation in Equation 2b. The calculation suggests that

[37]Survey evidence suggests that expenditure deferrals are widely used among payday borrowers and low-income households, and are viewed as a close substitute for formal credit. Bourke, Horowitz and Roche (2012) document that 62% of payday borrowers report that they would delay paying some bills if payday loans were unavailable. As exemplified in Morduch, Schneider and Collins (2014), some households are extremely knowledgeable and strategic about minimizing the costs of expense deferral, even while failing to accumulate a buffer stock to mitigate the need for future deferral costs.

7% of payday loans are deferred from the end of one pay period to the beginning of the next.

$$\widetilde{LoanVol}_{igt} = LoanVol_{igt} \times \exp[-\hat{\beta}_3 Long_{gt} + \hat{\beta}_4(LastDayOfMon_{gt} - CheckDate_{gt})] \quad (2a)$$

$$\widetilde{ShareAvoided} = 1 - \frac{\sum \widetilde{LoanVol}_{igt}}{\sum LoanVol_{igt}} \quad (2b)$$

$$\widetilde{ShareDeferred} = \frac{\sum_{t>15\text{th}} LoanVol_{igt} \times \overline{[\exp(\hat{\beta}_{1,.}) - exp(\hat{\beta}_{1,t})]}}{\sum LoanVol_{igt}} \quad (2c)$$

To estimate the total costs of budgeting errors associated with income timing in our sample, we multiply $\widetilde{ShareAvoided}$ and $\widetilde{ShareDeferred}$ by the total borrowing costs for Social Security benefits recipients. According to Stephens, Inc., total payday loan volume (interest charges) from storefront lenders was 29.2 (4.7) billion in 2010 and has remained very steady between 2010 and 2013. Social Security recipients represent 14% of total loan volume in our sample,[38] and recipients in the Wednesday groups represent 25% of loan volume by Social Security recipients. Assuming that total loan volume scales proportionately with fresh loan volume, we calculate that budgeting failures from long pay periods and the timing of pay during the month account for \$179 million (= \$29 bil $\times$18% $\times$ 14% $\times$ 25%) in borrowing and \$29 million (= \$4.7 bil $\times$18% $\times$ 14% $\times$ 25%) in fees annually. An upper bound for the costs of mistaken expenditure deferral add an additional \$12 million (= \$4.7 bil $\times$7% $\times$ 14% $\times$ 25%) in fees.

These numbers are likely to represent conservative estimates of the economic costs of budgeting failures for payday borrowers for several reasons. Our estimates do not include online payday loans, which represented nearly half of industry revenues in 2013 according to Stephens, Inc. Although payday borrowers receiving non-Social Security income and those not in one of the Wednesday groups may suffer similar budgeting failures, the estimates only include costs borne by Social Security recipients in one of the Wednesday groups. Borrowers with less stable sources of income may face even greater costs from budgeting mistakes than our sample population. Finally, some

[38]This statistic is consistent with CFPB (2013), which reports that 18% of all payday borrowers receive public assistance or government benefits, which largely consist of Social Security payments.

payday borrowing by Wednesday group recipients may be driven by other types of budgeting mistakes that we are not able to identify using our empirical framework.

V.D Heterogeneity by Income

Using our main regression specification, our final test evaluates heterogeneity in the magnitudes of budgeting mistakes by borrower income. Table 4 presents the results of stratifications by terciles of net monthly benefits income.[39] The cyclicality of loan volume over the pay period shows no consistent pattern across the two loan volume measures. However, the magnitudes of the both the long pay period and Wednesday group effects decrease with income across both measures. In particular, the difference in dollar loan volume per day between the fourth and second Wednesday groups is 10% for the lowest income tercile and only 0.2% for the highest income tercile. The overall share of dollar loan volume affected by budgeting errors range from 28-36% in the lowest tercile to 13-20% in the highest tercile.

