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Abstract

Despite news reports suggesting a rise in 401(k) borrowing in recent years, we find that the share of eligible households with 401(k) loans in the 2007 Survey of Consumer Finances was about 15 percent, roughly what it has been since 1995. We find that the best predictors of 401(k) borrowing appear to be the presence of liquidity or borrowing constraints and the size of 401(k) balances relative to income. Since the ongoing financial crisis has likely caused these factors to move in opposite directions, the predicted effect of the crisis on 401(k) borrowing is ambiguous. More fundamentally, we find that many loan-eligible households carry relatively expensive consumer debt that could be more economically financed via 401(k) borrowing. In the aggregate, we estimate that such households could have saved as much as $5 billion in 2007 by shifting expensive consumer debt to 401(k) loans. This would translate into annual savings of about $275 per household—roughly 20 percent of their overall interest costs—with larger reductions for households that carry consumer debt at high interest rates or who hold larger 401(k) balances. We posit that households might utilize 401(k) loans less than expected due to risk-aversion, self-control problems, and confusion about the potential gains, and suggest better financial education that clarifies the conditions under which 401(k) borrowing is advantageous. Finally, we note that allowing households to repay 401(k) loans gradually even after separation from their employers could improve household welfare by reducing the risks of 401(k) borrowing.

JEL classification: E21; G23; H24

Keywords: 401(k) loans; household debt; optimal borrowing; double taxation.

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1 Introduction

Over the past two decades, 401(k) accounts have become the dominant form of retirement plan for American workers, covering 70 million people and representing $2.8 trillion in assets in 2006 (U.S. Dept. of Labor (2008)). A relatively little-studied aspect of these plans is the loan feature, which allows many participants to borrow easily against their plan balances. The tax code limits the size of 401(k) loans to the lesser of $50,000 or 50% of the vested plan balance.[1] In general, loans must be repaid within five years, though loans for the purchase (not refinance) of a principal residence may be repaid over a longer period (e.g., 15 years).[2] Repayments are typically made via payroll deduction, but outstanding balances generally must be paid within 90 days of separation from the employer. As long as the repayments are made there are no taxes or penalties assessed on the loan. However, if the loan is not repaid on time (e.g., if the borrower separates from the employer and does not repay within 90 days), the loan is treated as a standard withdrawal and subject to tax at the ordinary income tax rate plus (if the borrower is under age 59-1/2) a 10 percent penalty.[3] Repayments include interest, typically the prime rate or prime plus one percentage point, which is paid into the account.

Should households borrow from their 401(k) accounts? The key advantage of a 401(k) loan is that it reduces the need for paying interest to outside lenders. Indeed, since the "borrowed" assets are already owned, a 401(k) loan is really just a withdrawal coupled with a schedule of replenishing contributions (with interest). A secondary advantage is that the transaction costs are typically quite low. Nonetheless, many financial advice publications discourage 401(k) borrowing, citing a number of reasons to be wary.[4] For example, there is an opportunity cost to 401(k) borrowing because asset returns on the borrowed amount are foregone while the loan is outstanding.[5] The opportunity cost could be higher than the cost of an outside loan, particularly if interest on the outside loan is tax-deductible (e.g., many mortgages and home-equity loans).[6] In addition, as noted above, borrowers who quit or lose their jobs generally must pay back the loan within 90 days or pay income

[1] However, the 50% cap is subject to a floor of $10,000; that is, a participant with a balance of $10,000 or less can borrow all of it. Thus, borrowing ability increases with account size for accounts between $20,000 and $100,000. From 2005 to 2007, the loan limits were increased to the lesser of 100% of the vested plan balance or $100,000 for qualified borrowers affected by Hurricanes Katrina, Rita, or Wilma. As noted below, many plans also impose minimum loan amounts.

[2] As noted below, residence loans make up a very small percentage of outstanding 401(k) loans.

[3] Technically, the repayment is due immediately upon separation, but plans typically allow a 90-day grace period before designating the loan as in default and hence deemed a distribution.

[4] For example, see Applegarth (2008) and Weller and Wenger (2008).

[5] Naturally this could turn out to be an advantage as well if asset returns are negative over the repayment period.

[6] A further argument is sometimes made that 401(k) loans are "double-taxed" because the repayments are made with after-tax dollars and withdrawals in retirement are also taxed. We show below that the loans are not double-taxed.

tax plus a 10 percent penalty on the loan amount. But more fundamentally, some worry that 401(k) borrowing simply encourages over-consumption, undermining retirement savings goals either indirectly (via unnecessary consumption) or directly (via reduced regular 401(k) contributions or defaulting on repayments).[7]

Nonetheless, to finance a given amount of consumption, many households would be better off using their own 401(k) assets than borrowing from an outside lender. That is, a 401(k) loan can be significantly cheaper than other types of borrowing—particularly credit-card borrowing, which frequently carries interest rates of well over 15 percent. Thus, under the conditions we discuss below, 401(k) borrowing can indeed be advantageous to household balance sheets.

To what extent do households actually borrow from their 401(k) accounts? The Transamerica Center for Retirement Studies (2008) reports that the share of 401(k) participants holding a loan jumped from 11 percent in 2006 to 18 percent in 2007, and the share reporting they took a loan "to pay down debt" increased significantly from 27 percent to 49 percent (while the share reporting loans for other purposes declined). The Transamerica study attributes the increase in 401(k) borrowing to declining economic conditions.[8]

We find that the share of eligible households with 401(k) loans in the 2007 Survey of Consumer Finances was about 15 percent, roughly what it has been since 1995. We do, however, find an increase in the share of 401(k) borrowers reporting they took their loan for debt consolidation.[9] We find that the best predictors of 401(k) borrowing appear to be the presence of liquidity or borrowing constraints and the size of 401(k) balances relative to income. Since the ongoing financial crisis has likely caused these factors to move in opposite directions—tighter borrowing constraints combined with significantly lower 401(k) balances—the predicted effect of the crisis on 401(k) borrowing is ambiguous.[10]

A more fundamental finding of our study is that many 401(k)-loan-eligible households carry relatively expensive consumer debt that could be more economically financed via 401(k) borrowing. In the aggregate, we estimate that such households could have saved as much as $5 billion in 2007 by shifting expensive consumer debt to 401(k) loans. This would translate into annual savings of about $275 per household—roughly 20 percent of

[7]Presumably with this type of concern in mind, Senator Charles Schumer introduced a bill in 2008 that would prohibit 401(k) loans made through "any credit card or any other intermediary" and would restrict the number of permissible outstanding loans to three. The bill was in response to the introduction by Reserve Solutions of a debit card linked to users' 401(k) accounts (see Lieber (2008)).

[8]Another possible factor in the change from 2006 to 2007 is a change in Transamerica's survey methodology from a telephone survey of 1,400 households in 2006 to an online survey of 2,000 households in 2007. While the online survey attempts to adjust for potential sample selection issues, it is difficult to control completely for changes in sample selection.

[9]In our data, the share of 401(k) borrowers reporting a loan for "investment or debt consolidation" increased from 36 percent in 2004 to 52 percent in 2007.

[10]Trejos (2009) reports that the average 401(k) balance fell about 27 percent in 2008, and the share of participants taking a 401(k) loan fell slightly, relative to 2007.

their overall interest costs—with larger reductions for households that carry consumer debt at high interest rates or who hold larger 401(k) balances.

We propose that this apparent puzzle—why households would not take the opportunity to reduce their interest costs by 20 percent or more—is an indication of either a willingness to pay to avoid the risks of 401(k) borrowing, or a common financial mistake. We posit several reasons why households might choose to borrow less than expected from 401(k) plans. They may be rationally averse to the risk of losing their jobs and having to pay back the loan in a short time frame. They may be expecting higher 401(k) returns than the after-tax interest they're paying on outside loans (or, at least, averse to the risk of such a scenario). They may rationally acknowledge self-control problems in spending by walling off 401(k)s in a separate mental account that is unavailable for current consumption. Alternatively, they may simply be making a mistake—for example, they may be confused about the potential advantages of 401(k) borrowing, or they may carry a credit card balance despite their intention to pay it off in full every month.

We conclude that households could benefit from financial education that clarifies the conditions under which 401(k) borrowing could be advantageous for them. For example, potential 401(k) borrowers might be presented with a "checklist" such as the following:

1. If you did not borrow from your 401(k), would you borrow that money from some other source (e.g., credit card, auto loan, bank loan, home-equity loan, etc.)?

2. Would the after-tax interest rate on the alternative (non-401(k)) loan exceed the rate of return you can reasonably expect on your 401(k) account over the loan period?

3. Would you be able to make your 401(k) loan payments without reducing your regular 401(k) contributions?

4. Are you comfortable with the requirement to repay any outstanding loan balance within 90 days of separating from your employer, or pay income tax and a 10 percent penalty on the outstanding loan?

