

# Nature and Implications of Pension Plan Freezes in the United States since 1998

Martin Holmer, Policy Simulation Group \*

November 8, 2013

## Abstract

This report documents how the recent trend in defined benefit pension plan freezing — as revealed in unpublished tabulations of National Compensation Survey data — has been used to project future freezes in PENSIM. The report describes the nature of the freeze assumptions that, beginning in 2013, are included in the baseline PENSIM assumptions regarding employer pension offerings. The report also describes the consequences of this trend for pension participation, employer pension cost, and future employee pension benefits. The sensitivity of the pension benefits consequences are tested by projecting future freezes at half the recent rate and at twice the recent rate.

Over the past decade or two there have been a number of defined benefit (DB) plan freezes in which employers close their DB plans to either new or all employees. When a plan is closed to only new employees, but existing plan participants continue to accumulate years of service, the event is called a soft freeze. When a plan is closed to all employees, and no employees accumulate additional years of service under the DB plan, the event is called a hard freeze. The results of the first comprehensive survey of DB plan freezes in the private sector were published by the Government Accountability Office

---

\*This report has been produced for the Employee Benefits Security Administration (EBSA) by the Policy Simulation Group (PSG) under contract DOLJ089327413, Task 5. The analysis in this report does not necessarily reflect the views of EBSA, its employees, or the Department of Labor.

(GAO) in 2008.<sup>1</sup> Subsequently the Bureau of Labor Statistics (BLS) began publishing annual data from the Employee Benefit Survey (EBS) portion of the National Compensation Survey (NCS) on DB plan freezes in both the private and non-federal public sectors.<sup>2</sup> Each DB plan sponsor was asked whether the plan was frozen, and if so, when the freeze occurred, what type of freeze was implemented, and what kind of defined-contribution (DC) pension plan was available to employees after the freeze. The most recent publicly available DB freeze data from the NCS EBS are for March 2012.<sup>3</sup>

In older versions of PENSIM, future DB plan offerings are simulated using NCS EBS data on unfrozen plans from the 1996–98 period.<sup>4</sup> Clearly there are fewer DB plans offered now than in the late 1990s and it would be desirable to revise PENSIM to reflect this recent trend away from offering DB plans. It is the projection forward in time of the late 1990s DB plan offerings of employers that needs to be revised in PENSIM. Such a revision requires not a change in 1996–98 offerings (which are correct), but rather the addition of information about how offerings are changing in the years after 1996–98.<sup>5</sup>

Beginning with the 3/15/2013 version, PENSIM has been able to simulate **post**-1996–98 DB pension plan freezes. This report describes the baseline parameter values of the DB-freeze process, which are derived from results of *unpublished* BLS tabulations, undertaken at the request of EBSA, of recent NCS EBS data on freezes. Then the report analyzes the implications (for employee pension participation, employer pension costs, and pension benefits in retirement) of assuming that the recent trend in DB plan freezes continues

---

<sup>1</sup>GAO, *Defined Benefit Pensions: Plan Freezes Affect Millions of Participants and May Pose Retirement Income Challenges*, GAO-08-817, July 2008.

<sup>2</sup>Scott F. Curtin, “Alternatives to Frozen Defined Benefit Pension Plans,” Bureau of Labor Statistics *Compensation and Working Conditions*, August 28, 2009 (<http://www.bls.gov/opub/cwc/cm20090826ar01p1.htm>).

<sup>3</sup>Published tabulations of the NCS EBS data for March 2012 are available at (<http://www.bls.gov/ncs/ebs/benefits/2012/>). Tabulations of the March 2009 data are available at (<http://www.bls.gov/ncs/ebs/benefits/2009/>).

<sup>4</sup>Martin Holmer, *et al.*, *PENSIM Overview*, Washington, DC: Policy Simulation Group, March 2013 (with periodic revisions) (<http://www.polsim.com/doc/overview.pdf>); and Martin Holmer and Asa Janney, *Characteristics of Pension Plans in the United States, 1996–98*, Washington, DC: Policy Simulation Group, December 2003 (<http://www.polsim.com/doc/penchar.pdf>). See *PENSIM Overview*, Chapter 10, for an explanation of how **pre**-1996–98 pension offering trends have been incorporated into the baseline PENSIM assumptions.

<sup>5</sup>See *PENSIM Overview*, Chapter 10, for an explanation of how **post**-1996–98 trends in pension offerings that are unrelated to the DB plan freezes considered in this report have been incorporated into the baseline PENSIM assumptions.

into the future. The report concludes with a discussion of how much the implications change if the future rate of DB plan freezing is half the recent rate or twice the recent rate.

All of the analysis described in this report makes the assumption that individual behavior with regard to DC plan participation, contribution, and balance rollover at job end, as well as the timing of retirement and pension claiming, is unchanged by the freezing of DB plans. While it is possible to change this employee behavior in PENSIM when simulating more DB plan freezes, uncertainty about the magnitude of such changes suggests a simpler analysis that measures just the impact of changes in employer pension offering behavior. Also, in these simulations most individuals with jobs having frozen DB plans work for employers who froze their DB plans years before the individual starts the job, raising a question about whether it is plausible to assume that an individual's behavior would be affected by the fact that their employer had offered an DB plan years before starting the job. It is possible to use PENSIM to conduct sensitivity tests that assume higher DC plan participation, more contributions, or more frequent rollovers, as well as a delay in retirement, but that sort of employee behavior sensitivity testing is not undertaken in this report.

## **Definition of Narrowly-Defined DB Plan Freezes**

NCS EBS data indicate that there have been two different kinds of DB plan freezes in recent years. The first kind of freeze involves the replacement of one DB plan with another DB plan. The second kind of freeze involves the replacement of a DB plan with a DC plan (or no plan). Since the turn of the century, most private-sector freezes have been the second DB-to-DC type, while most public-sector freezes have been the first DB-to-DB type.<sup>6</sup>

For many years, the baseline PENSIM assumptions regarding employer pension offerings have included the major offering trends over the 1975–2005 period.<sup>7</sup> These 1975–2005 trends include the shift from offering traditional DB plans toward offering cash-balance DB plans even as the fraction of private-sector employers offering any kind of DB plan dropped substantially.

Given that PENSIM already includes trends in the type of DB plan offered, the DB freeze trend discussed here will focus exclusively on DB plan

---

<sup>6</sup>This statement is based on the publicly available tabulations of NCS EBS data cited above.

