
Cost shifting and the freezing of corporate pension plans

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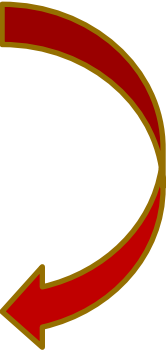
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The views expressed here are those of the authors and do not necessarily represent those of the Federal Reserve Board.

Retirement landscape (corporate sector)

\$ trillion assets

	1995	2000	2009	2012	2014
Defined Benefit Plans (DB)					
Private employers	1.5	2.0	2.2	2.7	3.2
Defined Contribution Plans (DC)					
Private employers	1.5	2.2	2.7	3.5	4.6
DB percentage	50%	48%	45%	44%	41%



Source: 2015 Investment company Institute report

Institutional background (DBPs):

- DBPs are governed by ERISA (1974);
- Sponsors make **tax-deductible contributions** to the pension fund, **manage the pension assets** and need to comply to specific **funding requirements**;
- **Sponsors promise a fixed retirement income** to employees (independent of the performance of the pension assets), based on salary and service.

Typically, participants receive at retirement (time r), an annual pension benefit equal to: $kN_r Y_r$, where k = benefit factor (for ex. 2%), N = years of service, Y salary at retirement.

- Bear **all investment risk** (and longevity risk);
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Shift Away From DBPs

HOW:

- ❑ Majority of new firms adopt DC arrangements.
- ❑ **Standard terminations** (mostly by small, well-funded employer plans);
- ❑ **Distress terminations** (few, but highly publicized).
- ❑ **Freezes** :
 - ❑ (a) “hard freeze
 - ❑ (b) “soft freeze”.
- ❑ **Conversions** to cash balance plans (CBPs) – as an alternative or predecessor to freezing.

WHY: (some of the most cited reasons)

- ❑ Increase in cost / risks of DB: investment, interest rate risk, longevity risk;
 - ❑ Volatility of mandatory contributions and changes in mandatory funding requirements (PPA 2006 and FASB 158);
 - ❑ Competitive pressures, employees’ demand for portability, etc.
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This Paper

Examines the **cost dimension** and studies the prospective **benefit accrual** patterns of defined benefit plans that freeze.

1. Do firms that freeze their DB plans have larger potential cost savings in the form of counterfactual DB accruals than comparable firms that do not?

Answer: Yes. Firms that froze would have faced on average at least 50% higher accruals as a share of firm assets than comparable firms that do not. The probability that a firm freezes a pension plan is positively related to the value of new accruals as a share of firm assets.

2. How much annual cost saving is realized by firms that freeze, taking into account both the DB accruals that they avoid and the increases in DC contributions that they make?

Answer: Firms are estimated to save around 3% of payroll per year. The savings amount to around 3% of total book assets for a 10-year horizon.

3. Which demographic groups generate most savings?

Answer: Realized savings are largest for workers aged 50-65 and smallest for workers aged 20-34.

Theoretical considerations

- In an **efficient market**, the worker's compensation would be equal to the marginal product of labor (MPL) and the freezing of pension benefits would not result in cost savings or the reduction in compensation.
 - However, if due to **labor market frictions** or **implicit contracts** some workers are receiving compensation in excess of MPL or outside wage opportunity, cost savings could be achieved.
 - Alternatively, if **workers value DB benefits less** than it costs the firm to provide them, there would be a surplus over which employers and employees can bargain and both parties would be better off.
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Implications of the results

Our findings that employers can achieve substantial savings is consistent with the last two possibilities:

- (1) A gap between compensation and MPL due to: search costs, firing costs, downward wage rigidities or implicit contracts;
- (2) Employees do not value DB benefits as much as they value a DC plan (see also evidence on life annuities) or they value the flexibility to change jobs.

Our results suggest that savings are achieved on older workers because of (1) – **see the demographic evidence-** and on younger workers because of (2) – **as the Cash Balance Plans freezes create savings** as well.

