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Participation in and Contributions to 401(k) Pension Plans: Evidence from Plan Data

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ABSTRACT

401(k) plans differ from traditional employer-sponsored pension plans in that employees are permitted to make pre-tax contributions and the employer may match part of the contribution. Since participation in these plans is voluntary, the sensitivity of participation and contributions to plan characteristics - notably the employer matching rate -- will play a critical role in retirement saving.

Using plan level data from Form 5500s filed annually with the Internal Revenue Service, I find that there is potential for expanding retirement saving through 401(k) plans although there is evidence that the Tax Reform Act of 1986 reduced their attractiveness. Annual employee contributions were reduced by about 4 percent compared to the prior year after controlling for employer match rates.

A simple model of employee contributions predicts that participation should increase with the match rate, and that, under reasonable assumptions, contributions will increase as well, but can eventually fall at higher match rates. I find evidence of both these effects. A .05 increase in the matching rate is associated with one to five percent increase in employee contributions.

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I. Introduction

Employer-sponsored pre-tax savings plans, often called 401(k) plans for the Internal Revenue Code (IRC) section that permits such plans for private corporations, differ from traditional employer-sponsored pension and retirement plans in two important ways. First, employees are permitted to make pre-tax contributions to the plan; the employer may or may not also contribute.[1] Second, once an employee is eligible, actual participation in 401(k) arrangements is generally voluntary.

401(k) plans are increasingly offered as a retirement benefit. Between May 1983 and May 1988, the availability of these plans increased by more than 3 times. The proportion of all civilian workers who were offered such arrangements (either exclusively or in addition to another employer plan) increased from 7% to 24%.[2] In a 1990 survey by Hewitt Associates, 93 percent of the 944 major U.S. employers surveyed offered benefits in this form. These companies, which make up 89 percent of the Fortune 500 and 54 percent of the Fortune 100, offered some matching 79 percent of the time. Fortune Magazine estimates that $130 billion was invested in 401(k)s in 1990.[3]

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[1]Similar plans for certain nonprofit institutions and state and local government are authorized under IRC section 403(b). In addition public-sector employees may participate in arrangements under section 457.

[2]Employee Benefit Issue Brief Issue Brief, September 1989, Number 94.

[3]See Management Accounting April (1991).

Concurrent with the growth of 401(k) plans has been a decline in employee participation in retirement plans. Participation rates have fallen even as overall coverage has increased.[4] Researchers have speculated that covered-worker participation may have fallen due to an increase in these voluntary employer plans, as part of the documented movement from defined benefit coverage to defined contribution coverage.[5] Even and Macpherson (1992) find that employees are less likely to participate in a new plan if it is a 401(k) plan.

Since participation is voluntary in 401(k) plans, unlike in traditional pension plans, the sensitivity of participation to plan characteristics - notably the employer matching rate -- will play a critical role in retirement saving. I use plan level data from Form 5500s filed annually with the Internal Revenue Service (IRS) to analyze participation in and employee contributions to 401(k) plans. A second focus of the analysis is to determine if the more restrictive contribution limits, nondiscrimination requirements, and lower marginal personal tax rates of the Tax Reform Act of 1986 (TRA86) have affected participation and contributions in these plans.[6]

The analysis indicates that the average annual employee contribution fell by about 4 percent following TRA86 (about $63

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[4]See Piacentini (1989).

[5]See Kruse (1991), and Beller and Lawrence (1992).

[6]Poterba, Venti, and Wise (1992) document the decline in Individual Retirement Account (IRAs) contributions in the post-TRA86 environment.

per participant and $97,000 per plan). The plan's match rate positively influences both participation (the number of active accounts) and employee contributions, although its effect on participation is small. Starting from an initial match rate of .10, a .05 increase in the match rate is estimated to increase contributions per participant by from one to five percent. Total saving (combined employee and employer contributions) is estimated to increase from six to 10 percent.

The next section briefly reviews the legislative background of 401(k) plans, in part to demonstrate lawmakers' commitment to equalizing saving opportunities across income groups and the complex rules that commitment entails. Section 3 presents a simple model of the individual's saving decision as a function of the plan match rate. Section 4 presents the empirical findings, and section 5 concludes.

2. Legislative background[7]

The preferential tax treatment accorded more recently developed defined contribution retirement plans, such as individual retirement accounts (IRAs), simplified employee pension (SEPs), section 401(k) arrangements, and Keogh plans for the self-employed, indicates a continued interest on the part of

[7]The information in this section comes from a variety of sources, including practitioner journals. A useful general reference is Fundamentals of Employee Benefit Programs, Employee Benefit Research Institute, 4th edition, 1990.

policy makers in encouraging retirement savings.[8] This preferential treatment is contingent on the employer's compliance with the nondiscrimination provision governing employee coverage and benefit levels and the rules set out in the Employee Retirement Income Security Act of 1974 (ERISA).