<sup>7</sup>See the first few pages of Chapter 10 of the *PENSIM Overview* for details.

freezes that involve the replacement of a DB plan with a DC plan or no plan.

The NCS EBS data permit this sort of distinction and maintaining this *narrow definition of a DB plan freeze* will allow major simplifications in the required microsimulation model enhancements. This simplification is also consistent with the hypothesis that, in the private sector, most of the traditional to cash-balance freezes have already been implemented and most future freezes are likely to involve a switch from offering a DB plan to offering a DC plan or no plan.

## **Recent Trends in Narrowly-Defined DB Plan Freezes**

This section summarizes how PENSIM simulates the timing and nature of narrowly-defined DB plan freezes and the characteristics of DC plans offered by employers after these DB plan freezes. More details on all these issues are available in section 7 of Chapter 10 in the most recent *PENSIM Overview*. Described here are the baseline DB freeze parameters used in PENSIM to project recent DB freeze trends into the future. It is easy for PENSIM users to change these parameter values, and therefore, simulate future trends in DB freezes that differ from recent trends (as is done at the end of this report).

Narrowly-defined DB plan freeze events in PENSIM are generated by a stochastic process with a piecewise linear exponential hazard function. There is a separate stochastic process for the private sector and for the state and local government sector. It is assumed that there will be no DB plan freeze in the federal government sector. Each stochastic process has a different start date and different rates of freezing in as many as three different time periods.

The starting dates and rates of the two stochastic processes are based on results from unpublished BLS tabulations of NCS EBS data gathered between 2009 and 2012. The private sector DB plan freeze process starts in 1999 and has an annual hazard rate of 0.0185 through 2011, which drops to 0.0116 beginning in 2012. The state and local government sector DB freeze process has an annual hazard rate of 0.0036 starting in 2008.<sup>8</sup>

Among participants in DB plans that are frozen (under this narrow definition), what fraction are in plans that are frozen hard rather than soft? Based on unpublished BLS tabulations, PENSIM assumes the hard-freeze

---

<sup>8</sup>The unpublished tabulations of the BLS NCS freeze data indicate that very few workers in state and local governments are in frozen DB plans that have been replaced by DC plans as of 2011. Recent legislative activity in some states suggests that in future years there may be more DB-to-DC freezes, but for the time being PENSIM projects a very slow rate of DB freezes in the state and local government sector.

probability is zero in the state and local government sector. In the private sector, the hard-freeze probability is 0.20 through 2009 and 0.40 beginning in 2010.

What kinds of DC plans are offered by employers after DB plans are frozen? Based on the unpublished BLS tabulations, PENSIM assumes that all employers in the state and local government sector offer a new or enhanced DC plan after the narrowly-defined DB plan freeze.

In the private sector among these narrowly-defined DB plan freezes, almost all employers offer a new or enhanced DC plan after the freeze. The fraction who do not is 7 percent in 2009 and 14 percent in 2012.<sup>9</sup> The baseline PENSIM assumption is that all private sector employers that freeze their DB plan, and had offered a DC plan before the freeze, offer a new or enhanced DC plan after the DB freeze. But some fraction of private sector employers that freeze their DB plan, and had *not* offered a DC plan before the freeze, offer no DC plan after the DB freeze. The probability of this subset of private sector employers not offering a DC plan after the freeze is assumed to be 0.20 through 2009 and 0.60 beginning with 2010 in the PENSIM baseline assumptions. The assumed values of this probability imply overall no-DC percents of 7 in 2009 (which is equal to the percent tabulated by BLS), 9 in 2012 (which is below the 14 percent tabulated by BLS), and 12 in 2050.

The post-freeze DC plan offerings are more complex than has been described so far because BLS defines a DC plan to mean a defined-contribution pension plan to which the sponsoring employer makes some kind of contribution, which excludes zero-matching salary-reduction plans. The PENSIM baseline assumption is that even if a private sector employer does not offer a BLS-style DC plan after the freeze, that employer will offer a zero-matching salary-reduction plan so that employees can avail themselves of the favorable income tax treatment of contributions to those plans while employers incur no contribution costs.

The PENSIM baseline assumption is that all employees who continue to accrue benefits under a soft-frozen DB plan continue participating in any pre-freeze DC plan and are not eligible for any new or enhanced DC plan offered by the employer after the DB freeze.

What are the detailed characteristics of the new or enhanced BLS-style DC plans offered after the DB freeze? PENSIM assumes that they are all positive-matching DC savings and thrift (DC/ST) plans.

---

<sup>9</sup>These unpublished NCS EBS estimates are participant weighted, are computed from data collected in March, are rounded to the nearest whole percent by BLS.

The post-DB-freeze DC/ST plans in the state and local government sector are assumed to be generous, all having the following characteristics: immediate and universal eligibility, immediate and complete vesting in employer contributions, automatic enrollment with a default three percent contribution rate, and employer matching at 100 percent of employee contributions up to 6 percent of earnings.

The post-DB-freeze DC/ST plans in the private sector are assumed to vary in their characteristics based on the unpublished BLS tabulations of NCS EBS data plus additional assumptions as described below. With respect to plan eligibility, 60 percent of employees in these plans are assumed to be covered by a plan with immediate eligibility, 30 percent with eligibility after one year of service, and 10 percent are assumed to be covered by a plan that grants eligibility to only those age 21 with one year of service.<sup>10</sup> (However, employees who experience a hard freeze on the job are assumed to be given immediate eligibility in any available DC plan.) The timing of vesting in employer contributions also varies: 35 percent have plans with immediate vesting, 25 percent have one-year cliff vesting, and 40 percent have gradual vesting over a two year period.<sup>11</sup> The unpublished BLS tabulations of BLS-style DC/ST plans paired with frozen private-sector DB plans indicate a relatively low fraction with automatic enrollment features. The baseline PENSIM assumption is that before 2010 only 25 percent of employees were covered by post-DB-freeze plans with automatic enrollment, but that beginning in 2010 the percent rises to 50 to more closely approximate the projected spread of automatic enrollment in other DC/ST plans. And finally, the employer matching characteristics of the post-DB-freeze DC/ST plans are assumed to vary as follows: 35 percent of employees covered by these plans have a plan where the employer matches employee contributions

---

<sup>10</sup>The unpublished BLS tabulations are: immediate 48.9%, service-all 35.7%, service-plus-age-21 8.6%, other 8.5%, unknown 6.8%. Assuming that the service requirement is one year and distributing the other and unknown 15.3% among the other three categories in proportion to the pre-distribution category percents, produces: immediate 57.74%, one-year-service 32.00%, one-year-service-plus-age-21 10.16%. Rounding to the nearest ten decimal points produces the 60, 30, 10 distribution described in the text.

