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UNDERSTANDING THE IMPACT OF EMPLOYER MATCHING ON 401(K) SAVING

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This article summarizes our current research on the impact of employer matching on 401(k) saving. In particular, we outline the reasons why this impact is difficult to identify, and describe our research with the Health and Retirement Study. We find greater diversity in matching provisions compared with previous studies. We exploit this diversity in our statistical analyses and find that employer matching significantly raises 401(k) saving. We also discuss the implications of this research for policy.

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>>> INTRODUCTION

As 401(k) plans have come to dominate the new pension landscape, researchers and policy makers have given increasing attention to the impact of plan characteristics on retirement saving decisions. One important characteristic is whether and to what extent the employer matches employee contributions. A typical match might be 50 cents for each dollar of employee contribution, up to a maximum percentage of pay, say, 6 percent. Although much of the discussion by the popular press and policy makers presumes employer matching raises saving, there is actually strikingly little consensus among researchers. Some studies have found that increases in the match rate raise 401(k) saving; others have found the opposite.

This article summarizes our current research on the impact of matching on 401(k) saving. In our view, isolating the effect of employer matching on employee contributions is important for four reasons. First, it is of fundamental interest to researchers focusing on the impact of employer-provided pensions on retirement and saving. Second, matching is often used to prevent binding pension non-discrimination requirements, a major regulatory burden. Third, a number of commonly advocated reforms to the Social Security system call for the introduction of voluntary private accounts, whereby individuals could choose to contribute additional funds toward Social Security. Naturally, earnings on those account balances would accrue until the date benefits were claimed. Under some reform proposals, the federal government would match those contributions as an incentive. In determining the optimal match rate (given the government's other revenue needs), it would be instrumental for policy makers to know how individual contributions would respond to the government match. Clearly, much could be learned in this context from the experience of employer matching for 401(k)s. Finally, a number of prominent companies have reduced or eliminated matching contributions recently due to declining profits. Although it remains to be seen if this is a long-term trend, understanding the impact of matching is critical to understanding the impact of these changes on retirement income security for a workforce increasingly dependent on 401(k) plans for retirement.

In this article, we outline the reasons why the impact of matching is difficult to identify, and describe our research with the Health and Retirement Study. We find greater diversity in matching provisions compared with previous studies. We exploit this diversity in our statistical analyses and find that employer matching significantly raises 401(k) saving: doubling the match rate would raise employee contributions by 25 percent. We discuss the implications of this ongoing research for policy.

>>> BACKGROUND

401(k)-type pension arrangements are defined-contribution plans, and are a subset of Cash or Deferred Arrangements (CODAs). Legally, the term "401(k)" refers to plans qualified under Section 401(k) of the Internal Revenue Code (IRC). However, researchers, policy makers, and the media frequently use this term loosely to describe plans that offer elective employee pre-tax contributions based on salary reduction. The array of plans with this feature is remarkably broad. For example, savings or thrift plans that allow pre-tax contributions from salary reduction must follow rules for 401(k)s. The same applies to profit-sharing plans. Qualified nonprofit organizations and public school systems can sponsor elective tax-deferred savings plans under Section 403(b) of the IRC. For the most part, 403(b)s operate like 401(k)s, although annual contribution limits differ slightly between the two. Plans for state and local government employees qualified under Section 457 of the IRC also have 401(k)-type features.¹ Overall, their distinguishing feature is they allow employees to make elective contributions on a pre-tax basis, funded by a reduction in the employee's salary. Throughout this article, we refer to plans with this feature as "401(k)-type" pensions.

From the employer's perspective, matching serves at least three important roles. First, it validates to employees the importance of retirement saving. Second, it potentially allows the employer to channel additional compensation to employees who are forward-looking. These employees may be more willing to invest in firm-specific skills. Finally, to the extent the employer faces binding pension non-discrimination requirements, matching (especially with caps) may be a way to increase plan participation among non-highly compen-

sated workers, potentially easing those constraints.

