Tax-Deferred Saving and Participation in Employee Stock Purchase Plans

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Abstract

Employee stock purchase plans (ESPPs) are designed to promote employee stock ownership broadly in the firm and provide another tax-deferred vehicle for capital accumulation in addition to traditional pensions and 401(k)s. We analyze the incentives employees face to participate in an ESPP, and find that 401(k) saving with employer matching contributions dominates ESPP saving for retirement on an after-tax basis for all but the shortest horizons. Then we examine empirically ESPP participation using administrative data from 1997-2001 for a large health services company that employs over 30,000 people. The picture that emerges from the analysis of these data suggests that participation in and contributions to the ESPP are relatively large in magnitude, and the 401(k) and ESPP plans do not compete for the first dollar of employer-based plan saving, but rather employees tend to exhaust saving opportunities in the 401(k) first, and then contribute marginal saving to the ESPP. However, employees appear to be backward-looking when forecasting future returns in making company stock purchase commitments, which suggests that employees may not be fully aware of the risk of company stock and the benefits of diversification. Taxes do not seem to be a prime determinant of ESPP participation.

Introduction

There has been great interest recently in the use of stock-based compensation in American companies. Although a large literature is emerging on stock options [see Murphy (1999) for a recent review], and an older literature on Employee Stock Ownership Plans (ESOPs), very little is known about employee stock purchase plans (ESPP). An ESPP is a tax-subsidized saving vehicle that allows a worker to use after-tax income to purchase company stock often at a discount. For employees in most plans, the primary tax advantage comes from the fact that if the shares are held long enough, the discount on the stock gets taxed as capital gains rather than as ordinary income. Because many of the tax advantages are contingent upon the plan being offered broadly in a firm, ESPPs potentially represent a much broader vehicle for company stock ownership than stock option plans typically targeted to top executives and key employees. Indeed, the National Center for Employee Ownership (2001a) estimates that over 15 million American workers are eligible for ESPPs.

In this paper, we analyze the incentives employees face to participate in an ESPP, defined as actively contributing to the plan. We do not discuss the corporate tax and finance implications of ESPPs (Hall and Liebman, 2000; Hallman and Rosenbloom, 2001), theories of why firms offer ESPPs and other stock-based compensation (Mitchell and Utkus, 2002), the impact of taxes on actual dispositions, nor explicitly the impact of company stock risk exposure (Mitchell and Utkus, 2002; Poterba, 2003a; Muelbrook, 2002; Liang and Weisbenner). The primary advantage of an ESPP is the ability to purchase company stock at an often substantial discount from fair market value. Our stylized calibrations suggest that tax advantages are dominated by purchase discounts in determining the value of ESPP participation to the employee. Because firms that offer ESPPs typically offer other employer-based saving plans, especially 401(k)s, we

analyze the attractiveness of ESPP saving versus 401(k) saving. We find that 401(k) saving with employer matching contributions dominates ESPP saving for retirement on an after-tax basis for all but the shortest horizons. However, ESPPs with purchase discounts typically dominate other conventional after-tax savings, and, depending upon assumptions about company share price risk and optimal asset location (Shoven, 1999; Shoven and Sialm (forthcoming); Poterba, Sialm, and Shoven, 2001; Dammon, Spatt, and Zhang, 2003), may dominate 401(k) saving once the employer matching contributions have been exhausted. Overall, it appears that ESPPs are most desirable after 401(k) saving opportunities have been fully used.

Then we examine empirically ESPP participation using administrative data from 1997-2001 for a large health services company that employs over 30,000 people. There are four principal findings. First, employees appear to use ESPPs once 401(k) saving opportunities have been exhausted. This is consistent with the stylized calibrations we present in the paper. Second, employees are backward-looking in making their forecasts of company stock returns when deciding to purchase shares, even though those returns likely are unpredictable (Benartzi, 2001). Specifically, participation is lower (higher) if the share price fell (rose) over the previous 6 months. Third, taxes do not seem to be a prime determinant of ESPP participation. Specifically, 401(k) participation is statistically and economically responsive to the marginal tax rate at which contributions are deductible. However, capital gains taxation does not appear to be an important determinant of ESPP participation. Specifically, variation in the spread between the marginal tax rate on ordinary income and statutory and anticipated marginal tax rates on long-term capital gains from the Tax Reform Act of 1997 (TRA97), Internal Revenue Service Restructuring and Reform Act of 1998 (IRSRRA98) laws, and the Tax Relief and Reform Act of 1999 (TRRA99) bill, passed by Congress, but vetoed by President Clinton, had no effect on

ESPP participation. The tax results are somewhat speculative, however, because our data lack information on some of the key factors that impact marginal tax rates, such as spousal earnings, non-labor income, filing status, and the number of dependents. Finally, the firm we study adopted automatic enrollment in the 401(k) plan in the middle of our sample period (Madrian and Shea, 2001). Whereas we find that automatic enrollment dramatically raised 401(k) participation, it had no effect on ESPP participation. This suggests that employees do not consider the 401(k) and ESPP to be substitutes in employer-based plan saving, yet this is not inconsistent with the finding that marginal saving is allocated to the ESPP once 401(k) opportunities have been exhausted.

This paper is organized as follows. Section II lays out the tax treatment and basic features of ESPPs. Section III compares an ESPP to a 401(k) as a retirement saving vehicle. Section IV describes the company data we used. Section V presents the estimation results. There is a brief conclusion.

I. Background

An ESPP allows a worker to purchase company stock. Although some plans allow employees to purchase shares with cash outright, most plans let employees accumulate after-tax income smoothly over time through payroll deduction. The National Center for Employee Ownership (NCEO) conducted a survey of 247 companies with stock-based compensation plans in 2000 (NCEO, 2001b). They found that only 12 percent of ESPP plans allowed for share purchase with a method other than payroll deduction. A survey of 100 firms with ESPPs by Hewitt Associates found similar results (Hewitt Associates, 1998). The period over which this accumulation is done is known as the offering period. The offering period is specified in the

plan description and typically lasts between 3 and 27 months, with 27 months being the legal time limit for most plans. The NCEO (2001b) found that 11 and 46 percent of companies with ESPPs had offering periods of three and six months, respectively.

Employees are permitted to purchase shares at the end of the offering period. In addition, plans with long offering periods may specify intermediate purchase dates, at which time employees may purchase shares. For example, the offering period may be one year, composed of four quarterly purchase periods. NCEO (2001b) found that only 24 percent of plans allowed for interim purchase dates within the offering period, and those that did had relatively long offering periods. Eighty-eight percent of the interim purchase periods had a length of six months.

A key plan parameter is the purchase price. Some plans use the fair market value on the purchase date as the purchase price. Other plans have what is known as a "look-back" feature, in which the employee may purchase at the minimum fair market value during the offering period. NCEO (2001b) found that 78 percent of plans had a look-back feature in determining the purchase price. In addition, most plans include incentives to participate that reduce the purchase price of shares. In some plans, the employer will match all or part of the employee's contribution to the plan, as in 401(k) plans. Alternatively, the employer may offer the shares at a discount legally limited to be no more than 15 percent of the fair market value at the beginning of the offering period or 15 percent of the fair market value at the purchase date. As illustrated below, a plan with a discount and a look-back feature can result in a significant gain at sale when stock prices rise during the offering period. NCEO (2001b) found that 86 percent of ESPP plans offered employees a 15 percent discount on the purchase price of the stock, 6 percent offered a 10 percent discount, and only 8 percent offered no discount.

Some ESPPs allow employees with accumulated payroll deductions to withdraw those funds before the end of the offering period. Usually when this occurs, the plan stipulates the employee is no longer eligible to purchase in that period, and, in some plans, may have to sit out subsequent offering periods before becoming eligible again. The extent to which the employee is effectively penalized depends on whether the plan has overlapping offering periods at a point in time. For example, the plan may specify a 12 month offering period, but new vintages are introduced each quarter, so that there may be 4 offering periods (at various stages of completion) going at a point in time. More complicated ESPPs have a "reset" provision, in which if the stock price falls by the end of the purchase period, the plan automatically withdraws the employees accumulated payroll deductions for that period, and enrolls them in the next offering period. This ensures the lowest purchase price to the employee. NCEO (2001b) reported that 82 percent of plans allowed withdrawals prior to the end of the offering period, but not enough detail was given in the report to know whether these came with penalties, reset provisions, etc.

There are two types of ESPPs: qualified and non-qualified. Qualified plans are the dominant type. NCEO (2001b) reported that 77 percent of ESPP plans were qualified. A qualified plan must comply with the rules spelled out in Section 423 of the Internal Revenue Code (IRC). These plans are often referred to as "423 plans." It should be noted that Section 423 plans are not covered by ERISA. The Section 423 rules require that only the employees of the company, parent company or subsidiaries may participate, and the right to buy company stock is non-transferable. In general, all employees must have the same rights and privileges under the plan, but there are some exceptions. First, employees with less than two years of tenure, employed twenty hours or less per week, employed five months or less per year, and

highly-compensated employees as defined in Section 414 legally *may* be excluded.[1] In practice, however, these exclusions do not appear frequently. For example, NCEO (2001b) reported that 98 percent of plans allowed employees with less than two years of service to participate and 68 percent of plans allowed part-time employees to participate. Second, employees who own five percent or more of voting power (for all classes of stock of the company, parent, and subsidiaries) are not eligible for the plan. Third, Section 423 limits purchases to $25,000 worth of stock (or less) per calendar year, although for plans with a contribution limit of 10 percent of compensation, this will bind for only a small fraction of employees. The plan may limit further the extent of employee participation, such as the number of shares an employee can purchase, as long as this relationship is uniform across employees. These limits are commonly expressed as a percentage of a plan-defined compensation base, which can include wages and salary, and potentially commissions, bonuses, and overtime. NCEO (2001b) found that 51 percent of plans included one or more of these additional compensation components in the plan compensation base. Overall, NCEO (2001b) reported that 71 percent of plans imposed limits on share purchases, and NCEO (2001a) indicated most plans have adopted limits of 10 to 15 percent of the plan compensation base.

