

4-2015

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

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The research reported herein was performed pursuant to a grant from the U.S. Social Security Administration (SSA), funded as part of the Retirement Research Consortium. The authors also acknowledge support provided by the Pension Research Council/Boettner Center at the Wharton School of the University of Pennsylvania, and the Vanguard Group. Programming assistance from Yong Yu is also appreciated. Opinions and conclusions expressed herein are solely those of the authors and do not represent the opinions or policy of the SSA, any other Federal agency, or any institution with which the authors are affiliated. Opinions and errors are solely those of the authors and not of the institutions providing funding for this study or those with which the authors are affiliated. 

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Tax-qualified retirement plans seek to promote saving for retirement, yet most employers permit pre-retirement access by letting 401(k) participants borrow plan assets. This paper examines who borrows and why, and who defaults on their loans. Our administrative dataset tracks several hundred plans over 5 years, showing that 20% borrow at any given time, and almost 40% do at some point over five years. Employer policies influence borrowing behavior, in that workers are more likely to borrow and borrow more in aggregate, when a plan permits multiple loans. We estimate loan default "leakage" at $6 billion annually, more than prior studies.



## Keywords

retirement plan loan, retirement wealth, household debt, loan default, consumption, buffer-stock

## Disciplines

Economics

## Comments

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April 2015

**PRC WP2014-01**
**Pension Research Council Working Paper**
**Pension Research Council**
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JEL Codes: D14, D04, D09, H24, J2

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## I. INTRODUCTION

Defined contribution (DC) retirement plans in the U.S. generally are accorded tax-deferred status as a means to encourage saving for old age,[1] yet most plans also include liquidity features giving workers pre-retirement access to their money.[2] The tax code typically discourages such pre-retirement access by imposing a tax liability and an additional 10 percent penalty tax on amounts withdrawn early. Nevertheless, estimates of aggregate premature withdrawals (so-called account "leakage") from all tax-deferred accounts, including both 401(k)s and IRAs, amount to 30-45 percent of annual total contributions (depending on the economic environment; Argento, Bryant, and Sabelhaus, 2015). Such sizeable outflows relative to inflows raise the important question of how these liquidity features may influence future retirement security.

A few recent papers (Li and Smith, 2010; Beshears et al., 2012) have examined the demographic and financial aspects of 401(k) borrowers, but no previous study has explored how employer loan policy affects participant behavior and consequent default outcomes. This is notwithstanding the fact that most DC participants in the U.S. have the option of borrowing from their retirement accounts.[3] Accordingly, here we address several questions regarding borrowing from retirement accounts. First, we ask whether and how participants' borrowing patterns

[1] Here we use the terms "DC plan," "401(k) plan," "retirement plan," and "pension plan" interchangeably. 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 (the worker can access his own contributions under limited conditions); certain types of non-hardship withdrawals (e.g. the withdrawal of employer profit-sharing contributions); and full access to savings on 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 though there are exemptions to the penalty.

[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 et al., 2012).

respond to different loan policies. Second, we investigate who defaults on plan loans, and how this pattern is related to employer loan policy. And finally, we offer our thoughts on the implications for retirement security of allowing 401(k) loans.

Drawing on a rich administrative dataset of 401(k) plans containing information on plan borrowing and loan defaults, we demonstrate that retirement account loans are quite common, with 20 percent of DC participants having an outstanding loan at any point in time, and nearly 40 percent borrowing over a five-year period. Prior research has suggested that the availability of plan loans encourages higher retirement plan contributions by making tax-deferred retirement accounts more liquid (Mitchell, Utkus, and Yang, 2007). Yet by law, participants must repay their 401(k) loans on a set schedule, usually through payroll deduction, and we estimate that fully 90 percent of loans are repaid in a timely way. Yet one in 10 loans is not repaid – failure to repay typically occurs when the worker leaves his current employer – and such loan "defaults" represent a permanent reduction or "leakage" from retirement savings.[4] We also show that employer loan policy has a sizeable effect on 401(k) borrowing. When a plan sponsor permits multiple rather than only one loan, each individual loan tends to be smaller; this is consistent with workers taking a buffer-stock approach, retaining the option to borrow more in case of future consumption shocks (Carroll, 1992).[5] At the same time, the probability of plan borrowing nearly doubles, and the aggregate amount borrowed rises by 16 percent, suggesting that employees perceive that easier loans are actually an encouragement to borrow (i.e., an "endorsement effect"). It is possible that firm loan policy might reflect endogenous differences in credit demand across groups of workers, so we undertake several tests to rule out such

[4] Inasmuch as 401(k) loans are a way people access their own saving, there is no technical "default" as with a conventional loan from a bank or other intermediary.

[5] As Carroll (1992:62) stated: "consumers hold assets mainly so that they can shield their consumption against unpredictable fluctuations in income."

endogeneity. Plan loan interest rates are generally low and have no significant impact on borrowing behavior.

Turning to defaults, we find that a vast majority – 86 percent – of employees who leave their jobs with a plan loan outstanding do default, exposing them to both penalty and any income tax due. Workers at firms allowing multiple loans have default rates that are higher by 1.7 percent points. Participants having only a single loan when multiple loans are allowed are 2.2 percent less likely to default, compared to workers in plans allowing a single loan, suggesting some underlying heterogeneity in credit demand. We also consider whether the economic turmoil of 2008-09 dramatically changed 401(k) plan borrowing and default patterns. This turns out not to be the case: in fact, participants were less likely to borrow during the downturn, and default rates remained stable. This could have been because voluntary job changes fell during the recession, so defaults declined; this seems to have offset higher involuntary job loss rates.