Related literature

- Modeling the differential risk characteristics between DB and DC plans: Bodie, Marcus and Merton (1988), Samwick and Skinner (2004), Poterba et al. (2007);
- DB pension accruals and their effects on labor market behavior: Lazear (1983), Mitchell and Fields (1984), Lazear and Moore (1988) and Stock and Wise (1990);
- Modeling the macroeconomic forces behind the shift: Kruse (1995) and Ippolito and Thomson (2000).
- Several papers look at the freeze sponsor financial characteristics (Munnell and Soto, 2007; Beaudoin, 2010), the subsequent impact on shareholder value (Rubin, 2007; Milevsky and Song, 2008; McFarland, Pang, and Warshawsky, 2009), decrease in liquidity pressures (Phan and Hegde, 2012) or risk taking activities (Choy, Lin and Officer, 2014)

Most of these studies came before the CBPs conversions and the wave of pension freezes of plans sponsored by large employers (ex. IBM, Verizon, GM, HP, Sears).

Our contribution to the literature

- Our data allows us to estimate the potential cost savings that could be generated by freezes not only at the plan level but also by age/service groups.
 - We can compare prospective savings of plans that are actually frozen with prospective savings of plans that have not been frozen.
 - We can examine any wage or alternative pension arrangements intended to offset the lost DB benefits in the period immediately following the freeze.
 - We can evaluate how much employees would have to value the structural features of DC plans in order to be indifferent between the two arrangements.
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Data and Methodology

Primary source: Form 5500 and its paper attachments. Filed annually with IRS and DOL, at plan level, from 1999 to 2010.

- Combined with COMPUSTAT (to identify the sponsors).
- Plan level filters: more than 1000 employees, availability of age-service-salary table.

Final sample: 8,484 plan-years

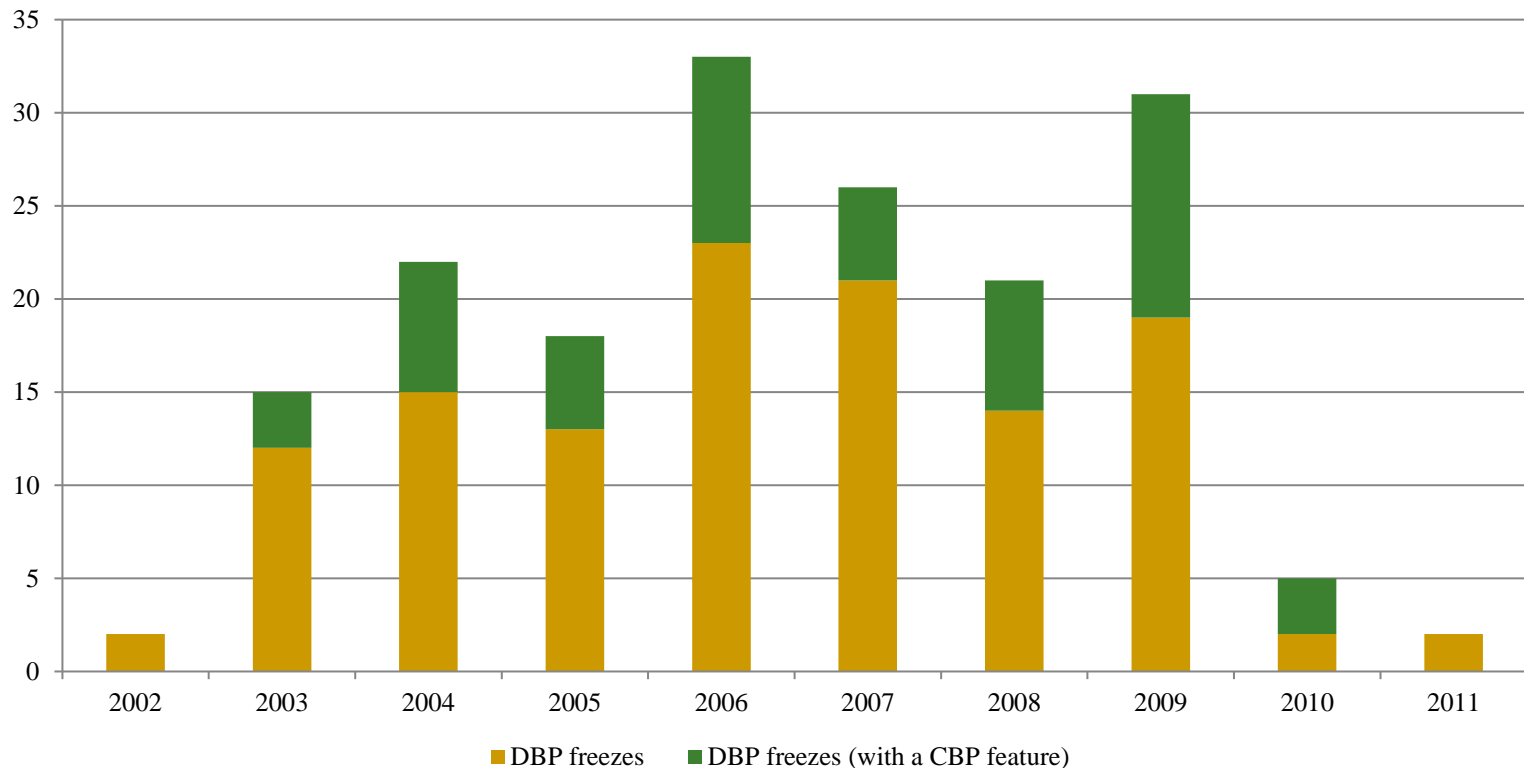
For each plan-year we **hand-collect** the following table:

Example: Xerox Corporation Retirement Income Guarantee Plan

Age Group	Service Group									
	<1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+
<25	157	297	38							
	\$37,272	\$47,783	\$46,381							
25-29	290	1,877	1,113	28						
	\$45,609	\$62,874	\$64,188	\$64,280						
30-34	268	2,037	2,704	678	69					
	\$48,594	\$70,739	\$71,797	\$73,889	\$70,838					
35-39	221	1,367	2,094	1,437	1,369	70				
	\$49,442	\$74,445	\$75,538	\$82,468	\$83,476	\$77,843				
40-44	205	1,047	1,624	1,049	2,007	2,373	355			
	\$53,620	\$75,557	\$77,173	\$85,723	\$90,267	\$85,715	\$78,478			
45-49	145	638	1,092	690	1,289	3,410	1,999	406		
	\$49,954	\$71,965	\$75,501	\$83,525	\$91,437	\$90,855	\$87,143	\$86,384		
50-54	103	428	651	432	806	1,060	1,224	1,696	114	
	\$51,393	\$72,208	\$73,844	\$80,177	\$87,100	\$89,129	\$91,712	\$93,062	\$88,210	
55-59	45	248	351	239	286	271	281	564	312	21
	\$51,026	\$71,141	\$77,044	\$75,080	\$82,843	\$87,265	\$91,771	\$93,768	\$91,462	\$93,106
60-64	13	76	120	66	50	54	52	73	96	36
		\$66,371	\$73,213	\$68,061	\$77,637	\$70,217	\$66,673	\$87,677	\$86,666	\$86,447
65-69	3	12	15	5	4	3	3	7	5	14
70+		1	1	6		1		2	1	2

Plan freezes

First we identify all ‘hard freezes’ reported in 5500, then manually checked against news, annual reports, the history of the plan: 213 plan freezes. Of these 175 plans report age-service matrices before the freeze (123 traditional DBPs and 52 with a cash balance feature).