The Revenue Act of 1978 first authorized employers to offer 401(k) plans, also referred to as cash or deferred arrangements (CODAs), but their use increased dramatically after the IRS issued clarifying regulations in 1981. In 1983, 4.4 million employees were reported as participating in 401(k) plans. By 1988, that number grew to 15.7 million participants.[9] 401(k) plan participants made up over 25 percent of all participants in primary defined contribution plans in 1987, compared to 5.7 percent in 1983.[10] They comprise an even larger fraction of participants in secondary and tertiary plans.

Part of the popularity of 401(k) plans may be due to the relative ease with which employees can save. An employer-sponsored salary reduction agreement involves less work for the

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[8]Some defined contribution plans are structured as "thrift" or "savings" plans. In these plans, the workers' deposits are made from after-tax income.

[9]See Andrews (1992) and Poterba, Venti, and Wise (1992) for details of the expansion in 401(k) plans.

[10]There are several types of defined contribution plans: money purchase plans (where employer contributions are stated as a percentage of employee salary); target benefit plans (where contributions are scaled to achieve a specified retirement benefit); profit sharing plans (including 401(k) arrangements), thrift plans, stock bonus plans, and employee stock option plans (ESOPS) which traditionally invest in employer's securities.

participant than another popular saving plan -- the Individual Retirement Account (IRA).[11] With the matching provision and no adjusted gross income limit, 401(k) plans have a greater potential for pre-tax saving than do IRAs. While the Tax Reform Act of 1986 (TRA86) reduced contribution limits for both IRAs and 401(k) plans, the 401(k) plan remains the more generous tax-deferred saving vehicle.

In 401(k) plans, a covered employee may elect to have the employer make payments as contributions to a trust under the plan on behalf of the employee, or to the employee directly in cash. Any amounts deferred at the employee's election (called elective contributions) are considered employer contributions to the trust, for which the employer receives a deduction. The employee, in turn, excludes these deferred amounts from income.[12]

Both employer and employee may make contributions to 401(k) plans. Employers may make contributions for the employee, whether or not the employee contributes to the plan, or may match a fraction of the employee contribution. In a typical plan, the employer contributes 50 cents for each dollar the employee saves,

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[11]Poterba, Venti, and Wise (1992) document that the 401(k) participation rate of eligible families is more than twice as high as participation in the IRA program.

[12]With the exception of one state - Pennsylvania - contributions to 401(k) plans are also exempt from state income tax. However, most states require employers to count an employee's elective deferral as wages in computing state unemployment insurance taxes. Some municipalities also treat elective deferrals as wages for local income tax purpose. Contributions are subject to social security tax.

up to six percent of compensation.[13] Beyond 6 percent of pay, employees usually may add unmatched contributions up to legislative limits. Plans may also be established without any employer contributions.

Because the saving is tax-favored, IRS rules restrict participant access to the funds. Elective deferrals may withdrawn without penalty before age 59 1/2 only upon retirement, plan termination, separation from service, financial hardship, or disability.[14] A 10 percent tax is imposed on lump-sum distributions paid to individuals before age 59 1/2 (in addition to income tax owed).[15] TRA86 permits one-time election of 5-year forward averaging for a lump-sum distribution received from a 401(k) plan after age 59 1/2.[16]

Since tax-deferred saving differentially benefits higher income workers, 401(k) plan regulations include pre-tax

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[13]The GAO (1988a) reports that 64 percent of plans with more than 50 employees offer a match rate of 50 percent or less. Plans which match up to a larger fraction of salary tend to have lower matching rates.

[14]IRS regulations define qualified financial hardship for early withdrawal purposes.

[15]If participant takes an early withdrawal but buys an annuity, there is no excise tax - just regular income tax. There is also a 15 percent excise tax on distributions to an individual in excess of specified limits (now $150,000 per year or $750,000 if lump sum).

[16]If the distribution is received in the form of employer securities or retirement bonds, there is additional favorable tax treatment - the net unrealized appreciation is not taxed on distribution but is taxed only when sold. IRA, 403(b), and Keogh lump-sums (if received for reasons other than death) are not eligible for this treatment.

contribution limits and nondiscrimination provisions in addition to those in ERISA which apply to all pension plans. The main purpose behind the more stringent regulations imposed in TRA86, described below, is to ensure a more equal distribution of benefits. Contribution limits and nondiscrimination tests will be reviewed briefly here; see Andrews (1992) and Piacentini (1989) for discussion of the loan and withdrawal provisions.