If the participant can answer "yes" to all four questions, the 401(k) loan could be advantageous to them; otherwise, other options might be better.

Finally, we note that allowing households to repay 401(k) loans gradually even after leaving their jobs could make households better off by significantly reducing the risks of 401(k) borrowing. A major risk is unexpected separation from the employer, which typically requires the repayment of a loan within 90 days. In the event of a job loss, this requirement could be quite damaging, given the high marginal value of income during unemployment. Even in the event of a job change, the lump-sum payment can be costly, relative to the amortized repayment that the borrower enjoyed before separation. These outcomes can cause significant hardship to uninformed borrowers. Moreover, they are costly ex-ante even to fully informed forward-looking participants, because the risk of unexpected job loss will

increase the amount of outside interest a risk-averse household would be willing to pay in order to avoid the 401(k) loan.

We note two 401(k) design changes that would reduce this risk. First, 401(k) loans could be made "portable" across employers—that is, loan servicing could roll over to the new employer after a job change, along with the account balance. This would allow participants to continue to repay outstanding balances over time via payroll deduction. Second, former employers could be required to continue servicing loans of unemployed workers after separation. This would allow separated employees with no current employer the chance to continue repaying their loans over time (e.g., by sending monthly checks), rather than in a single lump sum within 90 days.

These changes would impose some new burdens on employers who offer 401(k) loan programs, but would make households better off by reducing the risk of 401(k) borrowing to participants. Some analysts may question why 401(k) loan programs should be expanded or made more attractive to borrowers, a question which gets to the issue of why 401(k) loan programs are offered at all. As noted, one answer is that households are often better off financing consumption out of their own assets instead of by borrowing from outside lenders. A second answer is that, as discussed below, allowing participants some pre-retirement access to their savings can increase 401(k) participation and contributions, particularly among younger and more liquidity constrained households. Given that 401(k) loan programs exist, it seems appropriate to design them in a way that minimizes financial risks to participants and maximizes 401(k) participation and contributions.

2 Previous Literature

While 401(k) loans have not yet been the subject of extensive academic research, several studies have reported some of the basic details.[11] VanDerhei, Holden, Alonso, and Copeland (2008) provide descriptive data based on a large sample of 401(k) accounts, finding that about 18 percent of eligible participants had outstanding loans in 2007, with an average size of about 12 percent of the remaining account balance. They also find that borrowing increases steeply with plan tenure up to about 10 years and that loan amounts relative to account size fall monotonically with account size—suggesting perhaps that borrowers tend to take similarly sized loans in dollar terms.

Beshears, Choi, Laibson, and Madrian (2008) analyze typical 401(k) loan characteristics and usage in data from 401(k) providers, reporting, for example, that about a third of plans allow no more than one loan at a time and about 70 percent impose a minimum loan amount

[11] In an earlier version of this paper, we present more detailed findings from previous waves of the SCF (Li and Smith, 2008).

of $500 to $1,000. They also report that 87 percent of plans charge interest rates of prime or prime plus one percent and that 25 percent of plans impose a maximum loan term of less than 5 years.[12] They report that the median loan amount is about $3,500 and the median monthly payment about $118. Finally, they identify several factors expected to influence the wealth effect of 401(k) loan programs, including the effects on participation, contributions, consumption, and defaults.

As noted above, other studies have identified a positive relationship between loan provisions and contribution rates, presumably because the extra liquidity allows for precautionary as well as retirement savings motives. Mitchell, Utkus, and Yang (2007) and Holden and VanDerhei (2001) find that participants who could borrow from their accounts contributed about 0.6 percent of their salaries more than participants without a loan option; Munnell, Sunden, and Taylor (2002) estimate the effect at about 1 percent, and the General Accounting Office (1997) reports an effect of about 3 percent. Love (2006, 2007) shows that the availability of 401(k) loans can increase 401(k) participation and contributions in a life-cycle model of consumption, particularly among younger workers with precautionary motives.

A number of other papers are similar to ours in that they explore related household-finance puzzles. For example, Amromin (2003), Barber and Odean (2004), and Bergstresser and Poterba (2004) find that households often do not optimally locate assets across their taxable vs. tax-preferred accounts, while Amromin, Huang, and Sialm (2007) show that many households could improve their balance sheets by increasing 401(k) contributions while slowing prepayments on mortgage debt.

Gross and Souleles (2002) identify a similar puzzle to ours in that they find that many households simultaneously hold expensive credit card debt and liquid checking account balances that bear very low nominal interest rates. Telyukova and Wright (2008) and Telyukova (2008) provide a potential explanation in which households carry credit card debt despite its high costs and their available liquidity because they know they may need the liquid assets for later transactions. This explanation does not apply as cleanly to 401(k) loans, because unlike checking accounts, 401(k) balances are generally illiquid. One might argue that a household could potentially prefer to keep a higher-rate auto loan on its balance sheet in order to keep its 401(k) borrowing options open for emergencies. But this story would make less sense with respect to credit-card borrowing, since the household could pay off its credit card balance with a 401(k) loan, and then use the credit card for any emergency borrowing.

Finally, our work touches on the literatures studying financial education and the effects of 401(k) plan design. For example, Lusardi and Mitchell (2007a,b, 2008) examine the

[12]This statistic is for general loans; primary residence loans are typically longer, e.g., 15 years. Beshears et al report that about 98 percent of loans are general loans.

effects of financial education and financial literacy on saving and wealth outcomes, while Madrian and Shea (2001); Duflo and Saez (2002); Bertrand, Karlan, Mullainathan, Shafir, and Zinman (2009); Duflo, Gale, Liebman, Orszag, and Saez (2006) and Saez (2009) study the effects of plan design and the framing and presentation of choices on the participation, saving and borrowing behavior of households. We draw on these literatures in making our suggestions for financial education and plan design with regard to 401(k) loans.

3 When Should Households Take 401(k) Loans?

3.1 Conceptual Framework

In a classical life-cycle model of consumption, the demand for borrowing arises out of a household's desire to smooth the marginal utility of consumption over time in the face of rising earnings profiles with respect to age. In stochastic models, an additional incentive arises as households seek to borrow in order to maintain consumption after receiving negative income shocks. In models incorporating liquidity or borrowing constraints, constrained households are particularly likely to access all available forms of credit in order to help smooth the marginal utility of consumption across time and states of the world. Since the transaction costs of 401(k) borrowing are low, we would expect constrained households to be especially likely to use 401(k) loans.

In addition, we would expect that the net financial cost of 401(k) borrowing would be a key consideration. That is, for a given amount of total debt, a household would borrow from its 401(k) accounts rather than an outside lender if the cost of the 401(k) loan were less than the cost of the outside loan. For an outside loan, the cost is essentially its after-tax interest rate. For a 401(k) loan, as discussed above, the cost is the value of foregone returns on the account.

We offer a few caveats about this conceptual analysis before introducing a simple model. Most importantly, we are being intentionally vague about risk. A risk-averse household may avoid an option with a higher expected value if there is sufficient risk of a negative outcome. We will discuss the impact of risk in more detail below. Second, note that we are only considering the question of how best to structure a given amount of debt—we are not considering the effect of the 401(k) loan program on any new consumption or debt. In a dynamic model of borrowing, the optimal restructuring of debt could in turn feed back into a higher level of supportable consumption, and/or a reallocation of consumption across time periods.[13] Similarly, we are not modelling the effect of 401(k) borrowing on optimal contribution behavior. As noted above, younger households who know that they may want

[13]Moreover, in a behavioral sense, a 401(k) loan will not improve a household's balance sheet if it leads to a new spurt of consumption and debt that otherwise would not have occurred.

to borrow against 401(k) balances in the future may optimally increase their contributions, leading to higher balances.

Finally we note that a household whose motivation is to maximize contributions to the 401(k) (e.g., if they are constrained by the contribution limit) might prefer a 401(k) loan with a sufficiently high interest rate simply as a way to get more assets into the tax-favored account. For example, while the limit on 401(k) contributions is $16,500 in 2009,[14] a household could effectively get more into the account by taking a 401(k) loan if the loan carried an interest rate higher than the expected 401(k) return over the repayment period. In such a case, the loan would actually increase the amount of tax-favored saving.

3.2 Simple Model

The decision to take a 401(k) loan vs. an outside loan can be illustrated in a simple deterministic three-period model.[15] Consider a 401(k)-owning household who wants to borrow against future income in order to smooth consumption. Compare the case in which the household borrows from an outside lender with the case in which the household takes a 401(k) loan. Let's start with the outside-lender case. In the first period, say the household earns $2 and borrows $1 from an outside source. In the second period her earnings rise to $4 and she repays the loan, at an interest rate of i. In the third, she retires and consumes her after-tax 401(k) balance. Assume the 401(k) earns a return of r_1 in the first period and r_2 in the second.[16] Also assume that the tax rates in each of the three periods are t_1, t_2, and t_3, respectively. Finally, assume the 401(k) balance is $1 at the start of the first period and the household's discount rate is d.