For a qualified plan, the tax benefit to the employee comes from two sources. The first is deferral of taxes paid on the extent to which shares were purchased below fair market value, which is considered cash compensation. The second is that to the extent the company expense in providing the discount and look-back would have been paid out in cash compensation in the absence of the ESPP, employee net income is higher because stock appreciation is taxed at the capital gains tax rate, which for long-term gains is lower than the ordinary income tax rate. The extent of the tax benefit depends on whether the stock is sold in a tax-qualified disposition. A

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[1] The company ESPP we analyze in Sections IV and V does not exclude highly-compensated employees.

qualified disposition is one that satisfies what is known as the 1-2 holding rule: (1) the employee must hold onto to the stock for at least one year after the purchase date, and (2) two years after the beginning of the offering period. Let t index time, period 0 the beginning of the offering period, τ the end of the offering period, and τ' the disposition date. The 1-2 rule will be satisfied if $\tau' \geq 24$ and $\tau' \geq \tau + 12$ (when time is expressed in months).

To illustrate the tax liability under different holding scenarios, let i index individuals and θ^{LTG} be the combined federal-state marginal tax rate on long-term capital gains, θ^{STG} be the federal-state marginal tax rate on short-term capital gains, θ^y be the federal-state marginal tax rate on ordinary income, and θ^F be the federal marginal payroll tax rate. Denote the fair market values of a share of company stock at the beginning and end of the offering period as P_0 and P_τ, respectively. Under Section 423, the purchase price cannot be less than 85 percent of the fair market value at the beginning of the offering period or at the purchase date. Let δ denote the discount off the fair market value, where $0 \leq \delta \leq 0.15$. With a look-back feature, a participant will purchase at the minimum price during the offering period. The purchase price, B, can be written as

$$B_\tau = (1 - \delta) \min(P_0, P_t), \tag{1}$$

for all t, $0 < t \leq \tau$. If the share price falls during the period (and there is no reset provision), the participant purchases at the discounted minimum share price in the offering period, otherwise the participant does no worse than purchasing at the discounted share price at the beginning of the offering period. Section 423 provides that in a tax-qualified disposition (i.e., satisfies the 1-2 rule) *and when the shares were purchased at below fair market value*, the gain at sale, $G_{\tau'} = P_{\tau'} - B_\tau$, is decomposed into two parts: taxable ordinary income, $I_{\tau'}$, defined as $\min(P_{\tau'} - B_\tau, P_0 - B_\tau)$, the lesser of the spread between the fair market value at the time of sale

and the purchase price, $P_{\tau'} - B_\tau$, and the spread between the fair market value at the beginning of the offering period and the purchase price, $P_0 - B_\tau$, and taxable capital gain, $K_{\tau'}$, defined as that part of the gain at sale not treated as ordinary income. Thus, $G_{\tau'}$ is

$$G_{\tau'} = I_{\tau'} + K_{\tau'} = \min(P_{\tau'} - B_\tau, P_0 - B_\tau) + [P_{\tau'} - B_\tau - \min(P_{\tau'} - B_\tau, P_0 - B_\tau)]. \qquad (2)$$

$I_{\tau'}$ is taxed at the marginal tax rate on cash compensation. This rate includes the federal payroll tax. $K_{\tau'}$ is taxed at the marginal tax rate on long-term gains. Therefore, the tax liability, L, at disposition is

$$L_{it'} = (\theta_{it'}^y + \theta_{it'}^F)\min(P_{\tau'} - B_\tau, P_0 - B_\tau) + \theta_{it'}^{LTG}[P_{\tau'} - B_\tau - \min(P_{\tau'} - B_\tau, P_0 - B_\tau)]. \qquad (3)$$

Equations (2) and (3) imply that if the fair market value has fallen from the beginning of the offering period to the disposition date, then the gain at sale is taxed as cash compensation and there is no taxable capital gain.

For various reasons, plan participants may not meet the holding requirements in the 1-2 rule, and therefore trigger a disqualifying disposition. There are two possible tax liabilities. First, if the disposition is less than one year from the purchase date, $\tau' < \tau + 12$, then any gain (loss) is taxed (offset) at the short-term rate. The liability is

$$L_{it'} = (\tau_{it'}^y + \tau_{it'}^F) \cdot (P_\tau - B_\tau) + \tau_{it'}^{STG} \cdot (P_{\tau'} - P_\tau). \qquad (4)$$

If the disposition is greater than or equal to one year from the purchase date, but less than two years from the offering date, $\tau + 12 \le \tau' < 24$, then any gain (loss) is taxed (offset) at the long-term capital gains rate, and the liability is

$$L_{it'} = (\tau_{it'}^y + \tau_{it'}^F) \cdot (P_\tau - B_\tau) + \tau_{it}^{LTG} \cdot (P_{\tau'} - P_\tau). \qquad (5)$$

In both cases, the spread between the fair market value on the purchase date and the purchase price is treated as cash compensation. The capital gain since the purchase date, $P_{\tau'} - P_{\tau}$, is taxed at the appropriate rate depending upon whether it is a short- or long-term gain.

Panel A of Table 1 illustrates the after-tax rate of return from contributing to an ESPP for a qualified disposition held 18 months for various plan features and stock appreciation rates. The calculations are performed for a single individual who earns $40,000 and contributes 4 percent of pay to the ESPP, both of which are roughly the sample means for the company data we use below, and resides in Minnesota, the state with the most individuals in our data, in 1997, the first year in our sample below. We used first-dollar marginal tax rates on cash compensation and long-term gains calculated using NBER's TAXSIM calculator (Feenberg and Coutts, 1992). The plan is assumed to have a six-month offering period. The share price is $30 at the beginning of the offering period and appreciates at various annual rates shown in the left-most column of the table. There are no dividends. Because part of the benefit of ESPPs is deferral of taxes on any gain at sale deemed cash compensation, we assumed a real short-term interest rate of 3 percent and calculated the present value of the tax liability in τ' as of period 0, the beginning of the offering period. The after-tax rate of return includes the value of the discount and look-back features where appropriate. Across columns in panel A, the discount and look-back features clearly enhance the net return to ESPP participation. For zero share price appreciation, the net return to contributing is 9.7 percent with the 15 percent discount common in most plans. A comparison of columns (1) and (2) shows that as the rate of appreciation rises, the value of the look-back feature becomes important. Indeed, even when the stock price *falls*, contributing to an ESPP can yield a positive net return given the generosity of the 15% discount. If the real short-term interest rate of 3% for the present value calculation is used as a benchmark for the

opportunity cost, then in column (1), contributing is beneficial even if share prices were anticipated to decline by 9% per annum during the two years from the beginning of the offering period until eighteen months after purchase (i.e., the earliest date for a qualified disposition).

These comparisons ignore the impact of share price risk. In particular, purchasing company stock is ill-advised from the perspective of diversification, given the correlation between company stock and human capital returns. However, Muelbrook (2001) and Brennan and Torous (1999) have shown that value of lost diversification for an eighteen-month holding period like that assumed in Table 1 is quite small. We discuss share price risk in more detail below. In addition, it should be noted that in most plans the employee has the ability to buy company stock and sell immediately after purchase, known as a "same day sale," reaping the benefits of the discount and look-back features, and invest the proceeds in an after-tax saving vehicle (until, say, retirement). This is essentially a risk-free way for the employee to increase cash compensation. As we show below in our company data, participation is less than 100%, which, given the same-day-sale strategy, is not consistent with all employees being fully informed, financially rational, with access to perfect capital markets.

In addition to the discount and look-back, an important feature that distinguishes the purchase of company stock through an ESPP versus the open market (other than brokerage fees) is the provision that the lesser of the spread between the fair market value at the time of sale and the purchase price and the spread between the fair market value at the beginning of the offering period and the purchase price be taxed as cash compensation for a qualified disposition. That part of the gain at sale not treated as compensation is taxed at the long-term capital gains rate. For a plan with a six-month offering period, such a disposition requires holding the stock for 18 months. However, if the company stock were purchased on the open market and held for 12

months or more, any gain at sale would be taxed at the long-term capital gains rate anyway. A comparison of the net returns in panels A and B shows that the benefit of holding the stock an extra six months to obtain a qualified disposition is quite small.[2]

The second type of ESPP is a non-qualified plan. Such a plan does not meet all of the restrictions laid out in Section 423. In this type of plan, any gain received by the employee at the time of purchase of the company stock, either through a discount or look-back feature, counts as ordinary income and is taxed appropriately, while any appreciation since the time of purchase realized at sale is treated as capital gains income. An important distinction of a non-qualified plan is that the firm gets to take a deduction against the corporate income tax at the time of purchase for the amount of ordinary income. NCEO (2001b) reported that only 19 percent of ESPP plans were non-qualified. Because the company plan we study below is tax qualified, we limit the analysis in the remainder of the paper to Section 423 plans.

