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An Empirical Analysis of 401(k) Loan Defaults

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An Empirical Analysis of 401(k) Loan Defaults

Abstract

Many 401(k) pensions allow plan participants access to their pension saving before retirement via a plan loan. This paper investigates the determinants of defaults on such loans, using a rich dataset of over 100,000 participants who terminate employment with a plan loan outstanding. Overall, one in ten plan loans results in a default, and eight of ten workers who leave a job with a plan loan outstanding then default on that loan. Explanations relate to employee characteristics and plan design features: those with little non-retirement wealth, low income, and smaller 401(k) balances, are more likely to default than repay their loans at job termination. Moreover, borrowers with several smaller loans are more likely to default than are participants with a single loan of the same total size, perhaps due to heterogeneity in credit demand or lack of self-control. Local economic conditions have little impact on 401(k) loan defaults during the period we analyze.

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Many 401(k) retirement plans in the U.S. offer a loan feature which permits plan participants to access their pension saving prior to retirement. As of year-end 2008, 18% of defined contribution (DC) plan participants had a loan outstanding against their account, with a mean value borrowed of about \$7,200, or 16 percent of the average account balance (Holden, VanDerhei and Alonso, 2009). With a 401(k) loan, the principal balance plus interest must be repaid into the pension account over a period of time, through payroll deduction. But if an employee with a loan terminates employment, the loan outstanding balance is typically due and payable immediately. If the participant fails to pay the outstanding balance of the loan into the pension account, the loan is considered in default and the participant is subject to income tax (and a 10% penalty) on the outstanding balance. In effect, an unpaid loan is treated as a permanent, taxable distribution from the retirement account.

An important retirement policy question pertinent to 401(k) loans is whether they pose an undue risk to retirement security (USGAO, 2009). “Deemed distributions” due to loan defaults amounted to some \$600 million in 2007, representing 0.2 percent of \$3.7 trillion in assets held in DC plans (USDOL, 2009). Loan defaults in aggregate terms are thus small, compared to total assets held in DC plans. Yet at the same time, loan defaults may be costly for particular groups of participants such as the economically vulnerable or financially unsophisticated.

To explore the determinants of loan defaults in 401(k) plans, we analyze a unique dataset consisting of over 100,000 retirement plan participants who terminated employment with a pension loan outstanding, during the three-year period July 2005-June 2008. This file is drawn

from a larger set of almost one thousand 401(k) plans and 1.5 million participants used in our earlier analysis of loan adoption behavior (Lu and Mitchell, 2010). During this three-year period, on average one out of five active participants¹ had a loan outstanding, and 12% of loan holders (i.e., about 2% of participants) terminated employment with a 401(k) loan outstanding in a given year. Among 401(k) plan borrowers terminating employment, approximately 80% defaulted on their loans and 20% repaid them. In other words, over this three-year period, approximately 10% of all those with 401(k) loans (i.e., 80% of 12%) defaulted each year at the time of termination of employment. We also compare loan defaulters at the termination of employment with those who repaid their loan at that time. Not surprisingly, participants who defaulted on their loan were more likely to have larger loan balances than those who repaid; defaulters also had lower household incomes, smaller 401(k) balances, and lower non-pension financial wealth. This suggests that loan defaults may arise from liquidity constraints around the time of employment termination.

Other plan and participant factors also matter. For instance, participants leaving their employer having multiple loans outstanding are more likely to default, compared to those with a single loan (even after controlling for total amount borrowed and demographics). This suggests that there is unobserved heterogeneity in credit demand or in behavioral factors such as self-control, among plan borrowers. Thus participants who taking out one large loan may be more likely to plan for the need to repay, in the event of job termination. Alternatively, participants with several loans might fail to plan ahead, and thus take several small loans as the need arises, or perhaps they keep borrowing as their plan balance rises over time. In other words, having a

¹ Active participants are those employees making plan contributions (or eligible to make contributions).

one-loan per person limit might protect participants from accumulating more debt than they otherwise might.²

