

## **Why Are Companies Freezing Their Pensions?**

Alicia H. Munnell and Mauricio Soto  
with the assistance of  
J.P. Aubry and Christopher J. Baum

Prepared for the 9th Annual Joint Conference of the Retirement Research Consortium  
“Challenges and Solutions for Retirement Security”  
August 9-10, 2007  
Washington, D.C.

The research reported herein was pursuant to a grant from the U.S. Social Security Administration (SSA) funded as part of the Retirement Research Consortium (RRC). The findings and conclusions expressed are solely those of the authors and do not represent the views of SSA, any agency of the Federal Government or the RRC.

The shift in pension coverage from defined benefit plans to 401(k)s has been underway since 1981. This shift was the result of three developments: 1) the addition of 401(k) provisions to existing thrift and profit sharing plans; 2) a surge of new 401(k) plans in the 1980s; and 3) the virtual halt in the formation of new defined benefit plans. Shutting down a defined benefit plan and replacing it with a 401(k) plan was an extremely rare event, particularly among large sponsors. Today, however, large healthy companies are closing their defined benefit plans, and the pathway to that closure is a ‘freeze.’ This paper examines why companies are freezing their plans, what factors affect their decision, and what the results mean for the future of defined benefit plans.

The paper is structured as follows. Section I describes the long-term forces behind the shift from defined benefit to defined contribution plans, as well as recent developments such as the ‘perfect storm’ and regulatory and accounting changes. Section II explains why the early 21<sup>st</sup> century was always going to be a challenging period for defined benefit plans. Section III discusses why companies have resorted to freezing their plans and describes types of freezes. Section IV uses the Labor Department’s Form 5500s, Compustat, and data from press releases and SEC filings to identify factors that led to plan freezes during the last four years. Section V concludes.

## **I. Economic Factors Undermine Desirability of Defined Benefit Plans**

In the early 1980s, most workers with pensions were covered by a defined benefit plan, either exclusively or in combination with a supplementary defined contribution plan. Today, most workers with pensions rely solely on a defined contribution plan – usually a 401(k) (see Figure 1). The question is how pension coverage moved from there to here. The question can be answered on two levels – the mechanics and the underlying forces – both are relevant to the topic of pension freezes.

### *The Mechanics of the Shift from Defined Benefit Plans*

In terms of the mechanics, until the recent round of ‘pension freezes,’ actually shutting down large a defined benefit plan and shifting coverage to a 401(k) plan was an

extremely rare event, particularly among large plans.<sup>1</sup> Instead of conversions from defined benefit plans, the spread of coverage under 401(k) plans proceeded in three steps.

Initial coverage under 401(k)s resulted from the addition of 401(k) provisions to traditional thrift and profit-sharing plans in the early 1980s. This move was an obvious one because thrift plans required employees to make after-tax contributions. Since 401(k) plans allowed pre-tax contributions, introducing a 401(k) provision meant employees could maintain their contribution level and see an increase in take-home pay. In the case of profit sharing plans, the shift to 401(k)s and voluntary participation allowed employers to reduce the profits distributed to employees.

The second step in the growth of 401(k) coverage was a surge in new plan formation in the 1980s. Initial applications to the Internal Revenue Service (IRS) for determination letters show that during the 1960s and into the 1970s defined benefit and defined contribution plan formations grew in lock step.<sup>2</sup> After 1975, the picture changed dramatically, and the formation of defined contribution plans took off. This surge continued through the 1980s, after the emergence of 401(k) plans. A second surge in 401(k) plans occurred during the heyday of the 1990s (see Figure 2).

The third factor in the shift to 401(k) coverage was a spike in defined benefit terminations during the late 1980s and early 1990s. Terminations increased sharply after the Tax Reform Act of 1986 placed restrictions on very small defined benefit plans that benefited only highly paid individuals. Applications dropped after 1990 when the government placed an excise tax on the reversion of money from over-funded plans. These developments cut the number of defined benefit plans by more than 25 percent.<sup>3</sup>

### *Reasons for the Shift*

Why did 401(k) coverage spread so rapidly? The short answer is that 401(k)s had enormous appeal to both employees and employers. A slightly longer explanation is that, on the demand side, the tastes of youth became more important in the labor market and a

---

<sup>1</sup> See Ippolito (1999), Kruse (1995) and Papke et al. (1996).

<sup>2</sup> See U.S. Department of the Treasury (2007).

<sup>3</sup> The number of single employer plans went from 112,208 in 1985 to 82,717 by the end of 1991. See Pension Benefit Guaranty Corporation (2006).

booming stock market made investing look easy. On the supply side, the structure of industry changed and defined benefit plans became increasingly expensive.

*The employees' perspective.* In the 1970s and 1980s, baby boomers and married women flooded into the labor market.<sup>4</sup> For both these groups, the immediate reward of an account which they could control and take with them as they moved from job to job had much greater appeal than the delayed gratification of a defined benefit pension.<sup>5</sup>

If the stock market had faltered during the early years, young workers might have thought twice about the wisdom of managing their own retirement assets, but the debut of 401(k) plans coincided with the longest bull market in the country's history. Between 1982 and 2000, stock prices rose at annual rate of 16.9 percent compared to 8.7 percent between 1955 and 1981. Most people became convinced that investing was easy and that they could do much better at managing their own money than stodgy sponsors of defined benefit plans. Thus, 401(k) plans were embraced by employees.

*The employers' perspective.* From the employers' perspective, 401(k) plans offered a form of pension that their workers appreciated. Moreover, for the employer these plans eliminated the significant demographic risks involved in funding future retirement annuities. And the cost of a 401(k) plan was highly predictable, which became increasingly important during the 1980s as the economic environment became more competitive. These advantages of 401(k) plans would not have carried the day, however, if the need to encourage long service – a key factor in the design of traditional defined benefit plans – remained important.

But the nature of industry was changing dramatically. Employment was declining in large, unionized, manufacturing firms, which typically offered defined benefit plans, and was growing in “high-tech” firms and small, non-unionized companies in the services and trade sectors, which typically did not.<sup>6</sup>

Even large organizations were reorganized in ways that reduced the value of long-term relationships between employer and employee. New organizational arrangements

---

<sup>4</sup> In the case of married women, this preference was quite rational given that they were likely to be in and out of the labor force as they attempted to combine career and family. The choice may or may not have been smart for young males. But the decline in labor unions weakened the voice of older workers and perhaps the support for a longer view towards work and retirement.

<sup>5</sup> By 1983, 16.5 percent of private sector workers were union members. That number has since declined to 7.8 percent in 2005 (U.S. Bureau of the Census, 2005, Table 647).

<sup>6</sup> See Andrews (1992), Gustman and Steinmeier (1992), and Ippolito (1995).

were required to efficiently tap a more highly educated workforce.<sup>7</sup> The nature of the work required more in the way of generic human capital as opposed to firm-specific skills. To compensate outstanding employees, rewards needed to be based on performance rather than on long service. In such organizations, defined benefit plans were an actual hindrance. They forced management to spend money on adequate but unexceptional employees, since defined benefit plans rewarded older workers with firm-specific skills. They also made it expensive for managers to hire and difficult for managers to fire mid-career employees.

Just as employers had increasingly little to gain by offering pensions, the costs of such benefits also began to rise. Workers were living longer, making life-time annuities increasingly expensive. The reduction in inflation in the 1980s and 1990s raised the real cost of un-indexed lifetime payments. Finally, because employer plans held a significant portion of their assets in equities, large maturing plans produced significant volatility in company earnings and cash flow.

The regulatory environment also caused existing small firms and new companies established in the 1980s and 1990s to opt for a 401(k). The Employee Retirement Income Security Act of 1974 (ERISA) imposed minimum standards for participation, vesting, and funding and required firms to insure pension benefits by paying premiums to the Pension Benefit Guaranty Corporation (PBGC). In addition, during the 1980s Congress passed significant pension legislation every few years. Congress also repeatedly raised PBGC premiums and imposed an excise tax on employers who claim the excess assets of terminated plans. The cumulative impact of the legislative changes increased the relative costs of defined benefit plans, particularly for small plans.<sup>8</sup>

In summary, the appeal of visible account balances and the sense of control provided by 401(k) plans, the response of the workplace to technological advances, the increased labor force participation of married women, the increased educational attainment of young workers, and regulatory costs all contributed to the dramatic shift in pension coverage from defined benefit to 401(k) plans.