From the employee's perspective, basic economic theory suggests there are two potential effects of matching on employee 401(k) saving. First, employer matching raises the return to 401(k) saving. This should raise annual employee contributions. Second, to finance any *fixed* target level of retirement wealth the employee might desire, the higher return from matching requires less annual employee contributions. These are opposing effects, so that, *in principle*,

the effect of matching on employee contributions is *ambiguous* (even though most employers and policy makers believe that matching raises contributions).

In fact, this ambiguity has been mirrored in the previous attempts by researchers to isolate the impact of matching on employee contributions. As Table 1 documents, a number of studies, including Andrews (1992), Even and Macpherson (1996), EBRI (1994), Bassett, Fleming, and Rodrigues (1998), Papke (1995), GAO (1997), Clark and Schieber (1998), and Kusko,

Table 1 Summary of Results from Selected Previous Studies

Study	Data Source	Dependent Variable(s)	Effect of the Existence of Matching on Probability of Contributing	Effect of the Existence of Matching on Contributions, Conditional on Contributing	Effect of Match Rate on Contributions, Conditional on Offering a Match
Andrews (1992)	May 1988, CPS	Probability of Contributing; Contributions	Positive	Negative	---
Even and Macpherson (1996)	May 1988, April 1993, CPS	Probability of Contributing	Positive	---	---
EBRI (1994)	May 1988, April 1993, CPS	Probability of Contributing; Contribution Rate	Positive	Negative	---
Bassett, Fleming, and Rodrigues (1998)	April 1993, CPS	Probability of Contributing	Positive	---	No Effect
GAO (1997)	(1) 1992 SCF	Contribution Rate	---	Positive	---
	(2) 1992 Form 5500 (firm-level)	Proportion Contributing; Contributions	Positive	---	Negative
Munnell, Sunden, Taylor (2000)	1998 SCF	Contribution Rate	---	Positive	Negative
Papke (1995)	1986, 1987 Form 5500 (firm-level)	Proportion Contributing; Contributions	Positive	---	No Effect
Papke and Poterba (1995)	1986, 1990 survey of 43 firms	Proportion Contributing	Positive	---	Positive
Clark and Schieber (1998)	Personnel records at 19 firms with matching	Probability Contributing; Contributions	--	---	Positive
Kusko, Poterba, and Wilcox (1998)	Personnel records at a single firm with matching	Probability Contributing	---	---	No Effect

Note: All studies above estimated reduced-form specifications. The contribution rate in these studies is measured as annual contributions as a percent of income.

Poterba, and Wilcox (1998), among others, have found that annual 401(k) participation (defined as the percent of eligible employees contributing in that year) was higher among employers offering a match. However, there is substantial disagreement among researchers about how variation in the *match rate* affects contributions. Some studies have found that an increase in the match rate raises contributions (Papke and Poterba, 1995; Clark and Schieber, 1998); others have suggested that an increase in the match rate has no effect or even lowers 401(k) contributions (Bassett, Fleming, and Rodrigues, 1998; Papke, 1995; Munnell, Sunden, and Taylor, 2000; GAO, 1997).

>>> SUMMARY FINDINGS FROM OUR RESEARCH

We propose a natural explanation that can reconcile these disparate findings. Specifically, previous research has failed to recognize that fixed-rate employer matching with caps, and variable-rate matching, induce strong incentives for employees to concentrate contributions around the level of the cap (or where the match rate changes for variable-rate schemes). That is, employee contributions tend to be bunched together at these caps. This implies that, relative to no match, offering a match raises saving, but that once a match is offered, a change in the match rate *per se* may be ineffective in raising additional saving unless the change is big enough to move employees away from bunching at the caps. Changes in the *caps*, however, may be effective in changing saving behavior. Then, we develop a sophisticated empirical model, consistent with life cycle behavior, that explicitly accounts for bunching at the caps to estimate the effect of matching on 401(k) saving.