The upper panel of Table 1 illustrates this household's income, 401(k) balance, outside loan balance, and after-tax consumption in each period. In the first period, she borrows from an outside source, receiving a total income of $3 (including the $1 loan), which affords an after-tax consumption of $\$3 - 2t_1$. In the second period, she repays the loan, resulting in an after-tax consumption of $\$3 - 4t_2 - i$.[17] In the third period, she retires, receiving an income of $\$(1 + r_1)(1 + r_2)$ from the 401(k), affording an after-tax consumption of $\$(1 + r_1)(1 + r_2)(1 - t_3)$.

Now compare this to the stream of after-tax consumption she can afford when she takes a 401(k) loan instead of an outside loan. The results are summarized in the lower panel of Table 1. In the first period, she borrows from her 401(k), receiving an income of $3

[14] The limit is $22,000 for participants aged 50 or older in 2009.

[15] A more sophisticated model would account for risk aversion and more complicated dynamic interactions. Our model is intended to highlight a few of the key considerations related to 401(k) borrowing.

[16] Assume there is no return in the third period because the household withdraws the account at the beginning of the period.

[17] Note that the outside interest payment is not tax-deductible in this example (she still pays the full tax bill of $\$4t$). See below for how the results change when the outside interest payment is deductible.

(including the loan), which affords an after-tax consumption of $\$3 - 2t_1$ (exactly the same as when she borrows from an outside lender). In the second period, she repays the 401(k) loan at an interest rate of k, resulting in an after-tax consumption of $\$3 - 4t_2 - k$.[18] In the third period, she retires, receiving an income of $\$(1+k)(1+r_2)$ from the 401(k), affording an after-tax consumption of $\$(1+k)(1+r_2)(1-t_3)$.

Compare these two scenarios by computing the present value of the stream of after-tax consumption under each. Dropping the first period (which is the same under each scenario) and discounting at the rate d, we have:

$$PV_{outside} = 3 - 4t_2 - i + \frac{(1+r_1)(1+r_2)(1-t_3)}{1+d} \tag{1}$$

and

$$PV_{401k} = 3 - 4t_2 - k + \frac{(1+k)(1+r_2)(1-t_3)}{1+d} \tag{2}$$

Note that the only differences are that the 401(k) borrower pays an interest rate of k instead of i on the loan (the third term), and the 401(k) borrower earns a return of k instead of r_1 on the account (the first term in the numerator of the quotient). Now equate the two and solve for the threshold level of i above which the 401(k) loan would be preferred to the outside loan:

$$i^* = k + \frac{(1+r_2)(1-t_3)}{1+d}(r_1 - k) \tag{3}$$

Intuitively, the 401(k) loan is better when the outside loan rate i is high enough to overcome the cost of the 401(k) loan, which has two components: the direct cost of the interest paid on the 401(k) loan (i.e., k, which reduces consumption in the repayment period), and the net opportunity cost of the foregone return r_1 during the period the loan is outstanding (the second term). Note that the first-period opportunity cost $r_1 - k$ is compounded by the after-tax account returns in the later period.

Looking at the comparative statics, note that i^* increases with the 401(k) returns r_1 and r_2, which positively affect the opportunity cost of a 401(k) loan, and decreases with the tax rate t_3 and the discount rate d, which negatively affect the opportunity cost by reducing the value of 401(k) balances in retirement.[19] Since the 401(k) borrower is also a 401(k) lender, the 401(k) loan rate k has opposing effects on i^*—a higher k hurts the borrower in the repayment period (increasing i^*), but helps the borrower in the retirement period by offsetting the opportunity cost of the foregone return (decreasing i^*). On net, whether

[18] Note that the 401(k) interest payment is not tax-deductible.

[19] That is, retirement-period taxes actually encourage 401(k) borrowing relative to outside loans by reducing the opportunity cost of foregone account earnings.

i^* increases or decreases with k depends on the other opportunity cost parameters: r_2, which compounds the opportunity cost, t_3 which reduces it, and d, which discounts it. For households with a relatively large r_2 and a relatively small t_3 and d, the opportunity cost could outweigh the direct cost, and thus i^* would decrease with k. For other households—specifically, those for whom $(1 + r_2)(1 - t_3) < 1 + d$—the direct cost would dominate, and i^* would increase with k.

3.3 Taxes

The simple model illustrates why 401(k) loans are not "double-taxed," as is sometimes argued by analysts.[20] The argument is that since 401(k) loan repayments are not deductible, they are double taxed when taxed upon withdrawal in retirement. But the appearance of double-taxation is a misperception. Under a consumption tax, which is the conceptual basis of retirement-account taxation, each dollar of consumption should be taxed once. Recall that loan proceeds (which come from pre-tax dollars in a traditional 401(k)) are not taxed upon receipt. Thus, repaying the loan with after-tax dollars simply ensures that the consumption of loan proceeds is taxed once. The tax at withdrawal, in turn, ensures that the consumption of the *repayments* is also taxed once. Thus, the loan principal is not taxed twice. What about interest payments? Since they are taxed at withdrawal, they should be deductible when made; yet in reality there is no deduction. In this sense the interest payments are double-taxed; however, this deviation of reality from theory is at least roughly offset by another deviation: the time value of the deferral of tax on the consumption of the loan. Recall that loan repayments are typically made over a five-year period. Since consumption taxes are effectively paid upon repayment of the loan, rather than its receipt, borrowers enjoy a tax break by spreading out the tax payments. Indeed, it can be shown that if the discount rate is equal to the interest rate on the loan, the two deviations from theory offset each other perfectly.[21]

In the context of the model introduced above, it is clear that taxes should not discourage 401(k) borrowing. In the model, as in reality, the 401(k) loan principal and interest payments are not deductible, and the withdrawal in retirement is fully taxed. But this does not disadvantage the 401(k) loan relative to the outside loan because the outside loan faces the same treatment: consumer-loan principal and interest payments are generally not deductible.[22]

[20] For a typical example, see Dugas (2007).

[21] Even when the discount rate is less than the interest rate, the offset is quite close (for typical parameter values).

[22] Note that if the 401(k) loan rate k exceeds the outside loan rate r then the tax bill in retirement would be higher under the 401(k) loan than the outside loan, but this would be because the account was larger due to higher returns, not because of differential tax *treatment*.

In some cases, however, interest payments on outside loans *are* deductible—for example, many mortgages and home-equity loans. In the case of deductible outside interest, after-tax consumption in the second (i.e., repayment) period becomes $3 - 4t_2 - i(1 - t_2)$, and the equation defining i^* becomes:

$$(1 - t_2)i^* = k + \frac{(1 + r_2)(1 - t_3)}{1 + d}(r_1 - k) \tag{4}$$

That is, the comparison is the same as before, except the *after-tax* outside interest rate is used to measure against the threshold. In this case, taxes have two effects on the attractiveness of a 401(k) loan: as before, retirement-period taxes reduce the opportunity cost of foregone returns, encouraging 401(k) loans, but now repayment-period taxes reduce the direct cost of the outside loan, discouraging 401(k) loans. So what is the net effect of taxes on 401(k) loans in the case of deductible outside interest payments? It depends on the relative tax rates across time. If tax rates are constant over time (i.e., $t_2 = t_3$), the discouraging effect is generally stronger than the encouraging effect, since the discouraging effect is more direct (i.e., not diluted by other parameters)—that is, on net, taxes reduce the attractiveness of 401(k) loans. If tax rates fall in retirement (i.e., $t_2 > t_3$), as is often supposed, the discouraging effect is even stronger. If tax rates rise sufficiently in retirement, however, 401(k) loans could be encouraged by taxes even in the case of deductible outside interest payments.

The simple model outlined above illustrates a few key factors affecting the choice between a 401(k) loan and an outside loan. In particular, it highlights a number of reasons households might rationally choose to avoid 401(k) borrowing: they might expect a high 401(k) return over the repayment period, falling tax rates in retirement, or tax-deductible interest on outside borrowing choices. Moreover, there are other reasons not captured by this simple model that could further discourage 401(k) borrowing: aversion to the risk of job loss (requiring repayment in a low-income state), aversion to the risk of unexpectedly high opportunity costs, or behavioral considerations such as a rational acknowledgement of an inability to control spending or to meet retirement savings goals in the presence of 401(k) borrowing. In the following sections, we explore how some of the theoretical factors appear to relate to 401(k) borrowing empirically, and how much households might gain by restructuring their balance sheets to reduce borrowing costs.