---

<sup>7</sup> The following argument was developed by Sass (1997).

<sup>8</sup> See Husted (1998), Kruse (1995), Olsen and Vanderhei (1997) and McGill et al. (1996).

### *The 21<sup>st</sup> Century Brings More Trouble*

Sponsors of defined benefit plans began the 21<sup>st</sup> century by facing the ‘perfect storm.’ During the late 1980s and 1990s, a combination of growing asset values and regulatory constraints allowed defined benefit plan sponsors to make little or no cash contributions to their pension funds. After 2000, the decline of the stock market and the rapid drop in interest rates, dubbed by analysts as ‘the perfect storm,’ brought an end to these contribution holidays. Figure 3 shows the sudden increase in contributions after 2000, from an average annual amount of about \$30 billion per year between 1980 and 2000 to \$45 billion in 2001 and about \$100 billion in 2002 and 2003. Thus, market volatility suddenly made defined benefit plans considerably more expensive.

In addition to the ‘perfect storm,’ sponsors of defined benefit plans faced changes in the rules governing these plans in a way that would make them more expensive. In particular, in response to the growing deficit at the PBGC, in early 2005 the Administration proposed to improve the agency’s finances by raising employer premiums and tightening funding requirements.<sup>9</sup> The resulting legislation – The Pension Protection Act of 2006 (PPA) – imposed more of a ‘mark-to-market’ framework than the previous set of rules.<sup>10</sup> The ‘mark-to-market’ approach makes funding ratios more volatile, which generally makes the timing of contributions less predictable.

The PPA also curtailed the use of credit balances – notional balances accumulated from previous years that could be used in lieu of cash contributions.<sup>11</sup> This restriction put additional financial stress on plan sponsors, especially those with poorly funded plans.

Employers also faced reporting changes as the Financial Accounting Standards Board (FASB) undertook a comprehensive review to improve the transparency of pension accounting. In the wake of the first phase of that review, FASB required that the unfunded liabilities for pension and retiree health benefits appear on the firm’s balance sheet. Phase two is likely to impose more of a ‘mark-to-market’ approach for private

---

<sup>9</sup> The Deficit Reduction Act of 2005 raised the premium from \$19 to \$30 per participant per year.

<sup>10</sup> ERISA allowed assets to be smoothed over a 5-year period on a corridor of 80 to 120 percent of market value. The PPA reduced the smoothing period to 2 years and the corridor to 90 to 110 percent.

<sup>11</sup> Under ERISA, cash contributions that exceeded the minimum amount of contributions required by law were accumulated in a notional account. The PPA limited the use of credit balances in two ways. First, credit balances accumulate now at the actual rate of return of plan assets; and second, credit balances are subtracted from assets to estimate required contributions for “at risk” plans.

sector defined benefit pensions.<sup>12</sup> Thus, an attempt by the FASB to provide a more realistic assessment of pension plan finances is likely to introduce substantially more volatility in the reported financial results of the sponsoring companies, further discouraging sponsorship of defined benefit pensions.

The changing nature of work and the labor force that diminished the desirability of long-term employment relationships, the rising costs of providing lifetime benefits, the financial hit from the ‘perfect storm,’ and legislative and accounting developments all conspired to make defined benefit plans look particularly unappealing to employers at the beginning of the 21<sup>st</sup> century.

## **II. The Early 21<sup>st</sup> Century Was Always Going To Be Difficult**

The early 21<sup>st</sup> century was always going to be difficult for plan. A series of regulatory changes, which took place in the 1980s and 1990s, ensured that sponsors of defined benefit plans would be very lean in terms of funding their ongoing pension commitments and would therefore require increased contributions.<sup>13</sup>

### *Reduction in Full Funding Limits*

ERISA introduced both minimum funding requirements to ensure that employees’ benefits were secure, and maximum limits on tax-deductible contributions to protect tax revenues – originally a funding limit of 100 percent of actuarial liability. Under the Omnibus Budget Reconciliation Act of 1987 (OBRA87), however, Congress significantly tightened the funding maximum by lowering the limit to the lesser of 100 percent of actuarial liability or 150 percent of current liability.<sup>14</sup>

The introduction of the “150 percent of current liability” funding limit had a significant impact.<sup>15</sup> Under the new limit, many sponsors found their assets exceeded

---

<sup>12</sup> The second phase will address a broad range of issues including the measurement of plan obligations, selection of actuarial assumptions, and the display of benefit costs on the company’s income statement.

<sup>13</sup> See Munnell and Soto (2004), Schieber (2003), and Olsen and Vanderhei (1997).

<sup>14</sup> The full funding limit was increased to gradually from to 170 percent for 2003, and repealed after 2004. The PPA set the full funding limit as the ‘funding target’ plus 50 percent of the funding target, plus increases due to projected increases in compensation.

<sup>15</sup> Current liability is generally less than the projected plan liability because it does not include the effect of future salary increases. The actuarial liability, however, might be less than the current liability due to the difference in discount rates. See Pension Committee of the American Academy of Actuaries (2004).

150 percent of their current liabilities and were prohibited from making any further tax deductible contributions until their liabilities caught up with their assets. The fact that assets continued to grow as stock prices soared meant that many sponsors made no contributions for a significant period of time.

*The Impact of Reporting Requirements – FAS 87*

In 1985, FASB issued rules (The Statement of Financial Accounting Standards No. 87, *Employers' Accounting for Pensions*) requiring sponsors to account for accruing pension liabilities by a uniform method known as the “projected unit credit actuarial cost” method. Technically, FASB mandated the use of the projected unit credit only for reporting purposes. But sponsors appear to have either interpreted the FASB standard as an endorsement of the projected unit credit for funding as well as reporting or simply found it more convenient to use the same method for funding and reporting. As a result, a major shift occurred from the “entry age normal” method to the projected unit credit method for funding purposes (see Table 1).

The shift from entry-age normal cost to the projected unit credit method results in lower costs early in a worker’s career and higher costs later. Under the entry age normal cost method, the actuary projects the contributions needed each year to finance an employee’s benefits and then levels those contributions over the entire period the employee is expected to participate in the plan. Under the projected unit credit method, contributions are made as benefits accrue, so they start low and increase each year. In addition, because the projected unit credit method allocates a larger portion of the required future contributions to normal cost than does the entry-age normal method, it usually yields a substantially smaller unfunded liability. This will reduce minimum required amortization payments.

The reason that the shift in actuarial methods had such a large impact is it reduced funding when the baby boomers (those born between 1946 and 1964) were young workers (age 20 to 40). As the baby boomers aged, funding contributions became higher than they would have been under the entry-age normal cost method.<sup>16</sup>

---

<sup>16</sup> For a fuller discussion, see Watson Wyatt (1999) and Munnell and Soto (2004).

### *“Reversion Tax”*

A third factor discouraging contributions was an excise tax on reversions first introduced in 1986. Up to that time, any reversion of excess assets to employers upon termination of the plan was simply included in taxable income in the year it was received. But in the mid-1980s corporate raiders were seen to be taking over companies and terminating their plans in order to get their hands on ‘excess’ pension assets. For example, in 1985 financier Ronald Perelman took over Revlon, closed down its pension plan and got control of its \$100 million surplus.<sup>17</sup> In response to this raid and others, Congress enacted legislation in 1986 that introduced a 10-percent excise tax on reversions. Congress subsequently raised the rate to 15 percent in 1988 and to 50 percent in 1990.<sup>18</sup> While the reversion tax was not intended to limit contributions, some economists contend that it has severely restricted funding.<sup>19</sup>

### *Cap on Compensation for Funding Purposes*

In an effort to limit the revenue losses from private pension plans, Congress imposed caps on compensation that could be considered in funding and contributing to tax qualified plans. The Tax Reform Act of 1986 set the limit at \$200,000 indexed for inflation. In 1993, when the limit had risen to \$235,840 due to adjustments for inflation, Congress in the Omnibus Budget Reconciliation Act of 1993 cut back the limit to \$150,000 beginning in 1994. Again, the limit was indexed for inflation. Although the legislation was designed to reduce benefits for the highly paid, it had the effect of limiting funding across the board. The reason is that the legislation does not permit sponsors to include anticipated increases in the compensation limit due to inflation adjustments for funding purposes.