<sup>11</sup>The unpublished BLS tabulations are: immediate vesting 33.0%, cliff vesting 23.4%, graded vesting 37.9%, unknown 5.6%. Assuming that cliff vesting results in full vesting after one year and that graded vesting results in full vesting in two years, and distributing the unknown 5.6% among the other three categories in proportion to the pre-distribution category percents, produces: immediate 34.96%, one-year-cliff 24.79%, two-year-graded 40.15%. Rounding to the nearest whole percentage point produces the 35, 25, 40 distribution described in the text.

at 100 percent up to 6 percent of earnings, 47 percent are in plans that match at 50 percent up to 6 percent of earnings, 10 percent have plans that match 100 percent up to 4 percent of earnings, and the remaining 8 percent of employees are covered by a post-DB-freeze DC/ST plan that matches 50 percent of employee contributions up to 4 percent of earnings.<sup>12</sup>

The rest of the report describes various implications of simulating the future using these baseline PENSIM assumptions regarding DB freezes. All these simulations use the 3/28/2013 version of PENSIM and 2012 baseline economic and demographic assumptions. First, the implications for pension participation are discussed, then the pension cost implications are considered, and finally the pension benefit implications are described. The report concludes with sensitivity tests that project future DB freezes at half the recent rate and at twice the recent rate.

---

<sup>12</sup>Four unpublished BLS tabulations are used to derive these matching/up-to percents. The first shows that among narrowly-defined DB plan freezes with a new or enhanced DC plan available after the freeze, about 71% of employees had a DC/ST plan available, 16% had a profit-sharing plan, and 13% had some other type of DC plan available. Second, among those with a post-freeze DC/ST plan, the univariate distribution of the plan matching percent was: 25 percent 7.4%, 50 percent 31.0%, 75 percent 3.2%, 100 percent 15.5%, 200 percent 0.0%, other percent 13.3%, other contribution description 28.5%, unknown 1.2%. Third, among those with a post-freeze DC/ST plan, the univariate distribution of plan up-to percent was: less than four percent 4.5%, four percent 6.3%, five percent 7.2%, six percent 48.3%, seven percent 0.7%, greater than seven percent 3.3%, other contribution description 28.5%, unknown 1.2%. And fourth, among those with a post-freeze DC/ST plan, the joint distribution of matching/up-to percents was: 100+/6+ 5.49%, <100/6+ 46.83%, 100+/ $<6$  9.97%, <100/ $<6$  7.98%, other contribution description 28.5%, unknown 1.2%. This joint distribution shows that the “other percent” in the univariate matching percent distribution was less than six percent.

To simplify the joint distribution, it is assumed (based on the univariate matching-percent distribution) that all the mass in the under six percent matching range is at four percent and all the mass in the six plus percent range is at six percent. And it is assumed (based on the univariate up-to-percent distribution) that all the mass in the 100+ range is at 100 percent and all the mass in the under 100 range is at 50 percent.

Distributing the other contribution description and unknown 29.7% among the other four joint-distribution categories in proportion to the pre-distribution category percents, produces 100/6 7.8%, 50/6 66.6%, 100/4 14.2%, 50/4 11.4% for DC/ST plans. If it is further assumed that all the other plans (most of which are profit-sharing plans) have generosity equivalent to the most generous (100/6) DC/ST plan category, then the joint distribution of matching and up-to percents rounded to the nearest whole percent is as described in the text: 100/6 35%, 50/6 47%, 100/4 10%, 50/4 8%.

## **Implications for Employee Pension Participation**

In this report pension participation rates are expressed as a percent of all employees (not as a percent of those eligible for a pension on their job). And pension participation is restricted to an employee's current job (not prior jobs). The rate for each year is calculated for employees of all ages. A trend toward freezing DB pension plans can be expected to cause a decrease in the fraction of all employees who participate in a DB plan (because it is assumed that, on net, no new DB plans are being offered by employers) and to cause an increase in the fraction of all employees who participate in a DC plan.

Figure 1 shows two sets of simulated DB pension plan participation rates projected from 2008 until 2078. One set of projections assumes no DB plan freezes (which is the same as assumed in older versions of PENSIM) and the other set assumes the baseline DB freeze parameters described above. In each set of projections, the participation rates are shown for employees in the private sector, for employees in the public sector (including the federal government workers), and for employees in the whole economy.

In both employment sectors the DB participation rate is projected to decline slowly from its current level reaching 8 percent in the private sector and 67 percent in the public sector. In the whole economy DB pension participation is projected to drop from 30 percent in 2008 to 18 percent in 2078.

Figure 2 is the same as Figure 1 except that it shows DC pension plan participation rates. These rates rise over time as DB plans are frozen, but the rises are not as large as the falls in DB participation rates. This is because currently most DB plan participants also participate in a DC plan. This arrangement is somewhat less prevalent among state and local government employees, which is why the public sector DC participation rate rises more than the private sector rate in Figure 2.

## **Implications for Employer Pension Costs**

A trend toward freezing DB pension plans will obviously reduce the cost to employers of providing DB pensions. But, depending on the generosity of DC plans sponsored by employers before and after freezing their DB plans, the decline in employer DB costs may be offset by a rise in employer DC costs. If that is the case, the net cost reduction will be less than the gross cost reduction. (Remember that this report assumes no freeze-induced change in employee DC plan participation probabilities or contribution rates, so there