4 Data and Descriptive Statistics

4.1 Sample Characteristics

We use the 1992-2007 waves of the Survey of Consumer Finances (SCF) to examine the evolution of 401(k) borrowing and its impact on household balance sheets.[23] The SCF is a triennial nationally representative cross-sectional survey of household wealth and finances conducted by the Federal Reserve Board. The SCF is designed to over-sample the high end of the wealth distribution in order to obtain more precise estimates of aggregate household wealth holdings.[24]

We select households whose member (if single) or older spouse (if married) is between the ages of 21 and 60 and in which at least one member is working for pay. We exclude households in which any member reports self-employment or partnership income, as well as households reporting annual income of less than $3,000 or greater than $500,000, because these households can face very different financial environments than the more typical households that we are considering.[25]

Table 2 shows the evolution of 401(k) plan participation and loan utilization from 1992 to 2007 for our sample.[26] Participation in 401(k) plans grew from about one-third to about one-half of sample households from 1992 to 2007, while access to 401(k) loans grew from about one-fifth of sample households to about one-third. Overall, the share of sample households holding 401(k) loans grew from 2.3 percent in 1992 to 6.8 percent in 1998 (a year in which many households found access to credit to be more difficult), after which it declined a bit to reach 5.1 percent in 2007. Conditional on loan eligibility, borrowing peaked at 18.9 percent in 1998, falling to 14.9 percent by 2007. Broadly speaking, the share of eligible households taking 401(k) loans has been relatively stable at roughly 15 percent since 1995, with a bit more borrowing in the "credit-crunch" year of 1998.[27]

Table 3 reports some characteristics of the sample of 401(k)-owning households that are eligible to borrow against their accounts, breaking the sample into those with and without 401(k) loans at the time of the survey. Demographically, 401(k) borrowers look very similar

[23] We begin with the 1992 survey because earlier surveys did not include as much information about 401(k) loans.

[24] We use the survey's sample weights to make the results representative of the population. Note that the weights are constructed to make the SCF representative of all households, and not necessarily 401(k) holders or borrowers as subgroups.

[25] The income thresholds are roughly the first and 99th percentile of total annual income.

[26] 401(k) plans are the dominant, but not only, type of tax-preferred DC plan. We include SCF households reporting 401(k), 403(b), supplemental retirement annuity, thrift or savings plans, and profit-sharing plans, among others. We refer to all of these as "401(k) plans" in the text and tables. See Appendix for details.

[27] As we show below, major correlates of borrowing are credit constraints and 401(k) balances, both of which were relatively high in 1998. In contrast, the current financial crisis is characterized by elevated constraints and significantly *reduced* 401(k) balances, leaving the effect on 401(k) borrowing ambiguous.

to eligible non-borrowers, with comparable age, race, and marital status. However, 401(k) borrowers are a bit less likely to have a college degree.

More pronounced differences appear when we look at the balance sheet information available in the SCF. While borrowers and non-borrowers have similar median incomes, borrowers' median net worth is about 23 percent lower than that of non-borrowers, and their debt-to-income ratios are about 23 percent higher. Nonetheless, borrowers' 401(k) balances are significantly higher, despite their similar age and income. Moreover, the share of financial assets held as 401(k)s are notably higher among those with loans. These statistics paint a picture of a typical 401(k) borrower as having more debt and fewer non-401(k) assets than the typical non-borrower.

We explore balance-sheet differences in more detail by creating household-level measures of liquidity and borrowing constraints. Our first indicator identifies households whose liquid assets are less than 1 percent of their income (this is a variant of a traditional measure of liquidity constraint; see, e.g., Zeldes (1989)). Our second measure identifies households who respond "hardly ever" to a question about how frequently they pay off their total credit card balance each month.[28] Our third measure indicates whether the household reports being declined credit in the past five years.[29] The fourth indicator identifies households near their combined credit limit on their credit cards.[30] For each of our four measures of liquidity and borrowing constraints, 401(k) borrowers are significantly more likely to be constrained than non-borrowers. Looking at the indicators as a group, we see that 59 percent of non-borrowers report none of the constraints, compared to only 36 percent among borrowers. Similarly, about one-third of 401(k) borrowers indicate two or more constraints—a situation we identify as "highly constrained"—while only 15 percent of non-borrowers meet this criterion.

4.2 Borrowing Regression

Table 4 shows the marginal effects from a probit regression of 401(k) borrowing (among eligible households) on household characteristics, pooling the data from the 1995 through 2007 waves.[31] The goal of this exercise is to explore how different household characteristics affect the probability of taking a 401(k) loan.[32] Note that the standard errors reported in

[28]The other possible responses are "always or almost always" and "sometimes."

[29]Jappelli, Pisckle, and Souleles (1998), Amromin, Huang, and Sialm (2007) and Johnson and Li (2009) use a similar measure.

[30]This is similar to the "utilization rate," or borrowing relative to credit limit, used by Gross and Souleles (2002), except that they used account-level data and our data is household-level. We identify households with a combined credit card utilization rate of over 80% as borrowing constrained.

[31]We exclude the 1992 wave in this case because it is missing information on credit-card interest rates, as described below.

[32]Table 2 showed similar statistics from a different perspective: how household characteristics differed by borrowing status.

Table 4 are adjusted for the SCF's multiple imputation procedure.[33]

In our regression we first condition on overall debt levels, since households with a high demand for borrowing will be more likely to borrow from all available sources. We find that households in the highest quartile of debt (relative to income) are about 8-1/2 percentage points more likely to borrow on their 401(k) accounts than households in the lowest debt quartile.[34] Even conditional on debt-to-income ratio, moreover, we find that "somewhat constrained" households (those with one binding constraint indicator) are about 7 percentage points more likely than unconstrained households to tap their 401(k) assets, while "highly constrained" households (those with at least two constraint indicators) are about 20 points more likely to take a 401(k) loan.

Based on our theoretical borrowing model, we would expect households facing high outside interest rates to be more likely to borrow from their 401(k), but we find little evidence of this empirically: outside interest rates—which we define as the lowest rate the household reports on credit card or auto loans—appear to be essentially uncorrelated with 401(k) borrowing among eligible households. We use the lowest reported rate (instead of, say, the highest) because we want to estimate the household's ability to obtain outside financing. For example, we assume a household holding an 8% auto loan and an 18% credit card loan could obtain an additional loan for as low as 8%. Our negative findings may indicate that households are not considering outside options when deciding whether to take a 401(k) loan. On the other hand, the results could be due to measurement error: our use of the lowest reported current rate as a proxy for the best rate a household could get on a new outside loan may be a weak proxy at best. For example, a household's only current debt could be a credit card balance at 18%, yet could still be able to find a lower-rate loan for a hypothetical new purchase (e.g., a car loan). Conversely, a household could report a 5% car loan from a credit union, yet be unable to find such a low-rate loan for any additional hypothetical borrowing. Thus, the lowest reported outside borrowing rate may be a poor measure for the actual choice set available to the household considering a 401(k) loan.[35]

The theoretical borrowing model outlined above also emphasizes the role of 401(k) returns in affecting the opportunity cost of 401(k) borrowing. To explore whether 401(k) borrowing appears to be related to household expectations of future 401(k) returns, we

[33]The SCF provides 5 imputations of missing values for each observation; failure to correct for the additional records would overstate the precision of the estimates. We use the correction procedure suggested in the 2007 SCF codebook, which essentially runs five regressions (one for each set of imputations) and reports the average coefficients and standard errors that account for the difference between each estimated coefficient and the average. See the codebook for details (available online at http://www.federalreserve.gov/pubs/oss/oss2/2007/codebk2007.txt).

[34]The quartile breaks for the variables are reported in Table 5.

[35]Note that when we estimate the potential gains to a household from switching debt to 401(k) loans, we start with debt at the *highest* reported interest rates, since this is the debt that the household would optimally transfer first.

include an indicator of whether the 401(k) account is heavily invested in equities.[36] We find no significant correlation. Again, this could indicate that households are not considering future 401(k) returns in their borrowing decision, or it could result from measurement error: households could hold stock in their 401(k) accounts for long-term growth potential, even if their near-term return expectation is modest or poor.

In contrast to the opportunity cost variables, the size of the 401(k) account (which we measure relative to income) is highly correlated with the likelihood of borrowing: households with balances in the top quartile are about 22 percentage points more likely to borrow than households in the bottom quartile. This pattern could indicate that households are reticent about borrowing until they accumulate a sufficient "buffer" of assets, or that households are more likely to borrow when they can borrow substantial amounts.[37] Similarly, plan tenure is highly correlated with borrowing: households with at least ten years in the plan are about 16 percentage points more likely to take a 401(k) loan than those with under three years of tenure, other things being equal; this could be due to a greater familiarity with plan features, including borrowing.

