Borrowing from the Future:
401(k) Plan Loans and Loan Defaults

Timothy (Jun) Lu, Olivia S. Mitchell, Stephen P. Utkus, and Jean A. Young

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Abstract

Most active 401(k) participants have the option of borrowing from their retirement accounts, and nearly 40 percent do so over a five-year period. We show that employers' loan rules have a strong endorsement effect on borrowing patterns; that is, in plans allowing multiple loans, participants are more likely to borrow and take out larger loans. While the liquidity-constrained are most likely to borrow, better-off employees take out larger loans when they do borrow. We also provide a new estimate of loan default "leakage" at $6 billion annually. Our results show that defined contribution retirement plans, while designed mainly to support old-age financial security, include important features for financing current consumption.

Timothy (Jun) Lu
Peking University – HSBC Business School
Room 725, Peking University Campus, University City,
Shenzhen 518055
Email: junlu@phbs.pku.edu.cn

Olivia S. Mitchell
Wharton School, University of Pennsylvania
3620 Locust Walk, 3000 SH-DH
Philadelphia, PA 19104
Email: mitchelo@wharton.upenn.edu

Stephen P. Utkus
Principal
Vanguard Center for Retirement Research
100 Vanguard Boulevard
Malvern, PA 19355
Email: steve_utkus@vanguard.com

Jean A. Young
Senior Research Analyst
Vanguard Center for Retirement Research
100 Vanguard Boulevard
Malvern, PA 19355
Email: jean_young@vanguard.com

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More than 20 ago, Nobel Prize winner Franco Modigliani patented a method for issuing 401(k) credit cards, with the aim of making it easier for workers to withdraw savings from their retirement accounts to cover short-term consumption needs (Vise 2004).[1] Although the idea of 401(k) credit cards faded under criticism, the proposal highlighted the dual-purpose nature of U.S. defined contribution (DC) plans. While DC plans are intended for old-age financial security, they also provide several pre-retirement liquidity features, allowing retirement savings to be used to finance current consumption needs.[2] The U.S. tax code generally discourages such pre-retirement access by imposing a tax liability and an additional 10 percent penalty tax on amounts withdrawn. Yet estimates of aggregate premature withdrawals—so-called account "leakage"— from all tax-deferred accounts, including both 401(k)s and IRAs, range from 30 to 45 percent of annual total contributions, depending on the economic environment (Argento, Bryant and Sabelhaus, 2013). Such sizeable outflows relative to inflows raise the important question of how these features are presently used and how they may influence future retirement security.

In this paper, we examine aspects of the 401(k) loan feature: who borrows from their 401(k) plans, who defaults on an outstanding loan, and what the implications of 401(k) borrowing might be for retirement security. Most active DC participants in the U.S. have the option of borrowing from their retirement accounts. Loan uptake is reasonably common, with

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[1] We use the terms "DC plan", "401(k) plan", "retirement plan" and "pension plan" interchangeably throughout. More than 88 million private sector workers are covered by DC retirement plans holding more than $3.8 trillion in assets (U.S. Department of Labor, 2013).

[2] Pre-retirement liquidity mechanisms include hardship withdrawals, allowing the withdrawal of a worker's own contributions for limited conditions; certain types of non-hardship withdrawals such as the withdrawal of employer profit-sharing contributions; and complete access to savings upon termination of employment with the current employer. Hardship and non-hardship withdrawals and loans are at the prerogative of the plan sponsor. They are generally subject to income tax and a 10 percent penalty tax, but there are various exemptions to the penalty.

one-fifth of DC participants having an outstanding loan at any one point in time, and, in our sample, nearly four in 10 borrowing over a five-year period.[3] By law, participants are required to repay 401(k) loans on a set schedule, usually through payroll deduction, and fully 90 percent of loans are repaid in a timely way, according to our estimates. Prior research has suggested that the availability of such a loan feature encourages higher retirement contributions by improving the liquidity of a tax-deferred retirement account. At the same time, we estimate one in 10 loans is not repaid—failure to repay typically occurs when the worker leaves his current employer—and these loan "defaults" represent a permanent reduction or leakage from retirement savings.[4]

Our findings draw on a rich administrative dataset of 401(k) plans containing information on plan borrowing and loan default patterns. Employer loan policy has a strong effect on 401(k) borrowing. If a plan sponsor permits multiple loans rather than only one, each individual loan is smaller, consistent with workers following a buffer-stock model of protecting against consumption shocks. Yet the probability of borrowing nearly doubles, and the aggregate amount borrowed rises 16 percent, suggesting a behavioral endorsement effect from employer plan design. Also, given that 401(k) borrowing is both a function of lifecycle demand for debt, with younger households having the largest borrowing needs, and the size of the 401(k) account, which grows with age, we find a hump-shaped age profile of borrowing, with the propensity to borrow (and the fraction of wealth borrowed) highest among those age 35-45. Further, we find that liquidity-constrained participants, those with lower income and lower non-retirement wealth, are more likely to borrow from their 401(k) accounts. Yet it is the better-off, with higher incomes and higher non-retirement savings, who borrow the highest fraction of current 401(k) wealth.

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[3] In total, around 90 percent of plan participants had access to plan loans, and one-fifth of active workers had outstanding loans (in 2011; Vanderhei, Holden, Alonso, and Bass, 2012).

[4] It is important to note that, since 401(k) loans are a way to access one's own savings, there is no technical "default," as in a traditional loan from a bank or other intermediary.

In terms of loan defaults, avoiding default requires the borrower to repay the outstanding loan balance. In our dataset, about which we say more below, 86 percent of the workers terminating employee with a loan do default. Low-liquidity households are more likely to default, although the effects are economically small compared to the mean default rate. Given this sizeable default level when changing jobs with a loan, it may be that borrowers are surprised by either an unanticipated job change or by the need to replenish their account.

This paper also provides a revised estimate of $6 billion annually in national 401(k) loan defaults, which generates just over $1 billion in federal tax revenue per year. This is higher than previous estimates.[5] At the same time, our figure for loan defaults is an order of magnitude lower than retirement plan leakage due to account cash-outs upon job change, which the GAO (2009) reported at $74 billion in 2006. The small relative size of loan defaults is relevant to the policy question about whether and how retirement account leakage might be further restricted by law (Leonard, 2011). Finally, we consider whether the 2008-09 economic turmoil changed 401(k) plan borrowing and default patterns. Overall, our answer is no: participants were somewhat less likely to borrow during the downturn, and default rates remained unchanged. One likely explanation for no change in default patterns is that, as involuntary job losses rose during the recession, which potentially increased loan defaults, voluntary job changes fell, potentially lowering them.

In what follows, Section I provides an overview of 401(k) loan rules, and Section II reviews related studies. Section III describes the data and hypotheses. In Section IV we present empirical results on plan borrowing and results on loan defaults in Section V. Section VI reports our estimate of the aggregate tax revenue impact of loan defaults, and Section VII concludes.

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[5] GAO (2009) estimated plan loan defaults at $561 million for the tax year 2006. Yet that estimate relied on data on "deemed distributions" of loans representing a small fraction of actual loan defaults. We say more on this below.