We also explore the effect of broad economic conditions on the decision of loan default. In an economic downturn, two possibly countervailing influences could alter loan defaults. First, in a recession, the chance of being laid off rises, which could lead to higher 401(k) loan defaults. Second, the likelihood of voluntary job changes falls, which could reduce loan defaults. We use state-by-state monthly unemployment rates as a means to estimate the impact of macroeconomic conditions on loan default rates. We find that higher unemployment rates are associated with fewer loan defaults, but the effect is economically insignificant. (Our analysis period only covers the beginning period of the 2008-2009 recession, and so we cannot draw firm conclusions about the full impact of the present recession.)

In what follows, we first discuss related previous studies. We then describe our dataset and empirical strategy, following which we outline results. A final section concludes.

Prior Studies

The present study adds to a growing literature on 401(k) loans. In a recent study which uses data from the Health and Retirement Survey (HRS), Li and Smith (2009) report that some households carry expensive credit card debt, yet they fail to borrow from their 401(k) plan despite their lower interest rates. In effect, they argue that some households would pay less for borrowing, if they availed themselves of their 401(k)s instead. Nevertheless, those authors do not explicitly model the potential impact of loan defaults on eventual retirement accumulation. In a related study, Lu and Mitchell (2010) explore borrowing from one's plan, and they find that

² Under federal law, participants may borrow generally the lesser of 50% of their account balance or \$50,000. A participant with a \$1,000 account balance may borrow \$500; if the plan allows multiple loans, the participant may then borrow another \$500 after accumulating an additional \$1,000 in savings.

401(k) borrowers are more likely to be liquidity-constrained compared to non-borrowers in that they have lower incomes, smaller 401(k) balances, and less non-retirement financial wealth. They also note that 401(k) borrowers maintain a precautionary buffer when borrowing from themselves: people permitted to take several loans are more likely to borrow smaller amounts, and have more loans outstanding. Those authors also model loan default behavior and predict that taking a 401(k) loan and defaulting on it when employment is terminated can be optimal if other credit options are expensive.

Using survey data, Utkus and Young (forthcoming) link the incidence of plan borrowing to workers' levels of financial literacy, as well as demographic and other household attributes. They find that plan borrowing is more pronounced among the least financially literate; furthermore, loan takers contribute at lower rates to their retirement plans, have lower non-retirement wealth, and are less likely to pay off credit card debt each month. They interpret these results as indirect evidence that 401(k) borrowing is associated with impatience in financial decision-making. Other 401(k) loan studies mainly focus on how loan provisions enhance plan participation and plan contribution rates. For example, GAO (1997), Mitchell, Utkus and Yang (2007), and Holden and VanDerhei (2001), among others, report a moderate increase in participation and/or contribution rates when 401(k) plans offer a loan feature.

There is another, related, literature on household behavior in the credit card and bankruptcy field, though it does not touch on 401(k) plan borrowing. Thus Gross and Souleles (2002a, b) analyze individual credit card accounts to investigate the determinants of default rates and they also find evidence of buffer-stock behavior, similar to that identified above in 401(k) loans.

The Empirical Setting

Our dataset is drawn from 401(k) recordkeeping data provided by Vanguard, one of the leading DC plan recordkeepers, covering the three-year period July 2005-June 2008. Because of our interest in loan default behavior at employment termination, we utilize a set of 959 pension plans containing timely data on employment and plan status including employment termination. The dataset includes a number of participant demographic and 401(k) account measures (c.f. Lu and Mitchell 2010); it also includes a complete history of participant loan behavior, including date of loan initiation, loan terms (such as interest rate), loan amounts, loan repayment history, and, if relevant, information on loan defaults (including date of default and defaulted amounts).