The higher costs of budgeting mistakes for lower-income consumers could be driven by a number of factors. Lower-income consumers may be more likely to suffer from liquidity shocks. Although benefits income is very stable for all consumers in our recipient sample, lower-income consumers may be more likely to experience expenditure shocks or changes in non-benefits income sources. As suggested by the comparison between long and short pay periods, consumers with less liquidity may find it more difficult to substitute away from costly credit, potentially because they already make greater use of potential substitute tactics on a regular basis. Among retirement and disability benefits recipients, lower-income consumers may be more likely to have monthly rent or mortgage payments instead of owning their homes outright, which may be one reason the differences across Wednesday groups is driven by the lowest-income group. Finally, psychological scarcity may lead to more myopic behavior among lower-income consumers (Mullainathan and Shafir 2013).[40] While we cannot disentangle the roles of all of these potential mechanisms, our findings show that lower-

[39] A potential confounding factor when comparing income groups in this population is that benefits income is a function of prior earnings history, household structure, and other factors that may themselves affect borrowing behavior.

[40] Our results do not contradict those of Carvalho, Meier and Wang (forthcoming), who find that consumers exhibit similar levels of decision-making capacity before and after payday. Consumers' use of expenditure deferral prior to paydays suggest a significant degree of strategic behavior even when facing liquidity constraints. However, the large differences between recipients in across income terciles points to cross-sectional differences in either circumstances or decision-making that are not addressed in that study.

income consumers are more vulnerable to the costs of budgeting problems, and therefore stand to benefit more from interventions that solve these problems.

VI Conclusion

This paper sheds light on the nature of intra-month household budgeting, providing evidence that consumers over-estimate the ability of paychecks to cover deferred expenses and fail to account for predictable variation in the duration of pay periods and mismatches between the timing of income and monthly expenditures. The results suggest that systematic budgeting mistakes may be one driver of both low levels of buffer-stock saving and the use of high-cost credit by many households. We estimate that budgeting failures cause 18% of payday borrowing and lead to $29-41 million per year in excess costs among a subset of Social Security benefits recipients.

Short-term credit is often posed as a potential remedy for cashflow shortfalls experienced by liquidity-constrained consumers. However, if budgeting mistakes cause consumers to be liquidity constrained in the first place, then the same mistakes could also cause them to use credit in ways that exacerbate rather than alleviate their constraints. When consumers are over-optimistic and borrow only after they have over-consumed the cashflows needed for expenditure commitments, the added liability and interest costs of credit make it all the more difficult for consumers to budget their remaining cashflows.

Our results do not preclude the possibility that some consumers use short-term credit to deal with unexpected liquidity shocks and then quickly repay their debt. However, they highlight the need for better tools to help consumers reserve funds for anticipated cashflow needs before they are spent, which could help them avoid high-cost borrowing and the associated costs of having low levels of liquidity.