I. 401(k) Loan Rules

Participant loans from 401(k) plans are subject to U.S. Treasury tax rules governing borrowing, repayment, interest rates, and defaults, along with associated tax and penalty consequences.[6] A 401(k) loan is not a credit instrument in the conventional sense, but simply an arrangement allowing the participant to gain access to his retirement plan accumulations under certain conditions. First, the participant may only borrow up to half of his account balance with a maximum loan of $50,000 (fixed in nominal terms). Second, the participant must agree at the time of the loan to replenish the withdrawn funds plus interest in accordance with a standard flat-dollar amortizing loan schedule, typically through payroll deduction.

Plan sponsors may also impose their own requirements, including whether 401(k) loans are permissible at all, although as a practical matter 90 percent of active contributors have access to a loan feature. Sponsors may also determine the number of individual loans allowed, whether loans must be for a minimum amount (e.g., $1,000), and what the participant must repay in terms of an interest rate. Plan and regulatory rules interact as follows. If a 401(k) plan offers a loan feature with a minimum required loan amount of L_{min}, the participant with an account balance W_{401k} seeking to borrow loan amount L must satisfy two conditions:

$$L \leq \frac{1}{2} W_{401K} \text{ and}$$

$$L_{min} \leq L \leq \$50,000.$$

For a typical L_{min} = $1,000, a participant will not be eligible to borrow until such time as his account reaches or surpasses $2,000; at that point, he may borrow up to half of his account balance. The 50 percent limit will be binding until the participant's account balance exceeds $100,000; above that, the maximum withdrawal amount cannot exceed $50,000. Some plan

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[6] See GAO (2009) for additional background on regulations and laws for 401(k) loans.

sponsors permit participants to take out multiple loans in increments L_1, L_2, and so on, with $L = \sum L_i$. Because 401(k) "loans" are not conventional borrowing arrangements but rather represent withdrawals from one's own savings, they are not subject to credit underwriting and not reflected on credit reports; moreover, loan "defaults" have no credit reporting consequences.

Tax rules require a series of loan repayments *PMT* according to a schedule given by $L = \sum_{t=1}^{t=n} \frac{PMT}{(1+i)^t}$ where the loan interest rate is i and n refers to the number of periods over which the loan must be repaid.[7] In exchange for agreeing to these repayment terms, the participant can spend pre-tax L on consumption with no immediate income tax consequences. In other words, when the plan loan is exercised, the participant avoids paying current taxes and the early withdrawal penalty on the amount withdrawn from his pre-tax retirement account. At the time of the loan (ignoring the penalty), borrowing L in pre-tax dollars and spending it is the equivalent of earning $L/(1-\tau)$ in pre-tax wages, with a tax avoided of $\tau L/(1-\tau)$.

The loan repayment is taken from the participant's after-tax salary, $k(1-\tau)\omega$, where k is a constant $0 < k < 1$ and ω is gross salary. A portion of the payment stream represents principal repayment $\sum_{t=1}^{t=n} \frac{k\, prin(1-\tau)\omega}{(1+i)^t}$, where k_{prin} is the proportion of after-tax salary directed to principal payments. The present value of the tax liability associated with the income to generate these principal payments is simply the avoided tax liability on the amount borrowed, $\tau L/(1-\tau)$, assuming constant salary and no changes in marginal tax rates over the loan period. In other words, the participant avoids a tax liability upon withdrawal of pre-tax savings, but then pays a

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[7] Most loans are general purpose, with a maximum loan term of 60 months. Loans for purchase of a principal residence, which require documentary evidence of a home purchase, have a maximum term of 360 months. Interest rates are set according to the terms of the plan.

subsequent tax liability through repayment with after-tax wages. The two effects net to zero, at least with respect to principal repayments.[8]

The plan borrower also pays interest $INT = \sum_{t=1}^{t=n} \frac{k_{int}(1-\tau)\omega}{(1+i)^t}$, where k_{int} is the proportion of after-tax earnings devoted to interest. These payments are unlike the traditional cost of credit, in that the participant is effectively repaying himself; hence a higher interest rate leads to more rapid replenishment of borrowed funds. The interest payments are deposited to the participant's as if they were pre-tax plan accruals. At the time the plan loan is fully repaid, the interest component is worth $INT(1+i)^n$; in another N years, at the time of withdrawal in retirement, and assuming an account rate of return r, it will be worth $INT(1+i)^n(1+r)^N(1-\tau_N)$, where τ_N is the tax rate when the retiree receives benefit payouts. In effect, the interest associated with the loan repayment at the time of future withdrawal will be double-taxed: at tax rate τ when after-tax salary is contributed in the form of interest repayments, and at τ_N when the interest payments are withdrawn in the form of retirement benefits.

In this way, participants who borrow from their 401(k) plans face two costs associated with the loan interest rate. First, because loan interest payments derive from the employee's after-tax salary, the loan interest component is subject to double taxation. Second, the interest repaid to the participant's account i may be lower than the rate of return r earned on the account had the monies remained in other investments.[9] This relative opportunity cost, $r-i$, plus the cost of double interest taxation, can also be compared to the interest rate the participant would have paid to a third party financial intermediary, had he borrowed through conventional means. In

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[8] As a simple example, a participant in the 25% tax bracket borrows $1,000. The equivalent pre-tax income needed to generate $1,000 in after-tax spendable income is $1,000/.75 or $1,333, for a tax avoided at the time of borrowing of $333. In the repayment phase, the participant must provide $1,000 in after-tax wages to the account, requiring $1,333 in gross income, or an associated tax liability of $333. The tax avoided and the tax paid net to zero.
[9] Of course the loan interest rate could be higher than investment asset return r in periods of lower investment returns.

most circumstances, the opportunity cost and double taxation of interest in a 401(k) loan will be less than the cost of paying all interest to a financial institution.[10]

Finally, when the borrower leaves his job, at that time any remaining balance due on a 401(k) loan, L_{bal}, typically converts to a balloon payment. If a plan borrower leaves his job and does not repay L_{bal} within 60-90 days, the participant loan is considered "in default" and is reported to the IRS as a taxable distribution from the plan at that time, resulting in tax liability $L_{bal}(\tau+.1)$. In other words, the 10 percent penalty is imposed on the amount borrowed if it is not returned to the account. It is worth noting that $\tau\approx0$ for many low- and middle-income households today, due to a variety of tax credits, so the expected cost of default may be simply $0.1L_{bal}$.[11]

II. Prior Studies

Several prior studies have addressed the question of whether pension saving increases total saving,[12] but relatively few authors have examined whether the presence of a loan feature encourages employees to contribute to their 401(k) plans. One group (GAO, 1997) suggested that a loan feature can raise both participation and contribution rates, while others have observed that the loan feature influence savings mainly on the intensive margin, in the form of higher DC plan contribution rates (Munnell, Sunden, and Taylor, 2001, 2002; Holden and Vanderhei, 2001; Mitchell, Utkus, and Yang, 2007).

