Better Plans for the Better-Paid:
Determinants and Effects of 401(k) Plan Design

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Prepared for presentation at the
2005 Pension Research Council Symposium, April 25-26, 2005
The Evolution of Risk and Reward Sharing in Retirement

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Abstract

This paper seeks to understand why plan sponsors design their 401(k) plans the way they do. Drawing on a rich dataset of several hundred 401(k) plans, we find support for the argument that these plans are principally a form of tax-motivated compensation. In other words, to appeal to better-paid workers, employers provide more generous matching contributions and non-cash plan design features. At the same time, complex federal tax rules restrict pay discrimination in favor of the highly-paid, so these plans must also incorporate monetary and non-monetary incentives to induce a minimum level of participation by lower-paid workers. We show that, since all employees do not avail themselves of these saving incentives, the median employer promises a match equivalent to 3% of pay yet spends only about 2%. Also, generous match rates enhance participation by the lower-paid, but do not do much to increase plan-wide saving rates. Overall, employer 401(k) matching contributions are an imperfect vehicle for advancing broad-based retirement security objectives, and they have an uneven impact across firms.

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Company-sponsored defined contribution (DC) plans are today at the core of the US retirement system, with more than 60 million employees participating in DC plans holding $2.4 trillion in assets. The number of DC participants has grown at an annual 3% rate over the past two decades, almost double the rate of labor force increase.[1] Indeed it is estimated that for the Baby Boom generation, company-based DC plans will provide larger retirement benefits than Social Security (Poterba *et al.*, 2001). Against this optimistic backdrop, however, some experts have opined that workers may fail to properly exercise the new responsibilities imposed on them by participant-directed DC plans. Thus studies have reported that one-third of workers fail to join their 401(k) plans; some participants fail to contribute to the plan as much as they think they should or concentrate their portfolios in a single asset class; and young employees often fail to preserve their plan assets until retirement.[2]

Prior research has explored how employer matching contributions in 401(k) plans shape employee saving behavior.[3] By contrast, in this paper, we focus on the question of how and why employers shape their plan design features, and also explore how employee groups respond to these features. Our research is made possible by a rich new dataset of several hundred 401(k) plans covering more than 740,000 employees, containing unique detail on plan design features and workforce characteristics. We are able to model employer matching contributions with exceptional precision, and we also incorporate important non-monetary design features including

the plan investment menu and the presence of loans which we argue reflect liquidity and investment constraints inherent in 401(k) plans.

Our analysis seeks to reconcile competing rationales for 401(k) plan design features and employees' responses to them. Are 401(k) plans just a particularly complex form of compensation? Or do employers utilize such plans to shape other characteristics—such as age, tenure, or even the male-female mix—of their workforces? To highlight the relevant issues, we show that promised 401(k) matches vary from zero to over 6% of pay, while the median employer *promises* a match equivalent to 3% of pay. In practice, however, the *actual* employer expenditure on the promised match is substantially lower, because some workers fail to participate in the plan or to contribute at levels needed for the maximum match. What factors explain the wide variation in promised matches—and the forfeiture of compensation by some workers? One possibility is that these variations are driven largely by the value assigned to compensation paid in the form of matching contributions, presumably influenced by workers' marginal propensity to save and marginal tax rates. Another possibility is that employers intentionally direct a portion of their compensation budgets toward (or away from) workers with particular age, tenure, or other characteristics. The second view has support in prior research, which has shown that employee utilization of 401(k) plans is linked to workers' age, tenure, sex, and income levels. The question is whether those findings are a function of 401(k) plan construction, or rather whether plan design reflects the demand for a particular form of tax-advantaged compensation.

To evaluate these alternative interpretations, our analysis explores the full range of 401(k) plan incentives and restrictions as they are shaped by and in turn shape participants' behavior. We conclude that 401(k) plans are structured to accommodate workers' preferences

for tax-advantaged compensation, particularly those of better-paid employees who demand more tax-advantaged compensation and also better non-monetary plan features. Specifically, "better" plan design features—more generous matching contributions, more numerous fund offerings, and access to loans—are positively related to company pay levels. Yet in the US, all 401(k) plans are also subject to federal nondiscrimination testing (NDT) rules, requiring that lower-paid workers must participate in the plans at some minimum level in order to retain the plan's tax-preferred status: this has the effect of a certain minimum participation among lower-paid workers in a 401(k) plan. If employers fail to do so, highly-paid employees are restricted from contributing to the plan.[4] We find that firms appear to maximize compliance with nondiscrimination rules while minimizing matching contribution costs *via* two mechanisms. First, under NDT rules, the company match formulas work to encourage participation by non-highly compensated employees. Second, to encourage higher participation and saving rates, employers also offer broader investment menus and loan features. Importantly, we find no evidence that employers seek to reward other workforce characteristics, such as age, tenure, or the male-female mix. Thus employee saving patterns may be influenced by such factors, but we interpret the results as reflecting workers' own taste for saving, not an intentional effort by employers to reward specific classes of workers.

Our results have important implications for employers and policymakers. This is because they suggest that matching contributions tend to be imperfect incentives for ensuring broad-based retirement security, due to their association with workers' earnings and tastes for saving. Alternative policies to broaden the saving base would include automatic enrollment, employer or governmental nonelective contributions, and mandatory retirement plan contributions. Our results also suggest that federal nondiscrimination testing rules have very different impacts

across firms: that is, companies with lower-income and shorter-tenured populations are more likely to be constrained by the rules than are firms with higher-income and long-tenured workers.

In what follows, we first briefly review prior 401(k) research, and then we describe our methodology and data. Next we report our analysis of the determinants of employer plan design decisions, followed by an analysis of how employee behavior and employer actual costs react to structural plan design features. A final section offers conclusions and implications.

I. Prior Research

Prior researchers have explored saving patterns in 401(k) pensions, suggesting that employee saving rates in these plans are strongly influenced by employer matching contributions.[5] Several studies report that *introducing a match* (versus having no match at all) boosts plan participation and plan contribution rates, though the estimated magnitude of this effect varies widely (ranging from a low of 3% to more than 25%).[6] The results make intuitive economic sense: all other things being equal, offering a monetary reward for saving where there was no incentive previously should produce an increase in saving behavior. That said, it is unclear whether the introduction of a match works by increasing a worker's marginal propensity to save, by offsetting liquidity and investment constraints of 401(k) plans, or by some other means. But the research does suggest a positive relationship.

Studies that examine the impact of *increasing an existing match* report mixed findings.[7] Some show increases in employee saving behavior, while others indicate negligible or negative effects.[8] Here the economic intuition may be a bit more complex: if an employer raises an existing match by a small amount, the increase may be too small to have a material effect on average saving rates. Possibly the higher benefits of the match are offset by higher liquidity and

investment costs associated with 401(k) plans. An increase in the match may also have negative effects if employees think in terms of target saving rates. For example, an employee with a target saving rate of 9% would contribute 6% of her own salary when her employer provides a 3% match, but she would curtail her contribution to 5% of pay if the employer decided to raise the match to 4%.[9]

One drawback of prior 401(k) studies is that they all treat employer matching contributions as exogenous, without asking why employers offer matching contributions – and indeed, other plan features – in the first place? One possibility is that these represent a form of compensation motivated predominantly or exclusively by the tax deferral incentives offered under the federal tax code, about which we say more in the next section. Another possibility is that 401(k) plans, like other benefit programs, are used by employers to attract a workforce with specific characteristics.

This second view—of employers seeking to draw and retain "the best" workforce through a benefit program—is widespread in the benefits-consulting community.[10] The studies cited above tend to support this hypothesis, since many studies report statistically significant effects of age, income, tenure, and other worker characteristics on worker saving in 401(k) plans. An elaboration on this view is offered by Ippolito (1997), who suggests that employers with defined contribution plans use match rates along with deferred vesting to direct some portion of compensation to "savers" who he concludes have lower quit rates and higher job performance ratings.[11] Yet all these previous studies take as exogenous employers' decisions regarding matching contributions, without offering any tests of employer intentions regarding plan design. By contrast, in what follows, we investigate why employers design their 401(k) plans as they do, exploiting data on the wide variety of plan design patterns observed in the data. [12]

II. Methodology

U.S. employers have substantial flexibility regarding the design of their retirement plans. Offering a retirement plan is voluntary, and most private-sector firms that offer a company-based retirement program today include a 401(k) plan. A key element in such a plan is that the *employee* must first contribute some portion of his salary to the plan—known as the employee's "elective deferral" or "salary deferral amount"—before he is entitled to any matching contribution. Employees are afforded substantial tax incentives under the law for saving within 401(k) plans. Thus employee contributions from current wages are tax-deductible (up to $10,500 in 2001, the year of our data set); employer matching contributions are exempt from current taxation; and all investment earnings on the pension account are compound tax-free until withdrawal (which is typically later in life, when tax rates may be lower). By contrast, employers realize no particular tax advantage from offering a 401(k) plan: a firm can deduct employee compensation paid in the form of taxable wages or contributions to a tax-qualified retirement plan.[13]

According to this view of the 401(k) plan as tax-advantaged compensation, we would anticipate that several factors would explain both employer plan design and employee responses to these design elements. For example, a company having more highly paid workers would be expected to have more generous match features, as well as higher employee participation and saving rates; this is because salary levels should influence not only saving rates but also the preference for taxable versus tax-deferred saving. Demand for 401(k) saving will also be influenced by the availability of other forms of tax-advantaged compensation, such as some other DB or DC retirement plan, in addition to the 401(k) plan. Larger plans are likely to be less expensive to operate, and thus benefit from economies of scale in plan administration. Employee

behavior will be influenced by how readily workers can access their saving (i.e., whether the firm permits loans or after-tax contributions) as well as the plan's investment opportunity set (i.e., the number of investment options). All of these considerations would also be shaped by the complex series of federal tax rules that govern such plans, including the rules of nondiscrimination testing, about which we say more below.