Our empirical analysis focuses on participants at the time of employment termination. While the vast majority of those participants either pay off or default on all of their outstanding loans, slightly fewer than 2% of them pay off some of their loans and default on the remainder. If a borrower defaults on at least one of his loans, we classify him as a "defaulter."³ One important aside is that our dataset excludes plans that changed recordkeepers during the three-year period; we also eliminate participant records associated with any "divisional out" transfer in the period (e.g., when a division is sold and participant records are moved to some other recordkeeper). Retaining those plans or records would result in underestimates of the default rate, as we would observe participants taking loans but not have full records of their default behavior.⁴

³ Borrowers who leave employment with multiple loans outstanding are counted as a single observation.

⁴ There is no data element indicating whether a participant account was part of a divisional transfer-out. We therefore estimate a "partial transfer-out rule" as follows. For each plan, we calculate the monthly average number of participants that leave the system with a loan outstanding. If in a given month t , the number of such terminations of a plan is more than 100, and is higher than two times of its average monthly terminations, we determine that the plan has a 'partial transfer-out' in that month. As a result, we delete all the observations from that plan in month t . The main purpose of this arbitrary rule is to reduce the downward bias of the default rate. A clear drawback of this approach is that we may mis-identify plan-wide layoffs as partial transfer-out. Another possibility is that some borrowers may terminate in the month of a transfer-out. If the majority of the observations that we deleted fall in these two cases, the default rate of the remaining sample and the sample that is determined as 'partially transferred-out' should be somewhat similar. Yet we find that among the 103,991 loan records that are still in our sample, 81%

The analysis sample for much of the analysis includes 103,991 participants leaving employment with at least one loan outstanding. Table 1 reports summary statistics for the sample; we also compare them with all 401(k) borrowers and with 401(k) participants generally. Compared to other plan borrowers, those who terminate employment with a loan outstanding appear to be somewhat younger, have shorter job tenure, and have lower plan balances. Those who default on their loans at the time of job termination have lower incomes, lower 401(k) balances, and lower non-retirement wealth, than do those who repay their loans on job termination.

Table 1 here

Table 2 provides several measures of default behavior. Approximately one-fifth (20%) of active participants had a loan outstanding from their 401(k) plan in any given year, averaged over our three-year observation period. Each year, an average of 11.9% of participants with a loan outstanding terminated employment; about 80% of those terminating employment with a loan, or 9.6% of 401(k) borrowers, defaulted on their loan at job termination.

Table 2 here

Empirical Strategy

To analyze the determinants of 401(k) loan defaults, we compare those terminating employment and defaulting on their 401(k), with those terminating employment and repaying their loan in full. We estimate the following multivariate linear model:

$$D_{i,j,t} = \alpha' X_{i,t} + \beta' Z_{j,t} + \nu_i + \eta_j + \tau_t + \varepsilon_{i,j,t}, \quad (1)$$

where $D_{i,j,t}$ is a binary variable, taking value 1 if a participant i of plan j who leaves his job in month t with loans outstanding eventually defaults at least one of his loans, and 0 otherwise.

are shown to be defaulted, while the default rate is only 38% among the ‘partially transferred-out’ observations. This result suggests that we are doing a relatively good job in identifying partial plan transfer-outs.

$X_{i,t}$ is a matrix representing borrower characteristics, including household income, 401(k) account balance, a measure of non-retirement financial assets, the outstanding loan balance, and whether the participant is registered to use the internet to access their 401(k) account (which we take as a proxy for engagement). We also include other individual characteristics such as the borrower's age, gender, and plan tenure. $Z_{j,t}$ is a matrix of plan-level controls. These include the number of loans allowed by each plan; peer characteristics, such as plan-average age, tenure and household income; the number of participants in a plan (a proxy for firm size); and industry dummies. Finally, as a robustness check, we re-run the regression clustering at the plan level.⁵