We find no significant correlation between regular 401(k) contribution rates (i.e., net of any loan repayments) and 401(k) borrowing. This could indicate that households who borrow do not significantly reduce their contribution levels during repayment. Alternatively, it could reflect offsetting forces: borrowing households may reduce their contributions, but could have started from higher contribution levels in the first place (which would be consistent with borrowers' higher balances).

We also find no significant correlation between 401(k) borrowing and age or income, conditional on account balance, plan tenure, and other factors. Net worth, on the other hand, is negatively correlated with borrowing—households with the highest net worth-to-income ratios are about 10 percentage points less likely to take a 401(k) loan than households with the lowest net worth ratios.

Looking at other demographics, we find that households with a college degree are about 5 percentage points less likely to take a 401(k) loan, while marital status and race show no significant correlation. We find no significant difference across SCF waves, suggesting little discernible change in 401(k) borrowing behavior over time once we condition on underlying factors such as credit constraints and balances.

[36] See below for details of how we measure 401(k) asset allocation.

[37] Recall that the maximum loan increases with account balance for accounts between $20,000 and $100,000. Accounts of this size made up about 30 percent of accounts at the end of 2007 (VanDerhei, Holden, Alonso, and Copeland, 2008).

4.3 401(k) Loan Detail

Table 6 provides some details on the characteristics of 401(k) loans observed in the SCF.[38] The median outstanding loan balance grew from about $2,400 (in real terms) in 1995 to $4,000 in 2007. The SCF does not ask about the initial loan amount, but does collect information on loan payments, which provides some evidence of how far along the repayment process is. Annual payments in the data are quite large relative to the outstanding balance, suggesting that the median observed loan is, perhaps not surprisingly, about midway through the repayment process. Indeed, our calculation of how many months would be required to pay off the balance at the current rate is about 24 months at the median, a figure that is essentially unchanged across the SCF waves.

As a measure of 401(k) loan utilization, we calculate the loan balance relative to the maximum allowable loan, which we define according to the tax code as the lesser of $50,000 and 50% of the vested account balance.[39] As shown in Table 6, about half of loans in 2007 were less than a quarter of the maximum allowable size, and about 80 percent were less than half the allowable size. Thus, even allowing for the fact that the median loan is about halfway repaid, we find that borrowing households seem to utilize 401(k) loans significantly less than they could.

Beginning in 1998, the SCF asks households to identify the general purpose of the 401(k) loan. The survey reports the responses grouped into categories (which we are not able to subdivide). We find that the leading broad categories are home purchase or improvement, investment or debt consolidation, and vehicle or other durable good purchase. The "home purchase" share fell notably in 2004, and even further in 2007, which we attribute to the surge in those waves of home-secured loans such as cash-out refinances, home-equity lending, and subprime mortgages. Consistent with the Transamerica study referenced above, we find a sharp increase in the share of households reporting a loan for debt consolidation, from about one-third in prior waves to over one-half in 2007. This statistic is of particular interest because debt consolidation is the primary channel through which many households could favorably restructure their balance sheets using 401(k) loans.[40]

[38] In this table, we begin with the 1995 wave because it is the first to provide as much detail about 401(k) loans.

[39] Recall that the 50% limit faces a floor of $10,000; we implement this a maximum loan equal to 100% of account balances of $10,000 or less.

[40] The survey category labelled "investment" includes business investment, financial or real estate investment, and cash reserves. The survey category labelled "other" includes vacations, divorce, weddings, funerals, moving expenses, medical or legal expenses, and education expenses. The survey category labelled "debt consolidation" includes bill or debt consolidation, tax and insurance expenses, legal judgements, vehicle repairs, unspecified personal items, gifts, charitable donations, loans to others, and unspecified personal or living expenses. Thus, this category includes general expenses as well as debt consolidation. While we are not able to subdivide this category, we are able to subdivide responses to a similar question on a different type of loan from an earlier wave (though obviously this exercise should be taken with some healthy

5 Potential Gains from Restructuring Household Debt

5.1 Estimating Potential Gains

The key way a household could gain by using a 401(k) loan is by shifting high-cost debt to relatively low-cost 401(k) loans. We focus on the potential gains from swapping 401(k) loans with credit card and auto debt, which are two common sources of higher-cost household debt. We do not consider mortgages or home equity loans in this analysis. Because mortgages and home equity loans are collateralized by real property, their interest rates tend to be lower, and generally tax deductible as well, reducing the likelihood that 401(k) borrowing would dominate such loans.[41] Further, mortgages and home equity loans generally have longer terms than auto and credit card loans, resulting in lower monthly payments. Thus, while in some cases a household could gain by exchanging 401(k) borrowing for mortgage or home-equity borrowing, in general the bulk of savings is likely to come from higher-rate debt such as credit cards and auto loans.

As discussed above, the opportunity cost of a 401(k) loan is the foregone return on account assets. In general, the foregone return will be uncertain at the time of the loan.[42] To value the opportunity cost, we proceed in two steps. First, we estimate the share of each 401(k) account invested in stocks vs. fixed-income investments (which we treat as bonds). Second, we apply a variety of alternative return assumptions to these components to value the opportunity cost. Our preferred measure, as discussed below, accounts for the ex-ante uncertainty of returns by adjusting for return risk.

To estimate the household's share of 401(k)s held in stock, we use the SCF questions on 401(k) portfolio allocation. The SCF asks each household about up to six current 401(k) plans, three for each spouse.[43] We calculate the aggregate 401(k) stock allocation for each household as an asset-weighted average of the stock share for each plan reported by the household. Prior to 2004, the SCF question on 401(k) portfolio allocation allowed the following responses: "mostly or all stock," "mostly or all interest earning," or "split", with no further information available. Beginning in 2004, the responses were changed to "all in stock," "all in interest earning," and "split," with the latter response followed up with "About what percent is in stocks?" For survey years before 2004, we assign households responding "mostly or all stock" a stock share of 100 percent and those responding "mostly or all interest earning," a stock share of zero. For pre-2004 households responding "split,"

skepticism). Doing so, we find that, in that case, "debt consolidation" made up most of the category.

[41] Auto loans are also collateralized by real property, but the collateral depreciates quickly and the loans are not tax deductible.

[42] A possible exception is if the 401(k) assets are entirely invested in stable-value assets such as a Guaranteed Investment Contract, though even these returns may be uncertain over a five-year period.

[43] We ignore plans from previous employers because in general new loans are not allowed from such plans.

we impute the stock share using coefficients from a regression of 401(k) stock share on household characteristics among households who answered the follow-up question in 2004 and 2007.[44]

5.2 Measures of Opportunity Cost

Once we have estimated the household's share of 401(k)s in stock, we apply various rates of return to each portfolio component (i.e., stocks and bonds) in order to estimate the opportunity cost of a 401(k) loan. Because the opportunity cost is so fundamental to valuing the potential gains of taking a 401(k) loan, we construct four different opportunity cost measures, each based on a different technique for estimating future returns.

Our first measure applies typical long-run average rates of return to stocks and bonds—in our case, 10 percent for stocks and 7 percent for bonds. This type of long-run average is often used to predict future returns over long periods of time, though this approach may be less appropriate for short-term forecasting (i.e., the next five years, which is the typical time frame for 401(k) loans). Moreover, this measure is not a function of current or recent market conditions, nor does it account for the uncertainty of future returns.

As a second measure, we apply a five-year trailing average of stock and bond returns. This approach is a function of current and recent market conditions, and we use it as a proxy for the type of forecasting that households might actually do when making near-term financial decisions. Again, however, it does not account for the uncertainty of future returns.

Our third measure is a direct indicator of household expectations, which is the median response to a Gallup survey question about expected stock and bond returns in the near term.[45] This approach captures actual household expectations, which may or may not be well-reasoned, but again it does not account for the uncertainty of future returns.

Our fourth, and preferred, approach is simply to use the risk-free rate as a measure of risk-adjusted expected stock and bond returns. We prefer this approach because it accounts for the uncertainty of future returns, in this case by appealing to a no-arbitrage assumption that risk-adjusted stock and bond returns should approach the risk-free rate in equilibrium. Using the risk-free rate is also motivated by risk-neutral pricing models such as those presented in Jarrow and Turnbull (1996) and Cochrane (2005).[46]

The four measures and their return assumptions in 2007 are summarized in Table 7. For each of the measures, we search for SCF households who carry consumer debt (defined as

[44]The characteristics are age, education, marital status, race and net worth.

[45]The UBS/Gallup Survey of Investor Optimism is a monthly survey of 1,000 households with at least $10,000 of investable assets. The questions we use relate to the respondents' expectations of returns over the next year.