Data Issues

An important drawback of previous research has been the reliance on individual-level survey data, such as the Current Population Survey (CPS) used by Andrews (1992), EBRI (1994), Even and Macpherson (1996), Bassett, Fleming, and Rodrigues (1998), and the Survey of Consumer Finances (SCF) used by GAO (1997) and Munnell, Sunden, and Taylor (2000). Although they are nationally representative surveys, these sources are not well suited to measure the match-rate schedule faced by many individuals because of the great diversity in

matching provisions in actual plans (as will be illustrated below). The typical survey respondent has great difficulty in accurately conveying these provisions to interviewers, which results in substantial measurement error in individual-level survey data. Studies that instead have used detailed pension plan descriptions and employer personnel records, such as Clark and Schieber (1998) and Kusko, Poterba, and Wilcox (1998), have yielded very useful insights, but have done so for a limited set of firms that are not nationally representative. This makes it difficult to extend the results of these studies to broader groups of workers.

Another drawback has been the reliance on individual self-reported information on 401(k) contributions. Because many survey questionnaires are not designed in a way to elicit this information well, self-reported contribution data could suffer from substantial reporting error. For example, some plans mandate employee contributions as a condition of eligibility. Surveys like the CPS and SCF do not distinguish between mandated and voluntary contributions when querying respondents, so that voluntary contributions are measured with error.

Finally, determining the causal impact of matching on 401(k) saving has proven to be difficult for researchers for two important reasons. First, the data required to statistically model an employee's contribution decision are quite extensive: 401(k) contributions, components of household (including spousal) income, assets, debts, demographics, marginal tax rates, spousal pension coverage, and expected entitlements from Social Security and any non-401(k) pension plans. Estimates of Social Security and pension entitlements themselves require lifetime and job earnings histories, respectively. None of the previous studies discussed above had these requisite data. Second, and more fundamentally, it is difficult for researchers to adequately account for all of the efforts of employers to encourage 401(k) participation at the same time they are offering matching contributions. Firms have many ways to influence participation: offer financial education and retirement seminars, adopt plan features the marginal participant may find attractive, such as hardship withdrawals, borrowing against plan balances, or a wider array of investment options. If firms that offer matches experience greater 401(k) saving, but are also more likely to take other measures to raise participation, it is difficult

Table 2 Distribution of 401(k) Plans in the HRS, by Type of Matching

	(1) All 401(k) Plans in the HRS	(2) All 401(k) Plans in the Analysis Sample
Percent of Plans Offering Employer Match	52	54
Of Plans with Match, Percent with		
Discretionary Match	1	0
Match Through Profit-sharing	9	0
Fixed-rate Match	73	80
Variable-rate Match	17	20

Note: This table shows the distribution of 401(k) plans in the HRS by type of employer matching arrangement, based on the authors' tabulations from the employer-provided Summary Plan Descriptions discussed in the text.

to attribute greater saving to matching *per se*. Unfortunately, most of the previous studies did not have detailed information on other plan characteristics.

We overcome these problems in our research by using remarkably detailed data from the Health and Retirement Study (HRS), a nationally representative random sample of 51-61 year olds and their spouses (regardless of age) in 1992. The HRS asked detailed questions about household income, IRA contributions, tax information, wealth, demographics, spousal characteristics, employment, and pensions. A unique feature of these data is that the HRS collected Summary Plan Descriptions (SPDs), which are legal descriptions of pensions written in plain English, from employers of HRS respondents. These descriptions contain employer matching formulas that allow us to sidestep the problems with measurement error outlined above, and, instead, measure the exact incentives to contribute due to the employer match.

In addition, the HRS asked respondents permission to link their survey responses to administrative earnings data from the Social Security Administration (SSA) and the IRS. These data include Social Security covered earnings histories from 1951-1991 and W-2 earnings records for jobs held from 1980-1991, and were made available to us under a restricted-access confidential data agreement with the SSA and IRS, administered by the University of Michigan. In particular, the W-2's provide administrative data on earnings and 401(k) contributions (Cunningham and Engelhardt, 2002).