An expanded model of loan determinants considers two additional elements. The first is a more detailed analysis of the interaction of plan design with default behavior. While most plans only allow participants to have only one loan outstanding, some plans allow participants the option of taking two, three or more loans. As shown in Table 3, participants with multiple loans outstanding when they leave their jobs have a default rate of 94%, while those with only one loan outstanding have a much lower default rate of 77%. We further differentiate this second group of borrowers into those in plans that only permit one loan, and those allowed to take multiple loans. The default rate of the latter sub-group--i.e., the borrowers who can hold multiple loans, but only have one loan outstanding when they terminate the plan--is even lower, at 74%. To better understand the role that plan design plays in influencing default behavior, we categorize borrowers into three groups: (1) those who are only allowed to have one loan; (2) those who are permitted to take multiple loans, but only have one loan outstanding; and (3) those who have multiple loans. Since we control for the aggregate loan balance of each borrower when

⁵ Our original specification included monthly dummies as a control for time effects. However, a common practice among plans is to provide updated information on loan defaults on a quarterly basis and at the end of the year. As a result, we utilize a time flag that is set to 1 for the first calendar month of each quarter and for all Novembers and Decembers. For all the other months, the time flag is set to 0.

terminating employment, the coefficients of these variables should be statistically insignificant if the variation of default rate across these groups can be solely explained by the difference of loan balance. By contrast, if we find a significant effect for these regressors, it suggests a relationship between the number of loans allowed and default behavior.

Table 3 here

The second aspect of our expanded model models the relationship between macroeconomic conditions and default behavior. In economic recessions, employees are more prone to involuntarily lose their job, making it more difficult to pay off a 401(k) loan that is due and payable. Conversely, employees are more likely to stay with their current employers during an economic downturn, reducing the likelihood of loan defaults. These two effects work in the opposite direction. We use monthly state-by-state unemployment rates to estimate the effect of local economic conditions. Nevertheless, the default date in our dataset often lags the month of termination so there is some imprecision in the dating of the specific default date. In most cases, defaults are recorded in the next quarter after job terminations occur, so we use a three-month lagged average unemployment rate at the state level as the regressor.⁶

Combined, the expanded model is now as follows:

$$D_{i,j,t} = \alpha' X_{i,t} + \beta' Z_{j,t} + \lambda H_{i,t} \times P_{j,t} + \gamma E_{i,t} + v_i + \eta_j + \tau_t + \varepsilon_{i,j,t}, \quad (2)$$

where $H_{i,t} \times P_{j,t}$ indicates the interaction of whether multiple loans are held by the borrower, and whether multiple loans are permitted by the employer. $E_{i,t}$ denotes the economic factor.

Empirical Results on the Probability of Loan Defaults

Table 4 provides results from the simpler baseline model for plan loan defaults, while Table 5 presents results from the expanded model. Evidently, as is seen in Table 4, employees'

⁶ We also experimented with a simple three-month lagged unemployment rate, the one-month lagged rate, and the current month rate as robustness checks. Results are similar to those reported here.

non-retirement wealth is the most powerful determinant of 401(k) loan defaults, indicative of people's lack of liquid assets to repay their loans at the time of job termination. The effect is also economically meaningful relative to a mean default rate of 80%: having little non-retirement financial wealth means the worker is 9 percentage points more likely to default at job termination, compared to those with more other wealth. Other statistically significant factors include household income -- participants with household income below \$45,000 are three percentage points more likely to default on a loan; and the value of the 401(k) balance -- a doubling of the participant's account balance means a four percentage point reduction in the probability of default. The size of the borrower's aggregate loan balance is also important: a 100% increase in the loan balance means a four percentage point increase in the loan default rate.

Tables 4 and 5 here

The baseline model uses the number of loans permitted by each plan as a regressor, and results in Panel B of Table 4 suggest that allowing one more loan *decreases* the probability of default by 0.1 percentage point (though the estimate is statistically and economically insignificant). Incorporating an interaction between the number of loans held versus those allowed (Panel B of Table 5) shows that employees permitted to take multiple loans but who only hold a single loan are significantly less likely to default. By contrast, those with multiple loans are more likely to default: a marginal increase of four percentage points in the default rate, or a relative change of 5% (four points relative to an 80% default rate), controlling on borrower aggregate loan balances. In another word, for two participants with the same 401(k) total debt, the participant who borrows once is less likely to default, compared to the participant borrowing multiple times.