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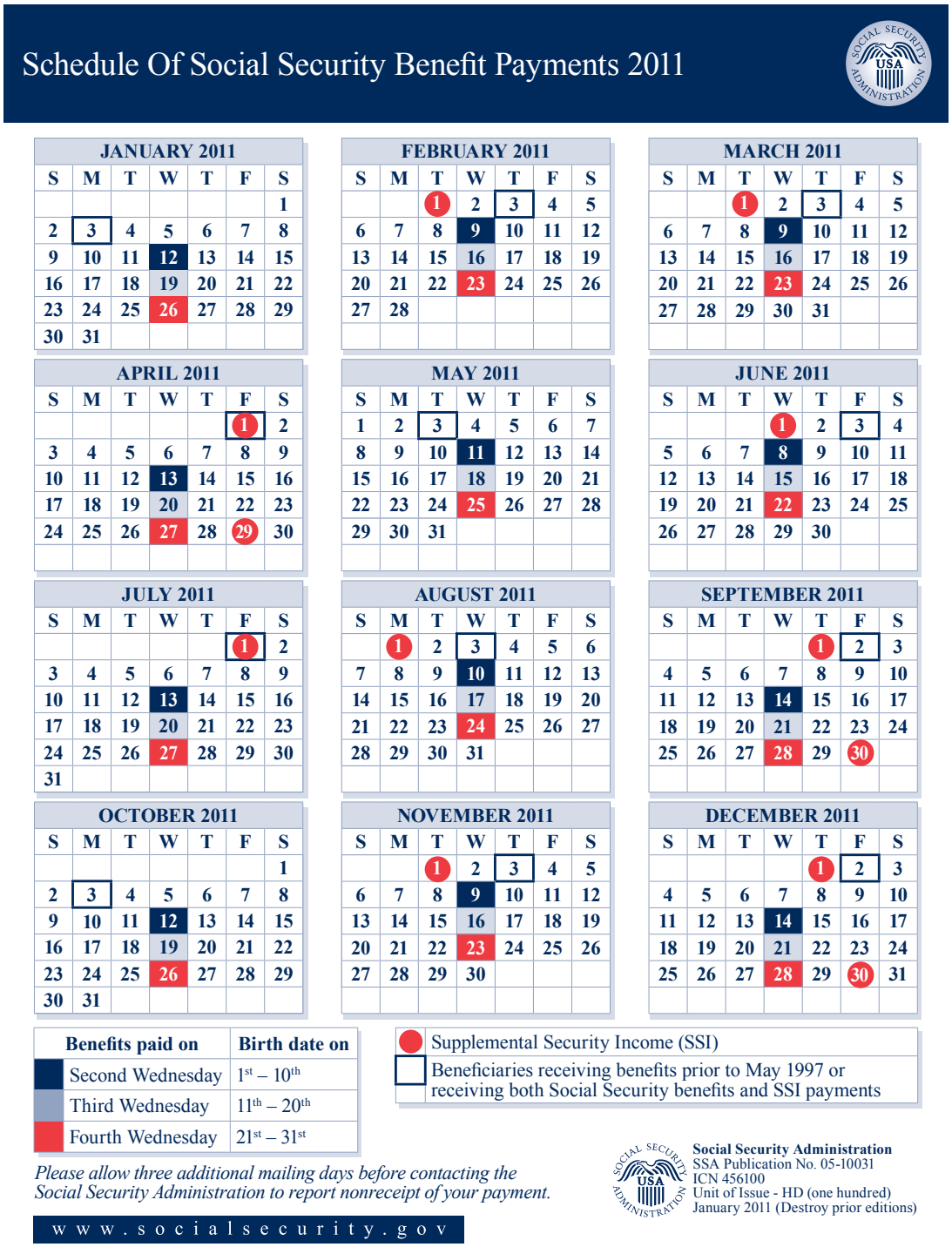
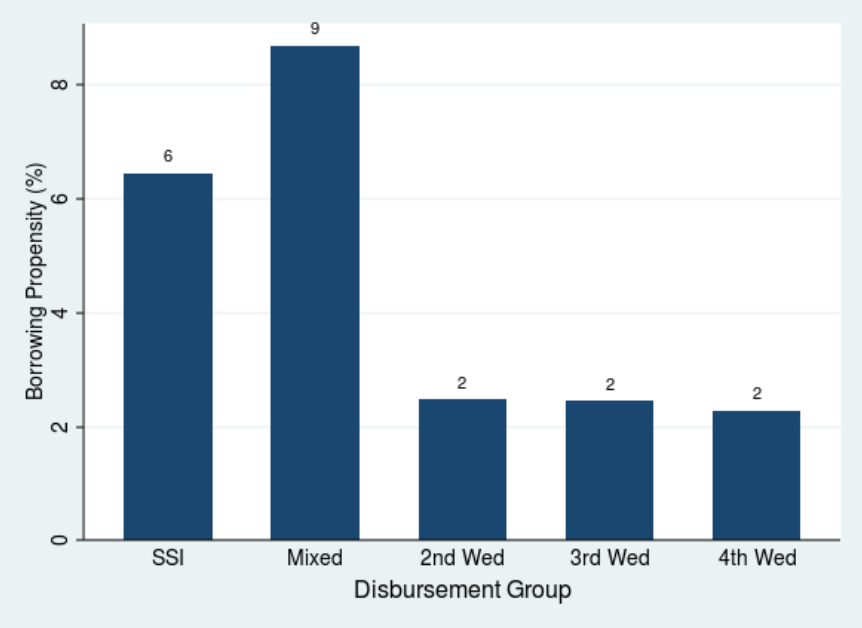
Figure 1: Social Security Administration Disbursement Calendar