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[10] While 401(k) borrowers are taxed twice on the interest they pay to their plan account, it should be noted that had the participant borrowed from a commercial lender the equivalent "tax" is 100% of the interest paid.
[11] The rules on loan issuance and repayment are somewhat more complex than summarized here. For example, the plan sponsor can also limit borrowing. Also the period for repaying a loan can vary by plan but cannot exceed the end of the calendar quarter following the quarter in which the participant terminates employment. Some employers also allow repayment of loans from participant bank accounts during the loan period or on job termination. Participants usually have the right to repay a loan balance at any time.
[12] For instance, both Benjamin (2003) and Gelber (2011) report that people eligible to participate in company 401(k) plans save more inside and outside their retirement plans. Using Danish data, Chetty et al. (forthcoming) found little evidence of crowd-out for the 85% of the population they deemed "passive", who saved more when their plan provided for automatic contributions.

Using data from the Federal Reserve Survey of Consumer Finances, Sunden and Surette (2000) and Li and Smith (2010) noted that the individuals borrowing from their 401(k) accounts, while having higher DC account balances, were more likely to have lower total financial assets, to have higher debt, and to be more credit-constrained. Considering liquidity constraints and borrowing in a related context, Gross and Souleles (2002a, 2002b) concluded that credit card borrowers exhibited "buffer stock" behavior—that is, they tended to not borrow to the maximum amount available, so as to leave a margin in case of emergency. The authors reported credit card interest rates averaging 16 percent, compared to, for example, an average 401(k) loan interest rate of just over 7 percent in our dataset (about which we say more below). This large difference in borrowing rates would seem to imply that employees would do well to substitute lower-cost 401(k) loans for much higher-cost credit card debt. Yet Li and Smith (2010) also found that many individuals held substantial credit card debt even when a plan loan would have been less expensive. They suggested that this seemingly illogical behavior might be shaped by financial advisers' negative views of 401(k) loans,[13] along with a mental accounting perspective, namely that 401(k) accounts might be thought of as restricted for retirement purposes rather than to be used for current consumption.[14,15]

In a study most closely related to ours, Beshears, Choi, Laibson, and Madrian (2011) used participant-level administrative data. They reported finding a hump-shape age profile for the incidence of 401(k) borrowing, but that study did not evaluate default behavior nor the role of plan-level policy on behavior. Our administrative data permits us to model firm-specific loan

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[13] Suze Orman, host of CNBC's "The Suze Orman Show" has been quoted at stating "It makes no sense in any circumstance to take a loan from a 401(k)" (Jansing, 2013).

[14] Financial literacy may also play a role: using survey data, Utkus and Young (2011) found that workers with lower levels of financial literacy were more likely to borrow from their DC accounts. Lusardi and Mitchell (2007) discuss how financial illiteracy influences retirement savings.

[15] In non-pension settings, Ayres and Nablebuff (2008) have argued that it is optimal for young people to buy stocks on margin. Hurst and Willen (2007) found that young households were sufficiently constrained that permitting them to use Social Security wealth to pay off debt could be welfare-enhancing.

policy, including minimums and number of loans allowed, and its effect both in terms of participant loan-taking, such as in a buffer-stock model, and in defaults.[16]

III. Data and Testable Hypotheses

Data. Our analysis uses a rich administrative dataset for DC plan participants covering the five-year period of July 2004 through June 2009.[17] The dataset includes 882 different 401(k) or similar-type DC plans. To assess the propensity to borrow, we use a time-varying sample of over 900,000 participants observed monthly, with total observations exceeding 55 million. In this sample we observe on average over 13,000 new loan-takers per month, for total observations on new borrowers exceeding 780,000. The data elements include participant demographic and financial characteristics, along with plan characteristics. The data set is unique in terms of the extent of information on workers, their plans, and their loan and default behavior.

Table 1 shows that in any given month an average of 1.38 percent of eligible participants took a new loan. The average individual loan amount borrowed is just over $7,800 (in $2010), with a median of nearly $4,600; the mean total amount borrowed is around $10,000, with a median of about $5,900. The average age of borrowers is 42, slightly younger than the average participant; borrowers have about eight years of tenure and somewhat lower income, lower non-retirement financial wealth, and half the plan account balance compared to all loan-eligible participants. Borrowers are also more likely to be in plans where multiple loans are allowed. During the period of the global financial crisis, which we define as September 2008 through June 2009, fewer participants borrowed from their retirement account. Loan interest rates vary by

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[16]A related body of work considers the use of lump-sum distributions from 401(k) plans, whether penalized or not; see Basset, Fleming and Rodrigues (1998), Burman, Coe and Gale (1999), Sabelhaus and Weiner (1999), and Amromin and Smith (2003).

[17] The data were provided by recordkeeper Vanguard under restricted access conditions, and the identity of individual firms and plan participants is masked.

plan, though many plans peg the interest rate to the prime rate plus 1 percent. Loan interest rates are only modestly higher for borrowers than for the entire participant sample.

Table 1 here

Figure 1 illustrates the current and cumulative percentage of loan-eligible participants with one or more outstanding loans. Over time, approximately 20 percent of active participants have loans outstanding. In other words, the rate of loan origination is approximately offset by the rate of loan repayment or default. Over the five-year period of our study, the cumulative proportion of participants with any borrowing from their retirement plan rises to nearly 40 percent. This suggests that instead of the same participants taking plan loans repeatedly, over a longer time horizon a greater fraction of participants eventually borrows from their retirement accounts.

Figure 1 here

Figure 2 highlights the impact that employer plan design may have on participant borrowing. Figure 2 presents the mean proportion of new loan-takers over our five-year period, comparing plans offering a single loan with those allowing multiple loans. When only one loan is allowed, an average of 1.10 percent of eligible participants take a new loan each month. With multiple loans, the average rises to 1.69 percent per month.

Figure 2 here

Hypotheses. To elucidate the factors that might affect plan borrowing and default behavior, we note that a lifecycle model would predict that borrowing is higher early in life, and then it will decline with age. This is because younger, lower-paid, and lower-wealth households are the most liquidity-constrained and hence more likely to need to borrow. Nevertheless in the case of 401(k) plans, borrowing is conditioned on an employee's account balance which rises with age, salary,

and other factors. *Ceteris paribus*, therefore, we would anticipate a hump-shared age profile for borrowing since the *ability* to borrow rises with age, but the *demand* for plan borrowing falls with age. Liquidity constraints are also associated with loan borrowing and default behavior. Liquidity-constrained households would be more likely to rely on 401(k) borrowing, and more likely to default upon job termination, since the outstanding balance accelerates as a balloon payment. In the empirical analysis below, therefore, we test the hypothesis that age, salary levels, account balances, and non-retirement wealth are associated with borrowing and default patterns in the expected directions.

We also examine whether plan features have an influence on plan loans and defaults. As noted above, a buffer-stock model implies that borrowers will seek to remain under the maximum borrowing limit to allow for potential future consumption shocks. In our dataset, 40 percent of plans (covering 52 percent of participants) permit employees to take out two or more loans simultaneously. Accordingly, the buffer-stock hypothesis predicts that participants in those plans will be more likely to have loans outstanding, since they may take additional loans if needed. Yet all else equal, the size of individual loans in plans permitting multiple loans will be lower, compared to when the plan allows only one loan. The availability of multiple loans may also be seen as an employer endorsement of plan borrowing (Benartzi, 2001). If this is true, we would expect that aggregate loan amount will be higher when multiple loans are permitted.