The inability to consider future inflation adjustments meant that for the period 1994-2001, the effective cap was \$150,000. With projected salary growth of 4.5 percent, a 35-year-old earning \$45,000 would be expected to have a salary of \$168,538 at age 65. This salary exceeded the cap by \$18,538, so the sponsor was required to reduce the

---

<sup>17</sup> Schultz (1999).

<sup>18</sup> Under the Omnibus Budget Reconciliation Act of 1990, the excise tax was lowered to 20 percent if part of the surplus is used to provide qualified pension benefits to participants.

<sup>19</sup> See Ippolito (2001).

funding below the amount required under current law. In 2001, Congress increased the compensation limit for funding purposes to \$200,000 beginning in 2002. Again, while the limit is indexed for inflation, the expected adjustments cannot be anticipated for funding purposes, once again limiting the ability of firms to fund projected benefits.

### *Overall Impact*

The implication of the OBRA87 funding limit, the shift from the entry-age normal method to the projected unit credit method, the reversion tax, and the cap on compensation for funding purposes is that sponsors of defined benefit plans in the early 21<sup>st</sup> century had done little to fund their ongoing pension commitments. Consistent data are available from 1979-2006 on the percentage of large plans in which assets exceed current liability (see Figure 4). The pattern reflects the story told above. In the wake of ERISA, funding improved steadily until the late 1980s. After the reversion tax and the full funding limit kicked in, the percent of plans with assets in excess of current liability declined. After 1996, the ratio rose once again due to the enormous increase in stock prices. When the stock market bubble burst in 2000, the percent of plans with assets in excess of current liability fell back to 33 percent in 2004, a level not seen since 1980.

### **III. The Freeze Becomes the Weapon of Choice**

Despite the ‘perfect storm,’ the changing funding and reporting requirements, and the predictable increase in required contributions, sponsors of healthy defined benefit plans did not terminate their plans. In fact, the liabilities in adequately funded plans that terminated fell to an all-time low in the 2000-2004 period, while those in terminated underfunded plans soared (see Table 2).

The challenge facing employers who want to terminate their plans in the early 21<sup>st</sup> century is the requirement that they must immediately vest all benefits and either purchase annuities in the private sector to cover benefit commitments to workers and retirees or provide a lump-sum payment. If plans were underfunded – and many plans were underfunded in the wake of the ‘perfect storm’ – sponsors had to come up with additional money to cover benefits promised to workers and retirees. Moreover, even for plans that appear fully funded, the low interest rate environment at the beginning of the

21<sup>st</sup> century made either the purchase of annuities or providing a lump sum extraordinarily expensive.

So instead of terminating their plans, plan sponsors have been instituting pension “freezes.” These freezes mean that the number of active participants in the plan – those accruing benefits – will slowly dwindle as covered workers move to different jobs or retire. Without new entrants to the plan, these frozen plans will eventually terminate. But the gradual pattern of termination offered by freezes has given sponsors time for the stock market to bounce back, for interest rates to rise, and for the firm to gradually put aside any additional funds required to cover promised benefits.

In practice, freezes are done in a number of ways. Common to all is that new hires are kept out of the plan. Instead, they are offered an alternative arrangement such as a 401(k) plan. What happens to workers already participating in the plan is what defines the specific type of freeze – who is affected and by how much.<sup>20</sup> The most extreme case is to stop all future benefit accruals to current participants – ‘hard freezes.’ Under hard freezes, benefits are literally frozen and additional years of service or salary increases will have no effect on retirement benefits. Nearly 85 percent of the freezes are hard freezes. Another option is to allow employees to accrue additional benefits for salary increases but not for additional service. This is called a ‘soft freeze,’ but it is an option rarely exercised by plan sponsors. Lastly, plan sponsors may close the plan to new entrants but leave accruals of active participants unchanged – ‘closed freezes.’ Of the recent freezes, about 13 percent correspond to ‘closed freezes.’

### *Financial Impact on the Employer*

A hard freeze generally has an immediate positive impact on the firm both in terms of funding requirements and financial reporting.<sup>21</sup> First, because no further benefit accruals will occur, the plan’s ‘normal cost’ – a component of the funding calculation – generally drops to zero. The plan’s current liability will decline each year as benefit commitments are paid off, further reducing funding contributions. Second, on the reporting side, analogous changes will be immediately evident. The computation of

---

<sup>20</sup> Sponsors can reduce accruals for some (“partial freeze”) or all (“total freeze”) active participants.

<sup>21</sup> See Tepfer (2006) and Latter (2006).

‘service cost’ (a concept very close to ‘normal cost’ on the funding side) is eliminated. The FAS 87 computation of Pension Benefit Obligation (PBO) drops to the level of the Accumulated Benefit Obligation (ABO). The decrease in the PBO reduces the interest cost component of the FAS 87 calculation.<sup>22</sup>

### *Financial Impact on the Employees*

For employees, the freeze of pension benefit accruals reduces retirement benefits. To offset these reductions, companies generally introduce a new 401(k) or enhance their existing defined contribution plan. For older workers, however, losses derived from a pension freeze are difficult to compensate. Table 3 shows the replacement rate – pension benefits as a percent of earnings at age 62 – under a typical defined benefit plan that is frozen and replaced by a typical 401(k) plan. Note that the two plans are roughly equivalent in that the employee joining the 401(k) plan at 35 and the employee who did not experience a freeze, would both end up with about 45 percent of pre-retirement earnings at 62 (43 percent for the defined benefit and 44 percent for the 401(k) plan).<sup>23</sup>

Older employees have far more to lose from a pension freeze. An employee who joins the company’s defined benefit plan at 35 would be entitled to a benefit equal to 43 percent of final earnings at age 62. If the sponsor freezes the plan when the employee is 50 and offers a 401(k), the replacement rate after the freeze is 28 percent, compared to 43 percent if the defined benefit plan had not been frozen (see Table 3).<sup>24</sup>

In short, instead of terminating their plans, plan sponsors have made pension freezes the weapon of choice. These freezes generally have a positive financial impact for plan sponsors – lowering future contributions and improving the balance sheet. For workers, especially those in their 50s, pension freezes lower pension benefits, even for those with enhanced 401(k) plans.<sup>25</sup>

---

<sup>22</sup> Freezing a plan, however, does not seem to increase the market value of the sponsor. See Rubin (2007).

<sup>23</sup> For more details on the calculations and assumptions see Munnell et al. (2006).

<sup>24</sup> These results are consistent with the findings of Vanderhei (2006).

<sup>25</sup> See Munnell et al. (2006).

#### **IV. Which Companies Chose to Freeze Their Plans?**

In an attempt to identify factors that led companies to freeze their plans, the following section explores the relationship between the probability that a plan was frozen and characteristics of the plan, the firm, and the industry. The hypothesis is that plans most likely to be closed had the potential to hurt the financial statements of the firm, were relatively easy to close, and occurred in environments in which most of the firm's competitors relied on defined contribution plans.

The analysis focuses on the largest 5,000 firms in terms of revenue. The financial information comes from the 2005 Compustat data. The plan information comes primarily from the Department of Labor's Form 5500 for 2004.<sup>26</sup> The 2004 data showed that of the 11,441 defined benefit plans, 1,133 had instituted a hard freeze. Subsequent information from press releases and sponsors' filings with the Securities Exchange Commission (SEC) revealed another 158 plans that were frozen in the period 2005-2007. These plans were flagged as frozen in the 2004 Form 5500 data. For example, Verizon Communications reported in December 2005 that as of June 30, 2006, managers covered under the defined benefit plan would stop accruing benefits. This information was incorporated into Verizon's 2004 Form 5500.

The next step was to merge the 2004 Form 5500 data (augmented with the freeze information from SEC filings and press releases) with the 2005 Compustat data. The construction of the sample is shown in Table 4. The merged sample accounts for about 70 percent of the number of firms that report having defined benefit plans in Compustat and to 52 percent in terms of assets (see Table 5).<sup>27</sup> The percentages were higher for the Standard & Poor's 500 – a subset of the larger sample.