Finally, we use our results to estimate an aggregate effect of 401(k) loan defaults on retirement savings. Our leakage figure totals around $6 billion due to loan defaults per year, a value far larger than prior estimates which relied on incomplete data.[6] Nevertheless, this is still an order of magnitude lower than retirement plan leakage due to account cash-outs on job change, which the GAO (2009) reported at $74 billion in 2006. The small relative size of loan defaults is relevant to the question of whether retirement leakage should be further restricted (Leonard, 2011).

In what follows, Section II provides an overview of 401(k) loan rules, and Section III reviews related studies. Section IV describes the data and develops our hypotheses. In Section V we present empirical results on borrowing, and in Section VI we provide results on loan defaults.

[6] 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.

Section VII reports our estimate of the aggregate tax revenue impact of loan defaults, and Section VIII concludes.

## II. 401(K) LOAN RULES

Borrowing from tax-qualified 401(k) plans is permitted under U.S. Treasury regulation governing loans, repayment, interest rates, and defaults, along with associated tax and penalty consequences.[7] A 401(k) loan is not a credit instrument in the conventional sense, but rather an arrangement allowing the plan participant to gain access to his retirement accumulations under certain conditions. First, the participant may only borrow up to half of his account balance, with a maximum loan of $50,000 (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 also may impose their own requirements on plan loans, including whether 401(k) loans are permissible at all, although as a practical matter, 90 percent of active contributors have access to loans. Sponsors may also determine the number of individual loans allowed, whether loans must be for some minimum amount (e.g., $1,000), and what the participant must pay in terms of an interest rate. In general, 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:

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

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

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

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. If a plan only allows one loan, a borrower must fully repay the current loan outstanding before she can take another plan loan. Some plan sponsors permit participants to take out multiple loans (some permitting two, others allow three or even more) in increments $L_1$, $L_2$, and so on, with $L = \sum L_i$. In those cases, borrowers can hold as many loans as the plans permit at a time, given that the total amount of outstanding loans do not exceed the cap described above.

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.[8] The loan repayment is taken from the participant's after-tax salary. A portion of the payment stream represents principal repayment while the other part represents interest. Loan interest 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 payments are deposited to the participant's account as if they were pre-tax plan accruals. 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 as well as an early withdrawal penalty on the amount withdrawn from his pre-tax retirement account. Li and Smith (2010) show

[8] 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.

that, in most circumstances, the opportunity cost of a 401(k) loan will be less than the cost of paying all interest to a financial institution.[9]

When the borrower leaves his job, 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 $\tau \approx 0$ for many low- and middle-income households today, due to a variety of tax credits, so the expected cost of default may be simply $0.1L_{bal}$.[10]

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. Accordingly, a 401(k) loan can be a convenient way of accessing credit, particularly for the credit-constrained. Moreover, loan defaults have no credit reporting consequences, and defaulting on a 401(k) loan has no effect on a borrower's ability to take a new loan from a new plan.

## III. PRIOR STUDIES

Saving and borrowing from a 401(k) plan is usefully examined against the broader literature on the impact of tax-advantaged retirement saving on total saving.[11] Focusing just on

[9] Lu and Tang (2014) compare different types of loans using scenario analysis, and find that, under reasonable assumptions, a 401(k) loan is typically less costly than a credit card loan.

[10] 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.

[11] For instance, Poterba, Venti, and Wise (1995) find that most 401(k) contributions represent net new saving. Both Benjamin (2003) and Gelber (2011) report that people eligible to participate in company 401(k) plans save more

401(k) plans, several prior studies have examined aspects of borrowing behavior. Work by the GAO (1997) concluded that allowing plan loans can raise both participation and contribution rates, while others have observed that making loans available influences savings mainly on the intensive margin, in the form of higher DC plan contribution rates (Munnell, Sunden, and Taylor, 2001/02; Holden and Vanderhei, 2001; Mitchell, Utkus, and Yang, 2007). In a survey of about 900 DC plan participants, Utkus and Young (2011) reported that about 40 percent of borrowers used plan loans for bill or debt consolidation, while over 30 percent used them for home improvement and repair. They also found that the least financially literate borrowers used 401(k) loans for consumption rather than investment purposes. Using the Survey of Consumer Finances, Sunden and Surette (2000) and Li and Smith (2010) found that people who borrowed from their 401(k) accounts had higher DC account balances, but they also had lower total financial assets, higher debt, and were more credit-constrained. In a study related to ours, Beshears et al. (2012) used participant-level information to show that plan borrowing followed a hump-shape age profile. That analysis did not evaluate defaults nor the role of employer policy on behavior as we do in what follows.[12]

In a distinct but related context, Gross and Souleles (2002a, 2002b) examined credit card borrower behavior. They concluded that their sample exhibited "buffer stock" behavior: that is, they tended to not borrow the maximum so as to leave a margin in case of emergency. That study reported credit card interest rates averaging 16 percent, compared to, for example, an average 401(k) loan interest rate of just over seven percent (in our dataset about which we say more

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inside and outside their retirement plans. Using Danish data, Chetty et al. (2014) found little evidence of crowd-out for the 85% of the population they deemed passive decision-makers, who saved more when they shifted employers with higher automatic contributions.

[12] 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), Burman, Coe, Dworsky and Gale (2012), Sabelhaus and Weiner (1999), and Amromin and Smith (2003).

below). Such a large difference in borrowing rates suggests that employees with access to plan loans might benefit from substituting lower-cost 401(k) loans for much higher-cost credit card debt. Somewhat surprisingly, Li and Smith (2010) reported that many people held substantial credit card debt even when a plan loan would have been less expensive. Those authors suggested that this seemingly illogical behavior could 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]

## IV. DATA AND HYPOTHESES

### A. Data

Our analysis uses a rich administrative dataset for DC plan participants covering the five-year period July 2004--June 2009.[16] The dataset includes 882 different 401(k) (or similar) DC plans. To assess the propensity to borrow, we use a time-varying sample of over 900,000 participants observed monthly, with over 55 million observations. In this sample, we observe on average over 13,000 new plan borrowers each month (or a total of 780,000 borrower observations). Variables available include plan characteristics and participant demographic/financial characteristics. We also observe information on loan default behavior for workers terminating employment.