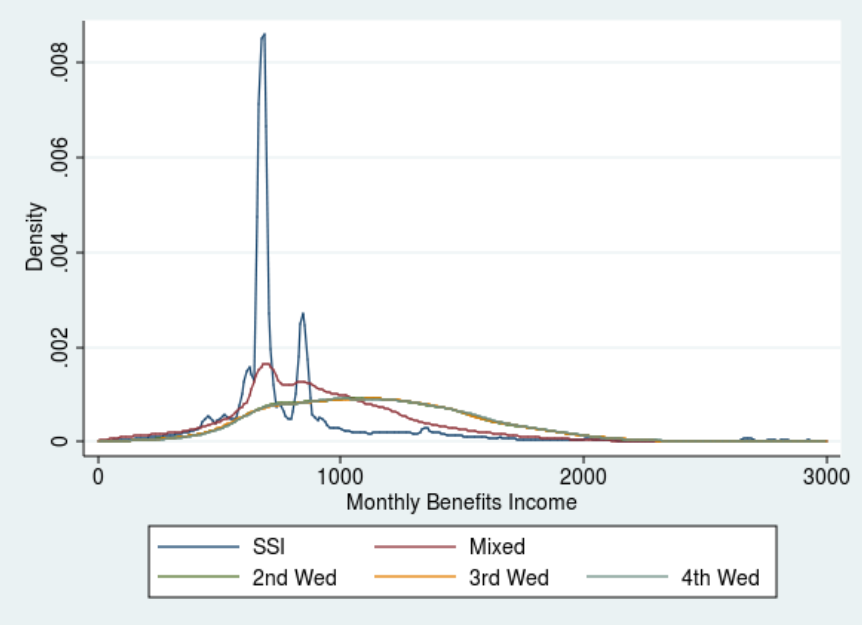
Source: www.socialsecurity.gov/pubs/calendar2011.pdf

Figure 2: Borrowing Propensity By Disbursement Group



Note: The figure shows the estimated percentage of recipients in each of the five Social Security disbursement groups who take out storefront payday loans.

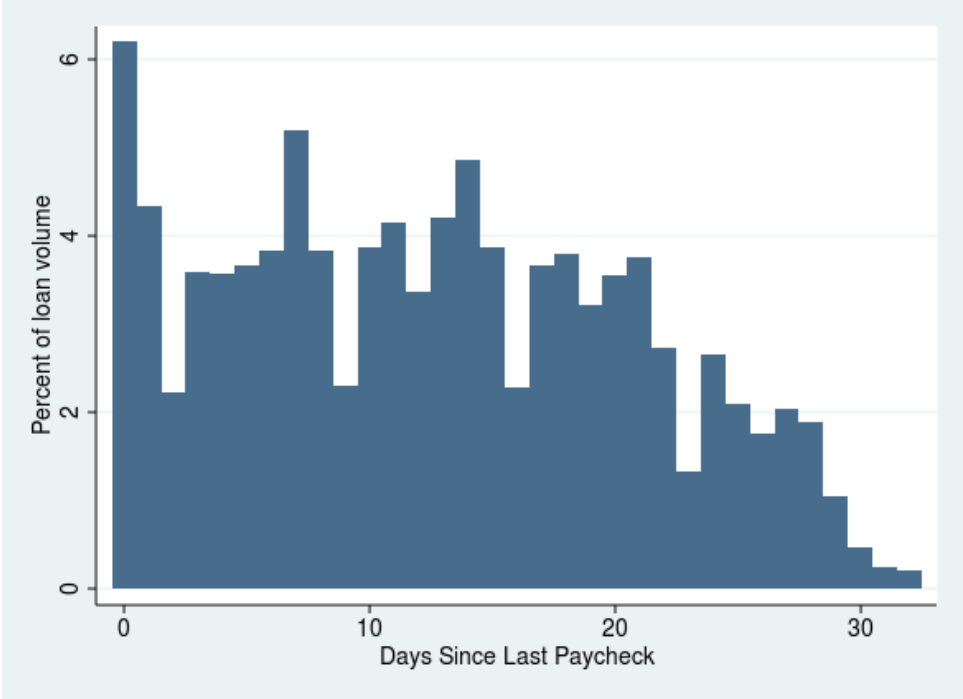
Figure 3: Distribution of Income By Disbursement Group