An alternative view is that 401(k) plans are designed to attract and retain workers according to desirable workforce traits such as age or tenure. In such a situation, factors such as workers' compensation levels, age, tenure, and sex, as well as saving behavior within the 401(k) plan, might be important determinants of plan design and employee behaviors. Of courses, since 401(k) tax benefits accrue to the employee, in a competitive labor market we would anticipate that workers would demand matching contributions according to their preferences for saving (i.e., their marginal propensity to save), as well as their preferences for taxable versus tax-deferred saving (influenced by their marginal tax brackets). But employees face two institutional constraints which limit the flexibility of saving in 401(k) plans. First, by law, 401(k) saving is relatively illiquid, as funds are generally inaccessible until job change or retirement (only limited access is possible through loans, after-tax contributions, or in-service withdrawals).[14] Second, in practice, the 401(k) investment universe is limited to the fund options selected and offered by the employer, typically a small number of funds.[15]

Modeling Employer Plan Design

To assess these determinants of 401(k) plan design, we first develop an empirical model of the employer's plan decisionmaking. Here employers are presumed to structure the *monetary* and *nonmonetary* features of their 401(k) plans so as to attract and retain workforce with particular attributes. For instance, if 401(k) plan design were mainly driven by preferences for

tax-motivated compensation among better-paid employees (subject to applicable tax law constraints), we might anticipate a positive link between compensation of highly compensated employees (HCE) and the generosity of the plan match rate. By contrast, if a firm wished to attract and retain a particularly stable workforce, plan features would be geared toward older, better-paid, and longer-tenured workers.

This formulation, shown in Equation (1), thus proposes that key plan design features (PD_j,) are shaped by both labor and product market factors. These include workforce characteristics (EE_j), employer-level controls (ER_j), and indicators of how constraining tax rules might be (TAX_j).

$$PD_j = \beta_0 + \beta_1 \cdot ER_j + \beta_2 \cdot EE_j + \beta_3 \cdot TAX_j + \varepsilon_1 \quad (1)$$

The PD_j vector measures the presence and value of employer contribution matches, as well as non-monetary features that relate to the investment and liquidity constraints within 401(k) plans. Investment variables include how many investment funds are offered to participants; how concentrated fund investment menus are in equity funds; and whether the employer offers company stock in the plan as an investment choice. Features that reduce liquidity costs of 401(k) saving include the presence of after-tax contributions or loans. Employer-side controls include firm size, as a proxy for economies of scale, and industrial sector.

To the extent that firm-side factors drive design decisions, we would anticipate that the β_1 term would be nonzero. In addition, if design features are driven by the need to attract and retain a suitable workforce, we would expect β_2 to be nonzero. And finally, if a 401(k) plan's features are constrained by nondiscrimination or other limits, we would anticipate that the β_3 term would be nonzero.

Modeling Plan-Level Employee Responses to Plan Design

We also explore plan-level responses to plan design factors, including 401(k) saving rates, investment patterns, and account usage. To this end, Equation (2) relates plan-level indicators ($EEBehavior_j$) such as plan-level participation rates, plan level contribution rates, investment patterns, and participants' access to a vector of plan design features (PD_j,), including the design of the match, features of the investment menu, and pre-retirement money access methods. We also control on plan-level worker characteristics (EE $_i$), the employer variables (ER_j) mentioned above, and indicators of how constraining tax rules might be:

$$EEBehavior_j = \gamma_0 + \gamma_1 \cdot PD_j + \gamma_2 ER_j + \gamma_3 EE_i + \gamma_4 TAX + \varepsilon_2 \quad (2)$$

To the extent that plan design features drive participation, contribution, and other behaviors, we anticipate that the γ_1 term would be nonzero; this is the outcome of most interest here. In addition, firm-side and workforce factors may also be influential suggesting that γ_2 and γ_3 will be nonzero. And finally, to the extent that the pension plan design features may be driven by regulatory limits on the amount of tax-qualified compensation that can be deposited into the 401(k) plan, we would again anticipate that the γ_4 term would be nonzero and statistically significant.

Consequences for Employer 401(k) Plan Expenditures

In a third specification we summarize actual employer expenditures for 401(k) matching contributions.[16] This model indirectly accounts for actual employee behavior, inasmuch as employer 401(k) plan expenditures depend on actual employee saving at each firm. Accordingly, the dependent variable of interest in Equation (3) is the employer's actual match cost (as a percentage of pay, *ERContrOverComp)*. We examine how this actual cost varies

according to plan design elements (PD_j,), worker characteristics (EE $_i$), employer-side variables (ER_j) and any tax constraints (TAX_j) mentioned above:

$$ERContrOverComp = \lambda_0 + \lambda_1 \cdot PD_j + \lambda_2 ER_j + \lambda_3 \cdot EE_i + \lambda_4 TAX + \varepsilon_3 \quad (3)$$

To the extent that plan design features drive costs, we anticipate that the λ_1 vector would be nonzero; this is the outcome of most interest here. In addition, firm-side and workforce factors may also be influential suggesting that λ_2 and λ_3 will be nonzero. And finally, to the extent that costs are driven by regulatory limits on the amount of tax-qualified compensation that can be deposited into the 401(k) plan, we would again anticipate that the λ_4 term would be nonzero and statistically significant.

III. Empirical Considerations in Nondiscrimination Testing

Analysis of 401(k) plan design is complex due to three issues: the unit of analysis, the complexity of plan design, and US tax rules governing retirement plans. Prior research has not always taken these important issues into account, yet they are of vital importance to understand plan design in the US context. To each we turn briefly.

Unit of Analysis

The 401(k) universe is highly skewed, meaning that statistical analysis will be quite sensitive to the level of aggregation used for analysis. For instance, in our sample (to be described in more detail below), the largest 3% of the plans account for half of all covered employees, and the largest 50% of plans accounts for 96% of covered employees.[17] Since we seek to explore plan design decisions at the firm level, the firm is the appropriate level of analysis. Of course, this means that this firm-level analysis will include many smaller and medium-sized firms. By contrast, employee-level analyses will be weighted toward plan features

and behavior of larger firms, a point often overlooked when interpreting evidence on 401(k) plans.

Complexity of Plan Design

Few prior studies have dissected the interesting non-linear and complex saving incentives inherent in 401(k) plan matching structures.[18] For instance, employer matches tend to be non-continuous, bunching at particular values. Additionally, 401(k) plans contain many features that affect liquidity and investment constraints, including different investment menus and differential plan access to loans and after-tax contributions. The presence of other retirement plans will also likely influence both saving and investment behavior within 401(k) plans, competing with 401(k) plans as a source of tax-deferred compensation, and in the case of employer- and government-guaranteed DB benefits, influencing risk-taking within the 401(k) plan. Studies which do not control on such factors will naturally find results which differ from the analysis to follow.

Tax Rules and Testing

Tax considerations play an essential role in determining 401(k) plan design and employee behavioral responses. Specifically, most forms of compensation in the US are subject to progressive income taxes; as noted, above, pension contributions are generally tax-deferred, but only as long as they satisfy a series of tax rules, most of which restrict allowable contributions. In particular, under *Section 402(g)* of the Internal Revenue Code (IRC), employees are limited as to the amount of current wages they can contribute to a 401(k) plan—in the year of our plan data, 2001, the limit was $10,500 per year. This rule effectively censors plan saving rates: for example, someone earning $150,000 in 2001 had a maximum possible plan saving rate of 7% ($10,500 divided by $150,000). Meanwhile, a person earning $1 million had a maximum possible plan saving rate of about 1% of pay.

US retirement plans are also subject two types of *nondiscrimination rules*. One set is called the ***general nondiscrimination rules***, requiring, among other details, that the "rights, features and benefits" of a plan be allocated equitably across eligible participants. Under this rule, no plan may offer, for example, a higher match to higher-paid employees or to employees based on managerial rank. A second set of rules, particularly important for 401(k) plans, is the so-called ***nondiscrimination testing*** *(NDT)* rules, for pre-tax 401(k) elective deferrals. Under these rules, an employer must divide its eligible plan participants into two groups: the highly compensated employees (HCEs, earning $85,000 or more in 2001) and the nonhighly compensated employees (NHCEs, or those earning below $85,000 in 2001). In the most common situation, the plan contribution rate of the HCEs may not exceed that of the NHCEs by more than 2%.[19]

When calculating plan saving rates under NDT rules, however, an employer may only count income subject to the ***Section 401(a)*** definition of compensation, which is the maximum level of pay that can be considered for retirement plan purposes; it was $170,000 per year in 2001. Thus, an employee earning $1 million and contributing $10,500 may have an *actual plan contribution rate* of just over 1% ($10,500 divided by $1 million). However, his plan saving rate *for federal tax purposes* is defined as 6.18% ($10,500 divided by $170,000). In other words, in any given 401(k) plan, as the number of highly compensated employees earning more than $170,000 and contributing $10,500 increases, saving rates for the HCE group will converge toward 6.18% for federal tax purposes. As a result, to comply with nondiscrimination testing rests, the employer must encourage the NHCEs to save at least 4.18% of earnings (2% less than the HCE threshold of 6.18%). In addition, many plans will seek to boost NHCE saving rates

above this level, because not all HCEs in the plan earn more than $170,000 annually, and not all

HCEs will contribute the maximum $10,500 per year.[20]

Finally, two other rules constrain highly-paid employee contributions and employer

matches in 401(k) plans. Under **IRS Section 415**, total employee and employer contributions to

any tax-deferred retirement plan cannot exceed 25% of pay or $35,000. For example, a worker

earning $40,000 in 2001 could only receive total employer and employee contributions of

$10,000. In addition, a **15% limit for profit-sharing plans** also applies, since 401(k) plans are

technically organized as profit-sharing plans under US law; as a result, they must generally limit

employee and employer contributions to 15% of the firm's total wage bill. Consequently,

depending on how many eligible participants actually join the plan and the amounts contributed,

plan participants could be subject to a 15% (or occasionally higher) limit on the sum of employer

and employee contributions.