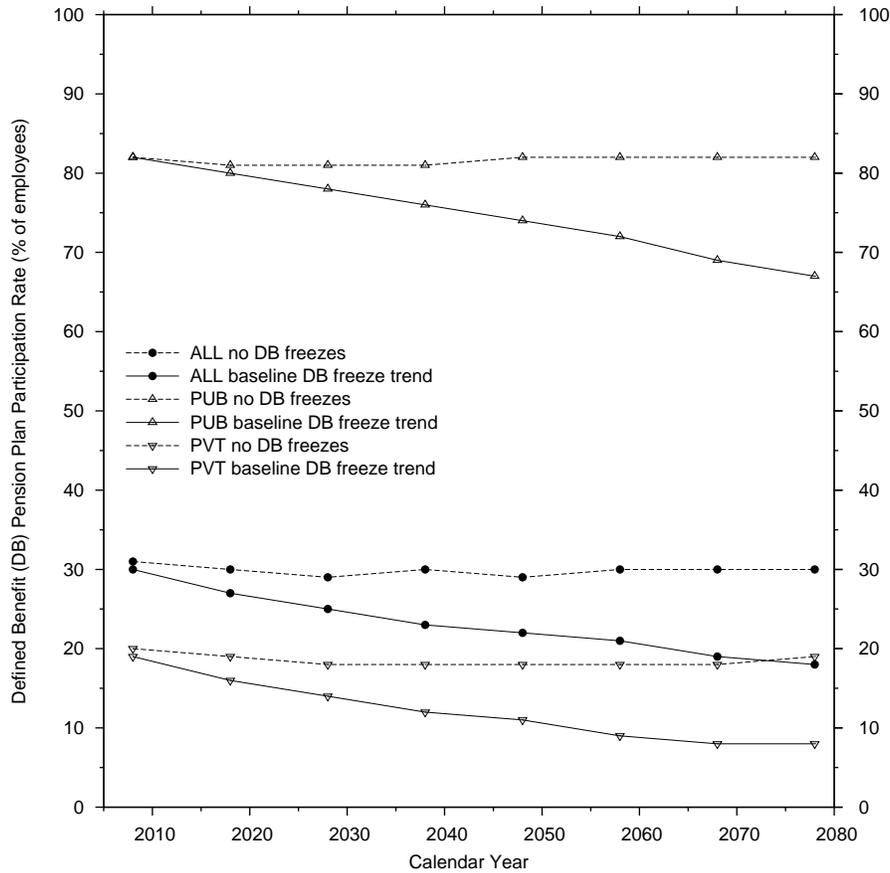


Figure 1: *Defined Benefit (DB) Pension Plan Participation Rate on Current Job by Employment Sector.* PENSIM (3/28/2013 version) projections under assumption of no DB freezes and under baseline assumption of continuation of recent DB freeze trends. DB participation is defined as being vested or being eligible and progressing toward vesting. The participation rate is expressed as a percent of all employees (of all ages), not as a percent of plan eligibles.

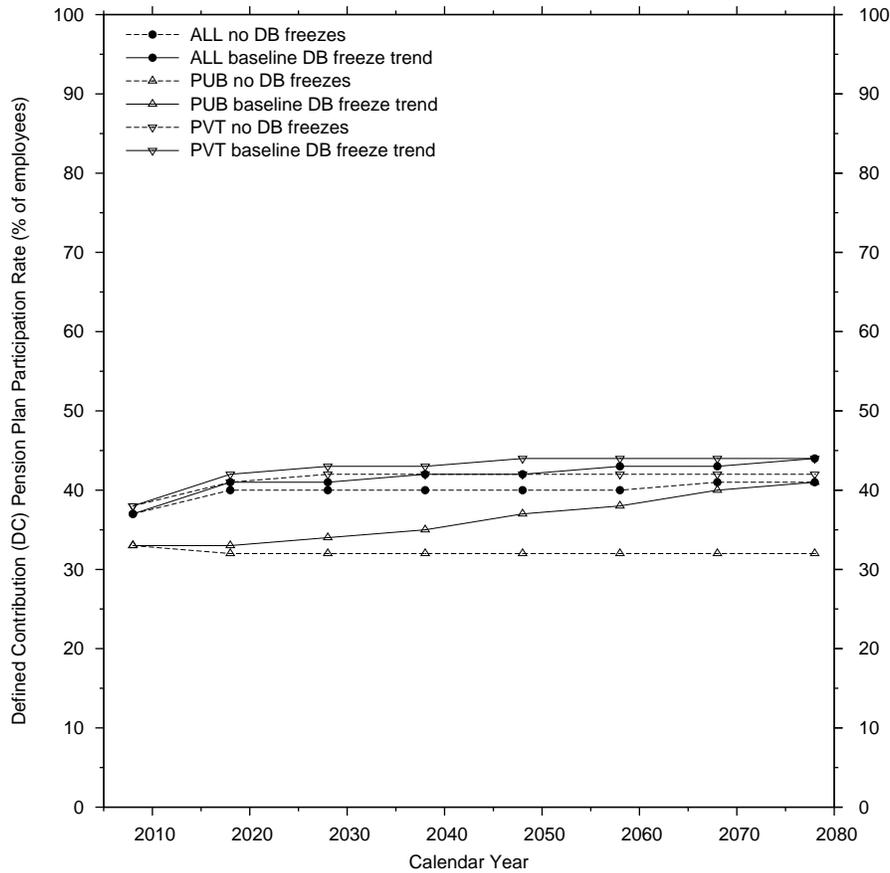


Figure 2: **Defined Contribution (DC) Pension Plan Participation Rate on Current Job by Employment Sector.** *PENSIM (3/28/2013 version)* projections under assumption of no DB freezes and under baseline assumption of continuation of recent DB freeze trends. DC participation is defined as being eligible for plan and having a positive plan account balance. The participation rate is expressed as a percent of all employees (of all ages), not as a percent of plan eligibles.

are no shifts in employee behavior that are affecting simulated employer DC costs.)

Figure 3 shows simulated percent reductions in the gross and net employer costs of providing pensions to members of the 2000 birth cohort that are caused by introducing the baseline DB freeze trend into PENSIM. The net employer cost reductions are not much less than the gross cost reductions because the baseline freeze assumptions imply that post-freeze DC plans are, on average, not much more generous than pre-freeze DC plans. This is more true in the private sector than in the public sector.

The magnitude of the gross cost reductions shown in Figure 3 depends not only on the generosity of the frozen DB plans, but also on the prevalence of DB plan freezes and on whether the freezes are hard or soft. Public sector DB plans are much more generous, on average, than private sector DB plans, but the cost reduction in the public sector is less because the prevalence of frozen DB plans is less and because all the freezes are assumed to be soft.