II. Saving through ESPPs versus 401(k)s

Like the firm we study below, most companies that offer an ESPP also offer a 401(k), so that the typical employee faces a decision as to how to allocate saving between plans. An important issue with comparisons of the tax value of ESPPs and 401(k)s is determining the correct holding period for the company stock. If employees view ESPPs as a form of retirement saving, the relevant horizon will be until retirement. Alternatively, employees could engage in (potentially complicated) buy-and-sell strategies involving capital gains and losses depending on the vintage of company stock purchased and the evolution of the stock price. In this case, there

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[2] The one exception is when the share price falls by 15%, in which case in panel A there is no gain from sale because the shares were bought and sold at the same price and taxed cash compensation is zero because the lesser of the two spreads is zero. Thus, the net return is zero. However, the purchase price is below the fair market value at

is obvious option value in holding the stock, which depends, in part, on the variance in stock prices and risk aversion. Finally, the employee simply could use the ESPP to buy company stock, sell it at the earliest date for a qualified disposition, or even a same-day sale (disqualifying disposition), reaping the benefits of the discount and look-back features, and invest the proceeds in an after-tax saving vehicle until, say, retirement.[3]

Modeling the option value of holding company stock is beyond the scope of this paper; instead, we focus on the three scenarios: same day sale, hold until the earliest qualified disposition, and hold until retirement. First, assume that the stock in an ESPP is held until retirement, the holding period meets the 1-2 rule, and there are no dividends. Let T_{it} be the retirement investment horizon from the perspective of period t (now expressed in years), so that a contribution in t is expected to be withdrawn (at retirement) in T periods. Then the value at retirement of one *pre-tax* dollar of cash compensation contributed to an ESPP in period t is

$$V_{it}^E = \frac{1-(\theta_{it}^y+\theta_{it}^F)}{B_t} \cdot \begin{bmatrix} P_{t+T_{it}} - \{(\theta_{it+T_{it}}^y + \theta_{it+T_{it}}^F) \cdot \min(P_{t+T_{it}} - B_t, P_0 - B_t) + \\ \theta_{it+T_{it}}^{LTG} \cdot [P_{t+T_{it}} - B_t - \min(P_{t+T_{it}} - B_t, P_0 - B_t)]\} \end{bmatrix}. \tag{6}$$

The second term in square brackets in (6) is the tax liability in (3). The factor $[1-(\theta_{it}^y+\theta_{it}^F)]/B_t$ reflects the fact that shares are purchased through ESPPs with after-tax dollars (i.e., one pre-tax dollar of cash compensation is subject to both income and payroll taxation), and that one dollar only buys a fraction of a (below-fair-market-value) share of stock. Second, assume that the stock is held until the date of the earliest qualified disposition, after which the balance is placed in an after-tax saving account invested in long-term bonds. The value at retirement in this case is

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the date of purchase, so that ordinary income is incurred in the disqualifying disposition, and the net return is actually -10.5%, large and negative.

[3] Not to mention there is an obvious strategy of same-day sale, depositing the proceeds into the 401(k).

$$V_{it}^{E} = \frac{1-(\theta_{it}^{y}+\theta_{it}^{F})}{B_t} \cdot \left[\begin{array}{l} P_{t'+T_{it}} - \{(\theta_{it'}^{y}+\theta_{it'}^{F}) \cdot \min(P_{t'}-B_t, P_0 - B_t) + \\ \theta_{it'}^{LTG} \cdot [P_{t'}-B_t - \min(P_{t'}-B_t, P_0 - B_t)]\} \end{array} \right] \cdot [1+(1-\theta_{it}^{I})r_t]^{T_{it}-(t'-t)}. \qquad (7)$$

Finally, assume that the stock is purchased through the ESPP, disposed in a same-day sale, and, again, placed in an after-tax saving account invested in bonds. Then the value at retirement is

$$V_{it}^{E} = \frac{1-(\theta_{it}^{y}+\theta_{it}^{F})}{B_t} \cdot \left[P_t - (\theta_{it}^{y}+\theta_{it}^{F}) \cdot (P_t - B_t) \right] \cdot [1+(1-\theta_{it}^{I})r_t]^{T_{it}}. \qquad (8)$$

Table 2 shows V^E for three representative taxpayers facing federal marginal tax rates on ordinary income of 15, 28, and 36 percent, respectively. Again, these taxpayers are assumed to live in Minnesota in 1997. We assume an annual return on bonds of 6 percent and a 15 percent ESPP discount. There are various recent estimates of historical annual average stock appreciation in the literature, e.g., Campbell (2001), Diamond (2001), and Shoven (2001), among others. We show calculations under somewhat conservative assumptions about annual company stock appreciation of zero, 3, 6, and 9 percent. These stock and bond return assumptions are identical to those in Poterba (2003b). With the exception of panel F in the table, all calculations assume time-invariant tax and interest rates. Panels A and B show calculations for the same-day-sale and earliest-qualified dispositions. Issues of share price risk aside, holding the company stock until the earliest date of a qualified disposition yields greater wealth at retirement than a same-day sale, but, overall the increment to wealth is small, between 3 and 12 percent, depending on the horizon and stock appreciation rates. Panel C shows calculations if the stock is held until retirement, the desirability of which depends on the length of the investment horizon, the expected price of the stock at retirement, and the relationship between tax rates today and in retirement. With tax rates constant, as long as the stock appreciates at about 4.5 percent or greater per year, the value of shares held until retirement (panel C) dominate

those sold at the earliest qualified date (panel B) and placed into a taxable account with a gross return of 6 percent.

The more interesting comparison is that of saving through an ESPP versus a 401(k). The value of one dollar of pre-tax cash compensation contributed to a 401(k) can be derived as follows. Let θ_{it}^P denote the combined federal-state marginal tax rate on pension income of household i in time period t. In addition, let θ_{it}^{401k} denote the combined federal-state marginal tax rate on 401(k) contributions. The federal portion of this rate is zero because 401(k) contributions are deductible, but in at least one state (Pennsylvania), 401(k) contributions are not deductible for the purposes of the state income tax. Also, let m_{it} be the employer match rate on employee 401(k) contributions and $\xi_{it+T_{it}}$ the fraction of the employer match in period t that is vested in T periods.[4] Then, following Cunningham and Engelhardt (2002), the value at retirement of one *pre-tax* dollar of cash compensation contributed to the 401(k) in period t is

$$V_{it}^{401(k)} = (1-\theta_{it}^F)(1-\theta_{it+T_{it}}^P)(1-\theta_{it}^{401k} + m_{it}\xi_{it+T_{it}})(1+r_t)^{T_{it}} . \qquad (9)$$

There are two things to note in (9). First, 401(k) contributions, while exempt from the federal income tax are included in the FICA payroll tax base, which is the reason θ^F appears in the equation. Second, unlike the typical characterization in the previous literature (Poterba, Venti, and Wise, 1994, 1995; Engen, Gale, and Scholz, 1994; Burman, Gale, and Weiner, 2001), the relevant tax rate at withdrawal is not the marginal tax rate on earned income, θ^y, but the marginal tax rate on pension income, θ^P. This can vary across individuals for two reasons. Annual taxable income, and, hence, tax rates, in retirement may be greater or lesser than when working. Unfortunately, there has been very little empirical analysis of the extent to which

marginal tax rates change, and, in particular, decline at retirement.   One exception is Burman, Gale, and Weiner (2001). They used a large panel of income tax returns from the Continuous Work History Survey (CWHS) that allowed them to hold household characteristics fixed. They calculated marginal tax rates on IRA contributions and withdrawals by income category under a number of different tax law, contribution, and withdrawal scenarios, and found that for many households, tax rates fell, the amount by which depended on income level. In addition, θ^P varies substantially across state. Twenty-four states provide partial or full exemption of private pension income from the state income tax (Baer, 2001; State of Wisconsin, Legislative Fiscal Bureau, 2001).

Panel D of Table 2 compares the value at retirement of one pre-tax dollar contributed to a 401(k) with an employer match of 50 percent invested in bonds yielding 6 percent. Again, the tax rate at withdrawal is the same at when the dollar is contributed in period t. A comparison of panels C and D indicates that annual company stock appreciation of just over 6 percent is needed for the wealth in an ESPP to equal that of a 401(k) with a 50 percent match. The presence of the employer match is an important reason the 401(k) can dominate the ESPP on an net return basis. To illustrate, Panel E gives the same 401(k) calculations but with no employer match. Stock appreciation of only about 4.5 percent is needed for the ESPP held until retirement to equal the 401(k). This indicates that for employees who contribute to the point at which the 401(k) employer match is exhausted (6 percent of pay for the firm we study below), the ESPP may be the marginal source of employer-based voluntary saving. Because of back-loading of the tax payment, the after-tax retirement wealth in a 401(k) critically depends on the marginal tax rate on pension income at withdrawal, which as mentioned above, varies across states. Although

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[4] The 401(k) plan at the firm we study below has 2-year cliff vesting, so that ξ will be one except for those

Minnesota does not exempt any pension income for state tax purposes, panel F of Table 2 gives the after-tax retirement wealth in a 401(k) as if pension income were exempted from the state tax (and taxed only at the federal marginal rate on ordinary income) for the purposes of comparison. For individuals in states that do not tax pension income, the expected return on the company stock must be higher for the ESPP to dominate the 401(k). Panel G shows the after-tax value of a conventional taxable savings account.

There are two important caveats to the comparisons in Table 2, both of which suggest the value of ESPP saving for retirement is overstated. First, we assumed that the tax-deferred saving in the 401(k) was invested in corporate bonds. In a series of influential papers, Shoven (1999), Shoven and Sialm (1998, forthcoming), and Poterba, Sialm, and Shoven, (2001), have argued that optimal asset location dictates that higher gross yielding equities should be held in tax-deferred vehicles like 401(k)s to maximize retirement wealth, even though interest on corporate bonds faces higher tax rates.[5] Therefore, an alternative assumption of 401(k) assets in equities would make 401(k) saving even *more* attractive than ESPP saving. Second, our comparisons neglected the impact of the risk of company stock. For example, Muelbrook (2002) calculates that because of share price risk employees value company stock at between 40-50% of market value for portfolios with moderate percentages of company stock held for 15 years. Thus, applying this rough adjustment for risk to the values in panel C of Table 2 for the ESPP held until retirement would make ESPP saving significantly less desirable than depicted in the table.