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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 (2013) 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.

[16] The data were provided by recordkeeper Vanguard under restricted access conditions, and the identities of individual firms and plan participants are masked.

In any given month, an average of 1.38 percent of eligible participants took a new loan in our data (Table 1). The average amount borrowed was just over $7,800 (in $2010), with a median of nearly $4,600; the mean total amount borrowed was around $10,000, with a median of about $5,900. Loan interest rates varied by plan, though many plans peg the interest rate to the Prime Rate plus one percent. Loan interest rates were only modestly higher for borrowers than for the entire participant sample. The average age of borrowers was 42, slightly younger than the average participant; borrowers had 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 were also more likely to be in plans where multiple loans were allowed. During the period of the global financial crisis, defined here as September 2008-June 2009, fewer participants borrowed from their retirement accounts.

*Table 1 here*

Figure 1 illustrates the monthly and cumulative percentage of loan-eligible participants having one or more outstanding loans. A first observation is that about 20 percent of active participants had a loan outstanding in any given month, so the loan origination rate was approximately offset by the rate of loan repayments or defaults. Over the entire five-year period of our study, the cumulative proportion of participants borrowing from their retirement plan rose to nearly 40 percent. In other words, instead of the same participants taking repeated plan loans, many different participants eventually borrow from their retirement accounts over a longer time horizon.

*Figure 1 here*

We are also interested in the impact of employer plan design on participant borrowing. Figure 2 presents the mean proportion of new plan borrowers over the five-year period, where

we compare plans offering only a single loan at a time, with those permitting multiple loans. When only one loan was allowed, an average of 1.10 percent of eligible participants took a new loan each month. With multiple loans, the average rose to 1.69 percent per month.

*Figure 2 here*

## B. Hypotheses

We seek to examine how plan loan policies influence plan borrowing and default patterns. As noted above, the buffer-stock model suggests that cautious borrowers will remain just below the maximum borrowing limit to protect against future consumption shocks. In a 401(k) setting, participants will be restricted by employer policy regarding both the number of loans allowed at one time, and the total amount that can be borrowed. In our dataset, 40 percent of plans covering 52 percent of participants permitted workers to take out two or more loans at once. In such cases, buffer-stock participants would be predicted to be more likely to borrow from their plan, but take smaller loans, compared to patterns in plans permitting only a single loan. We also hypothesize that the availability of multiple loans could be seen as an employer "endorsement" of plan borrowing (Benartzi, 2001). If this were true, we would anticipate that aggregate borrowing would be higher when multiple loans are permitted.

Permitting multiple loans may or may not affect default behavior at job termination. On the one hand, default behavior depends only on whether the borrower can pay off his outstanding balance, regardless of how many loans he has taken. In that case, there may be no relationship between defaults and multiple loans. On the other hand, taking multiple loans could indicate lack of self-control or inability to manage one's finances. If so, those who took several loans might be more likely to default.

Employers also have control over another plan feature that may affect borrowing behavior: the interest rate that workers must pay when borrowing from their plans. Yet the effect of the interest rate is complex, since a higher interest rate makes the loan costlier to the worker, while a higher interest rate boosts the worker's retirement account more quickly. Ultimately, which effect dominates is an empirical question.

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 is 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 potentially competing effects: voluntary job changes would be expected to decline during a recession, reducing the incidence of default. Yet involuntary job losses rise, raising the risk. Again, empirical analysis is required to discern the net effect.

In addition to our focus on the most relevant employer plan design features, we are also able to control on several demographic and financial factors that could affect plan borrowing and default behavior. Naturally age is important, as borrowing would be expected to be higher among the credit-constrained young and then decline with age. Yet in 401(k) accounts, borrowing is conditioned on the employee's account balance which rises with both age and salary. Therefore we would anticipate a hump-shared age profile for borrowing (as in Beshears et al. 2012) since the *ability* to borrow rises with age and salary, but the *demand* for plan borrowing falls with age. Li and Smith (2010) have also noted that liquidity-constrained households are more likely to rely on 401(k) borrowing. Using our much more extensive dataset, we examine the robustness of this

finding. Moreover we hypothesize that liquidity constraints are also more likely to associate with loan defaults on job termination, since the outstanding balance accelerates as a balloon payment.

## V. MULTIVARIATE ANALYSIS OF 401(K) BORROWING AND LOAN AMOUNTS

To investigate borrowing patterns from 401(k) accounts we use a multivariate model of the following form:

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

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 *i*th participant in the *j*th 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 dollars or number of loans allowed). The $PLAN_j$ vector includes a flag for whether the plan permitted multiple loans, the loan interest rate, and plan size (number of participants); The $PARTICIPANT_i$ vector refers to participant characteristics including age, sex, job tenure, income, account balance, and non-retirement household wealth.[17] We also control on the employer's main industry. The $MACRO_t$ vector controls for the lagged three-month average state-specific unemployment rate, and a flag indicating the financial crisis period (September 2008-June 2009).[18] Finally, we cluster observations at the plan level for robust standard errors.[19]

### A. Factors Determining Borrowing from the Plan

[17] Due to data limitation, we do not observe participants' education levels; Utkus and Young (2011) and Li and Smith (2010) find that higher educated individuals are less likely to take plan loans.

[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 a 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. We provide a detailed description of all explanatory variables in Appendix Table 1.