Unlike the contributions data used in previous studies, the administrative data are not subject to measurement error, as they are the employer's official report to the government on annual earnings and elective deferrals. In addition, the Social Security earnings histories allow for the calculation of lifetime earnings, Social Security, and pension entitlements.

Upon integrating the HRS survey and administrative data, we have a comprehensive description of the household's financial situation as of the first interview in the HRS, which occurred in 1992. This, along with the detailed matching provisions from the SPDs, allow us to model the incentives to contribute to a 401(k) significantly more precisely than in previous research. Finally, interview questions about retirement and financial planning seminars, and plan characteristics about withdrawal, borrowing, investment options, and other plan characteristics from the SPDs, allow us to account for other firm- and plan-specific factors that might be affecting 401(k) contributions and also correlated with the employer matching provisions.

Diversity in Matching Provisions

As discussed above, a typical match is often described in the pension literature as 50 cents for each dollar of employee contribution, up to a maximum percentage of pay, say, 6 percent. This is known as a *fixed-rate* match. This is the type of matching most often presumed in previous studies of 401(k)s.

However, Tables 2-4 show remarkable diversity in

Table 3 Cap on Matching Contributions, as a Percentage of Pay, for All Plans in the Analysis Sample

Cap on Employer Matching Contributions as a Percentage of Pay	(1) Number of Plans	(2) Percent of Plans	(3) Number of Individuals	(4) Percent of Individuals
Less than 2%	7	3.3	10	2.7
2	11	5.3	12	3.2
2.5	1	0.5	1	0.3
3	19	9.1	24	6.5
3.75	1	0.5	4	1.0
4	23	11.0	40	10.8
5	17	8.1	53	14.2
5.5	1	0.5	1	0.3
5.7	1	0.5	1	0.3
6	56	26.8	109	29.3
Greater than 6%	32	15.3	57	15.3
No Cap	41	19.6	60	16.1
Total	209	100.0	372	100.0

Note: Authors' calculations from the HRS restricted-access pension plan data for the 209 plans associated with the 372 HRS individuals (of the 1042 in the analysis sample) in plans with matching provisions.

matching provisions for the 401(k) plans in the HRS. Specifically, the data in these tables are drawn from the 1717 employer-provided SPDs for all HRS pensions, including defined-benefit plans. Of these, 658 are defined-contribution plans that allow for voluntary pre-tax employee contributions, of which 368 provide employer matching. Column 1 of Table 2 breaks down these 368 plans by the type of matching. Fifty-two percent of plans offered employer matching, and, among these, only seventy-three percent had fixed-rate matching. The remainder is divided almost exclusively between *variable-rate* and *profit-sharing* matching. Variable-rate matching occurs when the employer chooses to match different portions of contributions at different rates. For example, the employer might match the first \$500 of contributions at 75 cents-per-dollar, and any portion of contributions above \$500 at 25 cents-per-dollar. Seventeen percent of plans offered variable-rate matching. Nine percent of plans made matches through a profit-sharing mechanism. In this type, the

employer does not commit to a set schedule of matching contributions, but instead periodically (e.g., annually) considers whether and how much to match employee contributions based on some measure of firm performance clearly indicated in the SPD. As a group, fixed-rate, variable-rate, and profit-sharing matches are technically non-discretionary arrangements (though, obviously, profit-sharing allows for much “discretion” on the part of employers in matching employee contributions). The remaining category in Table 2 is discretionary matching, under which, naturally, the employer decides whether and how much to match, and there is no formal arrangement. Only one percent of plans utilized this arrangement.