III. Company Data Description

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employees making contributions within two years of retirement, for who ξ will be zero.
[5] This work is summarized in Poterba (2001a,b), and Bergstresser and Poterba (2002), Dammon, Spatt, and Zhang (2003), and Poterba and Samwick (2002) provide related analyses. Poterba (2003b) and Shoven (1999) analyzed the tax consequences of locating tax-deferred saving in equity mutual funds (Dickson and Shoven, 1995).

In the remainder of the paper, we examine empirically ESPP and 401(k) participation using administrative data from a large health services firm with approximately 30,000 employees. The company data come from eleven cross-sectional snapshots of all active employees: June and December, 1997; June and December, 1998; March, June, September, and December, 1999; March and June, 2000; and, December, 2001. The data contain basic administrative items such as hire date, birth date, race/ethnicity, gender, and cash compensation. The data also include variables that capture several important aspects of employee stock purchase plan participation, although we do not have all of this information available for some of the early cross sections. The ESPP data include participation status, the contribution rate, number of shares held, and for later cross-sections, the number of shares bought and sold. We also have data on 401(k) participation, such as current participation status and an individual's current contribution rate and investment allocation. We have data on stock options, which are granted to less than 15% of the company's employees, at a single point-in-time. Table 3 below shows the various data elements that are available in each of the cross-sections.

There are four non-wage/savings programs sponsored by this company. The first is the 401(k) plan. This plan is discussed in greater detail in Madrian and Shea (2001). Company stock is not an investment option within the 401(k) plan, and employer matching contributions are not made in the form of company stock. The second is the Section 423 ESPP, the features of which are summarized in Table 4 below. The features of this company's employee stock purchase plan are fairly standard. The plan has offering periods that begin on January 1 and July 1 and are six months in duration. There is no reset provision, so that the employee must decide at the beginning of the offering period whether to commit to the purchase of company stock six months in advance. During the offering period, the commitment is funded through payroll

deduction of even amounts. The plan, however, does have a look-back feature, and provides for a 15% discount off the minimum share price in the offering period. The amount of this commitment is an integer percentage of compensation, up to 10% of compensation during each contribution period. All full-time employees are eligible for the plan, as are part-time employees working 20 or more hours per week and temporary employees with assignments lasting more than 5 months. Beginning in 1999, all employees were immediately eligible to participate upon hire (although they actually could not enroll until the next contribution period); before 1999, there was a 60-day service requirement. Third, there is an employee stock ownership plan (ESOP). This plan is not associated with the 401(k) plan, but is operated separately and is a non-voluntary plan. At year-end, the company distributes shares of stock to all employees. The total number of shares distributed is determined annually on the basis of corporate profitability. These shares are then allocated across employees on the basis of employee compensation, so that more highly compensated employees receive more shares than do less highly compensated employees. However, the ESOP is small in the sense that the mean number of shares in our sample held in the ESOP was just over 300. In fact, the ESOP was discontinued toward the end of our sample period. Finally, the company grants stock options to approximately 4,000 of its 30,000 employees. These tend to be the more highly compensated employees within the firm. Unfortunately, we do not have very extensive information on the stock options granted to employees over time, or on when they are exercised. We do, however, have a picture of the stock options held by employees at a single point in time.

The incentives of employees to participate in the employee stock purchase plan clearly will depend on the stock ownership in these other stock plans (the ESOP and the stock option plan), and on how the company is performing in the marketplace. Figure 1 below shows the

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historical evolution of the company's stock price from 1997-2002, along with the performance of

the S&P 500 as a comparison. As can be seen, the company has experienced periods of

significant stock price declines (for example, March through August 1998), as well as periods of

relative stability (September 1999 through February 2000) and of rapid increase (March 2000 to

January 2001). There are periods in which the value of the company stock has tracked that of the

S&P 500 fairly closely, and other periods in which the value of the company stock has diverged

from that of the broader market. Thus, our data covers periods in which there is significant

variation in both the absolute return on company stock holdings over time and in the return

relative to the overall market.

For the empirical analysis in this paper, we use all of the June and December cross-

sections. Because the ESPP has a six-month offering period, participation does not change

between March and June or September and December, making the ESPP information in the three

March and September cross-sections shown in Table 3 redundant. The sample used for our

analysis is all employees who are ESPP eligible, 401(k) eligible, and who have been with the

company for at least 1 year. We impose the tenure restriction because the service requirements

for eligibility for the ESPP and 401(k) plan changed during the period covered by our data.

Employees with more than one year of tenure, however, were continuously eligible to participate

in both plans over the entire time period. Conditional on having one year of tenure, almost 99

percent of employees are eligible for both the ESPP and 401(k) plan. Overall, our sample

includes 163,043 person-year observations on 44,943 employees. The appendix table gives

summary statistics on the employees in our sample.

Table 5 gives summary sample statistics on ESPP participation and contribution rates for

each cross-section. Over all employees, the rate of participation, defined as having committed to

purchase shares in that cross-section's offering period (not as having a positive share balance), and shown in column 2, fluctuated between 35 and 38 percent and then rose to almost 44 percent in December, 2001, when the stock price appreciated significantly. The average contribution rate as a percentage of cash compensation was 4.6 percent, and basically time-invariant, as shown in column 4 of Table 5.

Figure 2 plots the relationship between the participation rate and share price. We display the participation rate at the beginning of the offering period, because that is when employees must commit a certain percentage of pay to company stock purchase. The pattern is striking. Participation clearly tracks company stock performance in the previous six months (i.e., the previous offering period): purchase commitments for the subsequent offering period are higher after prices have risen in the prior offering period, and are lower after prices have fallen. Employees appear to be backward-looking when making share price forecasts, even though prices are likely unpredictable.

Panels B and C show similar statistics for the sub-samples of non-highly- and highly-compensated employees, respectively. The IRS defines highly-compensated employees in part by an income cut-off: those earning more than $80,000 in 1997-99 and $85,000 in 2000-01. We used these cut-offs to form our sub-samples. Because Section 423 ESPPs are not governed by ERISA, there are no ESPP non-discrimination tests, so that the concept of "highly-compensated" refers to the 401(k) plan. Specifically, in the 401(k) plan, the company matches employee voluntary contributions up to 6 percent of cash compensation for all employees. However, non-highly-compensated employees have a 401(k) plan contribution limit of 15 percent of compensation, whereas highly-compensated employees have a limit of 10 percent. As suggested in the earlier analysis of Table 2, retirement saving through an ESPP would appear to be

desirable once 401(k) saving opportunities were exhausted. The results in panels B and C are not inconsistent with this, as ESPP contribution rates for the highly-compensated averaged about 6.5 percent of pay, almost two percentage points higher than average contributions for the non-highly-compensated in panel B.

For comparison, Table 6 shows summary sample statistics on 401(k) participation and contribution rates. In June 1997, 401(k) participation (defined as contributing to the plan) was 62 percent, but rose dramatically to 83 percent by the end of our sample. This was driven by the switch to automatic 401(k) enrollment analyzed in Madrian and Shea (2001). Participation among highly-compensated employees rose to a remarkable 95 percent in our sample period. Contribution rates for participants, shown in column 4 of the table, ranged from 6.4 to 7 percent. Therefore, when compared to the 401(k), the ESPP appears to be an important vehicle for employee saving, with conditional ESPP contribution rates about 70% of the 401(k) contribution rates. Indeed, contribution rates for the highly-compensated were roughly equal in the two plans, around 7 percent of pay.

To get a sense of the joint distribution of ESPP and 401(k) saving, Table 7 shows the cross-tabulation of ESPP contribution rate category with 401(k) contribution rate category. Each cell in the table indicates the percent of the total sample observations with ESPP and 401(k) contribution rates in the respective categories (in the ESPP offering period). For example, in column 1, 23.6 percent (of the person-year employee observations in the sample) neither contributed to the ESPP nor the 401(k). Almost 38 percent contributed to the 401(k) but not the ESPP, whereas only 5 percent contributed to the ESPP but not the 401(k), and 32.6 percent contributed to both plans. There is evidence that the ESPP is the marginal destination for employer-based plan saving once the 401(k) employer match has been exhausted. This can be

seen by reading down the columns in the table, in which there is a noticeable jump in the frequency of ESPP contributions for individuals contributing 6 percent of pay to the 401(k).

IV. The Determinants of ESPP Participation

We use these administrative data to estimate linear probability econometric models of ESPP participation. Specifically, the dependent variable is a dummy variable that takes on a value of one if the employee commits at the beginning of the offering period to contribute to the ESPP and purchase company stock at the end of the offering period, and zero otherwise. In our baseline specification, we modeled this decision as a linear function of dummy variables for gender (female), age categories (less than 30, 30-39, 40-49, and 50 and over), race (black, Hispanic, and other/unknown), and job tenure categories (1-2 years, 2-3 years, 3-5 years, 5-7 years, 7-10 years, and over 10 years). We do not observe marital status in these data. However, we have the employee's health insurance election: employee-only coverage, employee plus 1 dependent (a spouse or child), employee plus 2 dependents (spouse and/or children), or coverage waived. Because individuals who elected employee-only coverage are predominantly single, we included a dummy for this health election category in our specification as a rough control for marital status. In addition, we included a quartic function of gross cash compensation (in thousands of real dollars) to control for non-linear effects of income on the demand for company stock.

A. Construction of the Marginal Tax Rates

The relative attractiveness of contributing to the ESPP versus the 401(k) is in part due to the tax treatment of the two plans. Thus, we included an explanatory variable for the combined

federal-state marginal tax rate on the first dollar of 401(k) contribution. The greater the rate of deductibility of 401(k) saving the less attractive an ESPP becomes.