The far right-hand side of Figure 3 shows results produced by an extreme set of DB freeze assumptions. These results are for the private sector only and are generated from the assumption that all private sector DB plans are frozen in 2012. Under these assumptions, there are no employer costs in providing private sector DB pensions to members of the 2000 birth cohort because all private sector DB plans are frozen before they start working. The resulting employer cost reduction is simulated to be about 5.1 percent of pre-freeze payroll. This compares with an estimate of 5.2 percent produced from an analysis of Form 5500 data on 156 large hard-frozen DB plans conducted by Rauh, Stefanescu and Zeldes, in a recent working paper.<sup>13</sup> The closeness of these two different gross cost reduction estimates suggests that the employer cost of providing private sector DB plans simulated by PENSIM is not unrealistic.

## **Implications for Pension Benefits in Retirement**

Given the projected decline in DB pension participation shown in Figure 1, the fraction of families receiving DB pension benefits in retirement should be expected to fall in the future.

---

<sup>13</sup>Joshua D. Rauh, Irina Stefanescu, and Stephen P. Zeldes, “Cost Shifting and the Freezing of Corporate Pension Plans,” working paper, October 2012 ([http://kelley.iu.edu/stefanei/rsz\\_main.pdf](http://kelley.iu.edu/stefanei/rsz_main.pdf)). See *PENSIM Overview*, section 11.5, for a more complete discussion of their results, including the reason their *net* cost reduction estimates are biased downward.

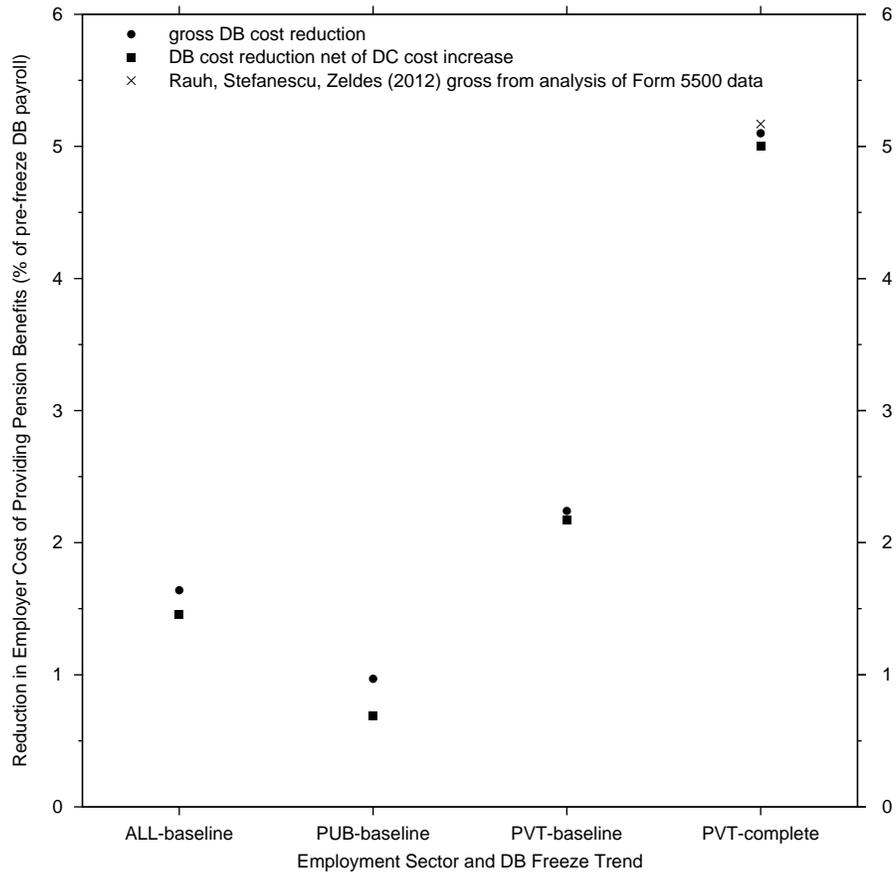


Figure 3: *DB-Freeze-Induced Reduction in Employer Cost of Providing Pensions to Cohort Born in 2000 by Employment Sector, with cost expressed as percent of pre-freeze DB payroll (that is, earnings of employees eligible for DB plans in the no-freeze-trend simulation).* Differences in employer cost in PENSIM (3/28/2013 version) projections under assumption of no DB freezes and under baseline assumption of continuation of recent DB freeze trends are labeled SECTOR-baseline. The cost reduction caused by a freeze of all private-sector DB plans in 2012 is labeled PVT-complete.

The projected decline in the family receipt of DB pension benefits among those between 70 and 74 years of age is shown in Figure 4. Notice that even under the assumption of no DB plan freezes (which is the same as assumed in older versions of PENSIM), the fraction of families receiving DB benefits is projected to decline from 48 percent in 2008 to 36 percent in 2048 and then level off. This decline is caused by past reductions in DB pension plan offerings by employers, a trend that started well before the late 1990s. In fact, tabulations of SIPP data indicate that the fraction of people age sixty or more (some of whom have not yet claimed pension benefits) whose family receives DB pension benefits was about 52% in 1998, 52% in 2003, 48% in 2006, and about 43% in 2010.<sup>14</sup>

When using the baseline DB freeze assumptions, PENSIM projects a somewhat more rapid decline in the family receipt of DB pension benefits in coming years. Figure 4 shows a decline from 47 percent in 2008 to 26 percent in 2078. The 47 percent estimate for 2008 can be directly compared to a 49.1 percent estimate tabulated from Heath and Retirement Study (HRS) data for 2008.<sup>15</sup> The decline implies that in about sixty-five years only one in four families aged 70–74 will receive a DB pension benefit.

Despite this projected decline in the receipt of DB benefits, families could have higher overall (DB plus DC) pension benefits in the future if the balances accumulated in DC plans generate annuity payments in retirement that rise by a larger amount than the freeze-induced decline in DB pension benefits. But the magnitude of the rise in DC plan balances depends critically on the pattern of corporate equity returns generated in the stock market from year to year. The analysis conducted for this report assumes that nominal equity returns vary from year to year in a log-normal random walk with a geometric mean of about 7.8% and an annual rate of return volatility of 20.2%.<sup>16</sup>

---

<sup>14</sup>Frank Porell and Diane Oakley, “The Pension Factor 2012: The Role of Defined Benefit Pensions in Reducing Elder Economic Hardships,” *National Institute on Retirement Security*, July 2012, Table 1, contains tabulations of the 1996, 2001, 2004, and 2008 panels of the Survey of Income and Program Participation (SIPP).