Because the extent of matching is not always known in advance to employees making deferral decisions in profit-sharing and discretionary plans, we focused on plans with fixed- and variable-rate matching in our empirical analysis. We used a sample of 1042 individu-

Table 4 Distribution of First-Dollar Match Rates as a Percentage of Contributions

(1) First-Dollar Match Rate (%)	(2) Number of Plans	(3) Percent of Plans	(4) Number of Individuals	(5) Percent of Individuals
0 to 24	9	4.3	11	3.0
25	23	15.3	43	11.6
26 to 49	5	2.4	9	2.4
50	90	43.1	143	38.4
51 to 99	22	8.1	34	12.4
100	57	27.2	116	31.2
200	3	1.4	4	1.1
Total	209	100.0	372	100.0

Note: Authors' calculations from the HRS restricted-access pension plan data for the 209 plans associated with the 372 HRS individuals (of the 1042 in the analysis sample) in plans with matching provisions.

als from the HRS who were eligible for a 401(k), whose employer provided a SPD for the plan, and who had linked administrative W-2 and Social Security earnings data from the SSA and the IRS. The earnings and deferral data from the W-2 records refer to calendar year 1991. These 1042 individuals were associated with 387 plans.² Column 2 of Table 2 shows that fifty-four percent (209) plans in our analysis sample offered matching contributions. Among these, eighty percent had fixed-rate matching. Of the 1042 individuals, 372 were associated with plans that offered matching.

Many plans limit the amount of the match. These caps are usually expressed as a percent of pay in the SPD, but also can be a percent of contributions, and even a fixed dollar amount. Table 3 shows the distribution of matching caps in the analysis sample, expressed as a percent of annual pay.³ About nineteen percent of these plans had caps on employer matching that were less than 4 percent of pay. The median cap was 6 percent of pay, but fifteen percent of plans had higher caps.

Plans also vary according to the match rate. Table 4 shows the distribution of "first-dollar" match rates in the analysis sample. Technically, first-dollar match rates are the rate at which the employer matches the first dollar of deferral by the employee. In plans with fixed-rate matching, this is *the* match rate, whereas for variable-rate plans, this is the first, and, almost always, the

most generous match rate in the schedule. Columns 1 and 2 indicate that these match rates were clustered at 25, 50, and 100 percent, where the median match rate was 50 percent. However, twenty-seven percent of the plans offered matches of 100 percent, and three plans offered match rates of 200 percent.

Together, Tables 2-4 illustrate both the diversity in matching provisions and the difficulty previous researchers have faced. Specifically, to account for an employee's exact incentive to contribute when there is a match, it is necessary to know all match rates and caps for a plan. Survey questions administered to individuals like those in the CPS and SCF are not designed to capture this, and they do not determine whether the match is discretionary or through profit-sharing. The use of individual responses about employer matching likely leads researchers to incorrectly measure match rates in these surveys.

The Analysis Sample

As discussed above, the analysis sample consists of 1042 individuals from the 1992 HRS. Descriptive statistics for selected variables used in our empirical analysis are shown in Table 5. Column 1 shows sample means for the full sample, with the standard deviation in parentheses, and the median in square brackets. Overall, the sample consists of mostly white, married individuals in their mid-50s, with some

Table 5 Sample Means of Selected Variables in the Analysis Sample, Standard Deviations in Parentheses, Medians in Square Brackets

	(1)	(2)	(3)	(4)	(5)
Variable	Full Sample	Sub-sample without Matches	Sub-sample with Matches	Sub-sample with Positive Contributions	Sub-sample with Zero Contributions
401(k) Contributions (in 1991 dollars)	1377 (1920) [500]	1232 (1895) [100]	1640 (1938) [900]	2446 (1982) [1892]	0 (0) [0]
Match Rate (in percent)	23 (37) [0]	0 (0) [0]	65 (32) [50]	28 (38) [0]	17 (33) [0]
After-Tax Wage (in 1991 dollars per hour)	10.04 (5.55) [8.92]	10.09 (5.56) [9.12]	9.96 (5.54) [8.51]	10.91 (5.96) [9.66]	8.91 (4.75) [8.23]
Age (years)	54.9 (5.2) [55.0]	54.9 (5.1) [55.0]	54.8 (5.4) [55.0]	54.7 (5.0) [55.0]	55.1 (5.5) [55.0]
Education (years)	13.3 (2.7) [13.0]	13.5 (2.7) [13.0]	13.0 (2.6) [12.0]	13.8 (2.5) [14.0]	12.7 (2.7) [12.0]
Percent Female	47	47	47	48	45
Percent White	82	81	85	86	78
Percent Married	80	79	82	81	79
Percent with Plans that Allow Borrowing	36	19	68	42	29
Percent with Plans that Allow Hardship Withdrawals	4	4	5	6	2
Percent with Plans that Allow Self-Directed Investment	63	46	92	66	58
Percent with Other Pensions at the Firm	47	53	34	45	48
Percent with Plan Limit less than Federal Limit	80	73	92	76	85
Percent with Plan that Allows After-Tax Saving	23	9	47	26	18
Percent that had Employer-Sponsored Retirement Seminar	23	23	23	25	20
Percent with a Spouse who has a Pension	39	39	38	42	35
Percent in a Union	34	39	27	28	43
Number of Observations	1042	672	370	588	454