This result suggests some heterogeneity of preferences in either the demand for credit or in self-control among borrowers. For example, participants who take a single loan might have the foresight to anticipate the likelihood of a possible future default; perhaps they also exhibit self-control by reserving an additional loan as a buffer for future borrowing. As another potential explanation, individuals who take out multiple loans might simply be impatient in all spheres; for instance, they might take out a first loan when permitted under plan rules, and then, as their account grows, they then take a second. Future research exploiting the time series feature of our dataset may be able to disentangle which of these or other explanations underlies this finding.

The impact of local economic conditions is captured in Panel C of Table 5. Higher unemployment rate actually correlates with lower loan default rate, and the effect is statistically significant at 5% level. However, a one percentage point increase in the local unemployment rate is only correlated with a 0.2 percentage point decrease in the loan default rate, which is economically insignificant. It appears that, at least for the time period we analyze, the impact of lower job turnover (leading to a reduced possibility of default) more than offsets the impact of layoffs (leading to unexpected unemployment and higher loan defaults). As our study period does not encompass the 2008-2009 recession and the large jump in unemployment that ensued, our results are not necessarily indicative of results over the entire downturn.

Conclusions

To our knowledge, our analysis is the first microeconomic assessment of loan default patterns in 401(k) plans. Using a unique panel data set of more than 100,000 participants terminating employment with a loan outstanding, we show that about one in ten 401(k) loans results in a default, and four of five of these participants default on their 401(k) loan; only 20% repay the loan at the time of job termination. Our analysis allows us to disentangle the effects of

participant demographics, plan features, and economic conditions on the probability of a 401(k) loan default. Consistent with earlier evidence on credit card borrowers, we find that similar factors help determine 401(k) loan defaults. Not surprisingly, households with nonretirement assets default less, probably because they have assets to repay a plan loan at the time of job termination. Default rates are also positively higher for participants with lower account balances, lower incomes, and who have borrowed larger amounts. In general, it is not surprising that 401(k) default behavior is associated with household liquidity constraints.

Unlike the case of credit card defaults, 401(k) loan defaults appear largely unaffected by a decline in economic conditions, in our study measured by state-by-state unemployment rates. From our results, it seems that while a deterioration in economic conditions raises involuntary job terminations and thus the probability of 401(k) loan defaults, at the same time a poor labor market leads to fewer voluntary job changes and a decline in 401(k) loan defaults. The two effects seem largely offsetting. However, our results do not encompass the full impact of the entire 2008-2009 recession. One particularly important finding is that holding multiple loans is associated with more defaults; further, the effect is statistically and economically 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 documented in previous studies of credit card delinquency, and it is worthy of future research. The tendency to borrow multiple small amounts may be indicative of impatience in decision-making, a theme also observed in other research on 401(k) loan behavior generally.

Our research has several practical and policy implications. While plan loans do appear to enhance plan participation and contribution rates by relaxing the illiquidity associated with tax-deferred DC accounts, our results indicate that nine in ten loans are repaid, but one in ten does

result in a default reducing the borrower's dedicated retirement wealth. Accordingly, one potential way to lower default rates at the margin might be to limit the number of loans outstanding, so that borrowers could only take one loan at a time (of course they could repay a smaller loan to take a bigger one). A second possibility would allow participants to continue to repay 401(k) loans even after job change, since more loan defaults occur at the time of job termination. Yet in light of our finding that loan defaulters are liquidity constrained, such a regulatory change might be useful only for participants who immediately move to a new employer and are financially able to make the loan repayments. Moreover, this change would raise administrative costs and require additional loan recordkeeping, since loan holdings at the prior employer would have to somehow be integrated with loan rules governing the new 401(k) plan, to avoid excessive borrowing from retirement accounts. A third option might be to reduce the size and scope of loans, for instance allowing participants to borrow only 25% of their account balances instead of 50% as now. Estimating the full impact of such policy changes is outside the scope of our current effort and would require additional research on how they would influence contribution behavior.