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

Our first dependent variable captures the probability of a participant taking a new loan in month *t,* estimated using Probit as indicated in Table 2. The mean value of the dependent variable is 1.4 percent per month. The basic model in Column 1 is supplemented in Column 2 with interactions between multiple loan availability with participant demographics. In both cases, the particularly salient plan feature is the ability to take more than one loan at a time. Specifically, if 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 twice.

By contrast, the employer-determined loan interest rates had no material effect on borrowing patterns. Our dataset includes wide dispersion in interest rates (the low was 1.8 percent and the high was 11.5 percent), so this result seems quite robust. We therefore conclude that 401(k) loan demand is fairly insensitive to the price of a plan loan, due to the interplay from lower take-home pay due to a higher interest rate for the loan repayment, versus faster account replenishment via a higher interest rate.

*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 earned lower incomes, had fewer non-retirement financial assets, and had a lower plan account balance. These are likely the most liquidity-constrained participants. There is also an inverted U-shape age pattern by age, with participants age 35-44 more likely to borrow compared to their younger and older peers, consistent with prior studies. Moreover, shorter-tenured workers were also less likely to borrow, suggesting that familiarity with the loan feature and ability to borrow grew with job tenure and time in the plan.

One concern voiced by policymakers is that plan borrowing might have ramped up during the financial crisis; nonetheless, our evidence suggests otherwise. That is, during the turmoil, participants were 41 percent less likely to take new loans (0.6 percentage points).[20] One reason might be that plan borrowing is often tied to home purchases and improvements (Utkus and Young, 2011). Given the housing market precipitated the financial crisis, this effect could explain why 401(k) borrowing fell.

Table 2 also helps us examine which participants were likely to be affected by key plan features. Column 2 shows that, in plans allowing multiple loans, younger and less senior participants were more likely to boost their probability of borrowing. Specifically, participants under age 35 (our reference category) were 50 percent more likely (than the mean, or 0.7 percentage points) to borrow from their plans when multiple loans were permitted. Furthermore, if an employer allowed more than one loan, participants with low household income (<$35,000) were 29 percent (0.4 percentage points) more likely to borrow from their own accounts, versus those with medium household income ($35,000- $87,500, the reference category). In other words, permitting multiple loans disproportionally induces young and low-income participants to borrow more.

Overall, plan loan policies appear to have a strong impact on participants' borrowing behavior. Permitting multiple loans boosts loan take-up rates dramatically, and these increases in borrowing are especially influential for young and lower-income individuals.

### B. Determinants of Loan Size

Next we turn to the intensive margin of borrowing, examining both the size of new loans and the aggregate value of plan borrowing. Table 3 reports estimation results using multivariate

[20] This confirms simulation results from Vanderhei et al. (2012) who, using a different dataset, observed that loan activity did not change much over the period 1996-2011.

ordinary least squares (OLS) models. Columns 1-2 examine the size of new loans (in natural logs) with a mean of 8.42 (or $4,532). Columns 3-4 focus on the total amount borrowed (in natural logs) with a mean of 8.66 (or $5,785). Because we control on participants' 401(k) account balances, these results should be interpreted as the relative proportion borrowed from participant accounts.

*Table 3 here*

Previously we showed that plans allowing multiple loans increased the probability of borrowing. This again was a significant determinant of the amount borrowed. When the employer permitted multiple loans, each individual loan was smaller by 19 percent (see Column 1).[21] This finding is directly supportive of the buffer stock hypothesis, where participants seek to maintain some unused loan capacity as protection against future consumption shocks. When a participant has the option of taking another loan, he is more likely to preserve the buffer in his account to keep the borrowing option open. Here, again, the plan loan interest rate is not statistically significant.

Mirroring the loan incidence results, we again find a hump-shaped pattern with age for loan amounts, with the largest loans (as a fraction of account wealth) taken by participants age 35-44. Although less likely to borrow in the first place, the better-off (those with higher income and more 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 their loans, and so they would be more willing to borrow. Another possibility is that better-off households may 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 borrow more from their 401(k) plans. The financial crisis did not affect loan

[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.

amounts, suggesting that, conditional on the lower borrowing rates during the crisis, proportions borrowed remained the same. State-specific unemployment rates had negligible effects.

Coefficient estimates on the factors associated with participants' aggregate loan size are provided in Columns 3-4 of Table 3. Most strikingly, the availability of multiple loans raised aggregate borrowing by 16 percent in Column 3, in contrast to our earlier finding that individual loans were smaller under this plan provision.[22] This difference does suggest that the availability of multiple loans could serve as an employer "endorsement effect" (Benartzi, 2001): that is, employees may perceive the chance to take multiple loans as reflective of employer encouragement to do so. The age pattern of loans also differs in this column compared to Column 1: in multiple-loan plans, participants age 35+ were likely to borrow 11 percent more than younger participants. In other words, when plan sponsors permitted multiple loans, younger workers took out more (Column 2), but those age 35+ borrowed a higher fraction of their retirement wealth (Column 4).

### C. Endogeneity Tests

An alternative explanation for the effect of loans limits on borrowing might be that the result reflects endogenous credit demand. That is, some firms might attract employees with an inherently higher demand for credit (due to lifecycle reasons or behavioral biases), and so they might offer a 401(k) plan with multiple loan features to attract such individuals. For example, an employer anticipating that its workers might need small frequent loans might be more likely to adopt a multiple-loan policy. In such a case, the positive correlation between participant borrowing and the number of plan loans allowed would reflect plan sponsor anticipation of worker borrowing needs, rather than workers' reactions to loan features.

[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.