Note: Authors' calculations based on the sample of 1042 HRS individuals working in 1991 with matched employer-provided pension plan data and W-2 data, excluding those in plans with discretionary and profit-sharing-based employer matching provisions, as described in the text.

Table 6 Mean Potential and Unused Employer Matching Contributions for the Sub-sample of Individuals Eligible for Employer Matching Contributions, Standard Deviations in Parentheses, Medians in Square Brackets

Variable	(1) Overall	(2) Sub-sample with Positive Contributions	(3) Sub-sample with Zero Contributions
Potential Employer Matching Contributions in 1991 dollars	1249 (1409) [939]	1362 (1153) [1068]	1021 (1804) [714]
Potential Employer Matching Contributions as a Percentage of Pay	3.8 (4.1) [3.0]	3.9 (2.8) [3.5]	3.8 (5.8) [3.0]
Unused Employer Matching Contributions in 1991 dollars	550 (1243) [205]	319 (741) [0]	1013 (1798) [710]
Unused Employer Matching Contributions as a Percentage of Pay	1.9 (4.0) [1.0]	1.0 (2.0) [0]	3.7 (5.9) [3.0]

Note: Authors' calculations based on the sub-sample of 372 HRS individuals working in 1991 eligible for employer matching contributions.

college education and relatively few children at home. The sample mean 401(k) contribution in calendar year 1991 was \$1377, but among contributors, the average contribution was \$2446 (shown in Column 4). A comparison of contributions between those without and with employer matching in Columns 2 and 3, respectively, indicates that individuals with matching contributed just over \$400 more on average than those without matching (\$1640 minus \$1232). The difference in the median contributions between these two groups was \$800. The average after-tax hourly wage, defined as the gross wage less federal and FICA taxes, was about \$10 per hour in constant 1991 dollars.

A comparison of Columns 2 and 3 in Table 5 also indicates that plans with employer matching differ along other dimensions that may make saving attractive. For example, if there is an employer match, the individual is much more likely to be able to borrow, direct the investment of plan balances, less likely to have another traditional pension plan, more likely to have the plan annual contribution limit lower than the federal limit, and more likely to be allowed to make after-tax contributions to the plan.

The match caps and rates in Tables 3 and 4 can be combined to calculate the total potential employer match. This is shown in Table 6 for individuals eligible for a match in the analysis sample. The mean potential match was \$1249, or 3.8 percent of annual pay. Financial planners frequently stress that employees should be contributing at least up to the point at which the employer match is exhausted. Therefore, the table also shows the amount of the employer match that went unused because contributions were not made up to the level of the match cap. Among the sub-sample of individuals who contributed less than the match cap, the average unused employer match was \$550, or 1.9 percent of pay. Naturally, those who contributed nothing accounted for most of this, but even among those who made positive contributions during the year, the average unused employer match still represented about 1 percent of pay (Column 2).