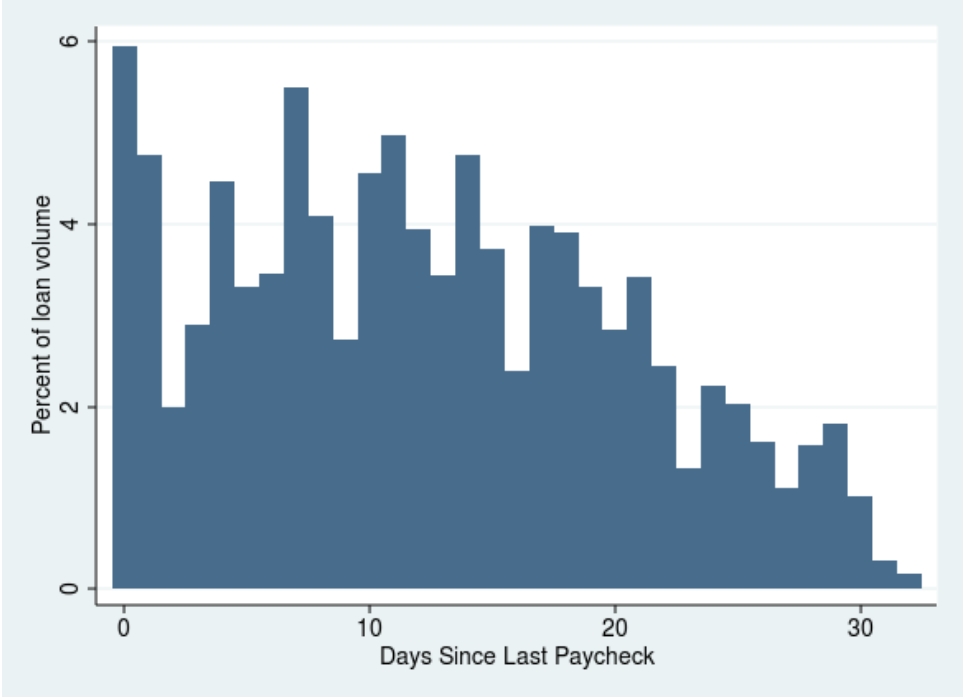
Note: The figure shows the distribution of net monthly benefits income for each Social Security disbursement group among payday customers in our sample.

Figure 4: Distribution of Loan Volume Within Pay Periods for SSI and Mixed Recipients

Panel A: SSI Disbursement Group



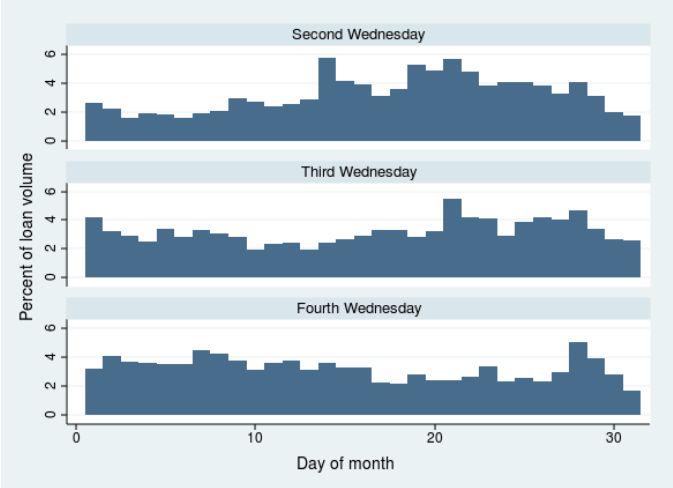
Panel B: Mixed Disbursement Group



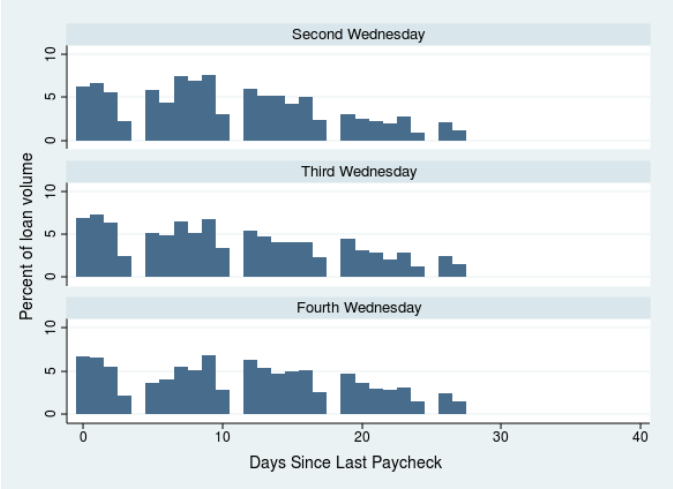
Note: The figure shows the fraction of total dollar loan volume made on each day of the pay period within the SSI and mixed disbursement groups.