While we cannot completely rule out this possibility, we have undertaken several additional analyses to test for robustness. If plan sponsors did, in fact, set loan policy in anticipation of participant needs, we might expect that plans allowing multiple loans would differ systematically from single-loan plans according to key characteristics. By contrast, if differences in borrowing behavior were due to participants reacting independently to plan loan policies, there should be no systematic differences across plans. To test this hypothesis, we run the following OLS regression:

$$MULTI\_LOAN_j = \delta + \alpha' PLAN\_CHAR_j + \varepsilon_j$$

Here the dependent variable takes the value of one if the plan allowed its participants to hold multiple loans, and 0 if it allowed only a single loan. The $PLAN\_CHAR_j$ vector consists of plan and plan participant characteristics including the plan mean and standard deviation of participants' age, tenure, household income, financial wealth, the plan loan interest rate, the number of participants in the plan, and controls for the firm's industrial sector. Our hypothesis is that there should be no statistically significant difference in observable characteristics between plans allowing multiple loans and plans allowing only one loan. Results provided in the appendix show that few factors are statistically significant.[23] In particular, household income and financial wealth did not influence whether a plan allowed multiple loans. Accordingly, we believe that plan sponsors did not establish plan loan policies in anticipation of participants' observable characteristics associated with borrowing needs.

Nevertheless, there could be unobserved factors that could potentially affect plan loan policies including differences in underlying demand for credit, discount rates, or liquidity needs. To address this possibility, we hypothesize that if plans allowed multiple loans due to plan participant demand, then the proportion of participants holding multiple loans in those plans

[23] See Appendix Table 2.

should be relatively large. Instead, we find that 86.2 percent of eligible borrowers took out no additional loans in plans allowing multiple loans; in other words only 14.8 percent took additional loans when allowed to do so. This result suggests that employer policy on multiple loans is not strongly tailored to unobserved loan demand. Another way to interpret this finding is to compare it with sequential borrowing in plans permitting only a single loan at a time. Sequential borrowers are defined to be those who take one loan at a time and then take a new loan after fully repaying the prior one. Those borrowers may have high loan demand yet they are constrained by the fact that the plan allows one loan at a time. In the latter plans, 13.9 percent of participants are sequential borrowers, a level rather similar to the 14.8 percent of multiple loan takers in plans allowing multiple loans. The similarity of these two results suggests that sponsors are not tailoring plan loan policy to employee characteristics. In sum, then, our findings appear robust to endogeneity considerations.

## VI. DETERMINANTS OF PLAN LOAN DEFAULTS

Next we explore the determinants of 401(k) loan defaults via summary statistics in Table 4. About one-fifth of loan-eligible employees in our sample had one or more loans outstanding. Among participants terminating employment with one or more loans outstanding, 86 percent failed to repay the outstanding balance due on their loans, on average; the remainder paid their account loans and hence avoided default. Since participants defaulting on their outstanding loan balances totaled around 10 percent of all participants with outstanding loans, we estimate that

about 90 percent of participants repaid their loans over the period during which we observed them.[24]

*Table 4 here*

Descriptive statistics on participants who defaulted versus repaid their loans are provided in Table 5, along with data on all borrowers and all loan-eligible plan participants. The default sample includes 151,458 participants in 401(k) plans who terminated employment with at least one loan outstanding.[25] Compared to other plan borrowers, they were somewhat younger, had shorter job tenure, and held lower balances. Those who defaulted on their loans also had lower income, lower balances, and had 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 plan loans.[26] Our goal here is to compare employees who terminated employment and defaulted on their 401(k) loans, with those leaving 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 of the individual defaulting; the mean of the dependent variable is 86 percent.

[24] Ninety-five percent of the loans in our sample were 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.

[25] 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.

[26] Approximately 10% of plan sponsors allowed terminated plan participants to continue to repay their plan loans. However, in our dataset, only five percent took advantage of this feature (authors' calculation).

Regressors are identical to those in our previous examination of loan probabilities and amounts borrowed. In addition, we also control for the borrower's remaining outstanding loan balance.

Results on loan default patterns appear in Table 6. Unlike before, we see that permitting participants to take multiple loans has no influence on default rates. The statistically significant effects in Column 1 indicate that the young, low-income, and lower-wealth borrowers were more likely to default, though the coefficients indicate small economic magnitudes relative to the mean default rate. In Column 2, several interaction effects are significant, but the main effect on multiple loans is not, suggesting that having a multiple loan policy did influence loan defaults on job change. Loan interest rates were also not statistically significant, nor were the financial crisis flag and our measure of local labor market conditions.

*Table 6 here*

While allowing multiple loans had no influence on default rates, such a policy could still have a different impact on single versus multiple-loan borrowers. To better understand the role that plan design plays in influencing default behavior, we categorized borrowers into three groups: (1) those allowed only one loan; (2) those permitted to take multiple loans, but who had a single loan outstanding; and (3) those with multiple loans. Since we control for the aggregate loan balance of each borrower on termination of employment, the coefficients of these variables should be statistically insignificant if the variation of default rates across groups is solely due to loan balance. By contrast if we found a significant effect of these regressors, it would suggest a relationship between the number of loans allowed and default behavior. Results appear in Table 7. Here we see that employees permitted to take multiple loans but who held just one loan were significantly less likely to default. By contrast, those participants having multiple loans were more likely to default, with a marginal increase of 1.7 percentage points in the default rate (or a

relative change of 2 percent relative to an 86 percent mean default rate, controlling on borrower aggregate loan balances). In other words, given two participants with the same 401(k) total debt, the employee who took one loan is less likely to default, compared to a participant with multiple loans.

*Table 7 here*

These results imply that borrowers may exhibit some heterogeneity in their demand for credit or in their degree of self-control. For instance, participants with a single loan might have the foresight to anticipate a possible future default, or they might have more self-control, reserving the additional loan as a buffer for future borrowing. By contrast someone taking multiple loans might simply be more impatient; for instance, he may have taken out a first loan when first allowed to do so, but then as his account grew, he might have borrowed again. In other words, limiting the number of loans outstanding could lower default rates, though the effect is small.