The probability of a plan being frozen was assumed to depend on three factors: the potential damage that the plan could do to the firm's financial results, the cost to the firm of closing the plan, and the competitive environment in which the firm operated.

---

<sup>26</sup> Plans that were identified as frozen in the partial 5500 data from 2005 are also included in the analysis.

<sup>27</sup> The assets in the merged data, however, represent more than 80 percent of the total assets reported by single-employer plans in the 5500 Forms from 2004.

Potential damage to the firm's financial results was measured by four variables:

- 1) *Credit balance as a percent of net income.* This variable measures accumulated credit balances. The use of credit balances is limited by the PPA. Companies with large accumulated balances are expected to respond by freezing their plans.
- 2) *Plan is underfunded.* This is a binary variable that identifies underfunded plans – those with assets below current liability. Firms with underfunded plans are likely to experience a hit to their balance sheet under new FASB rules and might require substantial contributions under the PPA. On the other hand, it might be easier to freeze overfunded plans in that benefit commitments could be more easily covered.
- 3) *Difference between actuarial liability and current liability as a percent of market capitalization.* This variable measures the financial gain from freezing the plan – after a plan is hard frozen, the actuarial liability is reduced to the current liability.<sup>28</sup> Firms that have more to gain would be more likely to freeze their plans.
- 4) *Credit risk.* The credit risk variable is the numerical representation of the Standard and Poor's credit rating for the plan sponsor. A higher numerical score corresponds to a higher credit risk – a lower credit rating.<sup>29</sup> As credit risk increases, firms would be inclined to freeze their plans in order to relieve financial pressure.<sup>30</sup>

Three variables were included to gauge how easy it would be for a firm to freeze a plan:

- 1) *Active participants to total firm employees.* This ratio measures how much of the firm's workforce is covered by the plan. Plans that cover the whole labor force might be more difficult to freeze than plans that cover only a portion of the employees.
- 2) *Collectively bargained.* Since the employer must negotiate with the union before freezing such a plan, collectively bargained plans are much more difficult to freeze.
- 3) *Hybrid plans.* The effect of having switched to a hybrid plan is uncertain. Firms that have hybrid plans have already moved away from traditional defined benefit commitments, making a change to a 401(k) plan less dramatic. On the other hand,

---

<sup>28</sup> Actuarial liability was increased by 4 percent for each 25 basis points the discount rate was above the discount rate for current liability (see Winklevoss 1993).

<sup>29</sup> Compustat codes the Standard and Poor's credit scores into numerical values, as follows: AAA=2, AA+=4, AA=5, AA-=6, A+=7, A=8, A-=9, BBB+=10, BBB=11, BBB-=12, BB+=13, BB=14, BB-=15, B+=16, B=17, B-=18, CCC+=19, CCC/CC=20,23, C=21,24, D/SD=27,29,90.

<sup>30</sup> Sponsors with high credit risk are more likely to have lower funding levels, higher discount rate assumptions, and represent greater risks to the PBGC. See Government Accountability Office (2005).

firms that have already switched to a hybrid plan might not need to freeze their plans to deal with uncertainty or risk.

Finally, four variables were included to represent the competitive position of the firm:

- 1) *Ratio of retirees to total participants.* This variable measures the age of the plan, and the extent to which, in underfunded plans, current firm income must go to provide benefits for past workers. A high ratio of retirees to participants is a sign that defined benefit plans might be inappropriate for the business model of the firm – the bulk of the current labor force might be outsourced or not covered by the plan. The expected impact would be assumed to be positive.
- 2) *Market capitalization of the firm.* The recent wave of pension freezes includes well-known firms with large market capitalization. These firms are subject to global competitive pressures. The expected impact would be assumed to be positive.
- 3) *Percent of competitors with defined contribution plan only.*<sup>31</sup> The greater the proportion of other firms in the industry with defined contribution plans instead of defined benefit plans, the greater the probability that a plan will be frozen.
- 4) *Research and development intensity in the industry.* The R&D intensity is measured as the median ratio of R&D expenditures to sales for each industry from Compustat. Industries with substantial R&D intensity are likely to benefit the most from the talent retention features of defined benefit plans. The expected impact of industry R&D intensity would be expected to be negative.
- 5) *Industry dummies.* These were designed to capture competitive pressures and other factors that could lead to freezes.

The descriptive statistics of the sample are presented in Table 6. More than 15 percent of plans experience some type of freeze. The majority of the freezes are hard freezes – 13 percent of the sample. Financial considerations are related to the freeze decision. Frozen plans have lower median credit balances, but a higher mean – a few companies that have accumulated substantial credit balances decided to freeze their

---

<sup>31</sup> This variable is measured as  $1-P(DBi)$ , where  $P(DBi)$  is the proportion of companies with defined benefit plans for industry  $i$ , using the top 5,000 companies in revenues from Compustat. Eighteen industry categories covering services and manufacturing are included.

plans; frozen plans have lower funding ratios and higher credit risk. The cost to the firm of closing the plan is also relevant. Frozen plans cover fewer employees, are less likely to be collectively bargained and are less likely to be hybrid. Finally, the competitive environment is also an important factor for the decision to freeze a plan. Frozen plans have a higher ratio of retired to total participants, and are likely to be in industries where defined contribution plans are more prevalent.

A regression model is estimated and the results are presented in Table 7. Given the binary nature of the dependent variable – 1 if a plan is frozen, 0 otherwise –, the model is estimated using a probit. The values reported in the table are the change in the probability of a plan being frozen given a one-unit change in a continuous variable or the shift in a dichotomous variable from zero to one. For example, a one-unit increase in the credit risk of the firm increases the probability of freezing a plan by 1.18 percentage points. If the plan is collectively bargained, the probability of freezing it declines by 7.18 percentage points, all else equal.

The results are shown for two measures of freezes – any type of freeze and hard freeze only. The variables enter the equations with the expected sign and are generally statistically significant. Plans with large credit balances or low funding ratios have a higher probability of being frozen. Employers are more likely to freeze plans that are easy to freeze – typically smaller, non-union plans. And older plans, with large legacy costs that drain current earnings, are obvious targets for freezes.

The results indicate that credit balances increase the probability of freezing a plan, although the coefficients are marginally significant. Sponsors with credit balances might experience a substantial increase in contributions under the funding rules of the Pension Protection Act of 2006. Without the ability to use credit balances to offset minimum required contributions, plan sponsors are exposed to sudden increases in contributions which could increase the volatility of earnings.<sup>32</sup>

Other financial considerations also affect the probability of freezing a plan. The funding variable suggests that underfunded plans are being frozen. Sponsors of these plans will see a significant increase in contributions under the PPA and will experience a

---

<sup>32</sup> Other features of the PPA make contributions less volatile than previous law. See Warshawsky (2007).

hit to their balance sheet and earnings statements under new FASB rules.<sup>33</sup> The financial health of the firm also appears to be driving freezes. An increase in the scale of risk – from BBB+ to BBB, for example – increases the probability of freezing by more than 1 percentage point. Financial gains from freezing a plan, however, do not seem to motivate freezes. The coefficient for the difference between actuarial and current liability is not significant under the proposed specifications.

In terms of the difficulty of freezing the plan, employers appear to be following the path of least resistance. Plans that cover relatively few employees are more likely to be frozen and collectively bargained plans are less likely. Freezing plans for white collar workers, however, may mean a freeze in the union plans down the road. In fact, press releases from some of the firms in the process of freezing their plans indicate the desire to freeze union plans upon negotiation with the union.<sup>34</sup>

Finally, the nature of the industry appears to matter. Firms with large legacy costs, as measured by the ratio of retired participants to total participants, are more likely to freeze their plans. Scale effects exist: firms with large market capitalization are more likely to freeze their plans. If defined contribution plans are prevalent in the industry, employers are more likely to freeze their defined benefit plans. Industries with high R&D intensity are less likely to freeze their plans. A second set of equations were run with an indicator variable with broad industry categories. Adding the industry variables enhances the explanatory value of the equations, but does not affect the coefficients on the other variables in the equation.