[46]To illustrate the importance of this point, consider how you might restructure your balance sheet if you knew for sure that you would earn 10% on stocks next year.

credit card plus auto loans) at rates in excess of the relevant measure of opportunity costs.[47] First we calculate the share of 401(k)-loan-eligible households that meet this criteria. Then we calculate how much consumer debt they could shift to a 401(k) loan, assuming they start with the highest-rate debt and keep going until either their high-cost consumer debt is exhausted or their 401(k) loan limit is reached. We measure the shiftable amount in the aggregate (i.e., weighting up households using the SCF weights), in dollar terms for the average household, and relative to total debt for the average household. Next we estimate the interest savings from the shift that would accrue over the following 3 years, both in the aggregate and in dollar terms for the average household.[48] Finally, we express an annual interest savings relative to annual interest payments, in order to estimate potential gains as a percentage reduction in annual interest costs.

5.3 Findings

Table 8 shows that many households could benefit from shifting debt to 401(k) loans, regardless of the assumption on 401(k) returns. The share of 401(k)-loan-eligible households who could gain from shifting debt to 401(k) loans ranges from about 42 percent (assuming long-run average stock and bond returns) to about 63 percent (using the risk-free rate, our preferred measure that accounts for uncertain returns). The aggregate amount of debt that could be profitably shifted ranges from about $70 billion to about $140 billion, depending on the measure. Note that these figures are quite large relative to the current level of outstanding 401(k) loans (about $45 billion in 2006).[49] At the household level, the average shiftable amount is about $6,000 to $8,000 dollars, representing 38 to 51 percent of consumer debt.[50]

Looking at the resulting potential gains, we estimate that households that shifted high-cost consumer debt to 401(k)s in 2007 could save $8 billion to $16 billion (in present value) over the following three years; that is, roughly as much as $5 billion per year. At the household level, this translates into average savings of as much as $275 per year, which seems relatively modest but represents an average savings of about 20 percent of annual interest payments.

Table 9 shows how these interest savings vary across the sample in 2007, using our

[47] We define "excess" in this context as at least 100 basis points above the opportunity cost measure, in order to allow for both measurement error and transaction costs.

[48] We use three years because most credit cards impose a minimum payment requirement that will pay off the current balance within three years. Car loan contracts are typically 5 years; however, taking into account the seasoning of loans, it seems reasonable to assume that about 3 years remain, on average. We estimate the present value of interest savings, using the assumed 401(k) return as the discount rate.

[49] See U.S. Dept. of Labor (2008).

[50] Recall that for this purpose we are defining consumer debt as the sum of credit card debt and auto loans.

preferred risk-adjusted measure. The distribution is roughly symmetric—both the mean and the median are around 20 percent. The standard deviation is about 12 percent, with about 10 percent of households facing a potential gain of 4 percent or less, and about 10 percent facing a gain of at least 40 percent.

To further explore the cross-sectional heterogeneity in potential gains, we regress the percent reduction in interest costs (using our preferred risk-adjusted measure) on household characteristics. Table 10 shows that the largest correlates are indicators of non-401(k) interest rates currently faced by the household. Households in the top quartile of outside interest rate face potential gains about 25 percentage points larger than households in the bottom quartile of outside interest rate. Smaller effects can be seen in the size of the 401(k) balance relative to income—households above the lowest quartile by this measure face potential interest cost reductions that are about 7 to 8 percentage points larger than households in the bottom quartile. This result follows from the fact that borrowing ability increases with account size for accounts between $20,000 and $100,000.

We find little significant correlation between the other variables and potential gains, except for the net worth-to-income ratio: households above the lowest quartile of this measure face potential gains that are about 4-5 percentage points larger than those in the lowest quartile.

As a final exercise, we use the earlier surveys (i.e., 1995 through 2004) to estimate the counterfactual gains that households could have enjoyed had they shifted debt to 401(k) loans in those years. This exercise is similar to the exercise performed above for 2007, except that we use actual realized stock and bond returns over the three years following each survey to value the realized opportunity costs of a counterfactual 401(k) loan. In doing this exercise, we assume that households would make no other changes to their portfolios.[51]

The results are shown in Table 11. Counterfactual gains vary widely with swings in market returns (particularly stock prices). Years in which 3-year-following returns are high (such as 1995) generate higher opportunity costs of 401(k) borrowing and thus lower potential gains of shifting debt than years in which such returns are low (such as 1998).[52] About 21 percent of households would have benefitted from shifting debt to 401(k) loans in 1995, and on average they could have reduced their interest payments by about 9 percent. In 1998, on the other hand, 70 percent of households would have benefitted from shifting debt, and the average interest savings would have been 27 percent.

[51] Some households could, for example, increase stock exposure in their non-401(k) accounts to offset reduced stock exposure in the 401(k); we ignore such potential behavior in calculating the realized opportunity costs.

[52] As an illustration, the annualized three-year growth in the Wilshire 5000 stock index was 23% for the three years following 1995, and -0.6% for the three years following 1998.

6 Conclusions

We find that the share of eligible households with 401(k) loans in the 2007 Survey of Consumer Finances was about 15 percent, roughly what it has been since 1995, though a significantly higher share of 2007 borrowers reports taking the loan for debt consolidation. We find that the best predictors of 401(k) borrowing appear to be the presence of liquidity or borrowing constraints and the size of 401(k) balances relative to income. Since the ongoing financial crisis has likely caused these factors to move in opposite directions—tighter constraints combined with significantly lower 401(k) balances—the predicted effect of the crisis on 401(k) borrowing is ambiguous.

We also find that many eligible households without 401(k) loans carry relatively expensive consumer debt that could be more economically financed via 401(k) borrowing. In the aggregate, we estimate that such households could have saved as much as $5 billion in 2007 by shifting their expensive consumer debt to 401(k) loans. This would translate into annual savings of about $275 per household—roughly 20 percent of their overall interest costs—with even larger reductions for households that carry consumer debt at high interest rates or who hold larger 401(k) balances.

We conclude that this apparent puzzle—why households would not take the opportunity to reduce their interest costs by 20 percent or more—is an indication of either a willingness to pay to avoid the risks of 401(k) borrowing, or a common financial mistake. Households may be rationally averse to the risk of losing their jobs and having to pay back the loan in a short time frame. They may be expecting higher 401(k) returns than the after-tax interest they're paying on outside loans (or averse to the risk of such a scenario). They may acknowledge self-control problems in spending by walling off 401(k)s in a separate mental account that is unavailable for current consumption. Or, they may simply be making a mistake—they may be confused about the potential advantages of 401(k) borrowing, or they may carry a credit card balance despite their intention to pay off balances every month.

We also conclude that households could benefit from financial education that clarifies the conditions under which 401(k) borrowing is advantageous. For example, potential 401(k) borrowers might be presented with a "checklist" covering issues such as whether they would otherwise finance their consumption from more expensive sources, whether they could maintain regular 401(k) contributions while repaying the loan, and whether they would be comfortable with the requirement to repay outstanding balances upon separation from the employer.

Finally, we propose two 401(k) design changes that could reduce the risk to borrowers of unexpected loan repayments after leaving an employer: first, 401(k) loans could be made "portable" across employers—that is, loan servicing could roll over to the new employer after

a job change, along with the account balance—and second, employers could be required to continue servicing loans of former employees after separation. Both of these changes would impose some new burdens on employers who offer 401(k) loan programs, but could significantly reduce the risk of 401(k) borrowing to participants. Given that 401(k) loan programs exist, in part to encourage participation and contributions, it seems appropriate to design them in a way that minimizes financial risks to participants.

References

Amromin, E. (2003): "Household Portfolio Choices in Taxable and Tax-Deferred Accounts: Another Puzzle?," *European Finance Review (Review of Finance)*, 7, 547–582.

Amromin, E., J. Huang, and C. Sialm (2007): "The Tradeoff Between Mortgage Prepayments and Tax-Deferred Retirement Savings," *Journal of Public Economics*, 91, 2014–2040.

Applegarth, G. (2008): "Warning: 401(k) Loans are Hazardous to Your Wealth," *MSN Money*.

Barber, B., and T. Odean (2004): "Are Individual Investors Tax Savvy? Evidence from Retail and Discount Brokerage Accounts," *Journal of Public Economics*, 88, 419–442.

Bergstresser, D., and J. M. Poterba (2004): "Asset Allocation and Asset Location: Household Evidence from the Survey of Consumer Finances," *Journal of Public Economics*, 88, 1893–1915.

Bertrand, M., D. Karlan, S. Mullainathan, E. Shafir, and J. Zinman (2009): "What's Advertising Content Worth? Evidence from a Consumer Credit Marketing Field Experiment," Manuscript.