Turning to interest rates charged for 401(k) plan loans, the expected effect is ambiguous. On the one hand, the higher the interest rate charged, the higher is the loan cost to the worker in after-tax salary. Yet the interest is paid to the worker's own account, and so a higher interest rate improves future savings. Ultimately it is an empirical question, since depending on the

borrower's discount rate, the cost of plan loan borrowing may have little net effect on loan patterns.

Another issue we explore is whether plan borrowing and loan default rates changed materially during the financial crisis of 2008-09. With respect to borrowing, the predicted impact of the crisis is also ambiguous: on the one hand, employees may have become more cautious and borrowed less, but on the other hand, they might have sought additional loans due to financial insecurity or household financial shocks. Regarding defaults, there are again two competing effects: voluntary job changes tend to fall during economic recessions, reducing the incidence of default, but involuntary job losses rise, raising the risk. Again, empirical analysis is required to discern the net effect.

IV. An Empirical Analysis of 401(k) Borrowing and Loan Size

We investigate borrowing patterns from 401(k) accounts using a multivariate model of the following form:

$$BORROW_{i,j,t} = + \alpha'PARTICIPANT_{i,j} + \beta'PLAN_j + \gamma'MACRO_t + \varepsilon_{i,j,t}$$

where $BORROW_{i,j,t}$ refers to a vector of several outcomes including the probability of borrowing, the size of new loans, and the total amount borrowed by the ith participant in the jth plan in month t. We examine all loan-eligible participants, defined as those having assets at least twice the minimum loan amount set by the plan and not otherwise subject to any other IRS or plan limit (whether in terms of dollar or number of loans allowed). The $PARTICIPANT_i$ vector refers to participant characteristics including age, sex, tenure, income, account balance, and non-retirement household wealth. The $PLAN_j$ vector includes includes a flag for whether the plan permitted multiple loans, the loan interest rate, and plan size (number of plan participants); we

also control on the employer's main industry. The *MACRO$_t$* vector controls for two macroeconomic factors: the lagged three-month average state-specific unemployment rate, and a flag indicating the financial crisis period of September 2008-June 2009.[18] Finally, we cluster observations at the plan level for robust standard errors.[19]

Our first dependent variable evaluated refers to the probability of taking a new loan in month *t,* estimated using Probit; as indicated in Table 2, the mean value is 1.4 percent per month. A streamlined model in Column 1 is supplemented with interactions between multiple loan availability with participant demographics in Column 2. In both cases, one plan feature is particularly salient: namely the ability to take more than one plan loan at a time. Specifically, when a plan sponsor allowed employees to take out multiple loans, the probability that participants took a new loan rose by 2.7 percentage points. Since the mean probability of taking a new loan was 1.4 percent, allowing multiple loans boosted the loan take-up rate by nearly twice.

By contrast, loan interest rates had no material effect on borrowing patterns. Since our dataset included wide variation in interest rates (the low was 1.8 percent and the high was 11.5 percent), the result is quite robust. We therefore conclude that 401(k) loan demand was relatively unrelated to the cost of the loan as a result of the interplay between the reduction in current take-home pay from loan repayment, the rate of replenishment of the account through the loan interest rate, and the borrower's discount rate. High discounters who may have been more sensitive to the effects of the loan on take-home pay were apparently offset by low discounters more willing to borrow because of the benefits of the higher interest rate for future savings.

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[18]When a participant defaults on an outstanding loan, the default is typically recorded at the end of the quarter following the quarter in which the job termination occurs. We therefore use the prior three-month average unemployment rate at the state level as a regressor, lagged by one month. We also experimented with a simple three-month lagged unemployment rate, the one-month lagged rate, and the current month rate as robustness checks, with results similar to those reported below.

[19] Computer limitations preclude clustering at the participant level for the entire sample. When we did so for a subset of observations, as a robustness check, results are similar to those reported here.

Table 2 here

Other results in Table 2 are also of interest. As hypothesized, participants were more likely to borrow from their 401(k) plans when they had lower income, fewer non-retirement financial assets, and a lower plan account balance; these are the most liquidity-constrained participants. There is also an inverted U-shape age pattern by age, with middle-aged participants age 35-44 being more likely to borrow compared to their younger and older peers. Short-tenured workers were also less likely to borrow, suggesting that familiarity with the loan feature grows with job tenure and time in the plan. We are also interested in whether plan borrowing ramped up during the financial crisis, but the evidence suggests the opposite: during the turmoil period, participants were 0.6 percentage points (or 41 percent) less likely to take a new loan.[20] One reason is that plan borrowing tends to be tied to home improvements and purchases (Utkus and Young, 2011), so the housing bust may help explain why 401(k) borrowing fell.

The interaction terms in Column 2 of Table 2 also confirm some of the hypotheses described above. First, participants who were younger or held less non-retirement wealth were more likely to borrow in plans allowing multiple loans. In particular, participants below age 35 (the reference category) were 0.7 percentage points (or 50 percent relative to the mean) more likely to take a plan loan, when multiple loans were permitted. Furthermore, when the plan allowed more than one loan, low-wealth participants were 0.5 percentage points (or 38 percent) more likely to borrow from their own accounts, compared to those with medium wealth, the reference category. There is also evidence that higher-income households were more likely to borrow.

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[20] This result confirms findings reported by Vanderhei et al. (2012) using a different dataset; they observe that loan activity did not change much over the period 1996 to 2011.

Next we turn to the intensive margin of borrowing, examining both the size of new loans taken, and also the aggregate of all plan borrowing. Table 3 reports estimation results using multivariate ordinary least squares (OLS) models. Columns 1-2 examine the size of the new loan amount (in natural logs), with a mean of 8.419 (or $4,532). Columns 3-4 focus on the total amount borrowed (in natural logs), with a mean value of 8.663 (or $5,785). Because we control on participants' current 401(k) account balances, these results may be interpreted as the relative proportion borrowed from participants' total accounts, for new loans or the total amount borrowed.

Table 3 here

Previously we showed that whether the plan permitted multiple loans strongly influenced the probability of borrowing, and this again proves significant in our results for the sizes of amounts borrowed. When a plan allowed multiple loans, Column 1 indicates that each individual loan was smaller by 19 percent. [21] This result is directly supportive of the buffer stock hypothesis, where people use the loan as protection against consumption shocks. Once again, the plan loan interest rate is not statistically significant.

Mirroring the results on the incidence of loans, there is a hump-shaped pattern with age, with the largest loans (as a fraction of account wealth) taken by participants who were age 35-44. Although less likely to borrow in the first place, the better-off (those with higher income and greater non-retirement financial assets) were more likely to take larger loans. One reason may be that better-off households have greater non-plan resources to repay the loan and so are more willing to borrow. Another possibility is that better-off households understand that 401(k) loan interest rates are generally more favorable than commercially available borrowing rates. We also find that those with little non-retirement wealth were less likely to have higher total 401(k)

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[21] The log mean of 8.419 declines by -0.207; in linear terms, the mean of $4,532 declines to $3,685 or 19 percent.

borrowings. The financial crisis did not affect loan amounts suggesting that, conditional on a lower level of borrowing during the crisis noted above, proportions borrowed remained the same. State-specific unemployment rates had negligible effects.