Figure 5: Distribution of Loan Volume for Wednesday Groups

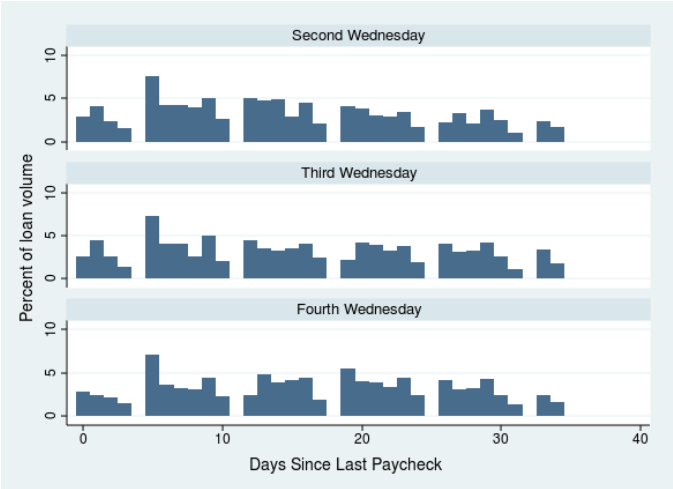
Panel A: Day of Month



Panel B: Days Since Check for 28-day Pay Periods



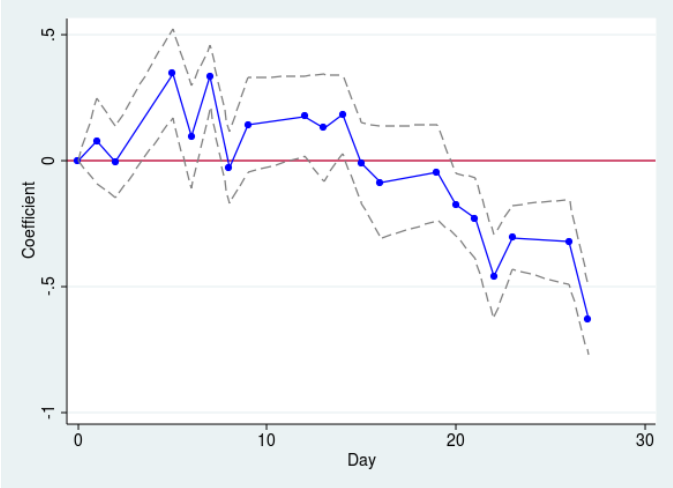
Panel C: Days Since Check for 35-day Pay Periods



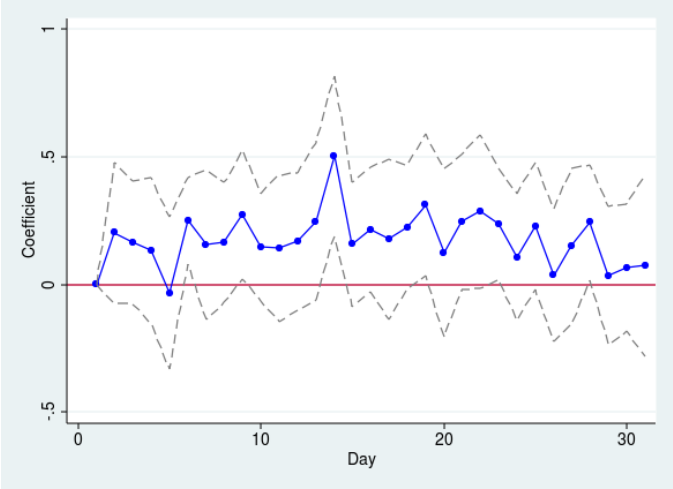
Note: The figure shows the fraction of total dollar loan volume made on each day of the month and each day of the pay period for the Wednesday disbursement groups.