<sup>15</sup>James M. Poterba, Steven F. Venti, and David A. Wise, “Were They Prepared for Retirement? Financial Status at Advanced Ages in the HRS and AHEAD Cohorts,” *NBER Working Paper No. 17824*, Cambridge, MA: National Bureau of Economic Research, February 2012, Appendix Table 1-2.

<sup>16</sup>These stochastic equity return assumptions are similar to those used by the Department of Labor in its official, peer-reviewed, and OMB-approved regulatory impact analysis of default investment rules for defined contribution pension plans. A page on the PSG website (<http://www.polsim.com/well-known-users.html>) provides links to the final rule in the October 24, 2007, *Federal Register*, and to details of the regulatory impact analysis.

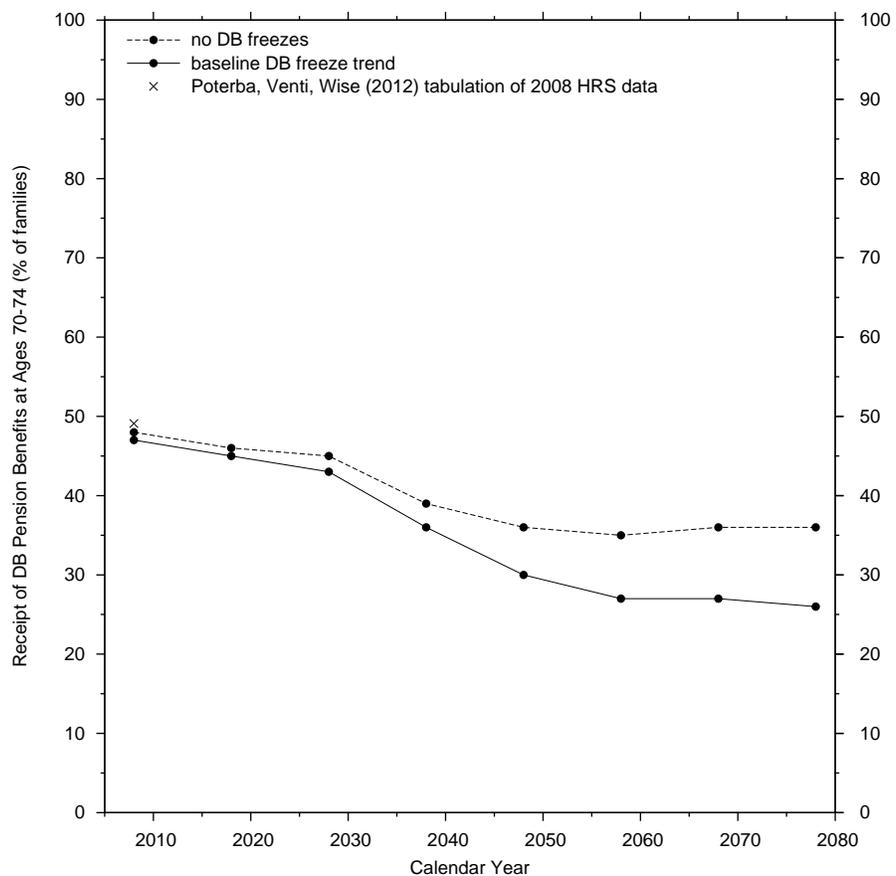


Figure 4: *Percent of Families Receiving DB Pension Benefit at Ages 70–74. PENSIM (3/28/2013 version) projections under assumption of no DB freezes and under baseline assumption of continuation of recent DB freeze trends.*

These equity return assumptions are used to generate 500 scenarios, each one of which has a different time series of equity returns over the lifetimes of those born in the year 2000. The simulated life histories are exactly the same across the 500 scenarios; only equity returns, and hence, DC and rollover account balances, and thus, DC-pension-generated annuity income differ across the scenarios. Comparing average family pension benefits at age seventy for the 2000 birth cohort under the no DB freeze assumptions (which is the same as assumed in older versions of PENSIM) and the baseline freeze assumptions described above, produces 500 different percentage reduction values for average family overall (DB plus DC) pension benefits, but just one percentage reduction value for average family DB pension benefits (because that value is the same in all 500 scenarios given that the stochastic assumptions do not affect DB pension benefits).

Figure 5 shows the percentage reduction in average family DB pension benefits and the distribution of the percentage reduction in average family overall (DB plus DC) pension benefits for the whole 2000 birth cohort and for each of its five lifetime family earnings quintiles.

For the whole cohort, although the reduction in average family DB pension benefits caused by projecting the recent DB freeze trends into the future is 20.1 percent, the reduction in average family overall (DB plus DC) pension benefits is much smaller: 5.6 percent at the median of the scenario distribution and between 4.3 and 7.1 percent in half the equity return scenarios. Consider a scenario that has relatively low equity returns that produce a relatively small increase in average DC benefit, and thus, a relatively large reduction in average overall pension benefits. Even in this scenario the resulting 95th percentile reduction in overall pension benefits is 8.5 percent, which is still much smaller than the 20.1 percent decline in DB benefits.<sup>17</sup>

Turning now to the lifetime family earnings quintile results in Figure 5, why is it that the lowest earnings quintile experiences the largest percentage reduction in average family DB pension benefits? The percentage reduction in DB benefits is 26.3 for the bottom quintile and steadily declines to 19.1 for the top quintile. The relatively high value for the bottom earnings quintile is caused mostly by the fact that under the no DB freeze projection it has the highest proportion of single-DB-beneficiary families among families who

---

<sup>17</sup>If corporate equity returns are assumed to be non-stochastic and equal to the assumed Treasury bond yield of 5.8% in every year, then the percentage reduction in overall pension benefits for the whole cohort is 7.3, which is higher than the 5.6 median in the stochastic case. The corresponding non-stochastic reduction percents for the lifetime family earnings quintiles are 10.8 for the bottom quintile, 8.3, 7.7, 7.2, and 6.8 for the top quintile.