Since default rates are rather widespread among those leaving jobs with a loan, yet few of our control variables have economically meaningful effects on the mean default rate of 86 percent, we conclude that other unobserved factors may be driving pension loan defaults. These could include financial illiteracy, discounting, or lack of self-control.[27] In our context, this could mean that many employees taking plan loans were simply unaware of the consequences of job termination for their 401(k) loans.

## VII. AGGREGATE LOAN LEAKAGE

[27] For instance, the least financially savvy tend to be unaware of how much debt they hold (Lusardi and Tufano (2009); also Agarwal and Mazumder (2013) show that financial mistakes are most prevalent for the least cognitively adept. Present-biased people are also more likely to have credit-card and general 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.

In recent years, several policymakers have proposed legislation to restrict retirement plan losses including plan loans.[28] In light of this interest, we use our empirical findings to estimate the aggregate amount of loan default leakage flowing from 401(k) plans annually.

The primary data source used to address 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 (USDOL 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,[29] yet 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 Labor Department'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 our main analysis). Accordingly, data on "deemed distributions" seriously 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 per year, or ten times the $600 million in "deemed" loan distributions.[30] This is smaller than the

[28]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).

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

[30] 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 (USDOL 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

leakage from account cash-outs on job termination of $74 billion (in 2006; GAO 2009) though not inconsequential. Assuming an effective tax rate of 10 percent and factoring in the 10 percent penalty associated with early distributions, we estimate that the tax revenue flowing to the U.S. Government associated with defaulted DC plan loans to be over $1 billion per year.

## VIII. CONCLUSION AND DISCUSSION

More than two decades 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 from their retirement accounts to cover short-term consumption needs (Vise, 2004). Although the idea of 401(k) credit cards faded under criticism, that proposal highlighted the dual-purpose nature of U.S. defined contribution plans. DC retirement accounts, which represent a growing fraction of US household wealth, are in essence dual-purpose, being used both to finance old-age retirement security and also to help cover current consumption needs. The loan feature is one of the prominent pre-retirement liquidity features of 401(k) plans permitting current spending.

Our study has focused on the effects of employer plan loan policy, and we conclude that loan policy is economically meaningful in shaping participant borrowing. In our dataset, one-fifth of plan participants had a loan at any given time, while almost 40 percent did so over a five-year period. Most importantly, when a plan allowed participants to take out multiple loans, participants were more likely to borrow in the first place, while individual loan amounts shrank. This suggests a buffer-stock approach to credit, similar to that found among users of credit cards. That is, given the ability to borrow multiple times, workers seem more willing to take the first

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that year. Extrapolating from our 1.3 million person sample provides an estimate of $6.3 billion 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 $7.1 billion, although it is unclear whether plan borrowing in non-401(k) plans is as high as in 401(k) plans.

loan when they retain slack borrowing capacity for future consumption shocks. Moreover, in multiple-loan plans, participants borrow greater amounts in aggregate, suggesting that they view the multiple-loan feature as an employer endorsement of borrowing. Although our paper has not explicitly evaluated a Modigliani-like proposal for a 401(k) credit card, a concern about enhancing 401(k) access is that it might boost this endorsement effect.

With our dataset we are uniquely able to assess loan default patterns. We show that nine of 10 loans are repaid, yet when workers with 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 finding implies that other factors, such as low financial literacy, impatience, or inattention, may be at work: many borrowers may simply be surprised by an unanticipated job change and its effect on an outstanding 401(k) loan. Another finding is that holding multiple loans at the time of job change is associated with more defaults, although the size of the effect is small. This effect is statistically significant after controlling for aggregate loan balances, implying unobserved heterogeneity of credit demand and self-control among these groups of borrowers. This phenomenon has not been previously documented in studies of credit card loan delinquency.

Finally, we 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, though it is still much smaller than retirement plan leakage due to account cash-outs on job termination.

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

workers do borrow from and default on their plans has led some to argue that 401(k) loans should be restricted.[31] Based on our results, those concerns seem overstated, particularly when compared to leakage from account cash-outs upon job change. We do, however, find that limiting the number of loans to a single one would be likely to reduce the incidence of borrowing and the fraction of total wealth borrowed, thereby reducing the impact of future defaults. Another option might be to limit the size and scope of loans in an effort to reduce the total dollars of loan default leakage.[32] For example, participant loans could be restricted to only a quarter of 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.

**ACKNOWLEDGEMENTS**

The research reported herein was performed pursuant to a grant from the U.S. Social Security Administration (SSA) funded as part of the Retirement Research Consortium. The authors also acknowledge support provided by the Pension Research Council/Boettner Center at the Wharton School of the University of Pennsylvania, and the Vanguard Group. Programming assistance from Yong Yu is also appreciated. Opinions and conclusions expressed herein are solely those of the authors and do not represent the opinions or policy of SSA, any other Federal agency, or any institution with which the authors are affiliated. Opinions and errors are solely those of the authors and not of the institutions providing funding for this study or with which the authors are affiliated.

[31] For instance, see Reeves and Villareal (2008), and Weller and Wenger (2008).
[32] Vanderhei's (2014) simulation results also indicated that retirement balances would be greatly increased if plan loan defaults were substantially reduced or eliminated.