Figure 6: Impact of Pay Cycle and Monthly Cycle on Loan Volume

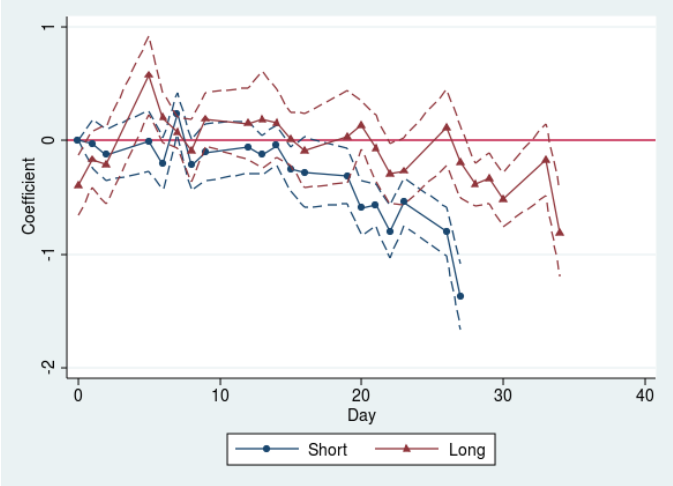
Panel A: Days Since Check



Panel B: Day of Month



Panel C: Days Since Check for Long and Short Pay Periods



Note: Figure shows coefficient estimates and 95% confidence intervals corresponding to regressions of loan volume on indicators for days since check and day of month. Panels A and B correspond to the regression reported in column (5) of Table 3. Panel C corresponds to a regression that separately estimates the effect of days since check for 28-day and 35-day pay periods.

Table 1: Summary Statistics

Panel A: Loan Terms at Origination

	Mean	Median	Std. Dev.
Loan amount total	$352	$306	$169
Principal	$305	$255	$149
Finance charge	$47	$45	$25
APR	352%	282%	260%
Cost per 100	$16	$15	$4
Contract duration (days)	21.0	20	10.5

Panel B: Borrower Statistics

	Mean	Median	Std. Dev.
Monthly benefits income	$962	$864	$503
Total # of loan cycles	7.0	7	4.2
# of fresh loans	1.1	1	0.4
# of rollover cycles	5.9	5	4.2
Total fresh credit	$427	$400	$224
Total fees	$370	$320	$288
Total days indebted	196	195	121

Table 2: Summary of Theories and Predictions

	Change in Borrowing Over Pay Cycle	Jump in Borrowing at Pay Date?	More Borrowing in Long vs. Short Pay Cycles?	More Borrowing if Longer Lag Between Pay Date and 1st of Month?
Lifecycle / permanent income hypothesis (LCPIH)	None	No	No	No
Smoothing intramonth consumption declines	Increase	No	-	-
Uniformly distributed expenditure shocks	Increase	No	No	No
Quasi-hyperbolic discounting	Increase	No	Yes	Yes
Overconfidence about cashflows	Increase	No	Yes	Yes
Expenditure deferral	Decrease	Yes, if also overconfident	-	-

Table 3: The Impact of Pay Timing on Loan Volume

	(1)	(2)	(3)	(4)	(5)
	Panel A: Loan Volume (Dollars)				
Fraction of loan volume affected by budgeting mistakes					
Long pay period and check date effects					18%
Deferred loans					7%
≥ 27 Days Since Check		- 0.512			- 0.628
		(0.076)			(0.071)
		[0.000]			[0.000]
Long pay period				0.191	0.325
				(0.055)	(0.058)
				[0.003]	[0.000]
Third Wednesday Dummy				- 0.005	0.002
				(0.018)	(0.021)
				[0.796]	[0.913]
Fourth Wednesday Dummy				- 0.039	- 0.034
				(0.016)	(0.019)
				[0.030]	[0.093]
Fixed effects included:					
Lender, month, and year	Y	Y	Y	Y	Y
Days since check	N	Y	N	N	Y
Days of month	N	N	Y	N	Y
R^2	0.881	0.901	0.886	0.884	0.911
	Panel B: Loan Volume (# Loans)				
Fraction of loan volume due to budgeting mistakes					
Long pay period and check date effects					17%
Deferred loans					4%
≥ 27 days since check		- 0.348			- 0.437
		(0.070)			(0.063)
		[0.000]			[0.000]
Long pay period				0.163	0.268
				(0.040)	(0.047)
				[0.001]	[0.000]
Third Wednesday Dummy				- 0.003	0.002
				(0.019)	(0.022)
				[0.874]	[0.925]
Fourth Wednesday Dummy				- 0.041	- 0.037
				(0.019)	(0.022)
				[0.044]	[0.107]
R^2	0.888	0.907	0.893	0.890	0.916

Note: Table shows results of regressions of log daily loan volume for lender X calendar date X recipient group cells. The fixed effects included in the regressions for each column are the same for both panels, and shown in Panel A. Standard errors clustered by recipient group X quarter are shown in parentheses, and p-values are shown in brackets.