Next we turn to an examination of dataset used in the analysis and we quantify how many

employees are subject to these different tax law constraints.

IV. Description of 401(k) Plan Features

Our analysis of the determinants of plan design draws on a unique and rich set of

administrative records for 507 401(k) plans, obtained from Vanguard for the 2001 plan year.[21]

Each plan record includes information on important design features including the employer's

match formula, features of the plan's investment menu, the presence of other retirement plans

(such as a DB or other DC plan), and indicators of participant access to plan accumulations prior

to retirement. We also gained access to records for the 740,000 employees in the firms offering

these plans; these data included age, sex, job tenure, earnings, plan participation, plan contribution, and asset and contribution allocation information.[22]

401(k) Plan Design Features

Key attributes of the 401(k) plans in our sample appear in Table 1. The mean employer is a mid-sized firm with about 1,500 employees; some 82% offered a match for employee 401(k) plan contributions.[23, 24] Matching formulas range from zero (18% of plans) to very generous matches of more than dollar-for-dollar on at least 6% of pay (2% of plans). Panel A shows that the median match by firms offering a match is 50 cents per dollar on the first 6% of employee contributions, as reported in prior studies (c.f. Papke, 1995). But we also find that employer match patterns are extremely *nonlinear*: the average firm matches an average of 55 cents per dollar the employee contributes on his first 3% of salary; 37 cents per dollar on his next 3% of pay; and only 5 cents per dollar for his next 2% of pay. There is also substantial variation in the so-called "match cap," which is the amount the employee must deposit to obtain the largest possible employer subsidy: the mean is around 5% of pay, while the median is 6%.

Table 1 here

These 507 plans also offer an average of 12.6 investment choices in their plan menus; 19% offer employer stock as an investment choice; and two-thirds of the investment options are equity funds. It is interesting to note that the majority, but not all, of the plans (85%) give employees access to their retirement accounts via a *loan feature*, which affords liquidity often perceived to be particularly attractive to low-wage savers. A quarter of the plans permit *after-tax contributions*, which allow employees a way to gain pre-retirement access to a portion of their saving; they also offer a tax benefit, tax-deferred earnings, to those who reach pre-tax savings limits.[25] Also, as indicated in Panel B, the most common formula is a *single-tier match formula,*

such as $0.50 on the dollar to 6% of pay. Another 11% of the plans have a *multi-tier formula,* where the employer offers a higher incentive on the first level of pay (such as 100% on the first 2% of employee contributions) and a lower incentive on subsequent levels of pay (such as 50% on the next 2%). The nonlinearity of 401(k) matching contributions is captured in Figure 1, which summarizes the match rate and tier for 360 single-tier formulas in our sample.

Figure 1 here

Our empirical tactic divides the nonlinear 401(k) match formula into an <u>incentive element</u>, reflecting how much the employee is rewarded per dollar contributed; and a <u>liquidity element</u>, indicating how much compensation the employee must "tie up" in the 401(k) plan in order to receive the entire employer incentive payment. Accordingly *Match_f3* indicates the value of the employer's matching contribution on the first 3% of pay contributed by the employee (i.e., from 0% to 3%); *Match_n3* captures the rate on the next 3% of pay (i.e., from 4% to 6% of pay); and *Match_n2* reflects the value of the match on an additional 2% of pay (i.e., over 6% and up to 8% of pay). Another variable, *EEReqContr4 MaxMatch,* captures how much the employee must contribute to receive the maximum subsidy from the employer. For example, in a tiered formula that paid dollar-for-dollar up to 2% and 50 cents per dollar from 2 to 4%, the maximum required employee contribution is 4%. An overview of the results for the 360 single-tier match plans appears in Figure 2, where we calculate the maximum amount the employer promises in the form of matching contribution. As shown, about one-third of plans promise to provide below 3% of pay; about one third, exactly 3%; and about one-third, more than 3%.[26]

Figure 2 here

It is worth noting that retirement plan designs are complicated along other dimensions. Table 2 indicates that the 401(k) plan designs fall into three broad categories: firms offering

401(k) plans alone (some 39% of plans); firms offering 401(k) plans accompanied by another DC plan such as a money purchase, profit-sharing, or ESOP plan (28%); and firms providing 401(k) plans paired with some form of DB plan (34% of plans).[27] Clearly, those who see US private pensions as being either of the DB or DC variety have far too simplistic a view. Accordingly, the analysis to follow controls on the existence of other DB or DC plans as factors influencing 401(k) plan generosity.

Table 2 here

Employee Characteristics

A summary of plan-level employee characteristics for the more than 740,000 workers in our full sample appears in Table 3. We see that the average participant in the average plan is male, is nearly 43 years old, earns $63,900 a year, and has spent almost 9 years on the job. The average plan participation rate is 77%,[28] with contribution rates for those saving in the plan amounting to 6.8% of pay; the average 401(k) account balance is $54,400.[29] An important finding is that, although the typical employer-promised match is 3% of pay, the cost of this match to the median employer is actually only two-thirds that level, at 1.9% of pay. In other words, workers forfeit much of the match because they fail to participate in their plans (63% of 1.1%, or 0.7% of pay), or because they fail to save at a rate needed to earn the full employer match (37% of 1.1%, or 0.4% of pay).[30] In terms of investment decisions, employees contribute 74% of their new money to equity funds, and 14% to company stock. The average participant avails himself of only 3.5 of the investment choices in his pension portfolio, versus the 12.6 funds offered. About one-quarter of participants in the average plan is registered to use the Internet to manage their accounts in 2001; 15% have a loan outstanding.

Table 3 here

One invaluable attribute of the plan-level data is that we can compute with some accuracy what fraction of the covered workers falls into the highly compensated employee group under federal nondiscrimination testing rules. For the average plan, almost one-fifth (19%) of participants are highly compensated employees who differ in important ways from their NHCE counterparts. Thus, as Table 3 shows, HCEs have substantially higher account balances, are older, are longer-tenured, and predominantly male. As expected, HCEs participate at much higher rates in the 401(k) plans than NHCEs (91% v. 74%). However, HCEs contribute at roughly the same rate of pay as NHCEs (6.8% v. 6.9%), most likely due to federal contribution limits. HCEs in our sample control about 41% of the 401(k) assets in the average plan, while representing 19% of participants. In terms of investments, HCEs contribute slightly more to equities (79% to 73%); they use the web more frequently to manage their accounts (42% v. 23%); and they are somewhat less likely to take a loan (11% v. 15%).

Table 3 also indicates how many employees are subject to other tax limits. Over one-tenth (11%) of participants in the average plan in 2001 are at the 402(g) limit of $10,500 for pre-tax 401(k) plan contributions. But this average conceals important cross-group differences: 41% of the highly compensated employees are at the limit, while only 3% of the nonhighly compensated are thus constrained. We are also able to estimate that 10% of plans are subject to employer-imposed NDT caps (these "caps" influence only 1.2% of HCEs in our entire sample, however). Finally, we estimate that about 6% percent of participants in the average plan are subject to either the Section 415 limit (25% of pay or $35,000) limit or any other plan-specific limit. Clearly, the nondiscrimination and other limits effectively "bite" for highly paid employees.

V. Multivariate Analysis

Next we turn to multivariate analyses of the factors shaping plan design; the plan-level responses to plan design outcomes, and the ultimate consequences for employer 401(k) plan costs.

Employer Plan Design Decisions

To evaluate how employers design 401(k) matching contributions, we turn to Table 4. In our sample of 507 plans, we see that match generosity is clearly a function of firm size (columns 1-2 and 6). Larger firms are more likely to provide a match in the first place and a more generous match on the first 3% of pay, as well as a larger overall economic value to the match (*MaxCostERMatch*). For example, a 10% increase in firm size evaluated at the mean will raise the value of the promised match by 9%. This firm size effect disappears on higher levels of pay, presumably because larger firms are more likely to offer another DB or DC plan besides the 401(k) plan. In effect, as firm size increases, employers appear to offer other retirement plans, and so they are marginally less generous with the 401(k) matching contribution.[31]

Table 4 here

In terms of workforce characteristics, the sponsor's 401(k) match formula proves to be positively associated with NHCE pay levels: that is, the probability of offering any match, as well as larger match rates on the first 6% of pay, rise with pay (cols 1-3), as does the overall economic generosity of the match (col. 6). In other words, the design of the employer match pattern is clearly motivated by workforce pay levels. The effects are modest in size but statistically significant. For example, as shown in Panel A of Table 5, if the mean NHCE income of $42,000 increases by 10%, the match rate on the first 3% of pay rises by 6% (from $0.55 to $0.58), and the match rate on the next 3% rises by 4% (from $0.37 to $0.39). Panel B estimates

the variation in the match design according to different levels of NHCE income, holding all other

independent variables at their means. For example, for a workforce with a mean NHCE income

of $25,000 (approximately the bottom 5% of firms), 80% of firms offer a match, and the

maximum promised match amount on average to 2.3% of pay. For a workforce with a mean

NHCE income of $55,000 (the top 5% of firms), all firms offer a match, and the promised match

is more than one and a half times higher, at almost 4% of pay.

Table 5 here

Because the general nondiscrimination rules restrict employers from favoring HCEs over

NHCEs, and since the dollar contribution caps more effectively bind HCEs rather than NHCEs,

we find that only NHCE income is a statistically significant factor in our regression analysis.

The percentage of HCEs in a plan has no influence on plan generosity, suggesting that federal

limits are binding. Equally important is what the data do not show. Plan design bears no

apparent relationship to workforce characteristics *other than pay*. This finding is of interest

since, if employers fashioned their match formulas to attract and retain workers with specific

demographic characteristics, we might anticipate significant coefficients on such factors as

employee age and tenure. However, no such relationships are evident. There is one exception:

employers appear to reward shorter-tenure workforces with a higher match, but only as long as

they contribute more of their own income. As we argue below, this effect is readily explained by

efforts to satisfy federal nondiscrimination testing rules among short-tenured workforces.