Contribution limits

Prior to TRA86, section 415 of the IRC limited before-tax contributions to the lesser of 25 percent of employee compensation or $30,000. After TRA86, for taxable years beginning after January 1, 1987, the maximum permitted annual before-tax or elective deferral is $7000, indexed to inflation beginning in 1988. In the 1991 tax year, employees could contribute up to $8,475 to a qualified plan.

After-tax or "voluntary" contributions on the part of the employee are not subject to the $7,000 limit for elective contributions but do count against the overall section 415 limits of $30,000, or 25% of compensation from all plans.[17] Nondiscrimination rules, discussed below, may prevent some employees from contributing to the limit even if they want to.

[17]Earnings on after-tax contributions are not taxed until distribution and some employers will match them. If the plan is organized as a profit-sharing plan, the limit is further reduced to 15 percent of gross salary.

Nondiscrimination tests

Nondiscrimination tests limit the amount that highly compensated employees may elect to defer in relation to other employees. These compliance tests must be carried out on an annual basis. In general, a highly compensated employee is anyone who owns more than 5 percent of a company, or anyone earning more than a certain indexed income threshold. The exact level of the threshold depends on factors such as whether or not an employee was an officer in the company or was a member of the "top paid" group of employees.[18]

Prior to TRA86, the actual deferral percentage (ADP) test required that a plan sponsor compare the average percentage contributed by the highest paid 1/3 participant group against the lowest paid 2/3's. Generally, the average percentage for the highest-paid third could exceed the average percentage for the lower 2/3s by 3 percentage points.

TRA86 tightened these requirements and added a parallel test for employee after-tax and employer matching contributions -- the actual contribution percent (ACP). Under the revised ADP test, the average percentage of compensation (taking into account employer contributions) deferred by highly compensated employees may not exceed the greater of: 125% of the average deferral percentage for all other eligible employees, or the lesser of

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[18]In 1988, the relevant threshold ranged from $47,011.50 to $78,353. Other, potentially more stringent, nondiscrimination requirements may apply where employer contributions, after-tax employee contributions, or multiple plan participation are present. See Employee Benefit Notes, March 1991, Volume 12 Number 3.

200% of the average deferral percentage of all other eligible employees or such average plus two percentage points. The ACP mirrors this test, except for the substitution of "actual contribution percentage" for "actual deferral percentage."[19]

If a plan fails either the ADP or ACP test in any given plan year, certain other contributions may be included to help pass these tests. For purposes of passing the ADP test, the regulations provide that the employer may include qualified nonelective contributions (QNCs) and qualified matching contributions (QMACs) in the ADP calculation. For the purposes of passing the ACP test, the employer may include QNCs or elective contributions in the ACP calculation. QNCs are nonforfeitable, nonelective employer contributions that are subject to the distribution restrictions applicable to Section 401(k) elective contributions. QMACs are nonforfeitable employer matching contributions that are subject to the same restrictions. These are sometimes called "helper" contributions or a "safe harbor."[20]

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[19]For example, if the non-highly compensated group has contributions (by both employee and employer) of less than 2 percent of gross income, the highly compensated group is limited to twice that ADP percentage. If the non-highly compensated contribute between 2 and 8 percent, the highly paid group may contribute that ADP plus 2 percent. If the lower paid group contributes 8 percent or more, the highly paid group is limited to 1.25 times that rate.

[20]401(k) "restructuring" can also be used to pass non-discrimination tests. Instead of comparing, on a plan-wide basis, average deferrals by highly compensated employees with others, the plan is restructured for testing purposes into groups of

A 10 percent excise tax is imposed on the employer for excess amounts remaining in the plan 2 1/2 months after the close of the plan year. Further, the plan may be disqualified if excess amounts are not corrected by the end of the following plan year. Excess contributions may be recharacterized (within 2 1/2 months of the close of the plan year) as after-tax employee contributions, to the extent required to satisfy the ADP test. Excess amounts may also be corrected by distributing them to the highly compensated employees to whom they relate. Correction of excess amounts may also be made by contributing additional helper QNCs or QMACs.[21]

These nondiscrimination tests require an ex-post adjustment of the effective match rate for some participants. If, at the end of the plan year, higher-income workers have tipped the balance of the plan, the sponsor may make additional contributions to lower-income participants' accounts. For some participants, the marginal plan match rate may be a lower bound on the plan's generosity.

In the next section I analyze a simple model of employee contributions based on utility maximization. The model predicts that participation should increase with the match rate, and that,

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participants. Separate plans then cover employees at different locations, or job categories. In September 1990, the IRS issued amendments which state that the restructuring rules require that the employee group share some common attribute other than that of a similar deferral percentage.

[21]See Faber, Journal of Pension Planning and Compliance, Winter 1990, part 1.

under reasonable assumptions, contributions will increase as well, but may eventually fall at higher match rates. These predictions are tested in section 4.