We calculated the combined federal-state marginal tax rate on the first dollar of 401(k) contribution using the NBER's TAXSIM calculator as follows. We assumed that all employees who elected the employee-only health coverage filed as single individuals, and the remainder filed as married jointly. There is no information on the number of tax dependents in our data, so we assumed no dependents for the construction of the tax rates. We applied the age exemption (where appropriate) and assumed everyone took the standard deduction. We do not have data on non-earned income, so the first-dollar tax rates on 401(k) contributions are the last-dollar tax rates on earned income. State of residence is included in our data.

In addition, we used TAXSIM and calculated the combined federal-state marginal tax rate on medium- and long-term capital gains, and included both measures in our specifications. In principle, the capital gains tax rate that matters for the stock purchase decision should be the rate expected to apply at the date of disposition as of the time of commitment at the beginning of the offering period. The offering periods we study range from January 1, 1997 to December 31, 2001, and span the capital gains tax changes in TRA97 and IRSRRA98, as well as the proposed changes in TRRA99 not enacted. Because news of many of these changes was released in the middle of offering periods, we made two measures of capital gains marginal tax rates and holding periods required for long-term gains treatment. The first is the *statutory* tax rate on and holding period for long-term gains at the beginning of the offering period. This rate assumes that any proposed or enacted changes in long-term gains rates and holding were not foreseen as of the time of commitment at the beginning of the offering period. The second is the *anticipated* tax rate and holding period at the beginning of the offering period. This rate assumes that the

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employee foresaw any proposed changes in the long-term gains rate and holding, and used those forecasts to make the ESPP participation decision. We used the timing of legislative "news" on rate and holding period changes laid out in Blouin, Raedy, and Shackelford (2000) and Shackelford (2000) to determine the anticipated rates.

Table 8 shows the consequent statutory and anticipated federal capital gains marginal tax rates at the start of the offering period by ordinary income rate, type of ESPP disposition, and sample cross-sectional offering period. Three types of disposition are considered. Disqualifying dispositions of stock held less than 12 months are taxed at the short-term capital gains rate, which equals the ordinary income tax rate, and, except for the slight rate reductions in the final offering period from EGTRRA, remained unchanged across our sample. Dispositions of stock held longer than 12 months would have been viewed at the beginning of the offering period as taxed at potentially two different rates, medium- or long-term, depending upon whether the stock was held less than or greater than 18 months, respectively.

To illustrate the difference between the statutory and anticipated tax rates, consider the first offering period in our data, from January 1, 1997 through June 30, 1997, shown in Table 8, for which the employee must commit by January 1, 1997. TRA97 was signed into law on August 5, 1997. It lowered the long-term gains rates from 28 and 15 to 20 and 10 percent, respectively, for all stock sales retroactive to May 5, 1997. In addition, the law lengthened the holding period required for long-term treatment to 18 months, but only retroactive to July 28, 1997. Even though, say, the lower long-term rates actually applied to long-term dispositions of stock purchased in this offering period, we assumed that the new tax law was not anticipated as of January 1, so there is no difference between the statutory and anticipated tax rates for this offering period. Next, consider the second offering period in our data, from July 1, 1997 through

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December 31, 1997, shown in Table 8. From the perspective of an employee deciding to commit to the purchase of company stock on July 1, 1997, the *statutory* rates (at that date) for a stock held 12-18 months and more than 18 months were identical (28 and 15 percent). However, a very well-informed, forward-looking individual may have anticipated that TRA97 would be signed a month later (August 5), the holding period for long-term gains would be lengthened to 18 months, and the rates on stocks held more than 18 would fall to 20 and 10 percent, respectively. In this case, the *anticipated* marginal tax rates on medium-term gains would have been 28 and 15 percent, and that on long-term gains, 20 and 10 percent, respectively. For the third offering period, which commenced on January 1, 1998, TRA97 was in effect. However, the repeal of the long-term holding period in IRSRRA98, back to 12 months, was not proposed until June 5, 1998, so we assumed no difference between the statutory and anticipated tax rates for this offering period. Finally, the anticipated long-term tax rates in the offering period beginning July 1, 1999, are 18 and 8 percent, respectively. This occurs because we assumed that the very well informed, forward-looking employee foresaw that Congress would pass TRRA99, which later occurred on August 5, 1999. This bill lowered the long-term tax rates to 18 and 8 percent, respectively. However, President Clinton vetoed the bill on September 23 of that year.[6] Selected statistics on the sample distribution of the marginal tax rates are shown in Table 9.

B. Estimation Results

Column 1 of Table 10 shows parameter estimates from the baseline estimation. Each estimate is interpreted as the change in the probability of contributing to the ESPP in the offering period for a change in the explanatory variable. The standard errors given in parentheses are corrected for the fact that the disturbance terms are heteroscedastic and there are multiple observations on the same individuals in the sample. All specifications in Table 10 include a full

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[6] We did not assume that the employee anticipated the veto.

set of state dummies and the quartic function of compensation, the parameter estimates all for which are not shown.[7] In general, the probability of participation rises with age, earnings, and is hump-shaped in job tenure.   Non-whites have significantly lower participation rates than whites. Individuals who elected employee-only health coverage, predominantly single, were slightly more likely to have participated. The relationship between gender and ESPP participation is somewhat sensitive to the sample and/or model specification, but is generally small.

Taxes appear to have a limited impact on ESPP participation. The larger the first-dollar marginal tax rate at which 401(k) contributions are deducted, the lower is ESPP participation. Evaluated at the sample mean marginal tax rate of 23.2%, this implies an ESPP participation elasticity of -0.1 with respect to this marginal tax rate. However, capital gains tax rates do not seem to matter.   Specifically, conditional on the first-dollar marginal tax rate for 401(k) contributions (which equals the short-term capital gains tax rate), the lower the long-term capital gains rate, and thus the greater the spread between the long- and short-term rates, the higher participation ought to be. Indeed, the point estimate associated with the long-term capital gains rate is negative in column 1, but not statistically different than zero. In addition, the estimate associated with the medium-term gains tax rate is actually *positive* (the wrong sign) and statistically significantly different than zero.

Two alternative specifications are presented in columns 2 and 3 to help better identify the impact of taxes. First, the anticipated federal-state marginal tax rates on long- and medium-term capital gains are used in column 2. Employees appear as equally unresponsive to these rates as to the statutory rates used in column 1. Second, the estimates for the capital gains tax rates in columns 1 and 2 may be biased toward zero because of measurement error in the tax rate construction due to lack of information on spousal earnings, unearned income, dependents, etc.,

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[7] These are available from the authors upon request.

as noted earlier. Column 3 attempts to address this to a certain extent by limiting the estimation to just the sub-sample of individuals who elected employee-only health coverage. These are predominantly single individuals for whom measurement error in capital gains marginal tax rates should have been less severe. Again, the estimates in column 3 for both the medium- and long-term gains are positive (the wrong sign), and suggest little role of capital gains taxes in the participation decision.

The simulations of the after-tax value of 401(k) versus ESPP saving in Table 2 suggested that the value of contributing to an ESPP should rise for those employees who have exhausted the employer match, and likely should be the marginal source of employer-based plan saving for those who have reached the 401(k) plan contribution limit. The tabulations in Tables 5 and 7 provided evidence in favor of this. We explore further these implications with the specifications in columns 4-6. In particular, the firm we study provides a 50% employer match on voluntary employee 401(k) saving up to a cap of 6 percent of compensation. Furthermore, highly-compensated employees have a lower 401(k) plan contribution limit of 10% of compensation, relative to a limit of 15% of compensation for non-highly-compensated employees. In column 4, a set of dummy variables for the 401(k) contribution rate categories were added to the ESPP participation equation. The excluded 401(k) category is for those employees who are not contributing to the plan. The estimates in column 4 for the full sample suggest an overall increasing relationship between the 401(k) contribution rate and ESPP participation. ESPP participation does rise once the 401(k) employer match is exhausted, but this effect is not non-linear. Those employees who are contributing between more than 6 percent and less than 15 percent of compensation to the 401(k) are between 5 and 10 percentage points more likely to contribute to the ESPP than employees who have contributed less than 6 percent to the 401(k).

These effects are economically large and statistically significant, and indicate that the ESPP is the marginal source of saving once the 401(k) match has been exhausted and contribution limits met.

Columns 5 and 6 estimate ESPP participation equations separately for the sub-samples of non-highly- and highly-compensated employees, respectively. The parameter estimates might differ across these two groups for a number of reasons. First, highly-compensated employees are more likely to have been eligible for stock options, and, thus, may have had different demand for company stock through the ESPP. Second, the highly-compensated include company executives, about 200 individuals, who were eligible for an executive non-qualified deferred compensation plan. Third, the highly-compensated are more likely to be more financially sophisticated than rank-and-file employees. Finally, the highly-compensated may have better information about the future course of company earnings and stock prices. A comparison of the estimates in columns 5 and 6 suggests that the age profile of ESPP participation differs greatly between the two groups of employees. Non-highly-compensated employees have a rising age profile that flattens at age 40. In contrast, highly-compensated employees have a steeply *declining* age profile that flattens at age 40. Rank-and-file women are significantly less likely to participate in the ESPP than men, but highly-compensated women are *more* likely to participate.

One feature of the 401(k) plan that changed quite significantly over our sample period is the switch to automatic enrollment. Prior to 1998, employees were only enrolled in the 401(k) if they made an affirmative election. Beginning April 1, 1998, however, all newly hired employees were automatically enrolled in the plan unless they actively opted out of participation (a so-called negative election). Madrian and Shea (2001) examined in greater detail the impact of automatic enrollment on 401(k) participation, contribution rates, and investment allocation.