### *Implications for the Future of Defined Benefit Plans*

The question is what these results imply for the future of defined benefit plans. The news is that many large healthy employers want to get out of sponsoring defined benefit plans.<sup>35</sup> This trend most likely reflects the decline in long-term employee-employer relationships, the burden of funding plans that have not adequately prepared for projected pension liabilities, the financial hit created by the ‘perfect storm,’ changes in

---

<sup>33</sup> The PPA requires plans to amortize unfunded liabilities within 7 years; previous law required sponsors to amortize unfunded liabilities within 3 to 7 years, but it exempted plans with funding ratios of above 90 percent. The new FASB rules required the unfunded liability to be reported on the balance sheet.

<sup>34</sup> See Met-Pro Corp. (2006) and Ackerman (2006).

<sup>35</sup> For example, IBM, Citigroup, and Hershey Foods froze their plans despite having credit ratings of A+.

funding requirements under the Pension Protection Act, and the potential uncertainty with regard to earnings statements in the wake of expected FASB requirements.

*Overall results.* The regression results imply that plans where credit balances are high relative to income, legacy costs are substantial and funding ratios are low have a higher probability of being frozen. That makes sense in that plans with these characteristics are likely to have the most impact on future earnings under FASB's expected reporting requirements. It is reasonable to expect more plans with these characteristics to freeze in the future.

*Implications for cash balance plans.* One of the more interesting findings comes from an insignificant result. The results, however, suggest that having a hybrid plan does not affect the probability of freezing a plan. The insignificant coefficient of hybrid plans appears puzzling. Hybrid plans eliminate several aspects of traditional plans that employers find burdensome. Benefit accumulations are not back-loaded but rather occur evenly over the employee's worklife, which fits most employers' personnel objectives. They are easier to explain to employees, which makes them a more effective recruitment tool. They remove most of the investment risk in that the plans promise a well-defined rate of return, usually linked to a Treasury security. And cash balance plans eliminate the demographic and inflation risk associated with the provision of annuities. Yet, the insignificant coefficient on the hybrid plan variable suggests that cash balance plans might not prevent plan freezes.

A possible explanation of why some cash balance plans have been frozen comes from the regulatory uncertainty that has surrounded these plans. Until very recently, cash balance plans were the target of extensive litigation which might have influenced the decision to freeze some of these plans. The PPA resolved the uncertainty for future conversions; court decisions have also ruled in favor of plans converted prior to the PPA.<sup>36</sup> The question is whether sponsors can live with cash balance plans now that the legal uncertainty is resolved. Recent developments indicate that sponsors might decide to

---

<sup>36</sup> See Cooper, Kathi, et al. v. The IBM Personal Pension Plan (2006); some argue, however, that the uncertainty surrounding cash balance plans has not been completely resolved (Zelinsky 2007).

convert to a cash balance rather than freezing the plan. Dow Chemical, for example, recently announced a plan conversion.<sup>37</sup>

The fact that firms might be able to live with cash balance plans suggests that ultimately defined benefit plans could possibly look more like old-fashioned money purchase plans – defined contribution plans with required employer contributions where employees might be given the right to direct investments – than like the current 401(k) plans. This would represent an improvement to the U.S. retirement income system.

*Financial incentives.* Another interesting finding rests with another statistically insignificant result. Previous analyses of employers moving away from traditional defined benefit plans – namely, the conversion to cash balance plans in the 1990s – concluded that labor force issues, not saving money, was the prime motivation.<sup>38</sup>

Data are available on the cost savings that could be achieved from a hard freeze. A hard freeze immediately reduces the firm's liability from a projected benefit concept to an accrued benefit measure. The difference between the actuarial liability and the current liability (the Form 5500 measures) relative to assets was added to the probit equations reported above. Regardless of the specification, the coefficients were never statistically significant. Additional equations were estimated including the difference between the projected benefit obligation and the accrued benefit obligation (the FAS 87 measures) relative to assets. Again, the coefficients were not statistically significant. Thus, short-term cost savings do not appear to be the motivation. This seems reasonable given that most companies enhance their 401(k) provisions when they freeze their plans.<sup>39</sup>

## V. Conclusion

Defined benefit plans in the private sector are on the decline. Although they still cover about 21 million workers and pay benefits to 23 million retirees, the proportion of the workforce covered by these plans has dropped by more than half (from more than 40 percent to less than 20 percent) since 1980.

---

<sup>37</sup> See Dow Chemical (2007).

<sup>38</sup> See Clark and Schieber (2000), Schieber (2003), and Coronado and Copeland (2004).

<sup>39</sup> Employers themselves do acknowledge that long-term cost savings are a major objective of freezing their plans. However, this objective ranks below the desire to reduce cost volatility, which dominates every survey as the prime objective. See Merrill Lynch (2006).

The early 21<sup>st</sup> century produced an uptick in the pace of decline driven by the financially devastating impact of the ‘perfect storm,’ legislation that will require underfunded plans to increase their contributions, and accounting changes that will force fluctuations in pension finance onto the earnings statement.

The PPA represents the most significant change in pension regulation since ERISA. The new funding rules, which take effect in 2008, significantly reduce the leeway that companies have in making contributions to their plans. Plans must now be 100 percent funded, and most sponsors of underfunded plans have only seven years to pay off any existing shortfall. Moreover, sponsors will have less ability to smooth the value of assets or liabilities, making cash contributions significantly more volatile.

At the same time, FASB has instituted the first step of a two-step pension reform project, by requiring sponsors to show pension surpluses or deficits directly on the balance sheet. This change could seriously cut into shareholder equity and introduces volatility to the balance sheet. In the second step, expected in the next three years, FASB is expected to require companies to mark-to-market the value of pension assets and liabilities, eliminating the smoothing available under current rules. This second phase could introduce enormous volatility in reported earnings.

Such volatility is not acceptable to plan sponsors, and may explain why large healthy companies have taken steps to end their defined benefit plans. The fact that these steps took the form of freezes rather than terminations reflects the fact that with underfunding caused by the perfect storm and very low interest rates, firms could not afford to pay off their liabilities immediately. Freezing their plans provided the option to terminate gradually. As funding levels improve, terminations are likely to replace freezes.

The forces in place suggest that companies will continue to move away from defined benefit plans. McKinsey & Company (2007) suggests that as much as 75 percent of defined benefit assets will be in frozen or terminated status by 2012. When the United Kingdom adopted regulatory and accounting rules similar to those recently adopted in the United States, the percent of assets in terminated or frozen status soared from 35 percent in 1998 to 70 percent in 2006. It may well be that the only defined benefit plans left standing in the private sector five years from now will be cash balance plans or some other form of hybrid. The age of the traditional defined benefit plan seems to be over.