3. A simple model of 401(k) contributions

This section presents a model of the individual's decision to save in a 401(k) plan, conditional on the plan's match rate.[22] Since ERISA sets overall eligibility parameters, and the IRS sets limits on overall contributions, the most critical dimension by which 401(k) plans differ is the match rate chosen by the sponsor.[23]

Assuming separability of saving s and consumption c for simplicity, an employee maximizes utility over s and c according to

$$\max_{s \geq 0,\ c \geq 0} U_1(s) + U_2(c). \quad \text{subject to } c+s \leq y \tag{1}$$

The employee faces exogenous matching rate m in a 401(k) plan. Total savings s will be x(1+m), where x is the amount contributed. Total consumption c is then y-x where y is income. The employee maximizes utility by choosing x, the amount of the

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[22]Most plans have a positive match rate. The GAO (1988b) reports 51 percent of firms which sponsor plans provide some matching contribution. Most participants face a positive match rate. Even and Macpherson (1992) report that 83 percent of participants in a primary 401(k) plan include employer contributions or offer matching contributions.

[23]Ease of loans and hardship withdrawals are other dimensions by which plans may differ. But the IRS and Department of Labor set overall limits with respect to these as well.

401(k) contribution.

$$\max_{x \geq 0} \; U_1((1+m)x) + U_2((y-x)). \tag{2}$$

The employee will participate in the plan (i.e. the optimal contribution

$x^* > 0$) if

$$(1+m)\frac{\partial U_1}{\partial s}(0) > \frac{\partial U_2}{\partial c}(y) \tag{3}$$

or, when (1+m) is greater than the ratio of the marginal utility from an extra dollar of consumption to the marginal utility of the first dollar of saving.

Assuming that the employee chooses to participate, the first-order condition for the optimal employee contribution x^* is used below to illustrate how contributions vary with the matching rate m. For notational simplicity, define $x(m) \equiv x^*(m)$. The first-order condition which x(m) solves is

$$(1+m)\frac{\partial U_1}{\partial s}((1+m)x(m)) - \frac{\partial U_2}{\partial c}(y-x(m)) = 0. \tag{4}$$

Differentiating (4) with respect to m yields

$$(1+m)\frac{\partial^2 U_1}{\partial s^2}\left[x + (1+m)\frac{\partial x}{\partial m}\right] + \frac{\partial U_1}{\partial s} + \frac{\partial^2 U_2}{\partial c^2}\frac{\partial x}{\partial m}) = 0. \tag{5}$$

Rewriting,

$$-[(1+m)^2\frac{\partial^2 U_1}{\partial s^2} + \frac{\partial^2 U_2}{\partial c^2}]\frac{\partial x}{\partial m} = [\frac{\partial U_1}{\partial s} + x(1+m)\frac{\partial^2 U_1}{\partial s^2}]. \qquad (6)$$

Because U_1 and U_2 are assumed to be concave, their second derivatives with respect to s and c are negative. Therefore, the term multiplying $\partial x/\partial m$ in (6) is positive. Because $\partial U_1/\partial s > 0$ and $\partial^2 U_1/\partial s^2 < 0$, it follows that

$$\frac{\partial x}{\partial m} = [(+) + (-)]. \qquad (7)$$

The contribution x will increase with matching rate m when

$$\frac{\partial U_1}{\partial s} > s|\frac{\partial^2 U_1}{\partial s^2}|, \qquad (8)$$

where, recall, $s = x(1+m)$.

To illustrate the condition in (8), consider two examples.

Example 1: $U(s,c) = \alpha\log(1 + s) + U_2(c)$

If $U_2(c) = c$, participation occurs when $(1+m)\alpha > 1$, that is, participation is increasing in m. Checking the contribution-match rate relationship for general $U_2(c)$,

$$\frac{\partial U}{\partial s} = \frac{\alpha}{(1+s)} > s|\frac{\partial^2 U}{\partial s^2}| = \frac{s\alpha}{(1+s)^2}.$$

Contributions are also increasing with the match rate in this example.

Example 2: $U(s,c) = \alpha s - (\beta/2)s^2 + U_2(c)$

$$\frac{\partial U}{\partial s} = \alpha - \beta s; \quad \frac{\partial^2 U}{\partial s^2} = -\beta.$$

Again, if $U_2(c) = c$, participation occurs when $\alpha > 1/(1+m)$. Contributions in example 2 will increase with m when $\alpha - \beta s > \beta s$, or when $s < \alpha/(2\beta)$. This example predicts that x will be positively related to m for small m, and negatively related to m for larger m.

The next section summarizes 401(k) plan statistics from Form 5500 filings, and estimates the empirical relationship between plan match rates and participation and contributions.