The Estimation Method and Results

Our empirical estimation framework uses non-linear budget set estimation and takes explicitly into account the detailed pension and tax incentives to contribute to a 401(k), including employer matching. This statistical

framework is quite technical. We briefly summarize it here. The interested reader is referred to Engelhardt and Kumar (2003) for a detailed description of the methods used.

First, the framework is consistent with the standard life-cycle model of saving. Second, the framework includes the employer match rate as part of the financial rate of return the employee gets by contributing and investing a dollar in the 401(k). This return is also influenced by the tax treatment of 401(k) deferrals, which is modeled explicitly. Technically, this financial rate of return is called the “match-adjusted tax price” of 401(k) saving. Third, this framework accounts for the impact of after-tax earnings, non-401(k) and Social Security accruals, incentives to contribute to IRAs, age, sex, race, marital status, number of children, education, firm size, industry, occupation, union status, the other plan characteristics shown in Table 5, and the impact of federal, state, and FICA taxation on the incentive to contribute. Fourth, it explicitly allows employee contributions to be constrained by federal and plan-specific 401(k) contribution limits. Finally, it accounts for the fact that marginal tax rates affect 401(k) contributions, but contributions themselves affect marginal tax rates through tax deductibility.

To compare the non-linear budget set approach with that from the previous literature, we first estimated a series of empirical models on our analysis sample similar in spirit to those in the literature. Contributions are modeled as a function of earnings, demographics, a dummy for whether the firm matches contributions and the match rate. Like the studies in Table 1, we find that the presence of a match raises contributions. However, conditional on offering a match, increases in the match rate may increase or decrease contributions depending on the specification, reflecting the same ambiguity as in previous studies.

In contrast, estimates using our non-linear budget set method yield unambiguous and strikingly different results: after taking into account the exact incentive to contribute, employer matching has a large and statistically significant impact on 401(k) saving. A detailed discussion of these estimates can be found in Engelhardt and Kumar (2003), but can be summarized in the form of elasticities for the primary variables in the analysis. The elasticity measures the percentage

change in 401(k) contributions for a percentage change in the variable of interest. The estimated elasticity of 401(k) contributions with respect to the match rate is 0.25. This elasticity can be translated as follows: an increase in the match rate from 50 percent to 100 percent raises 401(k) contributions by 25 percent. From Table 5, the average contribution for individuals with a match was \$1640, with the typical match being 50 percent. Our estimates imply that offering employees a higher match of 100 percent would raise their contributions by 25 percent, from \$1640 to \$2050. These estimates are significantly larger than those from previous research, and suggest employee contributions are quite responsive to matching.

Our other estimated elasticities conform to basic economic theory. Namely, an increase in the financial rate of return (tax price) of IRA saving reduces 401(k) saving, which indicates that 401(k)s and IRAs are substitutes in tax-preferred saving. In addition, the estimated elasticity of 401(k) contributions with respect to the after-tax hourly wage is 1, which means an increase in the after-tax wage from \$10 to \$15 per hour would increase 401(k) contributions by 50 percent.

>>> IMPLICATIONS FOR RESEARCH AND POLICY

As indicated in the introduction, we believe that one of the most important policy implications of this line of research may be in guiding thinking about the appropriate level of government matching (if any) should a system of Social Security voluntary private accounts be enacted. In the medium-term, we hope to use our estimates directly to determine the optimal level of government matching. We do caution, however, that our research is based on individuals who were drawn from the 1992 HRS. In particular, these people were born between 1931-41, and hence, tend to look more like old-style workers (i.e., more heavily unionized, more likely to be in manufacturing jobs, more likely to have a traditional pension in addition to the 401(k), etc.) than many younger workers today. In this sense, our results are not representative of all workers, but are probably most applicable to older workers.

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>>> ENDNOTES

- ¹ One important distinction, however, is that, technically, 457 plans are non-qualified plans.
- ² There are more individuals than plans because for large employers, unions, and multi-employer plans, the stratified random sampling design of the HRS resulted in multiple individuals covered under the same plan.
- ³ For plans with discretionary and profit-sharing matches, there are no well-defined caps on matching.

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