## References

- Ackerman, Bryon. 2006. "Remington Freezing Pension Plans for Non-Union Employees." *Utica Observer-Dispatch*. October 11.
- Andrews, Emily S.. 1992. "The Growth and Distribution of 401(k) Plans," in *Trends in Pensions 1992*, edited by John Turner and Daniel Beller. Washington, DC: U.S. Department of Labor.
- Clark, Robert L. and Sylvester J. Schieber. 2000. *An Empirical Analysis of the Transformation to Hybrid pension Plans in the United States.* Washington, DC: The Brookings Institution.
- Coronado, Julia Lynn and Philip C. Copeland, 2004. "Cash balance pension plan conversions and the new economy." *Journal of Pension Economics and Finance*, Cambridge University Press, vol. 3(3), pages 297-314, November.
- Cooper, Kathi, et al. v. The IBM Personal Pension Plan and IBM Corporation. 2006. 99-829-GPM. Appeal from the United States District Court for the Southern District of Illinois. G. Patrick Murphy, Chief Judge. Argued February 16, 2006–Decided August 7, 2006.
- Dow Chemical. 2007. Dow Looks to Future with New U.S. Retirement Program Company prepares to attract the best talent with innovative benefits plan. Press Release. Midland, MI - July 17, 2007.
- Gustman, Alan L. and Thomas L. Steinmeier. 1992. "The Stampede Toward Defined Contribution Pension Plan: Fact or Fiction?" *Industrial Relations* 31(2): 361-69.
- Hustead, Edwin C. 1998. "Trends in Retirement Income Plan Administrative Expenses." In *Living with Defined Contribution Plans: Remaking Responsibility*, edited by Olivia S. Mitchell and Sylvester J. Schieber, 166-77. Philadelphia, PA: University of Pennsylvania Press for the Pension Research Council.
- Ippolito, Richard A. 1995. "Toward Explaining the Growth of Defined Contribution Plans." *Industrial Relations*. 34(1): 1-20.
- Ippolito, Richard A. 1999. "The New Pension Economics: Defined Contribution Plans and Sorting." Paper prepared for EBRI policy forum on the next twenty-five years of ERISA.
- Ippolito, Richard A. 2001. "Reversion Taxes, Contingent Benefits, and the Decline in Pension Funding." *Journal of Law and Economics*. vol. XLIV (April).
- Kruse, Douglas. 1995. "Pension substitution in the 1980's: Why the shift toward Defined Contribution Plans?" *Industrial Relations*. 34(2):218-241.
- Latter, Gordon J. 2006. "The Trend to Freeze Pension Plans." *Pensions and Endowments*. 13. Merrill Lynch. June.
- McGill, Dan M. Kyle N. Brown, John J. Haley, and Sylvester Schieber. 1996. *Fundamentals of Private Pensions*. Philadelphia, PA: University of Pennsylvania Press.
- McKinsey & Company. 2007. "The Coming Shakeout in the Defined Benefit Market." New York: NY.
- Merrill Lynch. 2006. "The Trend to Freeze Pension Plans." *Pensions and Endowments* 13.
- Met-Pro Corporation. 2006. "Met-Pro Corporation Announces Pension Plan Changes." Press Release. November 1, 2006.
- Munnell, Alicia H. and Mauricio Soto. 2004. The Outlook for Pension Contributions and Profits in the US." *Journal of Pension Economics and Finance*, Cambridge University Press, vol. 3(01), pages 77-97, May.
- Munnell, Alicia H., Francesca Golub-Sass, Mauricio Soto and Francis Vitagliano. 2006. "Why Are Healthy Employers Freezing Their Pensions?" *Issue in Brief* 44. Chestnut Hill, MA: Center for Retirement Research at Boston College.
- Olsen, Kelly and Jack Vanderhei. 1997. "Defined Contribution Plan Dominance Grows Across Sectors and Employer Sizes, While Mega Defined Benefit Plans Remain Strong: Where We Are and Where We Are Going." EBRI Special Report SR-33. October.
- Papke, Leslie, Mitchell Petersen, and James Poterba. 1996. "Do 401(k) Plans Replace Other Employer Provided Pensions?" In *Advances in the Economics of Aging*, edited by David A. Wise, 219-40. University of Chicago Press.
- Pension Benefit Guaranty Corporation. 2007. Personal Communication with the Office of General Counsel, Disclosure Division. Washington, DC.
- Pension Benefit Guaranty Corporation. 2006. "Pension Insurance Data Book 2005." Pension Benefit Guaranty Corporation. Number 10. Summer.
- Pension Committee of the American Academy of Actuaries. 2004. "Fundamentals of Current Pension Funding and Accounting for Private Sector Pension Plans." American Academy of Actuaries.

- Rubin, Jordan. 2007. "The Impact of Pension Freezes on Firm Value." *Wharton Research Scholars Journal*. University of Pennsylvania.
- Sass, Steven A. 1997. *The Promise of Private Pensions*. Cambridge, MA: Harvard University Press.
- Schieber, Sylvester. 2003. "The Shift to Hybrid Pensions by U.S. Employers: An Empirical Analysis of Actual Plan Conversions." Pension Research Council Working Paper WP 2003-23.
- Schultz, Ellen E. 1999. "Pension Terminations: '80s Replay." *Wall Street Journal*. June 15, p.C1.
- Tepfer, Hal. 2006. "Step into the freeze: A DB Pension Plan Primer." *Workspan*.
- U.S. Bureau of the Census. 2005. *Statistical Abstract of the United States: 2006 (125th Edition)*. Washington, DC
- U.S. Department of Commerce. 1955-1975. *National Income and Product Accounts*. Washington, DC: U.S. Government Printing Office.
- U.S. Department of Labor, Employee Benefits Security Administration, Office of Policy and Research. 2004. "Abstract of 1999 Form 5500 Annual Reports." *Private Pension Plan Bulletin* 12. Washington DC: U.S. Government Printing Office. Available at: <http://www.dol.gov/ebsa/PDF/1999pensionplanbulletin.pdf>.
- U.S. Department of Labor, Employee Benefits Security Administration, Office of Participant Assistance. 2002-2006. *Annual Return/Report Form 5500 Series for Plan Years 1990-2004*. Washington DC: U.S. Government Printing Office.
- U.S. Department of Treasury. 1998-2006. *Internal Revenue Service Databook*. Internal Revenue Service. <http://www.irs.gov/taxstats/article/0,,id=102174,00.html>
- U.S. Department of Treasury. 2007. "EP Determination Letter Resource Guide - Do I Need to File for a Determination Letter for my Retirement Plan?" <http://www.irs.gov/retirement/article/0,,id=128038,00.html>
- U.S. General Accountability Office. 2005. *Recent Experiences of Large Defined Benefit Plans Illustrate Weaknesses in Funding Rules*. GAO-05-294. Washington, DC: U.S. Government Printing Office.
- Vanderhei, Jack. 2006. "Defined Benefit Plan Freezes: Who's Affected, How Much, and Replacing Lost Accruals" Working Paper No. 291. Washington, DC: Employee Benefit Research Institute.
- Warshawsky, Mark J. 1995. "Determinants of Pension Plan Formation and Termination." *Benefits Quarterly*. Fourth Quarter: 71-80.
- Warshawsky, Mark J. 2007. "The New Pension Law and Defined Benefit Plans: A Surprisingly Good Match." 2007. Working Paper. PRC WP2007-06. Pension Research Council Working Paper.
- Watson Wyatt 1986, 1992, 1998, 2001, 2006. *Survey of Actuarial Assumptions and Funding: Pension Plans with 1,000 or More Participants*. New York, NY.
- Watson Wyatt. 1999, "The Unfolding of a Predictable Surprise: A Comprehensive Analysis of the Shift from Traditional Pensions to Hybrid Plans."
- Winklevoss, Howard E. 1993. *Pension Mathematics with Numerical Illustrations*. University of Pennsylvania Press.
- Zelinsky, Edward A. 2007. "Cooper v. IBM Personal Pension Plan: A Critique." *New York University Review of Employee Benefits and Executive Compensation*.

Table 1. *Percent of Large Pension Plans Using Alternative Actuarial Methods, 1976–2006*

Actuarial cost method	1976	1981	1986	1991	1996	2002	2006
Projected unit credit	–	–	28	54	54	66	74
Entry age normal	57	53	40	31	31	24	19
Other	43	47	32	15	15	10	7

Source: Watson Wyatt Worldwide, 2006, 2003, 1998, 1992, 1986. *Survey of Actuarial Assumptions and Funding: Pension Plans with 1,000 or More Participants*.

Table 2. *Terminations of Single–Employer Plans Reported to the PBGC*

Year	Adequately funded plans		Underfunded plans	
	Number	Liabilities (billions)	Number	Liabilities (billions)
1985-1989	48,519	44.3	537	2.4
1990-1994	36,340	28.1	692	5.1
1995-1999	15,620	20.9	438	2.2
2000-2004	6,969	13.0	595	31.9

Source: Pension Benefit Guaranty Corporation (2007).

Table 3. *Total Replacement Rate at 62 for Worker Who Entered at 35, by Age at which Defined Benefit Plan Is Frozen and Replaced with a 401(k)*

Source	Age at which defined benefit plan is frozen and replaced with a 401(k)					
	35	40	45	50	55	62
Defined benefit plan	0%	3%	7%	13%	20%	43%
401(k) Plan	44	33	23	15	8	0
Total	44	36	30	28	28	43

Source: Authors' calculations.