Overall, the employer match appears to be mainly motivated by the need to offer better-paid

employees higher compensation in the form of 401(k) matching contributions. Yet due to the tax

rules constraining contributions by the highly paid, these incentives prove to be a linear function

of NCHE income only.

Next we consider the factors shaping 401(k) plan non-cash features, reported in Table 6. Here we examine three attributes of the investment menu: the number of funds (*NFundsOffered)*, the percentage of the menu that represents stock funds (*Fund_Stock)*, and the presence of company stock (*ER_Stock)*; and also pre-retirement access, namely the availability of after-tax contributions and loans (*After_Tax and Loan,* respectively). Not surprisingly, an important determinant of the plan menu features is again plan size. Probably due to scale economies, larger employers are more likely to offer more funds in the investment menu, a larger percentage of equity funds, and company stock, and they are also more likely to permit after-tax contributions and participant loans. Firms which offer DB plans are more likely to offer employer stock in their DC plans (consistent with recent findings by Brown *et al.,* 2004).

Turning to workforce variables, once again relatively few employee attributes appear to be associated with plan design features. All elements of "better" plan design are associated with employee income.[32] Better-paid employees have 401(k) plans with more funds, with a greater proportion of equity funds in their investment lineup (allowing greater diversification in what is an equity-dominated portfolio), the ability to invest in company stock (perhaps undesirable from a diversification perspective but attractive in terms of employee ownership and loyalty), and access to after-tax contributions. Most of these effects, while significant, tend to be relatively small in economic terms. For example, a 10% increase in mean NHCE income leads to only a 0.1 point increase in the number of funds.

Table 6 here

From this analysis, we conclude that employer 401(k) plan design decisions are mainly driven by scale economies (firm size) and employee compensation (which for matching contributions is mean NHCE compensation due to tax limits). These results are consistent with

the view of 401(k) plans as mainly a form of employee-preferred tax-deferred compensation. Better-paid NHCEs are likely to benefit from having a higher fraction of their earnings paid in the form of tax-deferred compensation, and it appears that employers design their 401(k) matching contributions plans with this consideration in mind. Arguably, without federal tax limits on contributions, both cash- and non-cash incentives would both be more nearly a linear function of earnings. There seems to be little evidence that plan design is motivated by employer efforts to tailor their workforce to other demographic characteristics, such as age or tenure.

Plan-level Participation and Saving Behavior

Having examined the factors influencing employers' choice of 401(k) features, we next assess how employees respond to these design features. Again, because we seek to understand how employer plan design drives employee behavior, we focus our attention on firm-level statistics. Table 7 reports results for employee saving patterns.

Table 7 here

To analyze the effects of NDT rules on employee behavior, we evaluate NHCE and HCE outcomes separately. The first result pertains to match design: a larger match on the first 3% of pay and a higher match threshold raise the fraction of NHCEs participating in the plan (col. 1). For example, each $0.10 increase in the match rate raises the NHCE participation rate by 0.8% points (i.e., from 77% to 77.8%). For the NHCE group, the participation incentive disappears between 3% and 6% of pay, and turns negative on matches above 6% of pay. These results are consistent with matching incentives designed to satisfy nondiscrimination testing requirements. As we noted above, HCE saving rates under federal tax rules converges on 6.18% (as the number of HCEs earning $170,000 and saving $10,500 increases). At a minimum, employers will see to encourage NHCEs to save 4.18% or more. It seems clear, then, that the initial match rates

strongly boosts incentives to participate in the plan, but above this, the impact is declining. There is some support for this in previous studies, though few have focused on plan-level data.[33]

These firm-level savings incentives appear to have different effects on particular plan behaviors. That is, match rates appear to boost participation, but they do *not* encourage plan participants to save more. Thus an employer who boosts the match rate will raise overall retirement saving, but this is accomplished by inducing more individuals to join the plan, rather than by increasing firm-level saving rates (Table 7, column 2). It would appear that at the margin, then, a higher incentive creates more savers. But arguably, for each additional saver a higher match attract, it also induces an existing participant to save somewhat less, leaving average plan contribution rates at best unchanged.[34]

Other aspects of plan design also influence participation and saving rates of NHCEs. For instance, offering a larger investment menu encourages more NHCEs to participate in a given plan, though at a declining rate. Indeed, the effect is nonlinear: our plan-level data show that participation peaks at 30 funds and falls after that [-1.177/(-0.02*2)=30]. In other words, the plan-level data does not confirm that workers follow a simple 1/N heuristic in investment choice. Offering more funds also has a powerful effect boosting the fraction of HCEs saving at the maximum allowable limit. But in a form of "choice overload" suggested by Jiang and Iyengar (2003), we find that plans which an investment menu containing a larger percentage of equity funds have *lower* NHCE plan participation. Specifically, if the proportion of stock funds rises by 10%, the participation rate of NHCEs falls by 1.62 percentage points: in effect, participants exhibit "equity fund overload." Offering loans reduces the liquidity costs of 401(k) plans, but it only has an impact on plan contribution rates (consistent with Munnell *et al.*, 2000, and Holden and VanDerhei, 2001). Allowing employees to add after-tax contributions has a competing

negative effect: that is, workers reduce their pre-tax saving in order to make more liquid after-tax contributions.

In terms of employee traits, we find that plan-specific levels of compensation, tenure, and fraction female are all significant factors in predicting plan participation and contribution rates. This could be interpreted to show that employers may seek to reward certain workforce characteristics differentially: these workers are more likely to join a 401(k) plan, and thus more likely to take advantage of the additional compensation in the 401(k) match. But below we suggest that firms do not direct compensation to these employees intentionally; rather, what we see reflected in the saving results is employees' own tastes for saving.

Table 8 provides a summary of the marginal effects of plan design on employee behavior. Panel A describes the impact of common plan design changes and their impact on NHCE participation and savings rates. Panel B and C, respectively, estimate the pure incentive effect of match design after controlling for all other variables (e.g., firm size, other plans, employee characteristics) at their means. As shown in Panel B, plans that offer no match but that are otherwise average in their characteristics have an expected NHCE participation rate of 65%. Introducing a match will raise the NHCE participation rate anywhere from 70% to 80%, a relatively modest range, demonstrating that employer matches have a smaller incentive effect than previously imagined. Figure 3 summarizes our results in graphical form. In terms of NHCE savings rates, shown in Panel C, better matches lead to a modest decline in plan contribution rates—from 6.7% with no match to 6.3% with the highest match.

Table 8 and Figure 3 here

The impact of plan design on investment allocation patterns and account usage is reported in Table 9. Contributions to equities at the plan level are influenced principally by

employees' average salary, which is positively associated with equity exposure, and age, which is negatively associated with risk-taking.[35] Contributions to company stock are higher when the firm offers a DB plan, and they are lower if the investment menu offers a larger proportion of competing equity fund choices. The average number of funds used by plan participants is a linear function of the number offered: that is, more choice leads to marginally higher portfolio diversification, although as noted above, there could be negative participation effects from the investment menu. Several factors drive use of the Internet at the plan level: better matches (leading to presumably higher balances), a greater number of funds, access to loans, and better paid employees. The factors influencing 401(k) loan usage—the size of the match and employee tenure—suggests that loan usage grows with the possibility of a larger account balance over time.

Table 9 here

Consequences for Employer Costs

We summarize the net impact of plan design feature in Tables 10, which offers an analysis of actual employer expenditures for 401(k) matching contributions. The results are striking: employers' actual expenditures are a function of plan design features and not employee characteristics. Key cost-drivers are more generous match rates and the provision of loans. More generous matches drive costs because, as we have argued above, of the need to create saving incentives under nondiscrimination testing. Loans drive costs by encouraging higher plan savings rates, meaning that employees consume a greater proportion of the promised match.

Table 10

Panel A of Table 11 provides estimates of employers' marginal costs of changing certain plan design elements. For example, raising the match rate on the first 3% of pay by $0.10—an

18% increase on a mean match rate of $0.55—raises employer costs only by about half that amount, or 8%, because of the failure of employees to participate or save fully in the plan. Meanwhile, introducing a loan raises plan contribution rates and therefore match costs by 15%. Panel B estimates variations in employer costs assuming changes in the match formula. Match costs range from less than 1% of wages to over 3.5% of wages depending on the formula adopted by the plan.

Table 11

Importantly, we find no evidence that actual employer expenditures are tied to any other workforce demographic variables, such as age or tenure. Taken in conjunction with our earlier results, it would appear that employers are not directing actual compensation expenditures to employees with these traits. Rather, the age, tenure and gender results we see reflected in the employee savings equation are reflective of a workforce's own saving preferences, not the employer's desire to reward certain attributes in their workforce.

VI. Discussion and Conclusions

This paper examines the determinants of employer decisions regarding 401(k) plan design. Drawing on a unique data set of more than 500 plans and over 740,000 employees, we find that patterns of plan design and employee behavior reflect two forces. On the one hand, better-paid workers demand "richer" 401(k) plans from employers, but on the other hand, employers must provide minimum incentives to lower-paid workers under federal nondiscrimination testing rules. At the plan level we find that match formulas are mainly a function of NHCE income, after controlling for other key attributes. Other desirable non-financial elements of 401(k) plan design—such as more investment choice, 401(k) loans or after-

tax contributions—are also a function of worker earnings. In other words, 401(k) plan design is strongly motivated by a desire to satisfy higher-paid employees' demand for tax-advantaged compensation. We find no evidence that firms design their matching contributions to attract and retain employees with specific characteristics, which leads us to conclude that 401(k) plans appear to mainly a complex form of tax-advantaged compensation, with both its provision by employers and its take-up by employees influenced by the average earnings level of a given firm.

Nonetheless, while maximizing compensation to better-paid employees, employer must comply with federal nondiscrimination testing rules, which provides an indirect incentive to encourage plan participation by lower-paid workers. In 401(k) plan, this occurs at two levels: first, a strong match incentive on the first 3% of pay, which falls to nil and then becomes negative at higher pay levels as the need to incent nonhighly compensated employees declines under federal tax law; and second, the presence of loans and a wide menu of investment choices, which reduce the investment and liquidity costs of 401(k) plans.