4. Empirical findings

The Form 5500 is filed annually with the IRS by all sponsors of pension plans with more than 100 participants.[24] These reports included data on plan eligibility, participation, employment, administrative cost, distributions, and contributions.[25] I use data from the 1986 plan year which precedes the revision of rules in TRA86, and from plan year 1987

[24]A Form 5500-C is required every three years of all plans with fewer than 100 participants.

[25]See Beller and Lawrence (1992) for further detail on the Form 5500 data.

which followed the changes.[26] I also use data from plan year 1985 to construct instrumental variables used in the estimation below.

According to IRS rules, all contributions to the 401(k) plan are officially made by the employer. However, the Form 5500 asks for a breakdown of contributions, and 70 percent of plans report employee and employer contributions separately. Plans for which both contributions are reported comprise my sample.[27]

About 63 percent of plans in the sample began after 1982; the remaining 37 percent of plans are converted thrift plans. Forty-one percent of plans below to manufacturing firms, 17 percent to firms in services, 15 percent to finance, insurance, and real estate, and between 5 and 6 percent to transportation and communication, wholesale trade, and retail trade.

Summary statistics for plans in 1985, 1986, and 1987 are presented in Table 1. In 1987, the average employee contribution was $1572, with a corresponding average employer contribution of $875 for a total of $2447 per participant. This average suggests that the TRA86 limit of $7000 on pre-tax contributions is unlikely to be binding for most participants.

I construct the plan match rate as the ratio of reported

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[26]Unfortunately, the definition of active participant was changed for the 1988 and 1989 plan years so that data from years will not be comparable. The definition was corrected in the 1990 plan year.

[27]About 10 percent of plans report employee contributions only. These are probably converted thrift or savings plans where only the employee is intended to contribute. The remaining 20 percent of plans attribute all contributions to the employer.

employer contributions to employee contributions. The match rate averaged .729 in 1987, and is virtually the same in prior years. This average match rate will differ from reported marginal rates. A 1988 Government Accounting Office (GAO, 1988a) survey of 401(k) plans reports that 64 percent of large employers match at a rate of $.50 or less. Poterba, Venti, and Wise (PVW, 1992) find with the 1989 Survey of Consumer Finances that almost 40 percent of participants report a match rate between 0 and 10 percent, and another 25 percent face a rate less than or equal to 50 percent.

This calculated average match rate can be reconciled with these lower marginal rates by recognizing that employer contributions reported on the Form 5500 include any flat per participant contribution made by the employer, or any helper contribution the employer made to pass the ADP or ACP anti-discrimination tests. So, while the calculated match rate exceeds the marginal incentive facing each saver, it may be a better indicator of overall plan generosity.

The GAO (1988a) reports a participation ratio of 62 percent which is the fraction of eligible employees who made contributions. I construct a measure of participation as the number of active accounts divided by the number of those eligible to participate. An active account is any existing 401(k) account - a contribution need not have been made that plan year. This participation rate averaged over 86 percent in each of the three years. Administrative costs per participant averaged about $102,

plan assets averaged $13,222 per participant, and plans distributed $1388 per participant.[28]

Tables 2-4 present cumulative frequencies for the participation rate, the average employee contribution, and average plan match rate. Most plans report well over 90 percent participation. About seventy percent of participants contribute $2000 on average in each year. Fifty-eight percent of plans have an average matching rate of 50 percent or less, 80 percent average 1.00 or less. Most of the econometric analysis focuses on plans with a match rate less than or equal to 1 as there are clear structural differences between contributions and match rates for rates greater than 1.

The participation equation to be estimated is

$$\text{prate} = \beta_1 + \beta_2 \text{d1987} + \beta_3 \log(1+\text{m}) + \beta_4(\text{firm size}) + \beta_5(\text{firm size})^2 + \beta_6(\text{sole plan})$$

where prate is the number of active accounts divided by the number of eligible employees. The match rate is transformed to be log(1+m).[29] d1987 is a dummy variable for 1987, firm size is measured as the log of total employees, and sole plan is a dummy variable which indicates that the 401(k) plan is the only pension plan offered.[30]

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[28]Unfortunately, the annual number of recipients is not reported.

[29]This functional form has some desirable features. It starts off at zero for m=0, increases almost linearly for small m, and the rate of increase declines as m gets large.

[30]This characteristic is not directly reported on the Form 5500. Dan Beller at the Department of Labor calculates it from the

The first column of Table 5 presents estimates of this equation using OLS on the pooled 1986 and 1987 data. The estimates indicate that the participation rate fell by 0.6 percent between 1986 and 1987. Of course, TRA86 did not make it more likely that active accounts would be closed. Rather, reductions in marginal tax rates reduced the advantages of tax-deferred saving and appears to have slowed new account formation.