To date, our analysis of 401(k) loan default behavior focuses on participants with a loan outstanding who leave their jobs. In the future we will explore the broader question of how defaulters at job change compare with all who take a loan, including those who repay their loans while continuing to work for the same employer. Another interesting question is how those who default or repay loans compare with 401(k) participants who never borrow at all. Our results suggest that certain intangible variables not captured in recordkeeping data may play a role, such as impatience and self-control regarding financial matters. Future research is likely to benefit

from efforts to integrate survey data with administrative records, to provide a more comprehensive understanding of 401(k) loan-taking, repayment patterns, and default behavior.

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Table 1. Sample Characteristics

	Participants terminating employment with a loan			Participants with a loan outstanding	All participants
	Defaulting	Repaying	All		
<i>n</i> =	83,894	20,097	103,991	870,775	4,350,832
<i>Demographic variables</i>					
Age (mean)	42.0	44.1	42.4	44.0	43.5
Household Income (mean)	\$67,970	\$82,688	\$71,040	\$72,315	\$83,127
Plan Tenure (mean)	8.1	8.8	8.2	10.6	8.1
Male (%)	46%	45%	46%	51%	50%
Female (%)	34%	27%	32%	36%	34%
Sex Missing (%)	20%	28%	21%	13%	16%
<i>401(k) account variables</i>					
Account Balance (\$)	\$39,046	\$79,125	\$46,385	\$70,904	\$80,555
Loan Balance (\$)	\$6,542	\$7,714	\$6,760	\$8,713	N/A
Number of Loans Allowed	1.7	1.7	1.7	1.7	1.6
Number of Loans Taken	1.3	1.1	1.2	1.3	N/A
Web Registered	63%	62%	63%	69%	59%
<i>Non-retirement wealth</i>					
Low wealth (%)	63%	45%	60%	56%	43%
Medium wealth (%)	28%	35%	29%	33%	35%
High wealth (%)	9%	20%	11%	12%	21%

This table reports mean characteristics for some of the key variables in our study. Our sample consists of all active participants who terminate their jobs with at least one loan outstanding over July 2004-June 2009. We record these variables as of the participants' final appearance in our monthly panel data. Household income is a categorical variable; account balance is the dollar amount accumulated in the participant's retirement account; loan balance is the participant's accumulated dollar amount of loans outstanding when he terminates his job. Non-retirement wealth is dichotomous, with 'low wealth' set to 1 if household non-retirement wealth is less than \$7,280; medium wealth if between \$7,280 and \$61,289, and high wealth if above \$61,289. Web registered =1 if a participant has web access to his account (0 else); the number of loans allowed refers to the maximum number of loans permitted in the plan. Source: Authors' calculations.

Table 2. 401(k) Loan Default Patterns

	July 05 - June 06	July 06 - June 07	July 07 - June 08	Three-year average	Three-year total
No. active participants on June 30	1,311,188	1,450,776	1,588,868	1,450,277	4,350,832
No. active participants on June 30 with loan outstanding	269,559	295,248	305,968	290,258	870,775
% of active participants with loan outstanding	20.6%	20.4%	19.3%	20.1%	20.0%
No. participants terminating with loan July 1 - June 30	32,654	33,983	37,354	34,664	103,991
% of loan holders terminating with loan	12.1%	11.5%	12.2%	11.9%	11.9%
<i>Default behavior</i>					
No. participants terminating with a loan and defaulting	26,608	27,671	29,615	27,965	83,894
Default rate as % of those terminating with loan	81.5%	81.4%	79.3%	80.7%	80.7%
Default rate as % of those with loan outstanding	9.9%	9.4%	9.7%	9.6%	9.6%

This table reports summary statistics on loans and defaults in our sample; see text.