Table 4. Construction of Merged Form 5500/Compustat Sample

<b>5500 Data: 2004</b>	
Defined benefit plans	11,441
Hard Frozen	1,133
<b>Freezes: 2005-07 from SEC filings and press releases</b>	
Total freezes	158
Hard frozen	101
Soft frozen	10
Closed to new entrants	47
<b>Compustat Data: 2005</b>	
Top firms in revenues	5,000
Firms with DB plans	1,654
<b>Merged 5500-Compustat Data</b>	
Defined benefit plans	1,896
Frozen, any type	286
Hard frozen	243
Firms	1,139
At least one plan frozen	196
At least one plan hard frozen	179

Source: Authors' calculations

Table 5. Comparison of Merged Sample with Compustat Information for S&P 500 and for Top 5,000 Firms

Item	Standard & Poor 500			Top 5,000 Firms		
	Compustat	Merger Process	Percent	Compustat	Merger Process	Percent
Firms with DB plans	342	335	98.0	1,654	1,139	68.9
Assets in DB plans <sup>1</sup>	\$1,321 B	\$973 B	73.6	\$2,339 B	\$1,208 B	51.6
Number of DB plans <sup>2</sup>	NA	667	NA	NA	1,896	NA

1. Our estimate of total assets in defined benefit plans from the 2004 Form 5500 is \$2,018 billion (\$1,493 from single-employer plans and \$525 from multiemployer or multiple employer plans); the estimate from the Federal Reserve's Flow of Funds is \$2,132 billion.

2. Compustat does not provide any information on the number of plans.

Source: Authors' calculations.

Table 6. *Descriptive Statistics of Sample*

Sample size (plans)	1,802							
Any freeze	278	15.4%						
Hard freeze	235	13.0%						
Any freeze	Not Frozen				Frozen			
	Mean	p25	p50	p75	Mean	p25	p50	p75
1) Financial considerations								
Credit balance to net income	29.1%	0.1%	3.4%	26.5%	35.4%	0.0%	1.6%	41.4%
Underfunded plan	50.7%	0.0%	100.0%	100.0%	63.3%	0.0%	100.0%	100.0% ***
(Actuarial liab. - current liab.)/ market cap	14.4%	0.0%	0.2%	1.4%	5.3%	0.0%	0.0%	0.5%
Credit risk	BB+	BBB+	BBB-	BB-	BB	BBB	BB	B+ ***
2) Easy to freeze								
Active participants / employees	28.8%	2.6%	17.1%	47.8%	16.3%	0.3%	4.6%	25.1% ***
Plan is collectively bargained	40.9%	0.0%	0.0%	100.0%	30.9%	0.0%	0.0%	100.0% ***
Hybrid plan	16.3%	0.0%	0.0%	0.0%	10.1%	0.0%	0.0%	0.0% ***
3) Competitive pressures								
Retired participants / total participants	50.7%	35.6%	50.4%	66.2%	62.8%	43.0%	64.3%	88.4% ***
Market capitalization	13.6	0.9	3.0	10.4	14.9	0.7	1.7	13.0
Percent in industry with DC plans only	57.6%	44.3%	53.9%	73.3%	55.3%	44.3%	53.3%	72.5% **
R&D Expenses to sales	2.6%	0.4%	1.9%	4.7%	2.7%	0.2%	1.9%	4.7%

Significance: \*\*\* 99 percent, \*\* 95 percent, \* 90 percent, + 85 percent.

Hard freeze	Not Frozen				Frozen			
	Mean	p25	p50	p75	Mean	p25	p50	p75
1) Financial considerations								
Credit balance to net income	29.4%	0.1%	3.4%	26.2%	34.7%	0.0%	1.5%	54.6%
Underfunded plan	50.2%	0.0%	100.0%	100.0%	68.9%	0.0%	100.0%	100.0% ***
(Actuarial liab. - current liab.)/ market cap	14.1%	0.0%	0.2%	1.4%	5.6%	0.0%	0.0%	0.5%
Credit risk	BB+	BBB+	BBB-	BB-	BB	BBB	BB	B+ ***
2) Easy to freeze								
Active participants / employees	28.5%	2.3%	16.9%	47.0%	16.2%	0.3%	4.8%	24.6% ***
Plan is collectively bargained	40.9%	0.0%	0.0%	100.0%	29.4%	0.0%	0.0%	100.0% ***
Hybrid plan	16.0%	0.0%	0.0%	0.0%	10.6%	0.0%	0.0%	0.0% ***
3) Competitive pressures								
Retired participants / total participants	51.0%	35.9%	50.6%	66.5%	62.6%	43.0%	64.1%	88.8% ***
Percent in industry with DC plans only	13.7	0.9	3.0	11.4	14.4	0.7	1.3	9.0
R&D Expenses to sales	59.0%	44.3%	69.4%	73.3%	55.1%	44.3%	44.6%	72.5% ***
Market capitalization	2.7%	0.4%	1.9%	4.7%	2.7%	0.2%	1.9%	4.7%

Significance: \*\*\* 99 percent, \*\* 95 percent, \* 90 percent, + 85 percent.

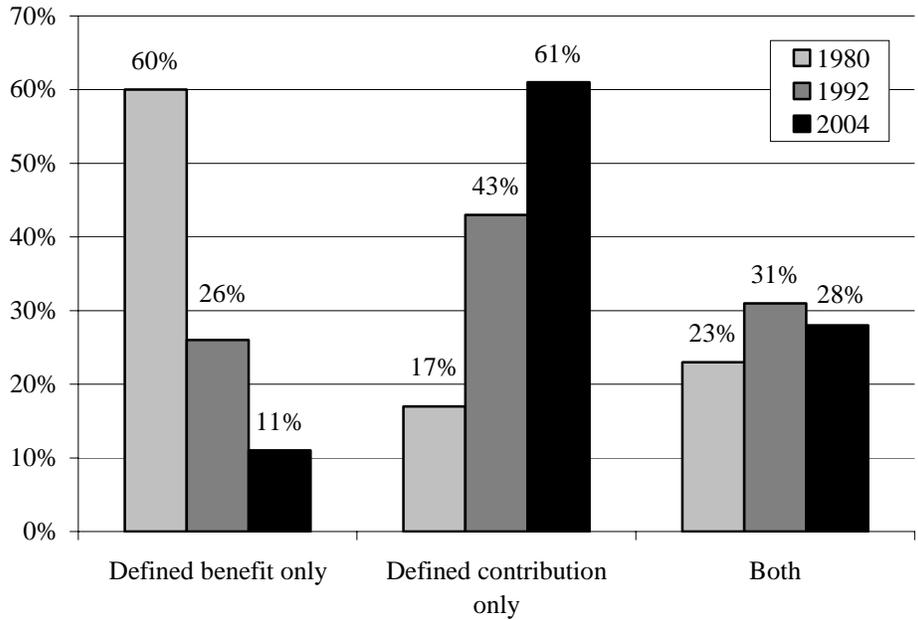
Source: Authors' calculations.

Table 7. *Probability of Plan Being Frozen*

Explanatory variables	Dependent variable			
	Any freeze		Hard freeze	
<i>Potential damage to financial results</i>				
Credit Balance to Net Income	0.0093 (0.007)	0.0095 + (0.007)	0.0077 (0.006)	0.0085 + (0.006)
Plan is underfunded	0.0365 * (0.018)	0.0337 * (0.018)	0.0584 *** (0.016)	0.0557 *** (0.016)
(Actuarial liab.- current liab.)/ market cap	-0.0008 (0.001)	-0.0010 (0.001)	-0.0005 (0.001)	-0.0008 (0.001)
Credit risk	0.0135 ** (0.007)	0.0115 ** (0.005)	0.0129 ** (0.007)	0.0118 *** (0.004)
<i>Cost of closing plan</i>				
Active participants/ employees	-0.2120 *** (0.056)	-0.2153 *** (0.054)	-0.1762 *** (0.052)	-0.1796 *** (0.046)
Plan is collectively bargained	-0.0776 *** (0.023)	-0.0819 *** (0.022)	-0.0684 *** (0.020)	-0.0718 *** (0.019)
Hybrid plan	-0.0343 (0.022)	-0.0340 + (0.021)	-0.0184 (0.020)	-0.0219 (0.019)
<i>Competitive position of firm</i>				
Retired participants / total participants	0.1817 *** (0.042)	0.1817 *** (0.042)	0.1375 *** (0.033)	0.1357 *** (0.031)
Market capitalization of firm	0.0009 *** (0.0003)	0.0007 *** (0.000)	0.0008 *** (0.000)	0.0008 *** (0.000)
Percent in industry with DC plans	0.1753 ** (0.070)		0.1923 ** (0.068)	
Industry R&D intensity	-0.8938 ** (0.400)		-0.6403 * (0.356)	
Industry: Ag., mining, construction		-0.0158 (0.051)		-0.0077 (0.044)
Industry: Mfg. Durable		0.0194 (0.054)		0.0044 (0.044)
Industry: Mfg. Nondurable		-0.0458 (0.043)		-0.0789 ** (0.030)
Industry: Transportation		-0.0009 (0.084)		-0.0601 (0.031)
Industry: Utilities		-0.0602 (0.042)		-0.0455 (0.035)
Industry: FIRE		0.1229 ** (0.075)		0.1025 * (0.067)
Industry: Services		0.0237 (0.049)		0.0151 (0.041)
Industry: Missing		0.1065 (0.253)		0.1038 (0.239)
Pseudo R <sup>2</sup>	0.1008	0.1134	0.1131	0.1421
Observations	1,784	1,802	1,784	1,802

Note: Significance: \*\*\* 99 percent, \*\* 95 percent, \* 90 percent, + 85 percent. Figures in parentheses are robust standard errors.