The marginal effect of a change in the matching rate m is found by dividing the estimated coefficient by (1+m). As is predicted by the model in the previous section, increases in m raise participation. Beginning with a match rate of .10, for example, a .05 increase in the match rate raises the participation ratio by 0.0114, or by about 17 people in a plan of average size. While the coefficient is statistically significant, the measured effect is not large.

The firm size coefficients indicate that a ten percent increase in the size of the firm reduces participation by 0.001 (evaluated at the 1987 mean firm size). The sole plan coefficient indicates that they have a 0.007 higher participation rate - about 11 people - relative to 401(k) plans which accompany other pension plans.

Some plans may be more successful at encouraging their employees to participate, or may have employees on average who participate more than other plans. Table 5 also presents estimates from a fixed effects regression to control for the

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universe of pension plans.

possibility that these plan unobservables are also correlated with the match rate. That is, employers may offer lower matching rates if they have employees who like to save (or conversely, if because of lower employee savings rates, the employer made larger helper contributions). Controlling for the time-constant unobservables eliminates the statistical significance of the match rate, and the direction of the effect is barely positive. The marginal effect of firm size becomes positive but is still small, indicating that a ten percent increase in firm size increases participation by 0.002. D1987, the dummy for 1987, remains negative but is not statistically significant. The effect of TRA86 on participation appears to be negative but small.

It appears that participation is unaffected by the match rate once plan unobservables are controlled for. There are two possible explanations for this. The first is that the measure of participation (number of 401(k) accounts divided by active participants) is too imprecise. The Form 5500 reports the total number of existing accounts, not the number of new accounts or accounts closed each year. Secondly, initial participation may well be a function of plan unobservables, such as the effort of an active benefits staff or the work force characteristics of the particular firm.[31]

To test the prediction that contributions are positively

[31]The sample includes only one 401(k) plan per firm, so the fixed effects are also controlling for firm characteristics.

related to the match rate, at least up to some point, the following contribution equation is estimated:

$$\log(ec) = \beta_1 + \beta_2 d1987 + \beta_3 \log(1+m) + \beta_4 (\log(1+m))^2 + \beta_5 (\text{firm size})$$

where ec is employee contributions per participant. The first two columns of Table 6 report estimates from OLS on the pooled 1986 and 1987 data (column 2 is included to illustrate the strong negative relationship between the average employee contribution and the match rate for match rates greater than 1).

The pooled regression (column one) indicates that the average employee contribution fell by 4.1 percent in 1987, relative to pre-TRA86 contributions. The effect is statistically significant, and amounts to about $64 per participant on average. This is the combined effect of the drop in marginal tax rates between the two years which made tax-deferred saving less valuable, and the drop in the maximum allowable contribution. If the more stringent anti-discrimination requirements forced employers to increase contributions for lower-income employees, the contributions were not large enough to completely offset these other factors.

As in the second example of section 3, employee contributions initially increase then decrease with the match rate. Both terms in log(1+m) are statistically significant. Table 7 contains calculations of the marginal effect of changes in the match rate on employee contributions and on total saving. Beginning from a match rate of .05, an increase of .05 increases

contributions by 1.18 percent, and saving (combined employee and employer contribution) by 5.94 percent. This positive marginal effect on contributions diminishes and becomes negative at a match rate of .15. At this point, a .05 increase in the match rate reduces employee contributions by .07 percent, but saving still increases by 4.28 percent. At a match rate of .50, however, even the marginal effects on saving become negative. The estimates give unrealistic predictions beyond this point.

This effect of the match rate on employee contributions is roughly consistent with the one piece of evidence we have from individual data. Andrews (1992) finds with the 1988 Current Population Survey (CPS) that contributions are lower when an employer match is provided (the CPS does not include the match rate or the amount of the employer contribution).

Unlike with participation, firm size is positively related to the contributions - a ten percent increase in firm size increases employee contribution by about 0.4 percent. It is likely that larger firms would have a permanent benefits staff which may facilitate employee contributions.

As with the participation estimates, it may be desirable to control for plan unobservables. Fixed effects estimates are presented in the third column of Table 6 to control for unobservable plan or firm characteristics which may correlated with the match rate. However, in the context of contributions, straightforward fixed effects may not be correct. First differencing the data to obtain the fixed effects estimates may

induce a separate endogeneity problem if, within a plan across time, high employee contributions lead to a lower match rate in the following year. That is, the match rate in 1987 is negatively correlated with error from the 1986 equation, as in the equation below:

$$ec_{87} - ec_{86} = \beta \text{ (match rate}_{87} - \text{match rate}_{86}) + (u_{87} - u_{86}).$$

But, fixed effects requires that the regressors in all time periods be uncorrelated with the errors in all time periods (the strict exogeneity assumption). It is difficult to sign the potential bias, however, because of the function form of the match rate; see Montgomery, Shaw, and Benedict (1992) for a related argument.