Coefficient estimates on the factors associated with participants' total amounts borrowed appear in Columns 3-4 of Table 3. Most strikingly, the availability of multiple loans raised total borrowing in Column 3 by 16 percent in contrast to our earlier finding that individual loan amounts were lower under this plan provision.[22] An explanation for this difference is that the availability of multiple loans may serve as an employer endorsement effect (Benartzi, 2001): that is, employees may perceive an option to take multiple loans as reflective of employer encouragement to do so. The age pattern of loans also differs in this column, compared to results in Column 1. Column 4 shows that in multiple loan plans, participants 35 and older were likely to borrow larger amounts than younger participants, by around 11 percent more. In other words, when plan sponsors permit multiple loans, younger workers take more in an initial loan (Column 2), but those age 35 and older borrow in total a higher fraction of their retirement account wealth (Column 4).

V. An Empirical Analysis of Loan Defaults

Next we explore the determinants of 401(k) loan defaults. Table 4 provides summary statistics on default rate patterns. As noted above, around 20 percent of loan-eligible employees in our sample had one or more loans outstanding. Of the borrowers terminating employment, 86 percent on average failed to repay the outstanding balance due on their loans; the remainder did pay off their account loans and hence avoided default. Since participants defaulting on their outstanding loan balance totaled about around 10 percent of all participants with an outstanding

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[22] The log mean of 8.663 rises by 0.150; in linear terms, the loan value grows from $5,785 to $6,721, or 16 percent.

loan, we conclude that about 90 percent of participants repaid their loans over the period we observe them.[23]

Table 4 here

Sample statistics on participants who defaulted versus repaid their loans appears in Table 5, as compared to all borrowers and all loan-eligible participants. The default analysis sample includes 151,458 401(k) plan participants terminating employment with at least one loan outstanding. [24] Compared to other plan borrowers, those who terminated employment with a loan outstanding were somewhat younger, had shorter job tenure, and held lower plan balances. Those who defaulted on their loans also had lower income, lower 401(k) balances, and less non-retirement wealth than those who repaid their loans on job termination.

Table 5 here

To analyze loan defaults, we focus only on participants whose jobs terminated while they held a plan loan.[25] The goal is to compare employees who terminated employment and defaulted on their 401(k) loans, with those terminating employment who repaid their loans in full. We estimate a multivariate Probit model where the dependent variable, $D_{i,j,t}$, refers to the probability

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[23] Ninety-five percent of the loans in our sample are general purpose loans with a maximum term of five years. For this reason our five-year sample period offers a reasonable view of steady state default rates over time, though default rates might vary under different economic conditions.

[24] We exclude plans that changed record-keepers during the five-year period and also exclude participants associated with any "divisional transfer outs" during the period (e.g., when a division is sold and participant accounts are moved to another recordkeeper). We model a "divisional transfer-out" rule for each plan by calculating the monthly average number of participants terminating with a loan outstanding. If in a given month, the number of participant terminations exceeds 100, and it exceeds two times the average monthly plan terminations, we code the plan as having a "divisional transfer-out" that month and delete observations for those participants. In addition to IRS loan maximums, some employers impose their own more restrictive rules. Accordingly we eliminated 41 plans where no participant borrowed at the 50 percent limit over the five-year period. Borrowers who terminated employment with multiple loans outstanding are counted as a single observation. Fewer than 2 percent of terminating participants with outstanding loans paid off a portion of the outstanding loans and then defaulted on the remainder.

[25] Approximately 10% of plan sponsors permitted terminated plan participants to continue to repay their plan loans. However, among Vanguard participants terminating with a loan in plans offering this feature, only 5 percent took advantage of this feature (authors' calculation).

of the individual defaulting; the mean of the dependent variable is 86 percent. Regressors are identical to those in our previous examinations of loan probabilities and amounts borrowed.

Results for the analysis of loan default patterns appear in Table 6. Unlike before, allowing participants to take multiple loans had no influence on default rates. There are several statistically significant effects in Column 1—young, low-income and lower nonretirement wealth workers were more likely to default—but these are economically small relative to the mean default rate. Our results are consistent with a model of liquidity-constrained participants unable to repay the outstanding loan balance upon job change. In Column 2 several interaction effects are significant, but the main effect on multiple loans is not. Loan interest rates were not statistically significant, nor were the financial crisis flag or our measure of local labor market conditions.

Table 6 here

Overall, few of the control variables included in the model have economically meaningful impacts on the mean default rate of 86 percent for those who leave their jobs with a 401(k) loan outstanding. Since default rates are rather widespread among those who leave their jobs with a loan outstanding, this could suggest that other unobserved factors, such as financial illiteracy, discounting, or lack of self-control, could be driving consumer behavior regarding pension loan defaults.[26] In our context, this could mean that many employees who borrow from their plans are simply unaware of the consequences of job termination for their 401(k) loans.

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[26] In other contexts, these factors do appear to play a role. For instance the least financially savvy cannot report how much debt they hold (Lusardi and Tufano (2009), and Agarwal and Mazumder (2013) show that financial mistakes are most prevalent among the least cognitively adept. Also present-biased people are more likely to have credit-card debt, as well as higher levels of debt, than those with lower discount rates (Meier and Springer 2010). And Mastrobuoni and Weinberg (2009) find some Social Security beneficiaries suffer from low self-control, resulting in low saving.

VI. Aggregate Loan Leakage

In recent years there have been policy recommendations to restrict plan leakage, mostly in the form of proposed legislation.[27] In this light, it is of interest to use our results to estimate the aggregate amount of loan default leakage flowing from 401(k) plans annually.

The main source of data on this question to date has been the *Private Pension Plan Bulletin*, an abstract of the Form 5500 Annual Reports which retirement plans must file with the Employee Benefits Security Administration of the US Department of Labor (US DOL 2012). One item reported in this document refers to the "Income Statement of Pension Plans With 100 or More Participants" and it lists the amount of "deemed distribution of participant loans." Some analysts have incorrectly interpreted this amount as representing the total amount of loan defaults.[28] Nevertheless, this number actually measures loan defaults only for active plan members due to temporary lay-off, long-term disability, maternity leave, or a leave of absence such as parental leave. Loan defaults due to job termination are instead recorded as "offsets" to participants' account balances at the time of default, reported as "direct benefit payments" in the US DOL's nomenclature.

In our dataset, only eight percent of the loan defaults observed were "deemed" loan distributions; the remaining 92 percent resulted from defaults on job termination (the latter being the focus of the analysis above). Accordingly, data on "deemed distributions" dramatically understates the total value of loan defaults. Applying our sample fractions to the entire private 401(k) system indicates that aggregate system-wide loan defaults are on the order of $6 billion

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[27]For example, U.S. Senators Kohl and Enzi proposed the 2011 Savings Enhancement by Alleviating Leakage in 401(k) Savings Act (SEAL Act). In their press release the Senators remarked that "[a] 401(k) savings account should not be used as a piggy bank" (Leonard, 2011).

[28] This number is reported in the GAO estimate of loan leakages (GAO, 1997).

per year, or ten times the $600 million in "deemed" loan distributions.[29] Assuming an effective

tax rate of 10 percent and factor in the 10 percent penalty associated with early distributions, we

estimate that the total tax revenue flowing to the U.S. Government associated with defaulted DC

plan loans to be over $1 billion per year, small by comparison to the U.S. Government's annual

total revenue of $2.7 trillion. Moreover, though loan default amounts have been understated in

prior studies compared to our estimates, they are still much smaller than the leakage from

account cash-outs on job termination of $74 billion (in 2006; GAO 2009).