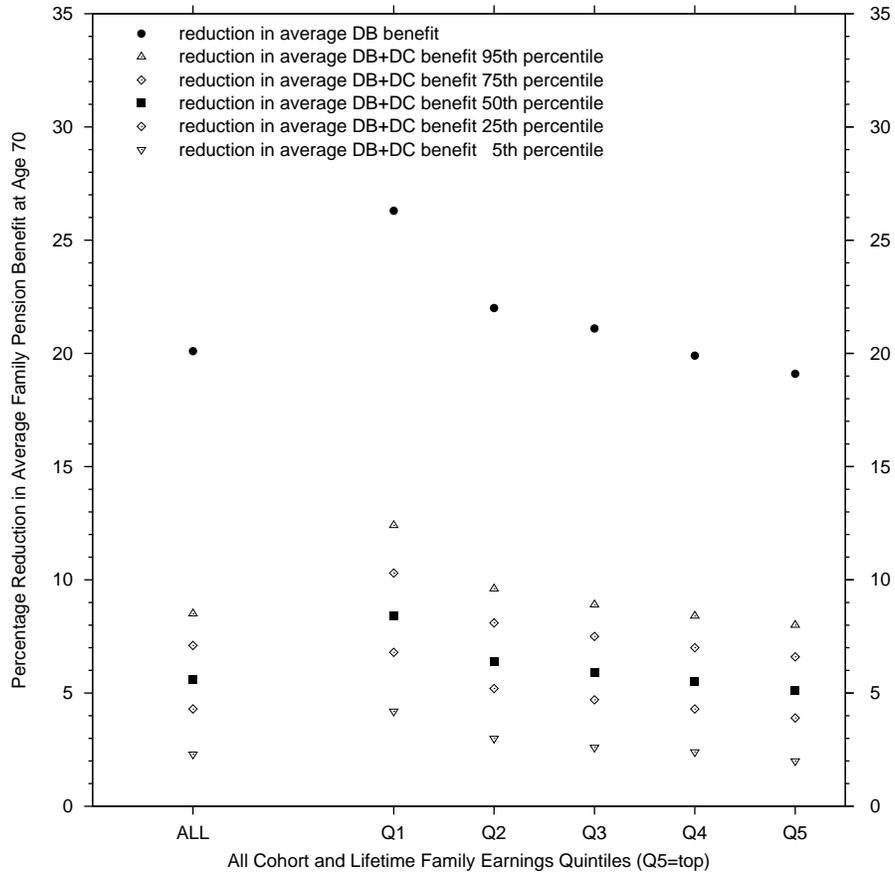


Figure 5: ***DB-Freeze-Induced Percentage Reduction in Average Family Pension Benefit Received at Age 70 by Cohort Born in 2000.*** Average benefit includes individuals whose family pension benefit is zero. Average benefit reduction computed from PENSIM (3/28/2013 version) projections under assumption of no DB freezes and under baseline assumption of continuation of recent DB freeze trends. Both projections assume stochastic corporate equity returns, which makes average DC benefit vary across 500 different time-series scenarios of simulated corporate equity returns. All other aspects of the cohort's lifetime experience are exactly the same across the 500 scenarios. The mean percentage reduction across the scenarios is either equal to or very close to the median shown in the graph. **See Appendix Table on page 20 for details including the impact of adding social security benefits to pension benefits, which is not shown here.**

receive a DB pension benefit (87% versus 73% in the top earnings quintile). This means that as DB plans are frozen over the course of their work lives, the bottom quintile experiences more often the loss of the only DB benefit received by the family under the no freeze assumptions. In other words, the relatively high proportion of single-DB-beneficiary families makes it more likely for an individual family in the bottom quintile to experience a one hundred percent reduction in DB benefits. Complete loss of DB benefits also occurs in the top quintile but not as often because a higher proportion of families have two DB beneficiaries under the no freeze assumptions.

The percentage reduction in average family overall (DB plus DC) pension benefits across the lifetime family earnings quintiles shown in Figure 5 mirror the quintile pattern of percentage reduction in average family DB benefits. The median percentage reduction in average overall pension benefits ranges from 8.4 in the lowest earnings quintile to 5.1 in the highest earnings quintile. In the 5th percentile scenario of low equity returns, the percentage reduction in average overall pension benefits is 12.4 for the bottom quintile. In the 95th percentile scenario of high equity returns, the percentage reduction in average overall pension benefits is 2.0 for the top quintile.

See Appendix Table on page 20 for more details on the results shown in Figure 5.

## **Sensitivity of Implications to Different Freeze Trends**

How much would the implications of DB pension plan freezes change if the future rate of freezing were different from the rate assumed in the baseline assumptions? To answer this question, two sensitivity tests are performed: one test assumes that the rate of DB plan freezing beginning in 2012 is half the baseline rate, and the other test assumes that the rate of DB plan freezing beginning in 2012 is twice the baseline rate. In both sensitivity tests, the rate scaling factor (that is, 0.5 or 2.0) is applied to the baseline hazard rate separately in the private sector and in the state and local government sector.

Figure 6 shows the median percentage reduction in the average family overall (DB plus DC) pension benefit for the whole 2000 birth cohort and for its lifetime family earnings quintiles. The figure reproduces from Figure 5 the median percentage reduction values produced by the baseline DB freeze assumptions and also shows the median values produced by assuming half and twice the baseline freeze rates.