Beshears, J., J. Choi, D. Laibson, and B. Madrian (2008): "A Primer on 401(k) Loans," Preliminary Manuscript.

Cochrane, J. H. (2005): *Asset Pricing*. Princeton University Press.

Duflo, E., W. Gale, J. Liebman, P. Orszag, and E. Saez (2006): "Savings Incentives for Low- and Middle-Income Families: Evidence from a Field Experiment with H&R Block," *Quarterly Journal of Economics*, 121, 1311–1346.

Duflo, E., and E. Saez (2002): "Participation and Investment Decisions in a Retirement Plan: The Influence of Colleagues' Choices," *Journal of Public Economics*, 85, 121–148.

Dugas, C. (2007): "401(k) Loans Come with Caveats," *USA Today*, Oct. 12.

General Accounting Office (1997): *401(k) Pension Plans: Loan Provisions Enhance Participation but May Affect Income Security for Some*. Washington, D.C.

Gross, D. B., and N. S. Souleles (2002): "Do Liquidity Constraints and Interest Rates Matter for Consumer Behavior? Evidence from Credit Card Data," *Quarterly Journal of Economics)*, 117, 149–185.

Holden, S., and J. VanDerhei (2001): "Contribution Behavior of 401(k) Plan Participants," Investment Company Institute Perspective Vol 7 No 4.

Jappelli, T., J.-S. Pischke, and N. S. Souleles (1998): "Testing for Liquidity Constraints in Euler Equations with Complementary Data Sources," *Review of Economics and Statistics*, 80, 251–262.

Jarrow, R., and S. Turnbull (1996): *Derivative Securities*. South-Western College Publishing.

Johnson, K., and G. Li (2009): "The Debt Payment to Income Ratio as an Indicator of Borrowing Constraints: Evidence from Two Household Surveys," Manuscript.

Li, G., and P. A. Smith (2008): "Borrowing from Yourself: 401(k) Loans and Household Balance Sheets," Federal Reserve Board, FEDS Working Paper 2008-42.

Lieber, R. (2008): "Update: New Proposed Legislation on 401(k) Debit Cards," *New York Times*, July 19.

Love, D. (2006): "Buffer Stock Saving in Retirement Accounts," *Journal of Monetary Economics*, 53, 1473–1492.

——— (2007): "What Can the Life-Cycle Model Tell Us About 401(k) Contributions and Participation?," *Journal of Pension Economics and Finance*, 6, 147–185.

Lusardi, A., and O. Mitchell (2007a): "Baby Boomer Retirement Security: The Roles of Planning, Financial Literacy, and Housing Wealth," *Journal of Monetary Economics*, 54, 205–224.

——— (2007b): "Financial Literacy and Retirement Preparedness: Evidence and Implications for Financial Education," *Business Economics*, 42, 35–44.

——— (2008): "Planning and Financial Literacy: How Do Women Fare?," *American Economic Review*, 98, 413–417.

Madrian, B. C., and D. F. Shea (2001): "The Power of Suggestion: Inertia in 401(k) Participation and Savings Behavior," *Quarterly Journal of Economics*, 116, 1149–1187.

Mitchell, O. S., S. P. Utkus, and T. Yang (2007): "Turning Workers into Savers? Incentives, Liquidity, and Choice in 401(k) Plan Design," *National Tax Journal*, 60, 469–489.

Munnell, A. M., A. Sunden, and C. Taylor (2002): "What Determines 401(k) Participation and Contributions?," *Social Security Bulletin*, 64, 64–75.

Saez, E. (2009): "Details Matter: The Impact of Presentation and Information on the Take-Up of Financial Incentives for Retirement Saving," *American Economic Journal: Economic Policy*, 1, 204–228.

Telyukova, I. A. (2008): "Household Need for Liquidity and the Credit Card Debt Puzzle," Manuscript.

Telyukova, I. A., and R. Wright (2008): "A Model of Money and Credit, with Application to the Credit Card Debt Puzzle," *Review of Economic Studies*, 75, 629–647.

Transamerica Center for Retirement Studies (2008): *9th Annual Transamerica Retirement Survey*. Los Angeles.

Trejos, N. (2009): "Toll on 401(k) Savings Adds Years More of Toil," *Washington Post*, Jan. 29.

U.S. Dept. of Labor (2008): *Private Pension Plan Bulletin: Abstract of 2006 Form 5500 Annual Reports*. Washington, D.C.

VanDerhei, J., S. Holden, L. Alonso, and C. Copeland (2008): *401(k) Plan Asset Allocation, Account Balances, and Loan Activity in 2007*. Washington D.C., Issue Brief No. 324.

Weller, C. E., and J. B. Wenger (2008): *Robbing Tomorrow to Pay for Today*. Center for American Progress.

Zeldes, S. (1989): "Consumption and Liquidity Constraints: An Empirical Investigation," *Journal of Political Economy*, 97, 305–346.

Appendix: Details of Sample and Survey Questions

Retirement Plans Included in Our Sample

As noted in the text, we use the term "401(k) plan" to refer to a number of types of employer sponsored defined contribution retirement accounts. The SCF survey was changed in 2004 to capture more information from households who might not know how to classify their plan. Prior to 2004, the SCF question was "I would like to know what general type of plan this is. In one common type of pension or retirement plan, the monthly retirement benefit paid is based on a formula usually involving age, years of service, and salary. In other plans, money is accumulated in an account until retirement. Is this plan like the formula plan or account plan?" If the respondent answered "account plan", the follow-up was "Can you tell me a little more about this plan? Is it a thrift or savings plan, a 401(k), Supplemental Retirement Annuity (SRA), a profit-sharing plan, or what?" We include as a "401(k) plan" plans identified as thrift or savings, 401(k)/403(b)/SRAs, profit-sharing plans, SEP and SIMPLE IRAs, (unidentified) defined contribution plans, TIAA-CREF, and money purchase plans. Not all of these types of plans allow loans.

In 2004, the question was changed to "There are two general types of pension plans. In one type, a worker is entitled to receive regular retirement payments for as long as the worker lives, which are most often determined by a formula as a percentage of final or average pay. In the other type of plan, money accumulates in an account designated for a worker, and that money may be paid out in a variety of ways depending on the plan or the worker's choice. Some plans may be like both of these types. Which type of plan is yours? (Is it the type that gives regular retirement payments, is it the type that accumulates an account balance, or is it like both?)" If the respondent answers "account plan," the follow-up question is "Is it a 401(k) or 403(b) account, a profit sharing plan, a supplemental retirement annuity, a thrift/savings plan, a "cash balance" plan, or something else? (What does your employer call it?)" For 2004, we include the plan as a "401(k) plan" if it is identified as a 401(k) plan, 403(b), thrift/savings plan, profit sharing plan, supplemental retirement annuity, SEP or SIMPLE IRA or money purchase plan.

Beginning in 2004, households were asked questions relevant to account-type plans (e.g., balances, loans, etc.) regardless of the response to the first "type of plan" question.

The SCF survey asks about as many as three plans for the head and three for the spouse, for as many as six plans per household. We construct annual household aggregate values of contributions, plan balances, loan balances and loan payments.

Table 1: Simple Borrowing Model

Period	(1) Income	(2) 401(k) Balance	(3) Loan Balance	(4) After-Tax Consumption
			Outside Loan:	
1. Borrow	2	1	1	$3-2t_1$
2. Repay	4	$1+r_1$	0	$3-4t_2-i$
3. Withdraw	0	$(1+r_1)(1+r_2)$	0	$(1+r_1)(1+r_2)(1-t_3)$
			401(k) Loan:	
1. Borrow	2	0	1	$3-2t_1$
2. Repay	4	$1+k$	0	$3-4t_2-k$
3. Withdraw	0	$(1+k)(1+r_2)$	0	$(1+k)(1+r_2)(1-t_3)$

Table 2: 401(k) Plans and Loans

	1992	1995	1998	2001	2004	2007
Percent of Households which:						
Have a 401(k) Plan	33.5	43.2	48.7	48.9	46.1	48.5
Can Take a Loan	20.3	28.3	36.0	36.8	32.4	34.1
Have a 401(k) Loan	2.3	4.5	6.8	5.4	5.3	5.1
Loan Rate Among 401(k) HHs	6.9	10.5	14.0	11.1	11.4	10.5
Loan Rate Among Elig. HHs	11.4	16.0	18.9	14.7	16.3	14.9
Sample Size	1,518	1,816	1,798	1,914	1,880	1,831

Table 3: Characteristics of 401(k) Loan-Eligible Households

	All	Without 401(k) Loan	With 401(k) Loan
Demographics:			
Mean Age (Years)	41.9	41.7	42.6
College Degree (%)	48.2	50.1	37.9
Married (%)	71.8	71.9	71.3
Nonwhite (%)	22.6	21.9	26.4
Balance Sheet Info:			
Median Income (th. 2007 $)	75	76	71
Median Net Worth (th. 2007 $)	138	144	111
Debt-Income Ratio (%)	122	118	145
Median 401(k) Balance (th. 2007 $)	23	21	33
401(k) share of fin. assets (%)	39.0	36.5	58.8
Liquidity & Borrowing Constraint Indicators:			
Liquid Assets <1% of Income (%)	10.3	9.0	17.8
Hardly Ever Pay Off Cards (%)	26.2	23.8	39.2
Declined Credit in Past 5 Yrs (%)	24.1	21.5	38.3
Card Balances >80% of Limit (%)	8.6	6.9	17.9
None of the Above (%)	54.9	58.5	36.1
Two or More of the Above (%)	18.0	14.9	34.7
Sample Size (households)	3,406	2,895	511

Pooled sample of 1992, 1995, 1998, 2001, 2004, and 2007 waves of the SCF.