VII. Conclusion and Implications

DC retirement accounts represent a growing fraction of US households' retirement assets.

As we have shown, such accounts are dual-purpose, being used both to finance old-age

retirement security and current consumption. A loan feature is one of the prominent pre-

retirement liquidity elements within 401(k) plans used for current spending.

In our rich administrative dataset, we show that a fifth of plan participants borrow at any

given time, while almost 40 percent do so over a five-year period. The effects of plan loan policy

are meaningful. When plans allow participants to take out multiple loans, participants are more

likely to borrow in the first place. This is suggestive of a buffer-stock model also found among

credit card borrowers. In other words, given the ability to borrow multiple times, workers are

more willing to take the first loan, given that they retain slack borrowing capacity for future

spending needs. There is an ever more pronounced behavioral effect from plan loan policy. In

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[29] During our five year period, we see about 130,000 loan defaults with an aggregate annual defaulted loan balance of around $0.156 billion. In 2006 there were 58.4 million active 401(k) participants (US DOL 2013), and assuming 90 percent had access to plan loans, this implies that about 52.5 million workers were eligible to take 401(k) loans that year. Extrapolating from our 1.3 million person sample provides an estimate of $6.3bn for total 401(k) annual defaults. Alternatively, if we were to use a count of 65.8 million participants for all private DC plans, this would raise the estimate to $7.1bn, although it is unclear whether plan borrowing in non-401(k) plans is as high as in 401(k) plans.

multiple-loan plans, participants borrow greater amounts, and so appear to view multiple-loan option as an employer endorsement of borrowing. Although our paper did not explicitly evaluate a Modigliani-like proposal for a 401(k) credit card, one concern about enhancing 401(k) access is that it might boost this endorsement effect.

Participant borrowing from 401(k) accounts follows a hump-shaped age pattern, peaking at age 35-44, both in terms of incidence and the fraction of account wealth borrowed. We also find that liquidity-constrained participants (low income, low nonretirement wealth) are more likely to borrow, though better-off households (high income, high nonretirement wealth) tend to borrow the largest fractions of their retirement accounts when they do borrow. During the financial crisis, the tendency to borrow fell, although among those who did borrow, the amount borrowed did not change.

With our dataset we are uniquely able to assess loan default patterns. We show that nine of 10 loans are repaid, yet when workers who have an outstanding loan balance terminate employment, 86 percent of them default on their loans. Although more liquidity-constrained participants are more likely to default, the size of these effects is small relative to the high default rate broadly. This result implies that other factors, such as low financial literacy, impatience, or inattention, may be at work: many borrowers appear surprised by an unanticipated job change or its effect on an outstanding loan. Using our dataset we also estimate the aggregate effect of loan defaults on retirement savings at approximately $6 billion per year. This estimate is larger higher than previous estimates, which relied on incomplete data, yet it is much smaller than retirement plan leakage due to account cash-outs on job termination.

Our research will be of interest to policymakers and plan sponsors seeking to evaluate the effectiveness of pre-retirement access features in U.S DC retirement plans. The fact that many

workers do borrow from and some default on their plans has led some to argue that 401(k) loans should be restricted.[30] Based on our results, those concerns seem overstated, particularly when compared to leakage from account cash-outs. We do, however, find that limiting the number of loans to a single loan would reduce the incidence of borrowing and the fraction of total wealth borrowed, thereby reducing the impact of future defaults. Another option might be to further limit the size and scope of loans, for instance allowing participants to borrow only a quarter of their account balances. These findings underscore the fact that DC retirement accounts are intended mainly for old-age financial security, although they do offer pre-retirement liquidity to meet current consumption needs.

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[30] For instance, see Reeves and Villareal (2008), and Weller and Wenger (2008).

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Table 1. Characteristics of 401(k) Loan-Eligible Participants and Borrowers

	Loan-Eligible Participants	Borrowers
Outcomes of interest		
Percentage of participants initiating a new loan monthly	1.38%	N/A
Mean (median) loan amount ($)	N/A	$7,841 ($4,558)
Mean aggregate loan amount ($)	N/A	$9,969 ($5,881)
Plan design factors		
Fraction in plans allowing multiple loans	48%	57%
Mean loan interest rate	7.16%	7.29%
Participant characterisics		
Percent male	51.8	44.9
Mean age (years)	44.7	41.6
Mean job tenure (years)	8.6	8.2
Income < $35,000	8.0%	13.9%
Income of $35,000- $87,500	48.8%	60.0%
Income > $87,500	43.2%	26.2%
Low wealth (non-retirement wealth less thant $7,250)	43.0%	64.9%
Medium wealth (non-retirement wealth of $7,250-$61,289)	31.2%	24.8%
High wealth (non-retirement wealth greater thatn $61,289)	25.8%	10.3%
Mean 401(k) account balance ($2010)	$ 86,541	$ 44,482
Mean ln (401(k) account balance) ($2010)	10.38	9.83
Macroeconomic variables		
Financial turmoil--fraction of observatons Sept. 08 - June 09	19.0%	16.3%
Mean lagged state-level unemployment rate (prior quarter)	5.3%	5.3%
Number of observations	55,175,718	784,489

Source: Authors' calculations

Table 2. Determinants of the Probability of Taking a New Loan

| | *Dependent Variable: Probability of Taking a New Loan* | | | |
| | (1) | | (2) | |
	Estimate (SE)	Marginal effect	Estimate (SE)	Marginal effect
Plan design factors				
Multiple loans allowed (dummy)	0.169*** (0.029)	2.7%	0.255*** (0.047)	4.3%
Loan interest rate (%)	-0.006 (0.004)	-0.1%	-0.006 (0.004)	-0.1%
Participant characteristics				
Age 35-45	0.042*** (0.010)	0.7%	0.067*** (0.012)	1.1%
Age 45-55	-0.032** (0.014)	-0.5%	-0.014 (0.016)	-0.2%
Age > 55	-0.245*** (0.016)	-3.5%	-0.250*** (0.019)	-3.8%
Male	-0.030*** (0.010)	-0.5%	0.007 (0.017)	0.1%
Tenure < 2 years	-0.336*** (0.022)	-4.6%	-0.278*** (0.026)	-4.1%
Tenure 2-6 years	-0.113*** (0.014)	-1.7%	-0.104*** (0.020)	-1.7%
Tenure > 12 years	0.046*** (0.009)	0.7%	0.056*** (0.015)	1.0%
Income < $35,000	0.107*** (0.005)	1.8%	0.096*** (0.007)	1.7%
Income > $87,500	-0.109*** (0.005)	-1.7%	-0.130*** (0.008)	-2.1%
Low wealth	0.185*** (0.006)	3.0%	0.203*** (0.007)	3.4%
High wealth	-0.160*** (0.005)	-2.4%	-0.170*** (0.007)	-2.7%
Ln (401(k) account balance)	-0.116*** (0.008)	-0.5%	-0.117*** (0.008)	-0.5%
Macroeconomic variables				
Financial turmoil period	-0.038** (0.018)	-0.6%	-0.039** (0.017)	-0.6%
Lagged state-level unemployment rate	0.007 (0.006)	0.1%	0.007 (0.006)	0.1%
Interactions				
Age 35-45*multiple loans			-0.043** (0.017)	-0.7%
Age 45-55*multiple loans			-0.031 (0.024)	-0.5%
Age > 55*multiple loans			0.011 (0.030)	0.2%
Male * multiple loans			-0.066** (0.027)	-1.1%
Tenure < 2 yrs * multiple loans			-0.112*** (0.028)	-1.7%
Tenure 2-6 yrs * multiple loans			-0.017 (0.024)	-0.3%
Tenure > 12 yrs * multiple loans			-0.020 (0.019)	-0.3%
Income < $35,000 * multiple loans			0.021** (0.010)	0.4%
Income > $87,500 * multiple loans			0.038*** (0.009)	0.6%
Low wealth * multiple loans			-0.033*** (0.010)	-0.5%
High wealth * multiple loans			0.018* (0.010)	0.3%
Number of observations	55,175,718		55,175,718	
Mean of dependent variable	0.014		0.014	
R-squared	0.01		0.01	