Turning to plan-level participation and saving result, we find that plan design and employee characteristics do shape outcomes. While some suggest that 401(k) plans are a mechanism by which employers reward older or longer-tenured workers at the expense of younger and shorter-tenured ones, we find that actual employer expenditures for matching contribution are unrelated to these demographic factors. Demographic effects appear to reflect employee taste for saving, not an intentional effort by employers to specifically target these demographic elements in this workforce. More broadly, retirement saving outcomes are not simply determined by individual worker characteristics such as their propensity to save or their tax exposure. Rather, retirement accumulations also influenced by how employers design their 401(k) plans, which in turn depends on with firm size, industrial sector, and average earnings—

in effect, the marginal propensity to save of one's peers. And utilization responses to these incentives vary not only with the characteristics of plan design, but also by a given workforce's taste for saving.

Our findings have several implications for employers and policymakers. They suggest, first, that tax-motivated matching contributions in 401(k) plans may be an imperfect way of ensuring broad-based retirement security. As we note, it is better-paid workers who will demand better matching contributions from their employers in the first place, and take-up of these matching contributions will be a function of a given workforce's savings preferences. Second, federal tax policy regarding nondiscrimination testing tends to create inequities across firms based on workforce characteristics. This is because matching incentives, and participation rates, tend to be more generous in companies with better-paid workers. As a result, NDT rules favor firms with better-paid and longer-tenured workforces, while not helping firms with the opposite workforce characteristics. Finally, because of firm-level design decisions, saving patterns in 401(k) plans tend to be "local." Thus, a low-wage worker employed all her life at a high-wage consulting firm would do better in retirement than if she earned the same salary but worked at a low-wage retail firm. Her high-wage colleagues in the consulting firm will demand a larger match, which will in turn induce a higher rate of plan participation by her and other lower-wage employees.

As a consequence, those seeking to enhance retirement security among low-income and low-tenured populations might consider alternatives to matching contributions in 401(k) plans. Options include automatic enrollment (c.f. Madrian and Shea, 2001), non-elective contributions by employers or the government, and mandatory retirement plan contributions. Reframing enrollment as a negative election encourages 401(k) saving regardless of the firm-specific match

incentive, and it also induces retirement saving regardless of that specific workforce's taste for saving. Employer nonelective contributions accomplish the same goal but in a different way. By making the same retirement contribution to all eligible employees, employers in effect substitute for weak employee saving preferences with their own. The same would be true of governmental nonelective contributions made to private plans or to a reformed Social Security system with personal accounts. Mandatory retirement plan contributions, whether made by the employer or employee, are an option adopted by countries such as Singapore and Australia, where they create uniformity of retirement saving independent of firm-specific characteristics. In the end, our results suggest that matching contributions may have limited success as a means to encourage retirement saving, particularly for low-income, short-tenure workforces where the demand for tax-deferred saving is weak.

Table 1. Employer 401(k) Plan Design: Descriptive Statistics (Plan Level)

Panel A. Employer Match Rates and Other Plan Design Features

	Variable Name	Mean	Median
Number of employees covered	Plan_size	1,460	283
Employer plan provides match for employee contributions	Positive_match	82%	
Match rate on first 3% of compensation (0-3%)	Match_f3	$0.55 on $1	$0.50 on $1
Match rate on next 3% of compensation (3-6%)	Match_n3	$0.37 on $1	$0.33 on $1
Match rate on next 2% of compensation (6-8%)	Match_n2	$0.05 on $1	$0.00 on $1
Match rates conditional on a match being offered:		$0.67 on $1	$0.50 on $1
Match rate on first 3% of compensation (0-3%)			
Match rate on next 3% of compensation (3-6%)		$0.49 on $1	$0.50 on $1
Match rate on next 2% of compensation (6-8%)		$0.44 on $1	$0.50 on $1
Promised employer match as % of pay	MaxCostErMatch	3.00%	3.00%
Employee contribution required for maximum employer plan match (the "match cap")	Contr4MaxMatch	4.90%	6.00%
Number of funds offered in plan	NFundsOffered	12.6	11
Fraction of funds offered that are equity funds	Fund_stock	65%	67%
Employer stock offered in plan	ER_stock	19%	
Employer plan permits after-tax contributions	After_tax	24%	
Employer plan offers loan	loan	85%	

Panel B. Characteristics of Employer Match Formulas

Type of formula	Example	No. of plans	% of plans	No. of employees	% of employees
Single match	50% on first 6% of pay	360	71%	535,078	72%
Multi-tier formula	100% on first 2% of pay; 50% on next 2%	56	11%	104,044	14%
No match	-	91	18%	100,853	14%
TOTAL		507	100%	746,690	100%

Note: Data derived from 507 plans; see text.

Table 2: Employer Retirement Plan Offerings

Type of Retirement Plan Offered	No. of plans	% of plans	No. of employees	% employees	Average plan size
401(k) only	196	39%	187,004	25%	954
401(k) plus DC	140	28%	82,325	11%	588
401(k) plus DB	102	20%	177,999	24%	1,745
401(k) plus DB and DC	<u>69</u>	<u>14%</u>	<u>292,647</u>	<u>40%</u>	4,241
TOTAL	507	100%	739,975	100%	1,460

Note: Data derived from 507 plans; see text.

Table 3: Employee Demographics and Plan Behavior: Descriptive Statistics (Plan Level)

	Variable Name	Plan Mean (HCE, NHCE)*	Plan Median (HCE, NHCE)*
PANEL A: EMPLOYEE CHARACTERISTICS			
Age	Mean_age	42.7 years (47.4, 41.9)	42.9 years (42.2, 41.9)
Income ($000)	Mean_comp	$63.9 ($157.4, $42.0)	$55.5 ($136.4, $42.3)
Job tenure	Mean_tenure	8.7 years (12.3, 8.2)	8.3 years (11.5, 7.6)
Sex (% female)	Female_pct	36% (15%, 42%)	33% (11%, 39%)
PANEL B: PLAN BEHAVIOR			
% Participating	ParticipationRate	77% (91%, 74%)	79% (94%, 76%)
Contribution as % of pay (for those participating)	ContributionRate	6.8% (6.8%, 6.9%)	6.8% (6.6%, 7.0%)
Employer's contribution (% of pay)	ErContrOverComp	1.8% (1.9%, 1.9%)	1.9% (1.8%, 1.8%)
Account balance ($000)		$54.4 ($153.8, $35.5)	$46.7 ($127.8, $31.6)
% Contribution to equities	Avg_Equity_pct	74% (79%, 73%)	75% (80%, 74%)
% Contribution to company stock	Avg_ComStk_pct	14% (14%, 14%)	7% (8%, 7%)
Number of funds used	Avg_NumFundsUse	3.5 (3.8, 3.4)	3.4 (3.7, 3.3)
% Web usage to manage 401(k) account	Web_Use Rate	26% (42%, 23%)	23% (41%, 21%)
% Taking a loan	Loan_takerate	15% (11%, 15%)	13% (9%, 14%)
PANEL C: IMPACT OF TAX LIMITS			
% Employees HCEs		17%	
% Participants HCEs	HCE_pct	19%	
% Plan assets owned by HCEs		41%	
% Plans that cap HCEs		10%	
% Participants at plan contribution limit < $10.5K	Avg_limit_plan_pct	6.1% (1.3%, 7.4%)	
% of Participants at $10.5k limit	% of participants at $10.5k limit	11% (41%, 2.5%)	7% (43%, 1.2%)

Note: Statistics cover 489,526 participants and 250,449 eligible non-participants in 507 plans.
* In 2001, HCEs are those earning at least $85,000; NHCEs earned below $85,000.

Table 4: Determinants of Employer 401(k) Plan Design: Match Features (All Employees)

	Components of Employer 401(k) Match					
	Positive_ Match	Match_f3	Match_n3	Match_n2	Contr4Max Match	MaxCost ERMatch
EMPLOYER CHARACTERISTICS						
Plan_size	0.044	4.474	-0.443	-0.027	0.104	0.187
	[0.013]**	[1.468]**	[0.919]	[0.461]	[0.069]	[0.071]**
DB	0.026	7.308	3.697	-3.933	0.016	0.32
	[0.043]	[4.100]	[2.909]	[1.714]*	[0.252]	[0.238]
DC	-0.024	-1.464	-7.288	0.168	0.26	-0.277
	[0.036]	[3.670]	[2.299]**	[1.378]	[0.226]	[0.205]
EMPLOYEE CHARACTERISTICS						
HCE_pct	-0.003	-0.041	-0.022	-0.075	-0.023	-0.007
	[0.002]	[0.149]	[0.090]	[0.061]	[0.008]**	[0.009]
NDT_cap	0.0003	0.09	-0.013	0.0003	-0.006	0.004
	[0.001]	[0.072]	[0.047]	[0.025]	[0.003]	[0.004]
Mean_comp_NHCE	0.007	0.729	0.315	0.075	0.022	0.05
	[0.003]**	[0.245]**	[0.124]*	[0.088]	[0.015]	[0.013]**
Mean_age	0.01	1.299	-0.496	0.524	0.044	0.083
	[0.008]	[0.694]	[0.433]	[0.313]	[0.049]	[0.046]
Mean_tenure	-0.013	-1.296	0.167	-0.171	-0.08	-0.083
	[0.007]	[0.666]	[0.434]	[0.295]	[0.040]*	[0.042]*
Female_pct	0.0004	0.126	0.065	-0.051	-0.012	0.003
	[0.001]	[0.110]	[0.070]	[0.049]	[0.006]	[0.007]
PLAN ATTRIBUTES						
Match_f3			0.471	-0.05		0.002
			[0.053]**	[0.015]**		[0.003]
Match_n3				0.196		0.047
				[0.042]**		[0.003]**
Match_n2						0.086
						[0.014]**
Constant	-0.007	-54.174	26.43	-24.489	0.641	-3.182
	[0.351]	[33.045]	[19.361]	[13.499]	[2.059]	[1.927]
Observations	507	507	507	507	507	507
R-squared	0.07	0.11	0.43	0.11	0.52	0.1

Notes: * significant at 5%; ** significant at 1%. Robust standard errors in brackets. Industry controls included.