While ESPP participation at this company always has been through an affirmative election, the dramatic increase in 401(k) participation from automatic enrollment documented in Madrian and Shea could affect ESPP participation if employees viewed the 401(k) and the ESPP as substitute saving vehicles. Madrian and Shea noted in their paper that it did not appear that the increase in 401(k) savings observed following the automatic 401(k) enrollment was a result of a decline in ESPP saving.

We explore this finding further in columns 7 and 8 of Table 10, in which we estimate the impact of being subject to automatic enrollment on 401(k) and ESPP participation, respectively. The dependent variable in column 7 is a dummy variable that is one if the employee contributes to the 401(k) in the ESPP offering period and zero otherwise. The estimates in column 7 confirm the results in Madrian and Shea (2001) of the impact of automatic enrollment on 401(k) participation. Being subject to automatic enrollment does indeed have a huge impact on participation in the 401(k) plan, increasing the probability of 401(k) participation by 30 percentage points on average.[8] In column 8, we replicate the regression specification of column 1 in the table, with the inclusion of an additional variable for whether or not an employee was subject to automatic enrollment when hired, and test to see if automatic enrollment had an impact on ESPP participation. The parameter estimate on automatic enrollment is negative, but economically very small and statistically insignificant. Therefore, automatic enrollment had no effect on ESPP participation.

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[8] Note that this effect is somewhat smaller than that reported in Madrian and Shea. There is no inconsistency in these results, however. The statistics reported in Madrian and Shea are for employees with 3-15 months of tenure, while the employees in our regression in column 7 of Table 10 all have more than one year of tenure. As Choi et al. (2001,2002) document, the impact of automatic enrollment on 401(k) participation rates declines quite significantly with tenure, so our slightly lower estimated magnitude of the impact of automatic enrollment on 401(k) participation is to be expected because we are estimating this effect on a sample with a much higher average level of tenure.

V.   Conclusion

Most employee stock purchase plans are designed to promote employee stock ownership broadly in the firm and provide another tax-deferred vehicle for capital accumulation in addition to traditional pensions and 401(k)s. The picture that emerges from the analysis of the company data suggests that participation in and contributions to the ESPP are relatively large in magnitude, and the 401(k) and ESPP plans do not compete for the first dollar of employer-based plan saving, but rather employees tend to exhaust saving opportunities in the 401(k) first, and then contribute marginal saving to the ESPP. This is consistent with the stylized calibrations of after-tax value we presented. However, the fact employees appear to be backward-looking when forecasting future returns in making company stock purchase commitments suggests that employees may not be fully aware of the risk of company stock and the benefits of diversification.

That capital gains taxation does not appear to be an important determinant of ESPP participation is somewhat puzzling, although it may be due to our data lack information on some of the key factors that impact marginal tax rates. One clear area for future research is the impact of capital gains tax changes on the timing of ESPP stock dispositions, which would require much more detailed data tracking different vintages of purchases and sales of company stock both before and after TRA97 and IRSRRA98.

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TABLE 1
After-Tax Return in Percent as of the Beginning of the Offering Period
on Company Stock Held 18 Months for a Resident of Minnesota
in 1997 in the 28% Federal Rate Bracket, by Annual Stock Appreciation Rate,
ESPP Plan Feature, and Type of Disposition

Annual Stock Appreciation Rate (%)	Plan Features			
	15% Discount, Look-Back (1)	15% Discount, No Look-Back (2)	No Discount, Look-Back (3)	No Discount, No Look-Back (4)
A. Qualified Disposition				
0	9.7	9.7	0	0
3	13.4	12.4	3.2	2.3
6	17.2	15.1	6.4	4.6
9	21.0	17.8	9.6	6.9
15	28.8	23.2	16.3	11.5
30	49.3	36.5	33.7	22.8
-3	7.7	7.7	-2.1	-2.1
-6	5.8	5.8	-4.2	-4.2
-9	3.9	3.9	-6.3	-6.3
-15	0	0	-10.5	-10.5
-30	-12.3	-12.3	-21.0	-21.0
B. Disqualifying Disposition at the Long-Term Gains Rate				
0	9.7	9.7	0	0
3	13.1	12.1	2.9	2.1
6	16.6	14.6	5.9	4.2
9	20.2	17.1	9.0	6.3
15	27.5	22.0	15.2	10.5
30	46.8	34.3	31.6	21.0
-3	7.2	7.2	-2.1	-2.1
-6	4.7	4.7	-4.2	-4.2
-9	2.3	2.3	-6.3	-6.3
-15	-10.5	-10.5	-10.5	-10.5
-30	-15.0	-15.0	-21.0	-21.0

Note: The after-tax return includes the value of the discount and look-back features where appropriate. This example assumes the individual is single, earns $40,000, contributes 4% of pay to the ESPP, the plan has a six-month offering period, and a share price of $30 at the beginning of the offering period, and no dividends. A three percent real discount rate was used to calculate the present value of the tax liability as of the beginning of the offering period. Both state and federal taxes included. The disqualifying disposition in panel assumed the individual held the shares until the day before the 1-2 rule was met.

TABLE 2
After-Tax Value in Dollars in Retirement of One Pre-Tax Dollar of Cash Compensation Contributed,
by Type of Saving Plan, Retirement Investment Horizon, and Selected Federal Tax Bracket,
for a Resident of Minnesota in 1997

Retirement Investment Horizon (Years)	Federal Tax Bracket (%)											
	15				28				36			
	Annual Company Stock Appreciation (%)											
	0	3	6	9	0	3	6	9	0	3	6	9
A. ESPP Same Day Sale												
5	0.98	1.00	1.02	1.04	0.75	0.76	0.78	0.79	0.73	0.74	0.76	0.77
10	1.22	1.25	1.28	1.30	0.90	0.92	0.94	0.95	0.86	0.88	0.90	0.91
20	1.92	1.96	2.00	2.05	1.31	1.34	1.36	1.39	1.21	1.23	1.26	1.28
30	3.02	3.08	3.15	3.21	1.92	1.95	1.99	2.02	1.70	1.73	1.76	1.79
B. ESPP Earliest Qualified Disposition												
5	0.98	1.02	1.06	1.12	0.77	0.80	0.82	0.87	0.75	0.78	0.81	0.85
10	1.23	1.28	1.33	1.41	0.93	0.96	0.98	1.05	0.89	0.92	0.96	1.01
20	1.92	2.01	2.06	2.21	1.35	1.39	1.43	1.53	1.26	1.30	1.34	1.42
30	3.02	3.19	3.24	3.47	1.98	2.02	2.09	2.24	1.76	1.82	1.88	2.00
C. ESPP Held to Retirement												
5	0.82	0.94	1.16	1.41	0.66	0.76	0.95	1.17	0.66	0.75	0.94	1.15
10	0.82	1.13	1.62	2.28	0.66	0.92	1.35	1.93	0.66	0.91	1.34	1.91
20	0.82	1.58	3.07	5.67	0.66	1.32	2.63	4.93	0.66	1.31	2.59	4.85
30	0.82	2.20	5.65	13.72	0.66	1.86	4.91	12.01	0.66	1.84	4.83	11.82
D. 401(k) with 50% Match												
5		1.43				1.19				1.14		
10		1.91				1.57				1.52		
20		3.42				2.84				2.73		
30		6.13				5.09				4.88		
E. 401(k) with No Match												
5		0.95				0.79				0.76		
10		1.27				1.06				1.01		
20		2.28				1.90				1.82		
30		4.08				3.39				3.25		
F. 401(k) with 50% Match, State Income Tax Pension Exclusion												
5		1.58				1.33				1.31		
10		2.11				1.79				1.75		
20		3.78				3.20				3.13		
30		6.76				5.73				5.60		
G. Conventional Taxable Account												
5		0.87				0.68				0.66		
10		1.09				0.82				0.79		
20		1.71				1.20				1.10		
30		2.69				1.75				1.55		

Note: This example assumes a plan with a six-month offering period, look-back feature, 15% discount, a share price of $30 at the beginning of the offering that grows at the annual rates given in the table, a real rate of return of 6 percent, and no dividends. Combined federal-state tax rates for a resident of Minnesota in 1997.

TABLE 3
Company Data on 401(k) and Employee Stock Purchase Plan (ESPP) Participation

Date	401(k) participation, contribution rate and investment allocation	ESPP contribution rate and ESPP share balances	ESPP shares bought and sold
1997			
June 1	X	X	--
December 31	X	X	--
1998			
June 30	X	X	--
December 31	X	X	--
1999			
March 31	X	X	--
June 30	X	X	--
September 30	X	X	--
December 31	X	X	X
2000			
March 31	X	X	X
June 30	X	X	X
2001			
December 31	X	X	X

TABLE 4
Employee Stock Purchase Plan Features

Eligibility	
Length of service	No service requirement from 1999 on; 60 day service requirement prior to 1999
Employment status	Full-time employees Part-time employees working 20+ hours/week Temporary workers with assignments of 5+ months
Contributions	Up to 10% of pay
Enrollment	Semi-annual (January 1 and July 1)

TABLE 5. Summary Statistics on ESPP Participation in Percent and Contribution Rates as a Percentage of Annual Compensation

Observation Date	Sample Size (1)	ESPP Participation Rate (%) (2)	Mean ESPP Contribution Rate (%) (3)	Mean ESPP Contribution Rate of Participants (%) (4)
A. All employees				
06/1997	20,896	36.0	1.6	4.5
12/1997	20,333	37.2	1.7	4.5
06/1998	21,808	35.8	1.7	4.6
12/1998	19,189	37.1	1.7	4.5
06/1999	20,350	35.8	1.6	4.6
12/1999	19,824	37.1	1.7	4.6
06/2000	19,829	38.0	1.8	4.7
12/2001	21,466	43.8	2.0	4.7
B. Non-highly compensated				
06/1997	20,026	34.6	1.5	4.4
12/1997	19,160	35.1	1.5	4.3
06/1998	20,504	33.6	1.5	4.4
12/1998	18,081	34.8	1.5	4.3
06/1999	19,010	33.3	1.4	4.3
12/1999	18,729	35.2	1.5	4.4
06/2000	18,569	35.6	1.6	4.4
12/2001	19,773	41.1	1.8	4.4
C. Highly compensated				
06/1997	870	69.2	4.3	6.2
12/1997	1,173	71.8	4.4	6.2
06/1998	1,304	71.6	4.7	6.5
12/1998	1,108	74.3	4.8	6.5
06/1999	1,340	70.9	4.7	6.6
12/1999	1,095	70.4	4.4	6.3
06/2000	1,260	72.1	4.7	6.6
12/2001	1,693	75.8	5.0	6.6

Source: Authors' calculations.