Source: Authors' calculations. Includes plan size and sector controls.

Table 3. Determinants of New Loan Amount and Aggregate Amount Borrowed

	Dependent variable: LN (New loan amount $)		Dependent variable: LN (Aggregate amount borrowed $)	
	(1)	(2)	(3)	(4)
	Estimate (SE)	Estimate (SE)	Estimate (SE)	Estimate (SE)
Plan design factors				
Multiple loans allowed (dummy)	-0.207*** (0.029)	-0.104*** (0.032)	0.150*** (0.025)	0.075*** (0.029)
Loan interest rate (%)	0.004 (0.004)	0.003 (0.004)	0.003 (0.004)	0.003 (0.004)
Participant characteristics				
Age 35-45	0.091*** (0.010)	0.167*** (0.020)	0.112*** (0.012)	0.044** (0.019)
Age 45-55	0.059*** (0.014)	0.152*** (0.025)	0.085*** (0.015)	0.028 (0.026)
Age > 55	-0.008 (0.019)	0.068* (0.036)	-0.001 (0.020)	-0.050 (0.035)
Male	0.048*** (0.011)	0.109*** (0.026)	0.043*** (0.011)	0.075*** (0.023)
Tenure < 2 years	-0.109*** (0.023)	-0.209*** (0.047)	-0.257*** (0.025)	-0.225*** (0.051)
Tenure 2-6 years	-0.067*** (0.017)	-0.074*** (0.028)	-0.118*** (0.020)	-0.171*** (0.035)
Tenure > 12 years	-0.071*** (0.026)	0.008 (0.048)	-0.049** (0.024)	-0.032 (0.054)
Income < $35,000	-0.039*** (0.006)	-0.005 (0.020)	-0.043*** (0.007)	-0.081*** (0.029)
Income > $87,500	0.048*** (0.007)	0.140*** (0.018)	0.041*** (0.007)	0.083*** (0.023)
Low wealth	-0.064*** (0.008)	-0.048* (0.027)	-0.061*** (0.008)	-0.169*** (0.026)
High wealth	0.052*** (0.007)	0.150*** (0.016)	0.046*** (0.007)	0.075*** (0.018)
Ln (401(k) account balance)	0.604*** (0.014)	0.605*** (0.014)	0.589*** (0.015)	0.588*** (0.015)
Macroeconomic variables				
Financial turmoil period	0.015 (0.018)	0.013 (0.017)	0.015 (0.018)	0.016 (0.019)
Lagged state-level unemployment rate	0.011 (0.007)	0.011* (0.006)	0.012** (0.006)	0.012** (0.006)
Interactions				
Age 35-45*multiple loans		-0.041*** (0.009)		0.036*** (0.011)
Age 45-55*multiple loans		-0.048*** (0.011)		0.030** (0.013)
Age greater than 55*multiple loans		-0.040*** (0.015)		0.026* (0.015)
Male * multiple loans		-0.035*** (0.013)		-0.018* (0.010)
Tenure < 2 yrs * multiple loans		0.059*** (0.021)		-0.020 (0.022)
Tenure 2-6 yrs * multiple loans		0.004 (0.011)		0.028* (0.014)
Tenure > 12 yrs * multiple loans		-0.038 (0.025)		-0.009 (0.029)
Income < $35,000 * multiple loans		-0.019* (0.011)		0.022 (0.016)
Income > $87,500 * multiple loans		-0.048*** (0.009)		-0.022** (0.011)
Low wealth * multiple loans		-0.009 (0.012)		0.058*** (0.011)
High wealth * multiple loans		-0.051*** (0.008)		-0.015 (0.009)
Number of observations	784,489	784,489	784,489	784,489
Mean of dependent variable	8.419	8.419	8.663	8.663
R-Squared	0.58	0.58	0.60	0.60

Source: Authors' calculations. Includes plan size and sector controls.

Table 4. 401(k) Loan Default Patterns by Year

	7/04-6/05	7/05-6/06	7/06-6/07	7/07-6/08	7/08-6/09	Period Total
Number of active participants	1,102,478	1,206,118	1,331,802	1,490,111	1,460,379	6,590,888
% of active participants with a loan outstanding	21.5	21.0	20.7	19.6	20.3	20.6
Terminations						
% of those with a loan terminating	10.3	11.0	10.6	10.6	13.1	11.2
Default rates						
% of those terminating with a loan who default	84.8	84.2	85.4	87.3	87.6	86.0
% of defaults as a fraction of loans outstanding	8.7	9.3	9.1	9.3	11.5	9.6

Source: Authors' calculations.

Table 5. Characteristics of Participants Defaulting on, or Repaying, Their Loans on Leaving Their Jobs

|	All Participants	Participants with a Loan		Participants Terminating with Outstanding Loans	
			All	*Defaulting*	*Repaying*
Number of observations	6,590,888	1,354,900	151,458	130,295	21,163
Plan design factors					
% Multiple loans allowed	43.3	49.7	47.6	47.1	50.6
# Loans taken	N/A	1.3	1.3	1.3	1.2
Loan interest rate (%)	6.89	6.88	7.04	7.07	6.85
Participant characteristics					
Mean age	43.6	44.1	42.9	42.4	46.1
% Male	49.0	51.0	48.0	48.0	53.0
Mean tenure	8.0	10.5	8.6	8.1	11.3
Mean income	$ 84,371	$ 73,252	$ 67,369	$ 64,958	$ 81,503
Low wealth	50	64	65	67	52
Medium wealth	29	25	24	24	29
High wealth	21	11	11	10	19
Mean account balance ($)	$ 73,248	$ 63,780	$ 43,667	$ 35,415	$ 94,716
Loan balance ($)	N/A	$ 8,132	$ 6,318	$ 6,099	$ 7,663

Source: Authors' calculations.