Table 5: Summary of Employer Match Design

Panel A. Responsiveness of Employer Match Design

Change in Variable	Change in Match Design
10% increase in firm size	6% increase in match on first 3% of pay; 9% increase in maximum promised match
10% increase in mean NHCE income	6% increase in match rate on first 3% of pay; 4% increase in match rate on next 3%

Panel B. Variation in Match Design based on NHCE Income
Forecast value of match variables, with all independent variables estimated at means except for NHCE income.

NHCE Mean Income	Positive match	Match rate on first 3%	Match rate on next 3%	Match tier	Employer maximum cost
$25,000	80%	51	37	5.4%	2.3%
$35,000	87%	58	40	5.6%	2.8%
$45,000	94%	65	44	5.8%	3.3%
$55,000	100%	73	47	6.1%	3.8%

Table 6. Determinants of Employer 401(k) Plan Design: Non-Monetary Plan Features (All Employees)

	Investment Menu			Money Access	
	NFunds Offered	**Fund_stock**	**ER_stock**	**After_tax**	**Loan**
EMPLOYER CHARACTERISTICS					
Plan_size	0.914	1.79	0.115	0.083	0.046
	[0.172]**	[0.546]**	[0.012]**	[0.014]**	[0.011]**
DB	0.537	-3.107	0.097	0.194	0.019
	[0.699]	[1.619]	[0.040]*	[0.051]**	[0.036]
DC	-0.634	0.129	-0.004	-0.064	0.001
	[0.591]	[1.389]	[0.029]	[0.034]	[0.032]
EMPLOYEE CHARACTERISTICS					
Mean_comp	0.026	0.038	0.001	0.0009	0.0003
	[0.007]**	[0.012]**	[0.0003]*	[0.0004]*	[0.0003]
Mean_age	0.216	0.391	0.001	0.006	0.001
	[0.124]	[0.357]	[0.005]	[0.006]	[0.008]
Mean_tenure	-0.058	-0.398	0.01	0.002	-0.001
	[0.088]	[0.303]	[0.005]	[0.006]	[0.006]
Female_pct	0.024	0.08	-0.0003	-0.0002	0.001
	[0.014]	[0.035]*	[0.001]	[0.0008]	[0.001]
Constant	-4.956	37.352	-0.664	-0.557	0.498
	[5.312]	[15.266]*	[0.205]**	[0.231]*	[0.316]
Observations	507	507	507	507	507
R-squared	0.1	0.09	0.35	0.24	0.06

Notes: * significant at 5%; ** significant at 1%. Robust standard errors in brackets. Industry controls included.

Table 7. Plan-Level Participation and Contribution Responses to 401(k) Design Features

	NHCEs		HCEs	
	Participation Rate	**Participant Contribution Rate**	**Participation Rate**	**% of Participants at $10.5k limit**
PLAN CHARACTERISTICS				
Match_f3	0.098	-0.004	0.049	-0.005
	[0.022]**	[0.002]*	[0.016]**	[0.039]
Match_n3	-0.0001	0.001	0.038	-0.119
	[0.031]	[0.002]	[0.022]	[0.061]
Match_n2	-0.092	0.002	-0.031	-0.053
	[0.040]*	[0.003]	[0.031]	[0.072]
Contr4MaxMatch	0.844	0.051	0.281	1.425
	[0.308]**	[0.028]	[0.269]	[0.493]**
After_tax	-0.186	-0.359	0.738	-1.412
	[1.525]	[0.124]**	[1.208]	[2.798]
NFundsOffered	1.177	0.017	0.325	1.225
	[0.299]**	[0.024]	[0.225]	[0.529]*
NFunds_sq	-0.02	-0.0001	-0.006	-0.015
	[0.006]**	[0.0004]	[0.004]	[0.009]
Fund_stock	-0.125	0.001	0.017	-0.054
	[0.055]*	[0.004]	[0.046]	[0.104]
ER_stock	1.163	-0.125	1.801	-0.668
	[1.746]	[0.153]	[1.282]	[3.000]
Loan	0.065	0.597	0.445	-0.206
	[2.207]	[0.192]**	[1.938]	[3.865]
EMPLOYER CHARACTERISTICS				
Plan_size	-3.621	-0.068	-0.896	-4.099
	[0.507]**	[0.046]	[0.630]	[0.975]**
DB	-2.021	0.054	-1.161	-1.466
	[1.608]	[0.121]	[1.769]	[2.806]
DC	-0.946	-0.204	-0.856	-3.69
	[1.283]	[0.107]	[1.043]	[2.372]
EMPLOYEE CHARACTERISTICS				
Mean_age	0.242	0.038	0.213	-0.021
	[0.235]	[0.022]	[0.201]	[0.359]
Mean_comp	0.534	0.058	-0.01	0.057
	[0.072]**	[0.007]**	[0.011]	[0.024]*
Mean_tenure	0.565	0.034	-0.02	-0.281
	[0.216]**	[0.022]	[0.188]	[0.311]
Female_pct	0.149	-4.2E-6	-0.063	0.128
	[0.036]**	[0.003]	[0.085]	[0.110]
Constant	42.885	2.073	78.938	49.56
	[11.184]**	[1.011]*	[11.105]**	[19.547]*
Observations	507	506	474	472
R-squared	0.39	0.3	0.11	0.19

Notes:* significant at 5%; ** significant at 1%. Robust standard errors in brackets. Industry controls included.

Table 8: Summary of Employee Behavior

Panel A. Responsiveness of NHCE Participation and Savings Rates

Change in Design	Change in Employee Behavior
Increase in match rate on first 3% by $0.10—from $0.55 to $0.65	0.8% point increase in NHCE participation rate; 0.07% point decrease in NHCE savings rate
Doubling of match rate on first 3%-- from $0.55 to $1.10	5.4% point increase in NHCE participation rate; 0.2% point decrease in NHCE savings rate
Adding 2 funds to plan	2.3% point increase in NHCE participation rate
Increasing equity funds from 65% to 75% of menu	1.5% point decline in NHCE participation rate
Adding a loan	0.6% increase in NHCE savings rate

Panel B. Variation in NHCE Participation Rate Based on Match Design
Forecast value of NHCE participation rate, with all independent variables estimated at means except for match variables

Base participation rate (no match): 65.4%

	Match rates		
Match tier	**$0.25 on the dollar**	**$0.50 on the dollar**	**$1.00 on the dollar**
3%	70.4%	72.9%	77.8%
4%	71.3%	73.7%	78.6%
5%	72.1%	74.6%	79.5%
6%	73.0%	75.4%	80.3%

Panel C. Variation in NHCE Savings Rate Based on Match Design
Forecast value of NHCE savings rate, with all independent variables estimated at means except for match variables

Base savings rate (no match): 6.7%

	Match rates		
Match tier	**$0.25 on the dollar**	**$0.50 on the dollar**	**$1.00 on the dollar**
3%	6.6%	6.5%	6.3%
4%	6.6%	6.5%	6.3%
5%	6.6%	6.5%	6.3%
6%	6.6%	6.5%	6.3%

Table 9: Employee Behavioral Responses—Investments and Access Methods (NHCEs Only)

	INVESTMENT DECISIONS			ACCOUNT USAGE	
	% Contribution to Equities	% Contribution to Company Stock	Average Number of Funds Used	Use of Internet to Manage Account	Use of Loan Feature
VARIABLE	Avg_Equity_pct	Avg_ComStk_pct	Avg_Num FundsUse	Web_UseRate	Loan_TakeRate
PLAN CHARACTERISTICS					
Match_f3	-0.004	0.071	0.001	-0.006	0.04
	[0.013]	[0.064]	[0.001]	[0.015]	[0.014]**
Match_n3	-0.004	-0.102	0.003	0.067	0.023
	[0.017]	[0.080]	[0.002]*	[0.025]**	[0.020]
Match_n2	-0.005	-0.012	0.002	-0.006	-0.034
	[0.025]	[0.100]	[0.003]	[0.035]	[0.037]
Contr4MaxMatch	0.19	3.514	0.016	-0.189	0.13
	[0.155]	[1.065]**	[0.014]	[0.216]	[0.179]
After_tax	-2.249	-4.979	-0.069	1.446	1.549
	[1.054]*	[3.952]	[0.077]	[0.982]	[1.151]
NFundsOffered	-0.031	-0.462	0.073	0.603	0.058
	[0.185]	[0.855]	[0.016]**	[0.210]**	[0.220]
NFunds_sq	0.0003	0.005	-0.001	-0.008	0.001
	[0.003]	[0.014]	[0.000]**	[0.004]*	[0.005]
Fund_stock	0.08	-0.465	0	0.055	0.018
	[0.041]	[0.187]*	[0.003]	[0.046]	[0.040]
ER_stock	3.52		0.564	2.278	0.461
	[1.236]**		[0.104]**	[1.326]	[1.354]
Loan	-3.911	-0.491	0.148	3.45	
	[1.041]**	[5.213]	[0.100]	[1.503]*	
EMPLOYER CHARACTERISTICS					
Plan_size	-1.055	2.328	-0.104	-0.666	0.815
	[0.371]**	[1.335]	[0.026]**	[0.387]	[0.393]*
DB	-1.224	10.845	-0.122	-0.223	-0.059
	[1.062]	[4.651]*	[0.070]	[1.124]	[1.225]
DC	-0.162	-0.925	0.09	-0.675	-0.457
	[0.772]	[3.761]	[0.061]	[0.917]	[0.873]
EMPLOYEE CHARACTERISTICS					
Mean_age	-0.333	-0.55	-0.025	-0.152	0.275
	[0.155]*	[1.004]	[0.012]*	[0.185]	[0.178]
Mean_comp	0.286	-0.209	0.006	0.439	0.014
	[0.047]**	[0.230]	[0.003]	[0.060]**	[0.049]
Mean_tenure	-0.292	-0.068	-0.003	-0.082	0.532
	[0.158]	[0.704]	[0.011]	[0.158]	[0.199]**
Female_pct	0.002	0.014	0.002	0.007	-0.044
	[0.022]	[0.122]	[0.002]	[0.026]	[0.026]
Constant	81.504	41.096	3.577	-0.367	-7.235
	[7.153]**	[46.190]	[0.549]**	[9.265]	[7.913]
Observations	501	95	503	507	432
R-squared	0.27	0.37	0.24	0.32	0.3

* significant at 5%; ** significant at 1%

Robust standard errors in brackets. Sector control variables not shown.