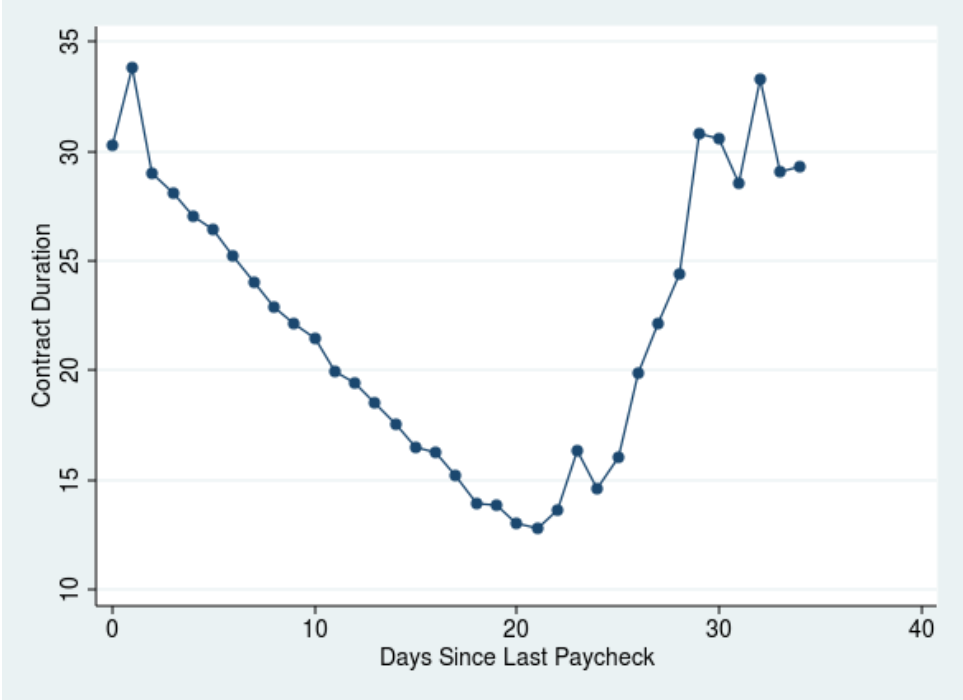
Table 4: Heterogenous Effects of Pay Timing by Income

	(1) Dollars	(2) Loans	(3) Dollars	(4) Loans	(5) Dollars	(6) Loans
	Lowest		Middle		Highest	
Mean Monthly Benefit:	$706		$1,120		$1,639	
Fraction of loan volume affected by budgeting mistakes						
Long pay period and check date effects	28%	29%	20%	18%	13%	15%
Deferred loans	7%	5%	6%	3%	7%	3%
≥ 27 Days Since Check	- 0.640	- 0.575	- 0.640	- 0.444	- 0.746	- 0.472
	(0.113)	(0.105)	(0.107)	(0.097)	(0.081)	(0.074)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Long pay period	0.376	0.343	0.378	0.299	0.324	0.261
	(0.056)	(0.059)	(0.042)	(0.039)	(0.050)	(0.045)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Third Wednesday Dummy	0.011	0.005	- 0.026	- 0.006	0.035	0.025
	(0.020)	(0.019)	(0.032)	(0.028)	(0.028)	(0.018)
	[0.607]	[0.773]	[0.425]	[0.826]	[0.224]	[0.188]
Fourth Wednesday Dummy	- 0.104	- 0.106	- 0.040	- 0.033	- 0.002	- 0.020
	(0.017)	(0.014)	(0.031)	(0.032)	(0.026)	(0.021)
	[0.000]	[0.000]	[0.222]	[0.320]	[0.934]	[0.358]
Fixed effects included:						
Lender	Y	Y	Y	Y	Y	Y
Month and year	Y	Y	Y	Y	Y	Y
Days of month	Y	Y	Y	Y	Y	Y
R^2	0.876	0.863	0.880	0.878	0.838	0.852

Note: Table shows results of regressions of log daily loan volume for lender X calendar date X recipient group X income tercile cells. Standard errors clustered by recipient group X quarter are shown in parentheses, and p-values are shown in brackets.

Figure A-1: Contract Terms by Days Since Check

Panel A: Contract Duration



Panel B: APR