Table 4: Probit Regression of 401(k) Borrowing Among Eligible Households

Variable	Marg. Effect (S.E.)	Variable	Marg. Effect (S.E.)
Debt-to-Inc Quartile 2	0.042** (0.024)	Contrib-to-Inc Quartile 4	-0.015 (0.021)
Debt-to-Inc Quartile 3	0.051** (0.021)	Age= 31-40	0.020 (0.021)
Debt-to-Inc Quartile 4	0.085*** (0.025)	Age= 41-50	0.024 (0.023)
Somewhat Constrained	0.074*** (0.021)	Age= 51-60	0.000 (0.010)
Highly Constrained	0.197*** (0.031)	Income Quartile 2	-0.010 (0.019)
Lowest Rate Quartile 2	-0.023 (0.016)	Income Quartile 3	-0.013 (0.019)
Lowest Rate Quartile 3	0.013 (0.021)	Income Quartile 4	0.003 (0.022)
Lowest Rate Quartile 4	0.005 (0.021)	Net Worth-to-Inc Q2	-0.030* (0.017)
401(k) is all in Stock	-0.003 (0.014)	Net Worth-to-Inc Q3	-0.075*** (0.018)
401(k)-to-Inc Quartile 2	0.111*** (0.031)	Net Worth-to-Inc Q4	-0.095*** (0.018)
401(k)-to-Inc Quartile 3	0.176*** (0.041)	College Degree	-0.049*** (0.014)
401(k)-to-Inc Quartile 4	0.216*** (0.047)	Married	-0.007 (0.017)
Plan Years= 3-5	0.086** (0.040)	Nonwhite	-0.002 (0.015)
Plan Years= 5-10	0.140*** (0.033)	1998 Wave	0.004 (0.020)
Plan Years >10	0.157*** (0.036)	2001 Wave	-0.009 (0.020)
Contrib-to-Inc Quartile 2	0.014 (0.018)	2004 Wave	-0.013 (0.020)
Contrib-to-Inc Quartile 3	-0.007 (0.020)	2007 Wave	-0.019 (0.019)

Pooled sample of 1995-2007 waves of the SCF. Sample size is 3,084 households. Marginal effects evaluated at the means. Standard errors of the marginal effects corrected for multiple SCF imputations (see text). Significance levels: * 10%, ** 5%, and *** 1%. Mean dependent is 0.154. See Table 5 for quartile breaks.

Table 5: Quartile Breaks used in Regressions

	First	Second	Third
Debt-to-Income Ratio	.36	1.07	1.87
Lowest Rate (%)	6.7	9.0	13.9
401(k)-to-Income Ratio	.11	.33	.81
Contrib-to-Income Ratio	.025	.049	.082
Income (th. 2007 $)	52.4	79.4	115.6
Net Worth-to-Income Ratio	0.78	1.83	3.74

Table 6: 401(k) Loan Detail

	1995	1998	2001	2004	2007
Median Values:					
Loan Balance (th. 2007 $)	2.6	3.8	3.5	4.3	4.0
Annual Payment (th. 2007 $)	1.5	1.9	1.4	2.3	1.8
Months to Pay Off[1]	24	25	25	23	25
Utilization Rate:[2] (% of HHs)					
<.25	60.4	54.2	60.6	58.9	51.4
.25-.50	23.3	27.2	19.0	25.2	28.6
.50-.75	9.2	12.0	10.5	12.0	9.8
>.75	7.1	6.6	9.9	3.9	10.2
Loan Purpose: (% of HHs)					
Home Purchase or Improvement	n.a.	34.4	34.6	25.2	13.7
Investment or Debt Consol.	n.a.	30.8	31.3	36.3	51.8
Vehicle or Durable	n.a.	10.5	23.1	18.0	9.4
Other	n.a.	24.3	11.1	20.5	25.2

[1]Number of months required to pay off the loan at the current rate.
[2]Utilization rate is the ratio of the actual 401(k) loan to the maximum allowable loan.

Table 7: Alternative Return Assumptions used to Measure 401(k) Loan Opportunity Costs in 2007

	Long-Run Average	5-year Trailing	Gallup Survey	Risk-free Rate*
Stock Return (%)	10.0	5.2	7.8	4.5
Bond Return (%)	7.0	4.4	4.4	4.5
Portfolio Return (%)	8.7	4.9	6.3	4.5

*Preferred measure

Table 8: Potential Gains from Shifting Debt to 401(k) Loans in 2007

	Long-Run Average	5-year Trailing	Gallup Survey	Risk-free Rate*
Households who could gain (%)	41.5	62.0	55.3	63.1
Shiftable Amount				
Aggregate (bill. 2007 $)	70	138	108	143
Average (th. 2007 $)	5.6	7.4	6.5	7.6
Share of Total Debt (%)	37.7	49.7	43.9	50.6
3-year Gain				
Aggregate (bill. 2007 $)	7.9	14.7	11.9	15.6
Average (2007 $)	633	794	718	825
Reduction in Annual Interest (%)	12.3	18.0	15.6	18.8

*Preferred measure

Table 9: Variation in Potential Gains from Shifting to 401(k) Loans in 2007*

	% Reduction in Annual Interest
Average	20.7
Std Dev	12.5
10th	4.2
50th	19.5
90th	39.9

*Using preferred risk-adjusted measure of expected future returns.

Table 10: Regression of Potential Gains on Household Characteristics, 2007*

Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)
401(k)-to-Inc Quartile 2	0.069***	Age= 31-40	-0.008
	(0.014)		(0.018)
401(k)-to-Inc Quartile 3	0.080***	Age= 41-50	0.004
	(0.017)		(0.017)
401(k)-to-Inc Quartile 4	0.070***	Age= 51-60	0.015
	(0.019)		(0.017)
Lowest Rate Quartile 2	0.099***	Married	-0.006
	(0.013)		(0.014)
Lowest Rate Quartile 3	0.154***	Nonwhite	0.011
	(0.016)		(0.012)
Lowest Rate Quartile 4	0.249***	Income Quartile 2	0.010
	(0.015)		(0.017)
Has a 401(k) loan	0.000	Income Quartile 3	0.015
	(0.015)		(0.016)
Debt-to-Inc Quartile 2	-0.006	Income Quartile 4	0.020
	(0.017)		(0.018)
Debt-to-Inc Quartile 3	0.005	Net Worth-to-Inc Q2	0.052***
	(0.016)		(0.017)
Debt-to-Inc Quartile 4	0.004	Net Worth-to-inc Q3	0.047**
	(0.015)		(0.019)
Somewhat Constrained	0.003	Net Worth-to-Inc Q4	0.050***
	(0.012)		(0.018)
Highly Constrained	-0.001	Constant	-0.043*
	(0.015)		(0.025)
College Degree	0.009		
	(0.011)		

*Dependent variable is the percent reduction in annual interest costs, using our preferred risk-adjusted measure of expected future returns. Sample size is 456 households from the 2007 wave of the SCF. Standard errors corrected for multiple SCF imputations (see text). Significance levels: * 10%, ** 5%, and *** 1%. See Table 5 for quartile breaks.

Table 11: Counterfactual Gains Had Households Shifted Debt to 401(k) Loans in Prior Years*

	1995	1998	2001	2004
Households who could gain (%)	21.4	69.5	68.4	47.5
Shiftable Amount				
Aggregate (bill. 2007 $)	13.6	106	12.7	67
Average (th. 2007 $)	2.9	5.6	6.5	5.2
Share of Consumer Debt (%)	39.6	53.7	51.6	39.1
3-year Gain				
Aggregate (bill. 2007 $)	1.2	17.4	15.2	7.1
Average (2007 $)	249	947	758	550
Reduction in Annual Interest (%)	9.4	26.5	19.6	14.2

*Using realized stock and bond returns.