Considering first the whole birth cohort, the median percentage reduction

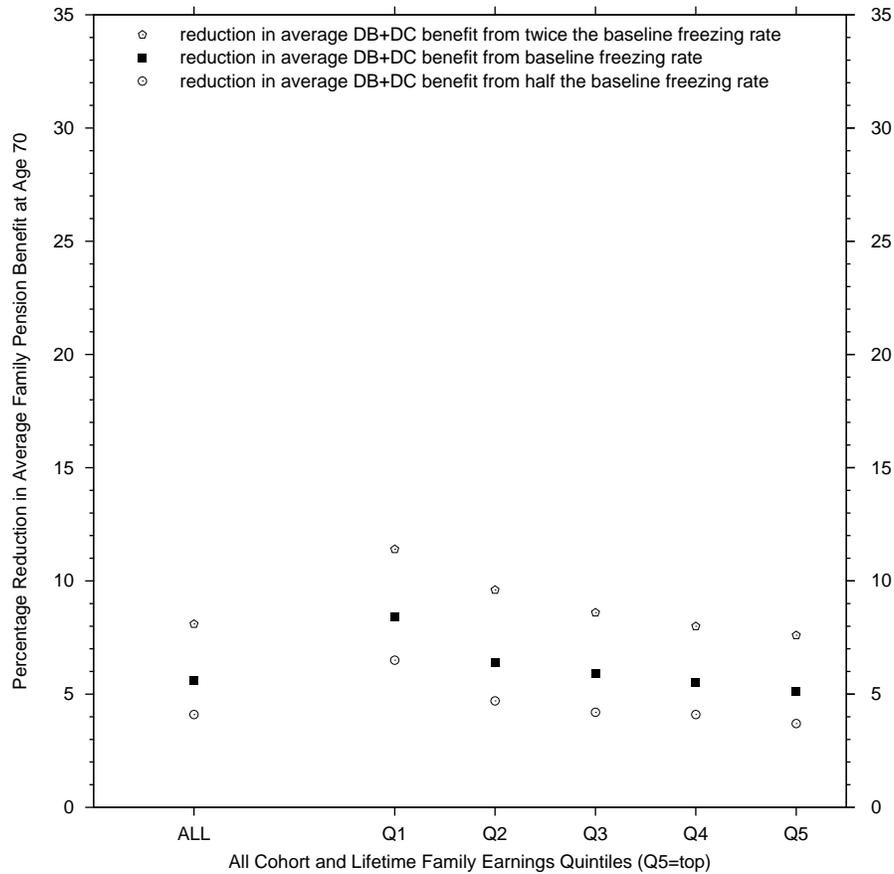


Figure 6: *Median DB-Freeze-Induced Percentage Reduction in Average Family Pension Benefit Received at Age 70 by Cohort Born in 2000, assuming baseline rate of DB plan freezing, half the baseline rate beginning in 2012, and twice the baseline rate beginning in 2012. Average benefit includes individuals whose family pension benefit is zero. Average benefit reduction computed from PENSIM (3/28/2013 version) projections under assumption of no DB freezes and under baseline assumption of continuation of recent DB freeze trends (or an assumption of slower trend or an faster trend). Both projections assume stochastic corporate equity returns, which makes average DC benefit vary across 500 different time-series scenarios of simulated corporate equity returns. All other aspects of the cohort's lifetime experience are exactly the same across the 500 scenarios.*

in the average family overall pension benefit falls from 5.6 to 4.1 when the projected DB freezing rate is half the baseline rate. When the projected freezing rate is twice the baseline rate, the median rises from 5.6 to an 8.1 percentage reduction.

Although not shown in Figure 6, the percentage reduction in the average family DB pension benefit for the whole cohort falls from 20.1 to 14.4 when the freezing rate is half the baseline rate, and rises from 20.1 to 29.7 when the freezing rate is twice the baseline rate.

Turning now to the results for lifetime family earnings quintiles in Figure 6, the median percentage reduction in overall pension benefits for the bottom quintile falls from 8.4 to 3.7 when the projected DB freezing rate is half the baseline rate. When the projected freezing rate is twice the baseline rate, the median rises from 8.4 to 11.4 for the bottom quintile.

For the top lifetime earnings quintile, the median percentage reduction in overall pension benefits falls from 5.1 to 3.7 when the projected DB freezing rate is half the baseline rate. When the projected freezing rate is twice the baseline rate, the median rises from 5.1 to 7.6 for the top quintile.

Although not shown in Figure 6, the percentage reduction in the average family DB pension benefit for the bottom earnings quintile falls from 26.3 to 19.5 when the freezing rate is half the baseline rate, and rises from 26.3 to 36.4 when the freezing rate is twice the baseline rate. For the top earnings quintile, the percentage reduction in the average family DB pension benefit falls from 19.1 to 13.7 when the freezing rate is half the baseline rate, and rises from 19.1 to 28.5 when the freezing rate is twice the baseline rate.

In conclusion, it is worth reiterating a point made at the beginning of the report: throughout the analysis described in this report, individual behavior is assumed to be the same under the no DB freeze assumptions and the baseline DB freeze assumptions, as well as in the two sensitivity tests. In other words, no individual behavioral responses to the DB plan freezes are assumed. For example, it is not assumed that people whose DB plan was frozen would contribute more to their DC plan or would work longer before retiring. Given the absence of such behavioral responses, the results presented here measure how much pension benefits would change without any individual responses. This means that the estimates show the magnitude of reductions in pension benefits that any individual behavioral responses would need to offset in order to maintain pension benefits at the same level they would be projected to be if there were no DB plan freezes.

## Appendix Table with Details of Figure 5 Results

Table shows results for the median percentage reduction in average family DB+DC pension benefit as shown with solid squares (■) in Figure 5 on page 16. Table also shows percentage reduction in average family DB pension benefit as shown with solid circles (●) in Figure 5. Social security (SS) benefits are payable benefits in 2070, which are estimated to be twenty-six percent below benefits scheduled under current-law policy. Average benefits at age seventy are calculated using all individuals in the group (even if they have a zero benefit), are adjusted for family size (by dividing couple benefits by 1.62), and are expressed in thousands of 2012 dollars.

	ALL	Lifetime Family Earnings Quintile				
		Q1	Q2	Q3	Q4	Q5
<i>Average Family Benefit in the No DB Freeze Projection:</i>						
DB:	11.081	1.765	4.368	8.615	15.039	25.612
DC:	15.869	2.631	6.432	12.921	21.553	35.394
DB+DC:	26.950	4.396	10.800	21.536	36.592	61.006
SS:	31.421	17.009	24.575	31.677	38.974	44.863
DB+DC+SS:	58.371	21.405	35.375	53.213	75.566	105.869
<i>Average Family Benefit in the Baseline DB Freeze Projection:</i>						
DB:	8.857	1.300	3.407	6.799	12.050	20.723
DC:	16.597	2.727	6.699	13.458	22.525	37.198
DB+DC:	25.454	4.027	10.106	20.257	34.575	57.921
SS:	31.421	17.009	24.575	31.677	38.974	44.863
DB+DC+SS:	56.886	21.039	34.688	51.947	73.566	102.802
<i>Percentage Change in Average Family Benefit:</i>						
DB: ●	-20.1	-26.3	-22.0	-21.1	-19.9	-19.1
DC:	+4.6	+3.6	+4.2	+4.2	+4.5	+5.1
DB+DC: ■	-5.6	-8.4	-6.4	-5.9	-5.5	-5.1
SS:	0.0	0.0	0.0	0.0	0.0	0.0
DB+DC+SS:	-2.5	-1.7	-1.9	-2.4	-2.6	-2.9

Notice that adding social security benefits to pension benefits reduces the percentage reduction in benefits for the whole cohort by more than half — dropping from a 5.6% reduction to 2.5% — and switches the quintile percentage reductions from being highest in the bottom quintile and lowest in the top quintile to being lowest in the bottom quintile and highest in the top quintile.