Table 10. Relationship between Plan Design and Employer Expenditures for Matching Contributions (as a Percent of Compensation)

	ER Expenditures as % of Compensation
PLAN ATTRIBUTES	
Match_f3	0.015
	[0.002]**
Match_n3	0.021
	[0.002]**
Match_n2	-0.0003
	[0.004]
Contr4MaxMatch	0.01
	[0.016]
After_tax	0.049
	[0.083]
NFundsOffered	-0.006
	[0.016]
NFunds_sq	0.0002
	[0.0003]
Fund_stock	0.001
	[0.002]
ER_stock	-0.009
	[0.134]
Loan	0.266
	[0.093]**
EMPLOYER CHARACTERISTICS	
Plan_size	-0.108
	[0.030]**
DB	0.038
	[0.072]
DC	-0.127
	[0.065]
EMPLOYEE CHARACTERISTICS	
Mean_age	0.024
	[0.012]
Mean_tenure	-0.016
	[0.013]
Female_pct	0.003
	[0.002]
Constant	-0.501
	[0.510]
Observations	507
R-squared	0.76

Notes:* significant at 5%; ** significant at 1%. Robust standard errors in brackets. Industry controls included.

Table 11. Summary of Employer Plan Matching Expenditures

Panel A. Responsiveness of Employer Plan Matching Expenditures

| Plan Feature	Change in ER Expenditures (as % of Compensation)
+ 10 cents match on first 3% of pay: from $0.55 to $0.65	+8%
+ 10 cents match on the next 3% of pay: from $0.37 to 0.47	+12%
Offers loan	+15 %

Panel B. Variation in Employer Expenditures Based on Match Design
Forecast value of employer match costs (as a percent of payroll), with all independent variables estimated at means except for match variables
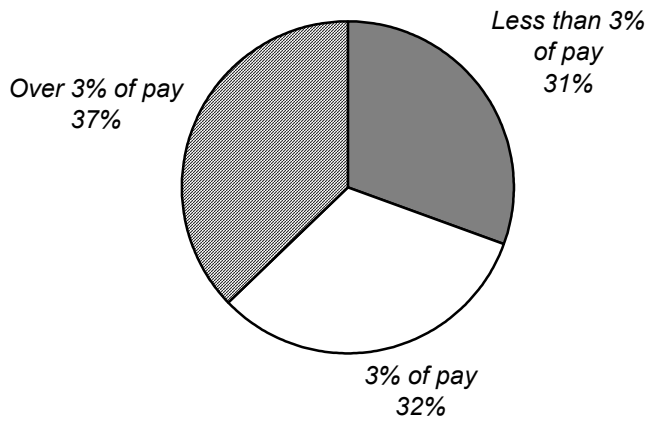
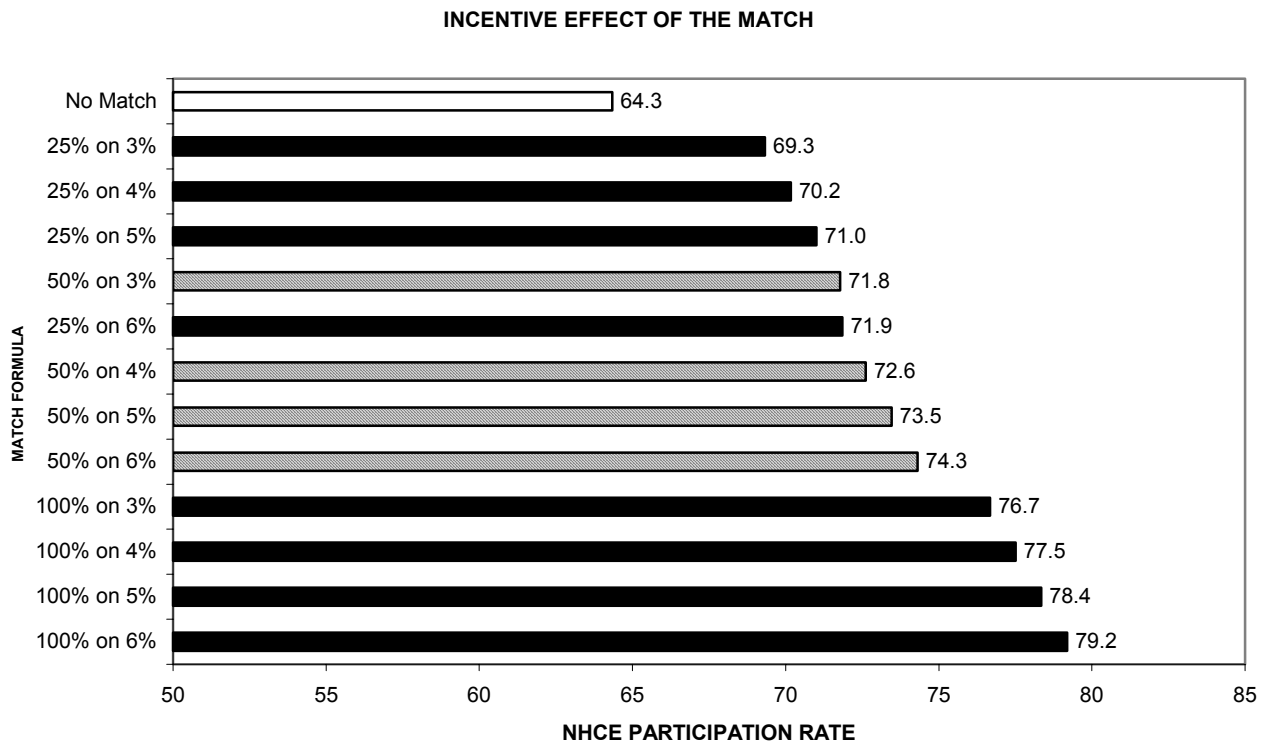| Match tier	Match rates		
	$0.25 on the dollar	$0.50 on the dollar	$1.00 on the dollar
3%	0.25%	0.63%	1.38%
4%	0.44%	0.99%	2.09%
5%	0.62%	1.35%	2.80%
6%	0.81%	1.71%	3.51%

Figure 1. Distribution of Employer Match Patterns in Single-Formula Plans
(360 Plans)
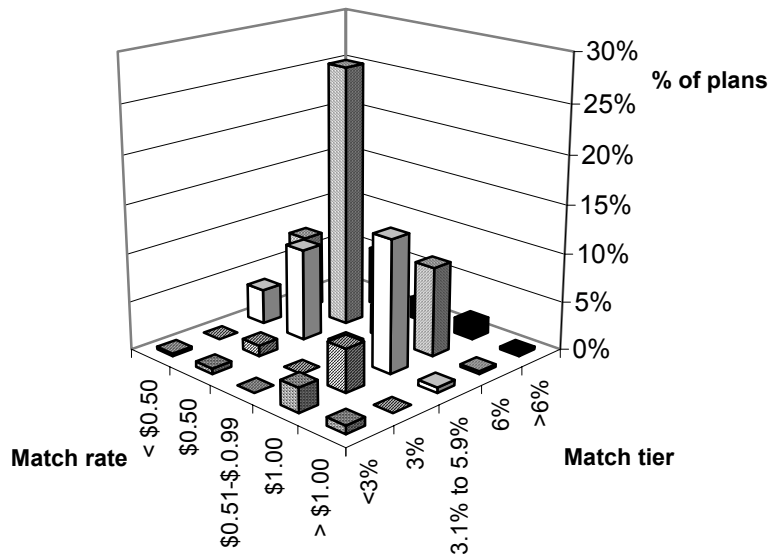
Figure 2. Distribution of Maximum Employer Match Rates in Single-Formula Plans
(360 Plans)

Figure 3. Pure Incentive Effect of the Employer Match
Projected NHCE participation rates at the sample means

INCENTIVE EFFECT OF THE MATCH

MATCH FORMULA	NHCE PARTICIPATION RATE
No Match	64.3
25% on 3%	69.3
25% on 4%	70.2
25% on 5%	71.0
50% on 3%	71.8
25% on 6%	71.9
50% on 4%	72.6
50% on 5%	73.5
50% on 6%	74.3
100% on 3%	76.7
100% on 4%	77.5
100% on 5%	78.4
100% on 6%	79.2

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Endnotes

[1]There are three times as many US workers participating in DC plans as defined benefit (DB) plans. Since 1985, the number of DB plan participants has declined by 8% annually and these plans hold fewer assets than in DC plans (DB assets are estimated at $2.2 trillion; Vanguard, 2004).

[2] For reviews of employee behavior in DC plans see Choi *et. al.* (2004) and Munnell and Sunden (2004). Engelhardt and Kumar (2003) provide an excellent schematic summary.

[3] In this paper, we use the term "401(k)" to include both 401(k) and 403(b) salary deferral plans. The former are offered in the corporate sector, while the latter are offered by non-profit employers, but both terms are derived from the section of the US tax code permitting contributions to these retirement plans to be tax-qualified under particular conditions (McGill et al. 2004). Our analysis excludes governmental plans (e.g. so-called Section 457 plans). More than 70% of US DC plans are 401(k)-type programs and 85% of DC plan participants have a 401(k) feature.