Fixed effects instrumental variables (FE-IV) allows future matching rates to be correlated with past errors while maintaining that the errors are uncorrelated with the match rate in past and current years. As a robustness check, I calculated match rates from the 1985 Form 5500 data, and used the 1985 and 1986 match rates as instruments for the regressor in the differenced equation.[32]

The FE-IV estimates in the fourth column of Table 6 confirm these suspicions. The coefficients on the match rate variables accord with those in the pooled OLS regression, although both the coefficients and standard errors have become much larger. Calculations of the marginal effect of changes in the match rate

[32]The chi-squared test of the overidentifying restriction did not come close to rejecting.

on contributions and saving using these coefficients are presented in Table 7. Using the FE-IV estimates, an increase in the match rate of .05 from .05 increases contributions by 5.07 percent, and saving by 9.83 percent. The marginal effect remains positive up to a match rate of .30. At a match rate of .35, a .05 increase in the match rate reduces employee contributions by -.67 percent, but saving increases by 3.03 percent. The marginal effects on saving again become negative at a match rate of .50.

These estimates could suffer from omitted variable bias if firms trade off their 401(k) contributions against the wage bill in total worker compensation. Woodbury and Hamermesh (1992) provide some indirect evidence on this issue. The authors find that the share of fringe benefits in total compensation is negatively related to the tax-price of benefits. Montgomery, Shaw, and Benedict (1992) find a one-for-one tradeoff between wage compensation and defined benefit pensions, while most of the rest of the literature finds that high pensions and wages go together.[33] If there were such a tradeoff for 401(k) pension plans, then the (omitted) wages would be negatively correlated with the match rate. Such a relationship is not likely to occur in the case of 401(k) plans, however, since wage compensation and the match rate must be determined before the amount of employee contribution is revealed.

Both the pooled OLS and FE-IV estimates suggest the same

[33]See Schiller and Weiss (1980).

basic relationship between the match rate and employee contributions. Average employee contributions initially rise with the match rate, but at some match rate between .15 and .35, contributions are reduced, although total saving increases. A .05 increase in the matching rate at a low initial match increases contributions from between 1 and 5 percent. The estimates produce unrealistic predictions at match rates above .50.

5. Conclusion

Tabulations of the Form 5500 data indicate that there is much potential for expanding retirement saving through 401(k) plans. While participation rates are high, employee contributions are well below allowable limits. There is evidence as well that TRA86 reduced the attractiveness of saving through 401(k) plans. Estimates show no increase in the number of new 401(k) accounts in 1987, and annual employee contributions were reduced by about 4 percent compared to the prior year after controlling for employer match rates.

A simple model of employee contributions is presented which predicts that participation should increase with the match rate, and that, under reasonable assumptions, contributions will increase as well, but may eventually fall at higher match rates. I find evidence of both these effects. Participation is positively related to the match rate, although the effect is small. Average employee contributions initially rise with the

match rate, but then fall at some match rate between .15 and .35, although total saving increases. A .05 increase in the matching rate is associated with one to five percent increase in employee contributions.

401(k) plans have potential to increase retirement saving, and it appears that encouraging employers to provide some matching would increase participation and contributions. However, if our concern is with saving for retirement, we should be as concerned with the outflow from 401(k) plans as well as the inflow. While there are penalties for early withdrawal, the limited evidence we have suggests that over one-third of individuals receiving lump-sum distributions from prior jobs spend the entire amount.[34] This potential for leakage needs to be investigated before we encourage 401(k) plans as a retirement saving vehicle.

[34]See Employee Benefit Notes, Employee Benefit Research Institute, Volume 12, No. 1, January 1991. Also see EBRI Issue Brief No. 65, April 1987.

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Table 1: 401(k) plan mean characteristics			
	1985	1986	1987
employee contribution	1555.48 (1154.26)	1669.25 (1267.06)	1571.51 (1097.79)
employer contribution	848.24 (864.73)	893.65 (921.96)	875.44 (853.88)
match rate	.728 (.823)	.714 (.819)	.729 (.827)
participation fraction	.887 (.181) [5598]	.873 (.160) [4194]	.869 (.167) [4814]
participants	1953.65 (8634.64)	1640.50 (7585.33)	1536.45 (7100.65)
total firm employment	7736.40 (23885.36)	6784.03 (22593.51)	6107.67 (21957.98)
sole plan	.307	.353	.392
administrative cost per participant	79.42 (240.97) [1195]	110.15 (654.95) [1809]	101.77 (534.92) [2105]
assets per participant	11792.64 (13909.83) [3519]	13095.74 (15724.72) [4662]	13222.44 (14653.18) [5317]
distributions per participant	1302.99 (1912.64) [3328]	1526.57 (2407.21) [4492]	1387.59 (2278.54) [5136]
number of observations	3565	4703	5363

Note: These are mean characteristics for 401(k) plans with more than 100 participants. Standard deviations are in parentheses. If a different number of observations other than that given in the last row is used in the calculations, it is given in brackets.