Table 6. Determinants of the Probability of 401(k) Defaults

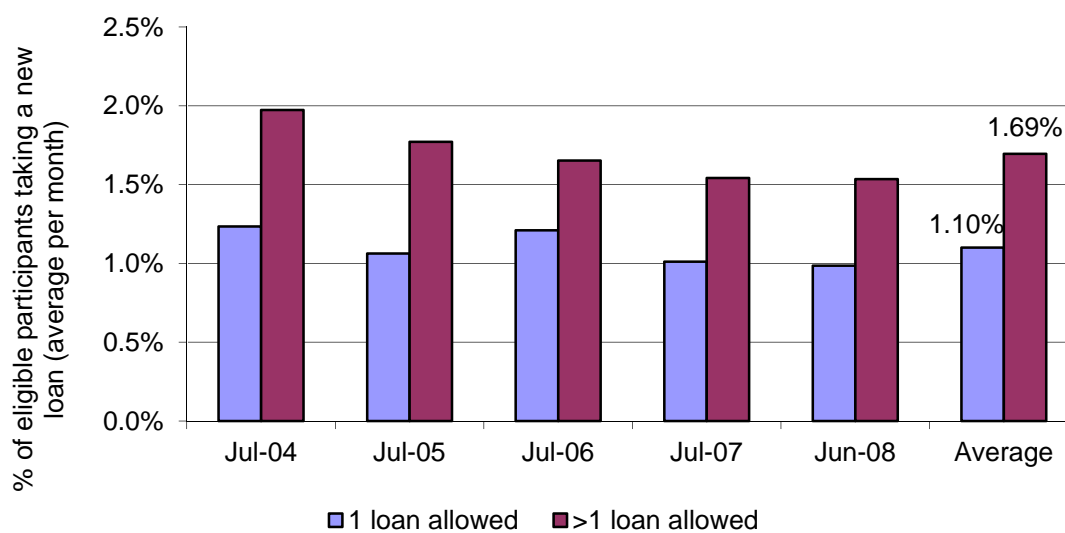| | *Dependent Variable: Probability of Participant Defaulting on Plan Loans Outstanding* | | | | | |
| | (1) | | | (2) | | |
	Estimate (SE)		Marginal Effect	Estimate (SE)		Marginal Effect
Plan design factors						
Multiple loans allowed (dummy)	-0.078	(0.051)	-1.0%	-0.040	(0.076)	-0.5%
Loan interest rate (%)	0.010*	(0.006)	0.1%	0.010	(0.006)	0.1%
Participant characteristics						
Age 35-45	-0.039**	(0.018)	0.5%	0.053	(0.044)	0.7%
Age 45-55	-0.062**	(0.025)	0.8%	0.036	(0.049)	0.5%
Age > 55	-0.000	(0.030)		0.017	(0.056)	0.2%
Male	0.015	(0.016)	0.2%	0.072**	(0.034)	1.0%
Tenure < 2 years	0.027	(0.034)	0.4%	-0.043	(0.066)	-0.6%
Tenure 2-6 years	0.053**	(0.022)	0.7%	0.008	(0.050)	0.1%
Tenure > 12 years	-0.043*	(0.026)	-0.5%	-0.053	(0.048)	-0.7%
Income < $35,000	0.072***	(0.016)	1.0%	0.025	(0.033)	0.3%
Income > $87,500	-0.121***	(0.013)	-1.5%	-0.118***	(0.028)	-1.5%
Low wealth	0.147***	(0.013)	1.8%	0.122***	(0.034)	1.6%
High wealth	-0.158***	(0.017)	-1.8%	-0.176***	(0.042)	-2.1%
Ln (401(k) account balance)	-0.389***	(0.016)	-1.9%	-0.389***	(0.016)	-2.0%
Ln Loan balance ($)	0.276***	(0.013)	1.1%	0.276***	(0.013)	1.1%
Macroeconomic variables						
Financial turmoil period	-0.007	(0.040)	-0.1%	-0.008	(0.040)	-0.1%
Lagged state-level unemployment rate	-0.005	(0.011)	-0.1%	-0.005	(0.011)	-0.1%
Interactions						
Age 35-45*multiple loans				-0.056**	(0.027)	-4.4%
Age 45-55*multiple loans				-0.059**	(0.028)	-4.5%
Age > 55*multiple loans				-0.011	(0.032)	-1.1%
Male * multiple loans				-0.035*	(0.021)	-3.1%
Tenure < 2 yrs * multiple loans				0.045	(0.039)	6.1%
Tenure 2-6 yrs * multiple loans				0.028	(0.030)	3.3%
Tenure > 12 yrs * multiple loans				0.006	(0.025)	0.7%
Income < $35,000 * multiple loans				0.030	(0.019)	3.7%
Income > $87,500 * multiple loans				-0.001	(0.015)	-0.2%
Low wealth * multiple loans				0.015	(0.019)	1.7%
High wealth * multiple loans				0.011	(0.022)	1.2%
Number of observations	151,458			151,458		
Mean of dependent variable (%)	0.86			0.86		
R-squared	0.12			0.12		

Source: Authors' calculations. Includes plan size and sector controls.

Figure 1. Percentage of Participants with 401(k) Loans Outstanding
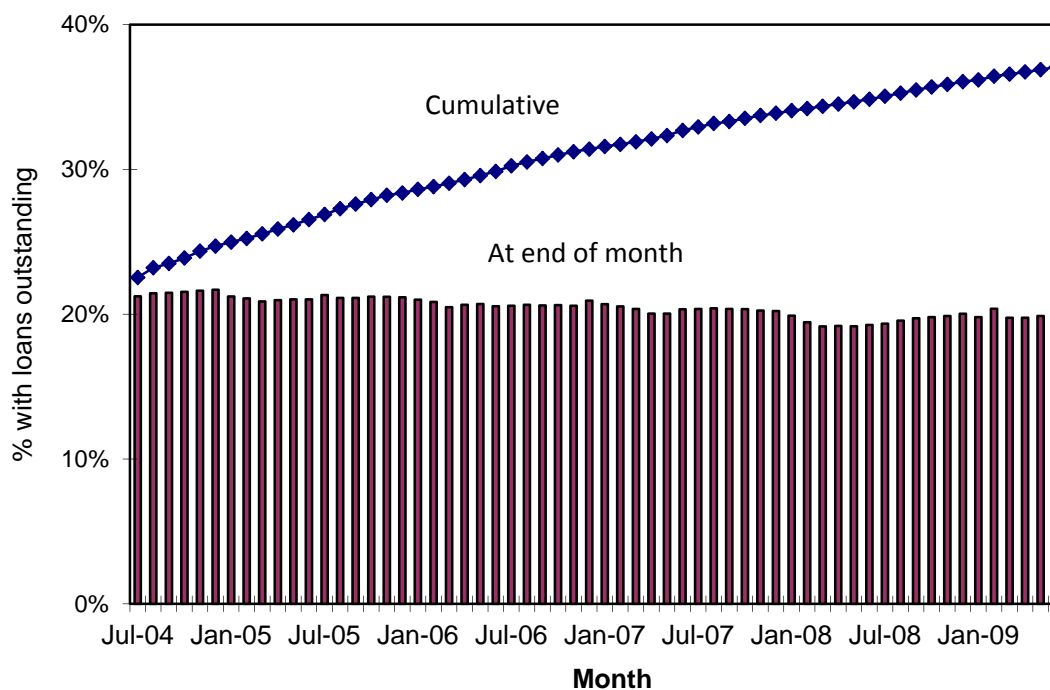
Source: Authors' calculations.

Figure 2. Loan Incidence by Number of Plan Loans

Source: Authors' calculations.