Table 3. Default Rates across Groups

Year	Fully Default Rate (%)	Partial Default Rate (%)	Fully Pay Off Rate (%)
#Loans Allowed =1	78.9	--	21.1
# Loans Allowed > 1, # Loans Taken = 1	73.6	--	26.4
# Loans Allowed > 1, # Loans Taken > 1	94.3	1.3	4.4

This table reports the default rates of participants by the number of loans allowed and number of loans taken. Row 1 indicates participants in plans that only permit one loan. Row 2 indicates participants in plans that allow multiple loans but who only have one loan outstanding when they leave their jobs. Row 3 indicates participants with multiple loans outstanding. Column 1 shows the percentage of participants in each group who default all of their loans. Column 2 shows the percentage of participants in the third group who default on some, but not all of their loans. Column 3 shows the percentage of participants in each group who fully repay all of their loans.

Table 4. Empirical Analysis of 401(k) Loan Defaults: Baseline Model

Variable	OLS results of Who defaults their loans
Panel A: Wealth Effect	
Household Income<45,000	0.030 (0.003)
45,000=<Household Income<87,500	0.023 (0.003)
Ln Account Balance	-0.064 (0.001)
Ln Loan Balance	0.059 (0.001)
Low IXI Wealth (%)	0.093 (0.004)
Medium IXI Wealth (%)	0.064 (0.004)
Panel B: Plan Characteristics	
# Loans Allowed	-0.001 (0.002)
Panel C: Control Variables	
Age <25 (%)	-0.012(0.006)
Age 25-35 (%)	-0.009(0.003)
Age 45-55 (%)	-0.012(0.003)
Age ≥55 (%)	-0.012(0.003)
Male	-0.003(0.002)
Plan tenure<2 years	0.046(0.004)
2 years≤plan tenure<4 years	0.029(0.003)
4 years≤plan tenure<6 years	0.022(0.003)
6 years≤plan tenure<8 years	0.022(0.003)
Web registered	-0.027(0.002)
Control for # of Plan Participants	Yes
Control for Industry	Yes
Control for Plan AVG. Characteristics	Yes
Control for Time Flag	Yes
Number of Observations	103,991
Mean of Dependent Variable	0.807
R-Square	0.294

This table reports OLS coefficient estimates (standard errors in parentheses) from the baseline multi-level linear probabilistic model. Column 1 reports coefficients for the probability of a borrower defaulting on his 401(k) loan in month t , conditional on a job termination. (The dependent variable = 1 if a participant defaults on at least one of his loans, 0 else). Means of independent variables appear in Table 1; the natural log of the account balance and the aggregate loan balance are used here. (If the account balance is less than \$1, the log account balance is set to 0). The reference group for the household income is participants with household income over \$87,500; the high IXI wealth group is the reference group for the IXI wealth categories. Age 35-45 is the reference group for the age indicators; plan tenure over 8 years is the reference group for tenure. The model also includes the number of plan participants, industry controls, plan average age, tenure, and household income, and a time flag.

Table 5. Empirical Analysis of 401(k) Loan Defaults: Expanded Model

Variable	OLS results of Who defaults their loans
Panel A: Wealth Effect	
Household Income<45,000	0.028 (0.003)
45,000=<Household Income<87,500	0.022 (0.003)
Ln Account Balance	-0.063 (0.001)
Ln Loan Balance	0.055 (0.001)
Low IXI Wealth (%)	0.090 (0.004)
Medium IXI Wealth (%)	0.063 (0.004)
Panel B: Number of Loans Effect	
# Loans Allowed > 1, # Loans Taken = 1	-0.011 (0.003)
# Loans Allowed > 1, # Loans Taken > 1	0.037 (0.002)
Panel C: Economic Factor	
Lagged Avg. Unemployment Rate	-0.002(0.001)
Control for Demographic Factors	Yes
Control for Firm Factors	Yes
Control for Plan AVERAGE Characteristics	Yes
Number of Observations	103,991
Mean of Dependent Variable	0.807
R-Square	0.296

This table reports the OLS estimates from a complete multi-level linear probabilistic model; for variable definitions see Table 4.