Table 2: Plan participation rate cumulative frequencies			
	1985	1986	1987
0.1	0.09	0.10	0.15
0.2	0.48	0.19	0.33
0.3	1.36	0.62	0.89
0.4	3.22	1.50	1.99
0.5	5.73	3.46	4.07
0.6	10.20	7.58	7.91
0.7	16.29	13.78	15.06
0.8	27.53	26.99	28.42
0.9	42.21	44.56	44.18
1.0	100.00	100.00	100.00
number of observations	5598	4194	4814

Table 3: Employee contribution cumulative frequencies			
	1985	1986	1987
$1000	34.47	30.07	32.15
$2000	73.66	70.42	72.74
$3000	91.92	90.26	92.56
$4000	97.42	96.64	97.82
$5000	98.63	98.21	99.03
$6000	99.30	98.83	99.38
$7000	99.52	99.28	99.63
$10000	100.00	100.00	100.00
number of observations	3565	4703	5363

Table 4: Plan match rate cumulative frequencies			
	1985	1986	1987
.25	21.99	23.28	23.07
.50	57.81	59.00	57.65
.75	72.79	73.04	72.40
1.00	80.56	81.12	80.70
1.50	88.56	89.05	88.53
2.00	92.90	92.96	92.50
2.50	95.01	95.07	94.50
3.00	96.52	96.39	96.33
3.50	97.48	97.49	97.52
4.00	98.40	98.47	98.47
5.00	100.00	100.00	100.00
number of observations	3565	4703	5363

Table 5. Participation rate regressions		
	Pooled regression	Fixed effects
constant	1.244 (.037)	———
d1987	-.006 (.004)	-.002 (.003)
log(1+match rate)	.250 (.012)	.002 (.016)
firm size	-.113 (.010)	-.084 (.042)
firm size^2	.006 (.001)	.006 (.003)
sole plan	.007 (.004)	-.009 (.013)
number of observations	7173	2410
r-squared	.1138	.0024

Note: The r-squared for the fixed effects estimation is from the first-difference regression. Standard errors are in parentheses.

Table 6. Employee contribution regressions				
	Pooled match rate <=1	Pooled match rate >1	Fixed Effects	Fixed Effects IV
constant	7.104 (.046)	7.676 (.277)	----	----
d1987	-.041 (.015)	.004 (.035)	.083 (.018)	-.046 (.070)
log(1+match rate)	.389 (.198)	-1.066 (.475)	-.092 (.123)	1.307 (.667)
$(\log(1+\text{match rate}))^2$	-1.448 (.271)	.028 (.200)	-.546 (.084)	-2.480 (.841)
firm size	.035 (.005)	.005 (.011)	.078 (.046)	.074 (.071)
Obs.	8202	1949	2723	1855
r-squared	.0327	.1384	.1304	----

Note: The dependent variable is the log(employee contributions/participant). The r-squared from the fixed effect estimation is from the first-difference regression. Standard errors are in parentheses.

Table 7. Marginal effects of the match rate using pooled OLS estimates

	$\partial \log(c)/\partial m$	% Δ c for Δm=.05	$\partial \log(s)/\partial m$	% Δ s for Δm=.05
m = .05	0.2359	1.18%	1.188	5.94%
.10	0.1027	0.5%	1.012	5.06%
.15	-0.0137	-0.07%	0.8559	4.28%
.20	-0.1158	-0.01%	0.7175	3.59%
.25	-0.2572	-0.01%	0.5428	2.71%
.30	-0.2852	-0.01%	0.4840	2.42%
.35	-0.3556	-0.02%	0.3851	1.93%
.50	-0.7852	-0.393%	-0.1185	-0.59%

Note: m = match rate, c = employee contribution, s = saving. These calculations use the regression coefficients from Table 6, column 1.

Table 8. Marginal effects of the match rate using FE-IV estimates

	$\partial \log(c)/\partial m$	% Δ c for Δm=.05	$\partial \log(s)/\partial m$	% Δs for Δm=.05
m = .05	1.0143	5.07%	1.9667	9.83%
.10	0.7584	3.79%	1.6675	8.34%
.15	0.5337	2.67%	1.4033	7.02%
.20	0.3356	1.68%	1.1689	5.84%
.25	0.1602	0.08%	0.9602	4.80%
.30	0.0044	0.02%	0.7736	3.87%
.35	-0.1345	-0.67%	0.6062	3.03%
.50	-0.7041	-3.52%	-0.0374	-0.19%

Note: m = match rate, c = employee contribution, s = saving. These calculations use the regression coefficients from Table 6, column 4.