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

| | Loan-Eligible Participants | Borrowers |
|---|---|---|
| *Outcomes of Interest* | | |
| % Participants taking new loan | 1.38 | N/A |
| Loan amount ($) | N/A | $7,841 |
| Aggregate Loan amount ($) | N/A | $9,969 |
| *Plan Factors* | | |
| % Multiple loans allowed | 48 | 57 |
| % Loan interest rate | 7.16 | 7.29 |
| *Demographic Controls* | | |
| Age | 44.68 | 41.58 |
| % AgeLT35 | 20.19 | 26.51 |
| % Age35-45 | 27.84 | 33.87 |
| % Age45-55 | 32.01 | 29.52 |
| % AgeGE55 | 19.97 | 10.11 |
| % Male | 51.81 | 44.91 |
| Tenure | 8.63 | 8.24 |
| % TenureLT2 | 17.88 | 15.24 |
| % Tenure2-6 | 29.71 | 33.2 |
| % Tenure6-12 | 28.08 | 29.03 |
| % TenureGE12 | 24.32 | 22.52 |
| *Financial Controls* | | |
| % IncomeLT35K | 7.97 | 13.86 |
| % Income35-87.K5 | 48.84 | 59.99 |
| % IncomeGT87.5K | 43.19 | 26.15 |
| % Low wealth | 42.97 | 64.92 |
| % Medium wealth | 31.24 | 24.79 |
| % High wealth | 25.79 | 10.29 |
| Account balance ($) | 86,541 | 44,482 |
| Ln Account balance ($) | 10.38 | 9.83 |
| *Macro Controls* | | |
| % Financial turmoil | 18.98 | 16.27 |
| % Lagged state unemployment rate | 5.31 | 5.27 |
| # 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; models include plan size and sector controls.

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

| | *Dep. variable: ln (New loan amount $)* | | *Dep. 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; models include plan size and sector controls.

**Table 4.** Default Patterns from 401(k) Loans: Full Period and by Year

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

**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 |

**Table 6.** Determinants of the Probability of Participants Defaulting on 401(k) Plan Loans Outstanding

| | *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; models include plan size and sector controls.

## Table 7. Determinants of the Probability of Loan Defaults: Extended Model

| | Estimate | (SE) | Marginal Effect |
|---|---|---|---|
| *Plan design factors* | | | |
| # loans allowed > 1, #loans taken > 1 (dummy) | 0.130** | (0.061) | 1.7% |
| # loans allowed > 1, #loans taken = 1 (dummy) | -0.193*** | (0.049) | -2.2% |
| Loan interest rate (%) | 0.010 | (0.006) | 0.1% |
| *Participant characteristics* | | | |
| Age 35-45 | -0.041** | (0.018) | -0.5% |
| Age 45-55 | -0.065** | (0.025) | -0.8% |
| Age > 55 | 0.002 | (0.030) | 0.0% |
| Male | 0.020 | (0.015) | 0.2% |
| Tenure < 2 years | 0.063* | (0.034) | 0.8% |
| Tenure 2-6 years | 0.062*** | (0.022) | 0.8% |
| Tenure > 12 years | -0.044* | (0.026) | -0.5% |
| Income < $35,000 | 0.069*** | (0.016) | 0.9% |
| Income > $87,500 | -0.115*** | (0.013) | -1.4% |
| Low wealth | 0.141*** | (0.013) | 1.7% |
| High wealth | -0.151*** | (0.017) | -1.7% |
| Ln (401(k) account balance) | -0.375*** | (0.016) | -1.8% |
| Ln Loan balance ($) | 0.255*** | (0.014) | 1.0% |
| *Macroeconomic variables* | | | |
| Financial turmoil period | -0.002 | (0.041) | 0.0% |
| Lagged state-level unemployment rate | -0.005 | (0.011) | -0.1% |
| Number of observations | 151,458 | | |
| Mean of dependent variable (%) | 0.86 | | |
| R-squared | 0.12 | | |

Source: Authors' calculations; models include plan size and sector controls.

**Figure 1.** Percentage of Participants with 401(k) Loans Outstanding

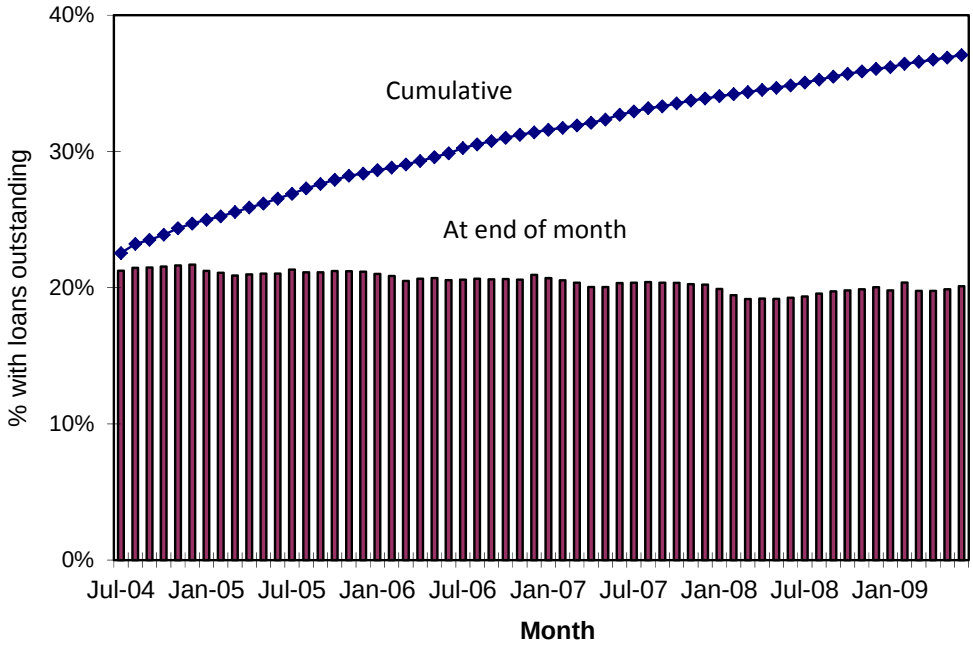
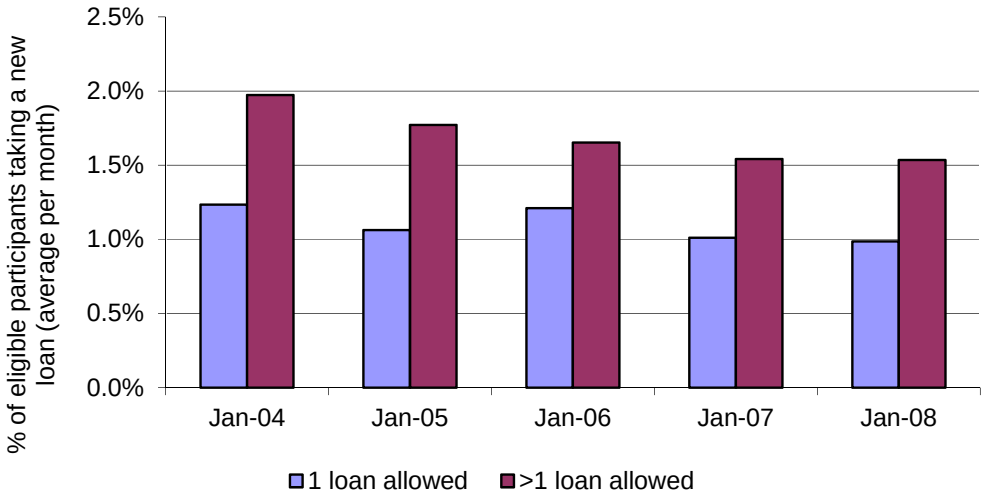