[4] Because of federal tax limits, the matching contribution is a function only of the average wages of the firm's nonhighly compensated employees (NHCEs) defined as those earning less than $85,000 in 2001, the year of our dataset. Conversely, highly compensated employees earned $85,000 or more. The rules for the Actual Deferral Percentage or ADP test under nondiscrimination testing are complex; in the general case, if the saving rates of the NHCEs fall between 2% and 8%, the HCE saving rate cannot be more than 2% higher than the NHCE rate.

[5] One reason that prior studies have come to different conclusions has to do with methodological issues. As we discuss in greater deal in the next section, analyzing 401(k) plan behavior requires

careful attention to model specification regarding three key parameters*:* the unit of analysis, the complexity of retirement plan design, and the complexity of federal tax rules.

[6] A partial list includes Andrews (1992), Even and Macpherson (1997, 2003), GAO (1997), Papke (1995), Papke and Poterba (1995), and Choi *et al.* (2004).

[7] See for instance Papke (1995), Clark and Schieber (1998), Munnell *et al.* (2000), Engelhardt and Kumar (2003), and Huberman *et al.*(2003).

[8] Studies using individual-level microdata collected from specific companies include Clark and Schieber (1998); Huberman, Iyengar, Jiang (2004); and Kusko, Poterba, and Wilcox (1998). Studies using individual-level microdata from nationally representative surveys include Andrews (1992); Basset, Fleming and Rodrigues (1998); VanDerhei and Copeland (2001); Cunningham and Engelhardt (2002); Engelhardt and Kuman (2004); Even and Macpherson (2003); Munnell, Sunden, and Taylor (2000).

[9] Pence (2002) focuses on employee aspects of 401(k) decision-making, arguing that workers who participate in such plans have an inherently greater interest in saving than other workers.

[10] For instance Wachovia states on its website that the "employee benefits plan protects the most important resource of your business—your employees. Employee benefits can be one of your most valuable recruiting tools. We can help you assemble a generous and affordable benefits plan that attracts and retains the best employees." (http://www.wachovia.com/small_biz/page/0,,446_610_1303_1312,00.html)

[11] In fact, Ippolito sees this compensation structure as a way to reward unobserved but valuable employee traits such as willingness to defer gratification ("low discounters"), on the grounds that

these workers may actually be more productive. He also believes that DB plans with back-loaded benefits designs permit firms to reward long tenure and experience.

[12] Another paper, by Elton et al. (2004), on employer plan design is interesting but not directly relevant to our topic, as it explores the types of 401(k) investment options offered.

[13] Employer retirement plan contributions are only deductible to the extent of federal tax limits. Some have argued that firms may derive a benefit from offering employer stock within a DC plan, but productivity gains from company stock tend to be negligible and may reflect employer and employee myopia about benefits and costs (Benartzi *et. al.* 2004; Mitchell and Utkus, 2003).

[14] Participants in 401(k) and 403(b) plans may borrow up to 50% of their account balance, up to a maximum of $50,000. In plans allowing after-tax contributions, participants may choose to contribute earnings after paying taxes. These contributions are immediately available for withdrawal at any time, making them liquid. Earnings are tax-deferred and are subject to restrictions and taxation upon withdrawal. According to the Profit Sharing / 401(k) Council of America (2004), nearly half of plans with 5,000 or more participants offer an after-tax feature, compared to less than 5% of plans with less than 200 participants. Certain plans permit participant withdrawals—so-called "in-service withdrawals"—in the event of severe financial hardship. In our sample less than 1% of participants took in-service withdrawals and so we ignore them as a potential source of liquidity for 401(k) savings.

[15] Upon job change or retirement, employees have the option of rolling over their plan assets to an Individual Retirement Account (IRA), which offers substantially greater investment flexibility compared to the typical 401(k) plan.

[16] Here we are considering only the costs of the matching contribution. Employers may also incur administrative costs for plan operation including plan design, legal and compliance costs; recordkeeping fees paid by the employer; and other expenses such as discretionary expenditures on employee communications.

[17] This skewness is not unique to our sample. For instance, Mitchell and Utkus (2003) report that only 3% of US defined contribution plans offer company stock, but because they are among the largest US firms, 42% of participants are found in these plans.

[18] Engelhardt and Kumar (2003, 2004) are an important exception and provide important detail on the nature of 401(k) matching contributions.

[19] In the most common case of the Actual Deferral Percentage or ADP test, if the saving rates of the NHCEs fall between 2% and 8%, the HCE saving rate cannot be more than 2% higher than the NHCE rate. There are different rules when NHCE saving rates fall below 2% or above 8%.

[20] Under the NDT testing rules, should NHCE contribution rates fall short of the legally required amount, the plan is said to "fail" nondiscrimination testing. In this case the plan can either refund HCEs' contributions, which is a laborious and time-consuming process for the employer and may require the employee to file a revised tax return, or alternatively the employer may simply limit HCE contributions to some lower rate to avoid failing the test in the first place. For example, an employer could restrict HCEs to no more than a 6% contribution rate to meet the nondiscrimination rules, in which case a HCE earning $100,000 would be allowed to contribute only 6%, rather than the statutory 10.5% of salary noted above. In practice HCEs are often capped at a flat rate (such as 6%) when a plan fails nondiscrimination testing, though the sponsor may also impose a dollar limit. HCEs subject to a cap in the 401(k) plan are sometimes eligible

for executive compensation or non-qualified plans instead. Another option for capping HCEs is to subject those in executive plans to a smaller 401(k) limit, while allowing lower-paid HCEs not eligible for the executive plan to save at a higher rate.

[21] The identity of individual firms and plan participants is masked. Union plans are excluded from our sample of 507 plans, since there the match is collectively bargained rather than determined solely by the employer.

[22] The datafile does not include measures of employee educational attainment or workplace financial education programs, though all employees received plan enrollment material and a quarterly plan newsletter, and all have access to online educational materials. We also lack data on vesting schedules for employer contributions, indicating participants' ability to take employer contributions with them when they change jobs. We did investigate tenure patterns in more detail (an analysis not reported here), and the results were similar to those shown here.

[23] According to the US Department of Labor, 84% of full-time private industry employees in the US in 2000 were in saving and thrift plans with a "determinable" match rate (DOL, 2004: 69).

[24] Even in the one of five plans that did not provide a "match," some proportion does have employer contributions elsewhere in the retirement benefit design—whether to a DB plan, a companion money purchase plan, a companion profit-sharing or ESOP plan, or a profit-sharing or ESOP contribution to the 401(k) plan itself. The other DC plan contributions are not considered "matching" contributions because they are made to all eligible employees, not just 401(k) participants; they may be discretionary; and they are not made contemporaneously with employee 401(k) contributions. However, these contributions are still sometimes promoted as "a match" by employers.

[25] With after-tax contributions, employees may withdraw contributions at any time. Earnings compound tax-free and are subject to the same restrictions governing pre-tax contributions. Because of their liquidity, after-tax contributions compete with pre-tax saving, and so any regression of pre-tax saving against after-tax contributions should show a negative coefficient for the after-tax indicator. In a number of plan designs, employees who reach various federal tax limits on pre-tax contributions are able to make additional after-tax contributions, thereby gaining an additional tax benefit, the ability to defer taxes on the earnings on such contributions.

[26] At the employee level, since more participants are in large plans, nearly four in ten participants are provided with a match equivalent of 3% of pay. But this 3% promise can manifest itself in quite different ways in terms of required employee contribution: as a $0.50 on the dollar match on a 6% employee contribution, as a $1 for dollar match on a 3% employee contribution, or, less frequently, something in-between.

[27] In the case of DC plans, a 401(k) participant may receive an employer contribution to a companion money purchase plan, profit-sharing plan, or Employee Stock Ownership Plan (ESOP). The profit-sharing or ESOP contribution may be integrated within the 401(k) plan itself, or it may be in a standalone plan.

[28] This is the participation rate calculated at the plan level. Across the universe of employees, the participation rate is 66%. The reason for this difference is that participants are skewed to the largest plans, and larger plans tend to have lower participation rates, often because they offer another retirement plan besides the 401(k) plan.

[29] The plan-weighted average participation rate is 77%--i.e., the average of participation rates calculated at the plan level is significantly higher. This is because large plans have more

employees, and they also have much lower 401(k) participation rates (often because they offer other retirement plan benefits).

[30] This accords with recent findings from Choi et al. (2004).

[31] All equations also control on industrial sector and, predictably, firms in sectors like manufacturing or finance and insurance had more generous designs than firms in wholesale/retail trade (results not reported here in detail but available on request).

[32] We do not distinguish between NHCE and HCE employees because there are no federal constraints on non-monetary plan design features.

[33] Only Papke (1995) and Papke and Poterba (1995) use firm-level analysis and they detect a positive association between plan participation and match generosity. However they do not exploit the nonlinearity of the match rate in as much detail as do we. Papke (1995) uses aggregate Form 5500 data, so she must infer rough match rates from actual plan contributions of employers and employees. Papke and Poterba (1995) suffer from a small sample (43 plans). Both studies have few independent variables, but include match rate, plan size and the presence of another pension plan.

[34] The two prior firm-based studies offer mixed results. Papke (1995) shows that introducing a match increases employee contributions, but the marginal change in employee contributions is negative at higher match rates. The Papke and Poterba (1995) study shows that introducing a match increases employee contributions but they find no effect of higher match rates. Studies using individual-level data are also very mixed. For instance Clark and Schieber (1998), Cunningham and Engelhardt (2002), and Huberman et al (2004) suggest that higher match rate

increases employee contribution rates; by contrast, Engelhardt and Kumar (2004) and Kusko *et al.* (1998) find a negative effect; and Munnell *et al.* (2000) find no impact.

[35] The negative link between age and equity holding confirms Agnew *et al* (2003), but it differs from Ameriks and Zeldes (2001); the latter study relies on longitudinal CPS and TIAA-CREF data and controls on alternative combinations of age, year, and cohort effects.