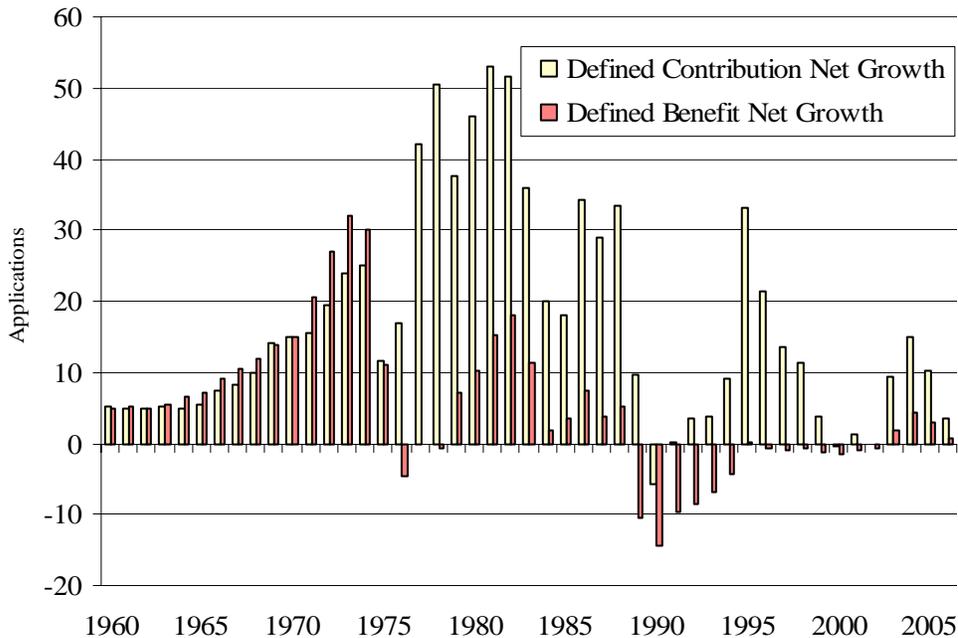
Figure 1. *Private Sector Workers with Pension Coverage, by Pension Type, 1980-2004*



Note: Although these calculations adjust for double-counting, some overestimation of coverage may still remain.

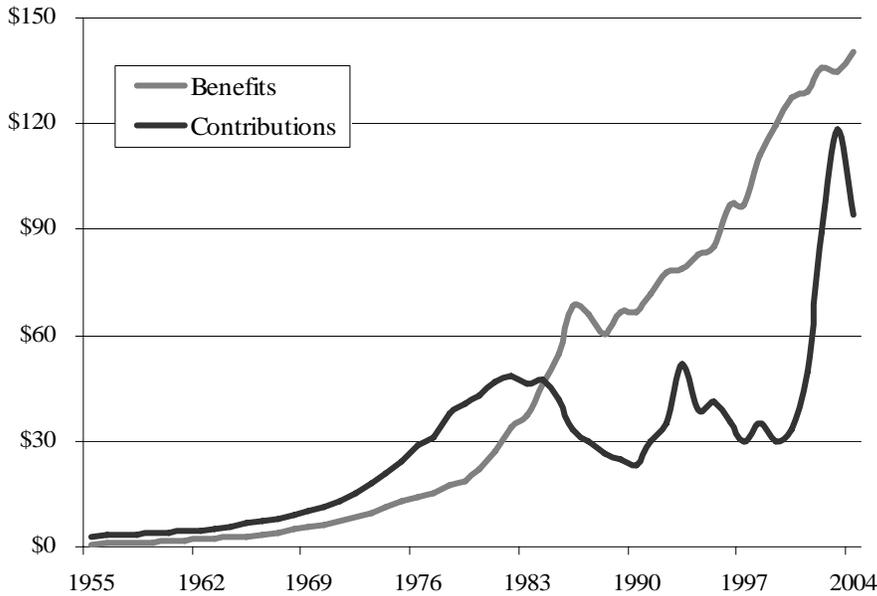
Sources: U.S. Department of Labor (2004); and authors' calculations from U.S. Department of Labor (2002-2006).

Figure 2. *Net Growth of Pension Plans, thousands, 1960-2006*



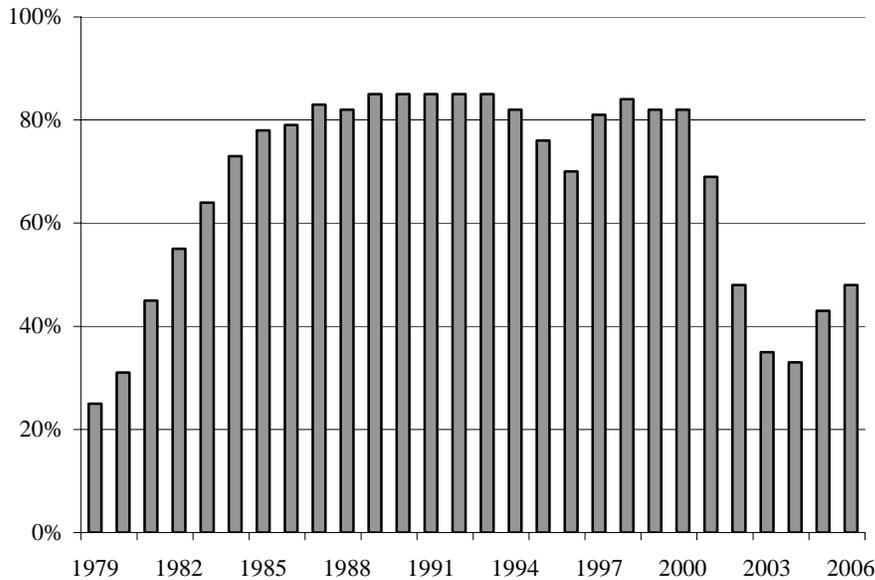
Sources: Data for 1960-1976 are estimated using Figure 1 from Warshawsky (1995); Data for 1977-1987 were estimated using data from McGill et. al. (1996); Data for 1988-2006 are from IRS Data Books (1988-2006).

Figure 3. *Defined Benefit Plans, Contributions and Benefits, billions, 1955-2004*



Sources: U.S. Department of Labor (2004); U.S. Department of Commerce National Income and Product Accounts (1955-1975).

Figure 4. *Percent of Large Plans with Assets Greater than Current Liability for Accrued Benefits, 1979-2006*



Note: Current liability is the actuarial present value of accrued benefits using assumptions specified by the internal revenue service. The value is disclosed in the plan's Form 5500 Schedule B. The interest rate used in this calculation was between 90 percent and 105 percent of the 30-year Treasury over the past 4 years. The Job Creation and Worker Assistance Act of 2002 increased the limit to 120 percent for 2002 and 2003. The Pension Equity Funding Act of 2004 raised the rate to the long-term average of the corporate bond rate for 2004 and 2005. The PPA extended the use of the corporate bond rate for 2006.  
 Source: Watson Wyatt Worldwide (1986, 1992, 1998, 2001, 2003, 2006).