**Figure 2.** Loan Incidence by Number of Plan Loans



**Appendix Table 1.** Description of Explanatory and Control Variables

| Variables | Descriptions |
|---|---|
| *Plan design factors* | |
| Multiple loans allowed (dummy) | 1 if a plan permits participants holding multiple loans, 0 otherwise |
| Loan interest rate (%) | Plan loan interest rate charged by a plan in a given month |
| *Participant characteristics* | |
| Age < 35 | Reference group. 1 if a participant ages below 35 years, 0 otherwise |
| Age 35-45 | 1 if a participant ages between 35 and 45 years, 0 otherwise |
| Age 45-55 | 1 if a participant ages between 45 and 55 years, 0 otherwise |
| Age > 55 | 1 if a participant ages above 55 years, 0 otherwise |
| Male | 1 if a participant is male, 0 otherwise |
| Tenure < 2 years | 1 if a participant joins the plan less than 2 years, 0 otherwise |
| Tenure 2-6 years | 1 if a participant joins the plan from 2 to 6 years, 0 otherwise |
| Tenure 6-12 years | Reference group. 1 if a participant joins the plan from 6 to 12 years, 0 otherwise |
| Tenure > 12 years | 1 if a participant joins the plan longer than 12 years, 0 otherwise |
| Income < $35,000 | 1 if a particiant's household income is less than $35,000, 0 otherwise |
| Income $35,000 - $87,500 | Reference group. 1 if a particiant's household income is between $35,000 and $87,500, 0 otherwise |
| Income > $87,500 | 1 if a particiant's household income is more than $87,500, 0 otherwise |
| Low wealth | We use data from the IXI company to impute non-retirement household financial wealth at the ZIP+4 level. The data, which are categorical in nature, are collapsed into three groupings. The low wealth dummy takes value 1 if a participant has IXI imputed wealth less than $7,280, 0 otherwise |
| Medium wealth | Reference group. 1 if a participant has IXI imputed wealth between $7,280 and $61,289, 0 otherwise |
| High wealth | 1 if a participant has IXI imputed wealth more than $61,289, 0 otherwise |
| Ln (401(k) account balance) | The natural log of a participant's 401(k) account balance in a given month, standardized in 2010 dollar |
| Ln Loan balance ($) | The natural log of a 401(k) borrower's total outstanding loan balance in a given month, standardized in 2010 dollar |
| *Macroeconomic variables* | |
| Financial turmoil period | 1 if the time is between September 2008 and June 2009, 0 otherwise |
| Lagged state-level unemployment rate | In month t, the average state-level unemployment rate of months t-1, t-2, t-3 |
| *Other control variables* | |
| # plan participants | The number of plan participants in a given month, divided by 10,000 for normalization. Results not shown. |
| Industry dummies | We categorize plans in 10 different industries: manufacture, agriculture, transportation, finance, retail, media, business, education, public, and others. Each plan takes value 1 in its own corresponding industry, and 0 in others. The manufacture industry is treated as reference group. Results not shown. |

**Appendix Table 2.** Impacts of Plan and Plan Participant Characteristics on the Probability of Plan Offering Multiple Loans

| | Estimate (SE) | | Marginal Effect |
|---|---|---|---|
| # Plan participants | -0.000 | (0.001) | 0.0% |
| Plan average age | -0.007 | (0.011) | -0.3% |
| Plan standard deviation of age | -0.014 | (0.016) | -0.5% |
| Plan average tenure | 0.040** | (0.016) | 1.5% |
| Plan standard deviation of tenure | 0.004 | (0.019) | 0.1% |
| % Low income participants in plan (< $35,000) | 1.067 | (0.799) | 40.5% |
| % High income participants in plan (> $87,500) | -0.131 | (0.276) | -4.9% |
| % Low wealth participants in plan | -0.386 | (0.278) | -13.8% |
| % High wealth participants in plan | -0.010 | (0.369) | -0.4% |
| Industry Controls | | Yes | |
| Number of observations | | 822 | |
| R-squared | | 0.03 | |