TABLE 6. Summary Statistics on 401(k) Participation in Percent and Contribution Rates as a Percentage of Annual Compensation

Observation Date	Sample Size (1)	401(k) Participation Rate (%) (2)	Mean 401(k) Contribution Rate (%) (3)	Mean 401(k) Contribution Rate of Participants (%) (4)
A. All employees				
06/1997	20,896	62.1	4.3	7.0
12/1997	20,333	63.9	4.4	7.0
06/1998	21,808	65.9	4.6	7.0
12/1998	19,189	68.1	4.8	7.0
06/1999	20,350	71.3	4.9	6.9
12/1999	19,824	76.9	5.2	6.8
06/2000	19,829	79.9	5.3	6.7
12/2001	21,466	83.4	5.3	6.4
B. Non-highly compensated				
06/1997	20,026	61.1	4.3	7.0
12/1997	19,160	62.6	4.4	7.0
06/1998	20,504	64.4	4.5	7.0
12/1998	18,081	66.7	4.7	7.0
06/1999	19,010	69.8	4.8	6.9
12/1999	18,729	75.9	5.1	6.7
06/2000	18,569	78.8	5.2	6.6
12/2001	19,773	82.3	5.2	6.3
C. Highly compensated				
06/1997	870	84.6	5.9	6.9
12/1997	1,173	85.2	5.5	6.5
06/1998	1,304	89.4	6.0	6.7
12/1998	1,108	90.4	6.5	7.2
06/1999	1,340	92.1	6.9	7.5
12/1999	1,095	93.2	6.8	7.3
06/2000	1,260	95.3	7.1	7.5
12/2001	1,693	95.5	7.1	7.5

Source: Authors' calculations.

TABLE 7. Cross-Tabulation of ESPP and 401(k) Saving by Contribution Rate Categories						
	ESPP Contribution Rate Category (as a Percent of Annual Compensation)					
401(k) Contribution Rate Category (as a Percent of Annual Compensation)	0%	1-4%	5%	6-9%	10% (Plan Limit)	Row Total
	(1)	(2)	(3)	(4)	(5)	(6)
0%	23.60	3.34	0.81	0.30	0.58	28.63
1-2%	3.23	1.40	0.08	0.04	0.04	4.78
3%	8.34	2.41	0.32	0.15	0.18	11.41
4-5%	4.54	2.13	0.38	0.14	0.11	7.31
6% (Employer Match is Exhausted)	13.31	6.94	1.84	1.03	2.04	25.16
7-10% (10% is Limit for Highly-Compensated Employees)	5.40	3.20	1.47	0.69	2.01	12.76
11-15% (15% is Limit for Non-Highly-Compensated Employees)	3.97	1.79	1.05	0.44	2.71	9.96
Column Total	62.38	21.21	5.96	2.78	7.68	100.00

Note: Authors' Calculations. Each cell shows the percent of the sample observations with ESPP and 401(k) contribution rates in the respective categories.

TABLE 8
Statutory and Anticipated Federal Capital Gains Tax Rates by Ordinary Income Tax Rate,
Type of ESPP Disposition, and Sample Cross Section

Sample Cross-Section	Start of Offering Period	End of Offering Period	Ordinary Income Tax Rate	Statutory Capital Gains Tax Rate at the Start of the Offering Period for a			Anticipated Capital Gains Tax Rate at the Start of the Offering Period for a		
				Disqualifying Disposition Less than 12 months	Disqualifying Disposition Held 12-18 Months	Qualified Disposition Held 18 Months	Disqualifying Disposition Less than 12 months	Disqualifying Disposition Held 12-18 Months	Qualified Disposition Held 18 Months
6/1/97	1/1/97	6/30/97	39.6	39.6	28	28	39.6	28	28
			28	28	28	28	28	28	28
			15	15	15	15	15	15	15
12/31/97	7/1/97	12/31/97	39.6	39.6	28	28	39.6	28	20
			28	28	28	28	28	28	20
			15	15	15	15	15	15	10
6/30/98	1/1/98	6/30/98	39.6	39.6	28	20	39.6	28	20
			28	28	28	20	28	28	20
			15	15	15	10	15	15	10
12/31/98	7/1/98	12/31/98	39.6	39.6	28	20	39.6	20	20
			28	28	28	20	28	20	20
			15	15	15	10	15	10	10
6/30/99	1/1/99	6/30/99	39.6	39.6	20	20	39.6	20	20
			28	28	20	20	28	20	20
			15	15	10	10	15	10	10
12/31/99	7/1/99	12/31/99	39.6	39.6	20	20	39.6	18	18
			28	28	20	20	28	18	18
			15	15	10	10	15	8	8
6/30/00	7/1/00	6/30/00	39.6	39.6	20	20	39.6	20	20
			28	28	20	20	28	20	20
			15	15	10	10	15	10	10
12/31/01	7/1/01	12/31/01	39.1	39.1	20	20	39.1	20	20
			27.5	27.5	20	20	27.5	20	20
			15	15	10	10	15	10	10

TABLE 9. The Sample Distribution of Combined Federal-State
First-Dollar Marginal Tax Rates

Timing and Income	Tax Rate Distribution Percentile				
	10th	25th	50th	75th	90th
Statutory Ordinary Income/Short-Term Capital Gains	15.0	18.0	20.9	31.0	35.1
Statutory Long-Term Capital Gains	12.0	14.0	17.0	24.0	28.0
Statutory Medium-Term Capital Gains	12.9	15.0	19.0	24.5	32.1
Anticipated Long-Term Capital Gains	10.0	13.2	16.0	23.0	26.9
Anticipated Medium-Term Capital Gains	12.0	14.1	18.0	24.0	29.3

Note: Authors' calculations.

Explanatory Variable	Full Sample (1)	Full Sample (2)	Employee-Only Health Election Sub-Sample (3)	Full Sample (4)	Non-Highly Compensated Employees Sub-Sample (5)	Highly Compensated Employees Sub-Sample (6)	401(k) Participation, Full Sample (7)	Full Sample (8)
TABLE 10. Linear Probability Parameter Estimates of the Determinants of ESPP Participation, Standard Errors in Parentheses								
Dummy if Female	-0.0021 (0.0030)	-0.0021 (0.0030)	-0.0205 (0.0048)	-0.0087 (0.0029)	-0.0116 (0.0031)	0.0168 (0.0095)	0.0339 (0.0026)	-0.0021 (0.0030)
Dummy if Age less than 30	-0.0783 (0.0041)	-0.0783 (0.0041)	-0.0376 (0.0063)	-0.0340 (0.0040)	-0.0402 (0.0041)	0.1636 (0.0346)	-0.1043 (0.0039)	-0.0782 (0.0041)
Dummy if Age 30-39	-0.0361 (0.0035)	-0.0361 (0.0035)	-0.0180 (0.0059)	-0.0035 (0.0035)	-0.0119 (0.0036)	0.0485 (0.0121)	-0.0565 (0.0030)	-0.0360 (0.0035)
Dummy if Age 40-49	-0.0214 (0.0037)	-0.0215 (0.0037)	-0.0106 (0.0062)	0.0020 (0.0036)	-0.0026 (0.0038)	0.0123 (0.0118)	-0.0422 (0.0030)	-0.0214 (0.0037)
Dummy if 1-2 Years Tenure	-0.0366 (0.0037)	-0.0366 (0.0037)	-0.0363 (0.0065)	0.0052 (0.0037)	0.0130 (0.0038)	-0.0508 (0.0161)	-0.2403 (0.0038)	-0.0341 (0.0041)
Dummy if 2-3 years Tenure	-0.0030 (0.0041)	-0.0029 (0.0041)	-0.0071 (0.0071)	0.0302 (0.0040)	0.0387 (0.0041)	-0.0439 (0.0158)	-0.1812 (0.0038)	-0.0019 (0.0041)
Dummy if 4-5 Years Tenure	0.0177 (0.0038)	0.0177 (0.0038)	0.0200 (0.0069)	0.0389 (0.0037)	0.0476 (0.0039)	-0.0303 (0.0134)	-0.1212 (0.0035)	0.0184 (0.0039)
Dummy if 6-7 Years Tenure	0.0364 (0.0044)	0.0364 (0.0044)	0.0484 (0.0080)	0.0438 (0.0043)	0.0515 (0.0045)	-0.0152 (0.0150)	-0.0595 (0.0039)	0.0371 (0.0044)
Dummy if 8-10 Years Tenure	0.0318 (0.0040)	0.0319 (0.0040)	0.0454 (0.0074)	0.0320 (0.0039)	0.0363 (0.0040)	0.0326 (0.0143)	-0.0087 (0.0035)	0.0323 (0.0040)
Dummy if Black	-0.0600 (0.0037)	-0.0597 (0.0037)	-0.0540 (0.0061)	-0.0229 (0.0036)	-0.0187 (0.0037)	-0.0635 (0.0327)	-0.1128 (0.0039)	-0.0597 (0.0037)
Dummy if Hispanic	-0.0736 (0.0052)	-0.0735 (0.0052)	-0.0622 (0.0090)	-0.0529 (0.0051)	-0.0406 (0.0051)	-0.2025 (0.0275)	-0.0754 (0.0052)	-0.0734 (0.0052)

	Full Sample	Full Sample	Employee-Only Health Election Sub-Sample	Full Sample	Non-Highly Compensated Employees Sub-Sample	Highly Compensated Employees Sub-Sample	401(k) Participation, Full Sample	Full Sample
Explanatory Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dummy if Other Race	-0.0837 (0.0048)	-0.0836 (0.0048)	-0.0792 (0.0079)	-0.0805 (0.0047)	-0.0752 (0.0048)	-0.1048 (0.0255)	-0.0294 (0.0047)	-0.0838 (0.0048)
Dummy if Employee Only Health Election	0.0113 (0.0030)	0.0115 (0.0030)		0.0053 (0.0029)	0.0121 (0.0030)	-0.0027 (0.0171)	0.0267 (0.0029)	-0.0114 (0.0030)
Dummy if 1/1/97-6/30/97 Offering Period	-0.0210 (0.0054)	-0.0197 (0.0055)	0.0092 (0.0097)	-0.0009 (0.0053)	0.0116 (0.0055)	0.0254 (0.0668)	0.0482 (0.0049)	-0.0252 (0.0063)
Dummy if 7/1/97-12/31/97 Offering Period	-0.0426 (0.0055)	-0.0575 (0.0119)	-0.0140 (0.0100)	-0.0232 (0.0053)	-0.0132 (0.0056)	0.0259 (0.0661)	0.0580 (0.0049)	-0.0473 (0.0064)
Dummy if 1/1/98-6/30/98 Offering Period	-0.0708 (.0119)	-0.0758 (0.0118)	-0.0279 (0.0197)	-0.0517 (0.0116)	-0.0439 (0.0124)		0.0813 (0.0048)	-0.0756 (0.0124)
Dummy if 7/1/98-12/31/98 Offering Period	-0.0698 (0.0120)	-0.0446 (0.0048)	-0.0345 (0.0199)	-0.0510 (0.0118)	-0.0450 (0.0125)	0.0054 (0.0172)	0.0821 (0.0048)	-0.0744 (0.0125)
Dummy if 1/1/99-6/30/99 Offering Period	-0.0664 (0.0047)	-0.0665 (0.0047)	-0.0581 (0.0079)	-0.0606 (0.0046)	-0.0589 (0.0048)	-0.0399 (0.0163)	0.0827 (0.0045)	-0.0705 (0.0054)
Dummy if 7/1/99-12/31/99 Offering Period	-0.0526 (0.0047)	-0.0478 (0.0049)	-0.0444 (0.0080)	-0.0538 (0.0046)	-0.0519 (0.0048)	-0.0370 (0.0174)	0.1092 (0.0043)	-0.0560 (0.0053)
Dummy if 1/1/00-6/30/00 Offering Period	-0.0560 (0.0047)	-0.0560 (0.0047)	-0.0473 (0.0080)	-0.0578 (0.0046)	-0.0562 (0.0048)	-0.0470 (0.0162)	0.1077 (0.0041)	-0.0588 (0.0051)
Statutory MTR on Long-Term Capital Gains	-0.0017 (0.0020)		0.0009 (0.0031)	-0.0006 (0.0020)	-0.0009 (0.0021)	-0.0004 (0.0083		-.0016 (0.0020)
Statutory MTR on Medium-Term Capital Gains	0.0043 (0.0019)		0.0009 (0.0028)	0.0022 (0.0018)	0.0015 (0.0020)	-0.0009 (0.0021)		-0.0043 (0.0019)

TABLE 10. (Continued)

TABLE 10. (Continued)

Explanatory Variable	Full Sample (1)	Full Sample (2)	Employee-Only Health Election Sub-Sample (3)	Full Sample (4)	Non-Highly Compensated Employees Sub-Sample (5)	Highly Compensated Employees Sub-Sample (6)	401(k) Participation, Full Sample (7)	Full Sample (8)
First-Dollar MTR on 401(k) Contributions	-0.00068 (0.00044)	-0.00055 (0.00044)	-0.00050 (0.00080)	-0.00062 (0.00042)	-0.00084 (0.00043)	-0.0076 (0.0038)	0.00085 (0.00027)	-0.00068 (0.00044)
Anticipated MTR on Long-Term Capital Gains		-0.0027 (0.0020)						
Anticipated MTR on Medium-Term Capital Gains		0.0051 (0.0019)						
Dummy if Subject to Automatic 401(k) Enrollment							.2960 (0.0038)	-0.0065 (0.0045)
Dummy if 401(k) Contribution Rate 1-2%				0.1295 (0.0055)	0.1290 (0.0056)	0.0089 (0.0463)		
Dummy if 401(k) Contribution Rate 3%				0.0849 (0.0037)	0.0820 (0.0038)	0.1369 (0.0312)		
Dummy if 401(k) Contribution Rate 4-5%				0.1640 (0.0047)	0.1592 (0.0048)	0.2154 (0.0285)		
Dummy if 401(k) Contribution Rate 6%				0.2103 (0.0032)	0.2033 (0.0033)	0.2722 (0.0185)		
Dummy if 401(k) Contribution Rate 7-10%				0.2628 (0.0041)	0.2557 (0.0044)	0.3194 (0.0184)		
Dummy if 401(k) Contribution Rate 11-15%				0.3193 (0.0045)	0.3104 (0.0046)			
Constant	0.1094 (0.0284)	0.1093 (0.0284)	-0.0774 (0.0578)	-0.0070 (0.0277)	-0.0836 (0.0353)	0.7290 (0.2297)	0.4133 (0.0297)	0.1130 (0.0285)

	Full Sample	Full Sample	Employee-Only Health Election Sub-Sample	Full Sample	Non-Highly Compensated Employees Sub-Sample	Highly Compensated Employees Sub-Sample	401(k) Participation, Full Sample	Full Sample
Explanatory Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
R^2	0.1328	0.1328	0.1232	0.1739	0.1524	0.1044	0.1715	0.1328
Number of Observations	163,043	163,043	56,218	163,043	153,253	9,790	163,043	9,790

TABLE 10. (Continued)

Note: Each estimate is interpreted as the change in the probability of contributing to the ESPP in the offering period for a change in the explanatory variable. The standard errors given in parentheses are corrected for the fact that the disturbance terms are heteroscedastic and there are multiple observations on the same individuals in the sample. All specifications include a full set of state dummies and a quartic function of annual cash compensation, the parameter estimates for which are not shown.

Explanatory Variable	Full Sample (1)	ESPP Participants (2)	ESPP Non-Participants (3)
Appendix. Sample Means of Selected Variables, Standard Deviations in Parentheses, Medians in Square Brackets			
Dummy if Female	.779	.720	.813
Dummy if Age less than 30	.172	.111	.209
Dummy if Age 30-39	.385	.390	.382
Dummy if Age 40-49	.289	.323	.269
Dummy if Age 50-64	.154	.177	.140
Dummy if 1-2 Years Tenure	.205	.161	.231
Dummy if 2-3 years Tenure	.142	.135	.146
Dummy if 4-5 Years Tenure	.176	.185	.171
Dummy if 6-7 Years Tenure	.107	.122	.095
Dummy if 8-10 Years Tenure	.107	.141	.127
Dummy if 10+ Years Tenure	.238	.257	.227
Dummy if Black	.108	.071	.131
Dummy if Hispanic	.060	.041	.071
Dummy if Other Race	.070	.051	.081
Dummy if Employee Only Health Election	.345	.328	.356
Annual Compensation	41,410 (31,606) [33,000]	52,465 (39,944) [42,350]	34,740 (22,822) [29,070]

	Appendix. (Continued)		
Explanatory Variable	Full Sample (1)	ESPP Participants (2)	ESPP Non- Participants (3)
Statutory MTR on Long-Term Capital Gains	18.8 (6.6) [17.0]	20.7 (6.8) [20.0]	17.6 (6.2) [16.0]
Statutory MTR on Medium- Term Capital Gains	20.3 (7.0) [20.0]	22.2 (7.3) [21.0]	19.1 (6.5) [18.0]
First-Dollar MTR on 401(k) Contributions	23.2 (7.6) [20.9]	25.7 (7.9) [22.3]	21.8 (7.0) [20.0]
Anticipated First-Dollar Federal-State MTR on Long- Term Capital Gains	17.8 (6.3) [16.0]	19.6 (6.5) [19.0]	16.7 (5.8) [15.0]
Anticipated First-Dollar Federal-State MTR on Medium-Term Capital Gains	19.3 (6.9) [18.0]	21.2 (7.2) [20.4]	18.2 (6.5) [16.8]
Dummy if Subject to Automatic 401(k) Enrollment	.821	.822	.820
Dummy if No 401(k) Contributions	.290	.134	.378
Dummy if 401(k) Contribution Rate 1-2%	.048	.041	.052
Dummy if 401(k) Contribution Rate 3%	.114	.082	.134
Dummy if 401(k) Contribution Rate 4-5%	.073	.074	.073
Dummy if 401(k) Contribution Rate 6%	.251	.315	.213
Dummy if 401(k) Contribution Rate 7-10%	.128	.196	.087
Dummy if 401(k) Contribution Rate 11-15%	.100	.160	.064
Number of Observations	163695	61596	102099

FIGURE 1. Monthly Stock Price

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FIGURE 2. Company Stock Price and ESPP Participation