Summary statistics

Traditional DBPs	Freezes (N=411)		Non-Freezes (N=5,022)		Difference (freeze-non-freeze)	
	mean	median	mean	median	mean	median
Sponsor level						
Total assets (sponsor) (\$mil)	22,545	2,814	36,932	6,664	-14,387 ***	-3,850 ***
Market leverage	0.34	0.28	0.30	0.25	0.04 **	0.03 **
Interest coverage	7.64	4.35	10.23	5.16	-2.59 **	-0.81 ***
EBITDA/ Sales	0.15	0.12	0.17	0.14	-0.02 ***	-0.02 ***
Plan level						
ABO= accumulated benefit obligation, or the pension obligation						
ABO (\$mil)	397	98	713	189	-316.00 ***	-91.50 ***
ABO/ Total Assets (sponsor)	10.6%	4.8%	8.1%	3.8%	0.02 ***	1.04% ***
ABO / Payroll	179.7%	100.5%	232.8%	152.0%	-53.0% ***	-51.5% ***
Payroll (\$mil)	232	97	333	116	-101.00 ***	-19.50 ***
Payroll/ Total assets (sponsor)	7.8%	5.0%	4.8%	2.4%	3.0% ***	2.6% ***
Salary per Active Participant	51,904	49,641	58,578	57,123	-6,673 ***	-7,482 ***
Active Participants (%)	55.7%	56.6%	50.2%	49.3%	5.5% ***	7.3% ***
Total Participants	9,522	3,671	13,810	4,797	-4,288 ***	-1,126 ***
Funding (%)	-6.2%	-9.1%	2.9%	-2.2%	-9.1% ***	-6.9% ***
Service Cost/ Payroll	5.67%	4.7%	6.57%	5.6%	-0.90% **	-0.81% **
Service Cost/ABO	5.49%	4.6%	4.47%	3.6%	1.02% ***	0.98% ***

Measurement of accruals (i.e. potential cost savings)

Cost savings generated by freezes are not directly observable.

However, the age/service distribution and the plan's characteristics at any point in time (**time t**) are. So we can estimate what the pension benefits would be in the absence and in the presence of a freeze a few years later (**time s, s>t**).

$$ABO_{s|[no\ freeze\ prior\ to\ s]} = kN_s Y_s Z_{s,R}$$

$$ABO_{s|[freeze\ at\ t]} = kN_t Y_t Z_{s,R}$$

k = benefit accrual (%)

N_s = number of years the employee has worked as of time s ;

Y_s = employee's salary as of time s ;

$Z_{s,R}$ = the cost as of time t of buying a deferred annuity stream of \$1 that begins at year R (retirement)

Measurement of accruals

For each worker, the pension benefit that is lost in the event of a freeze at time t is:

$$\lambda_{t,s} = ABO_{s|[no\ freeze\ prior\ to\ s]} - ABO_{s|[freeze\ at\ t]}$$

For example, the cost savings accumulated over a 5 year period would be:

$$\delta_{t,t+5} = kZ_t Y_t [5 + (N_t + 5) E(g_{t,t+5})]$$

Available parameters: salary (Y) and salary growth (g), service years (N), discount rate (i)

Calibrated parameters: k (benefit accrual percentage)

ENTRY and EXIT: estimated from plan time series

Age Group	Service Group									
	<1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+
<25	157	297	38							
25-29	290	1,877	1,113	28						
30-34	268	2,037	2,704	678	69					
35-39	221	1,367	2,094	1,437	1,369	70				
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45-49	145	638	1,092	690	1,289	3,410	1,999	406		
50-54	103	428	651	432	806	1,060	1,224	1,696	114	
55-59	45	248	351	239	286	271	281	564	312	21
60-64	13	76	120	66	50	54	52	73	96	36
65-69	3	12	15	5	4	3	3	7	5	14
70+		1	1	6		1		2	1	2

ENTRY and EXIT: estimated from plan time series

Age Group	Service Group									
	<1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+
<25	157	297	38							
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60-64	13	76	120	66	50	54	52	73	96	36
65-69	3	12	15	5	4	3	3	7	5	14
70+		1	1	6		1		2	1	2

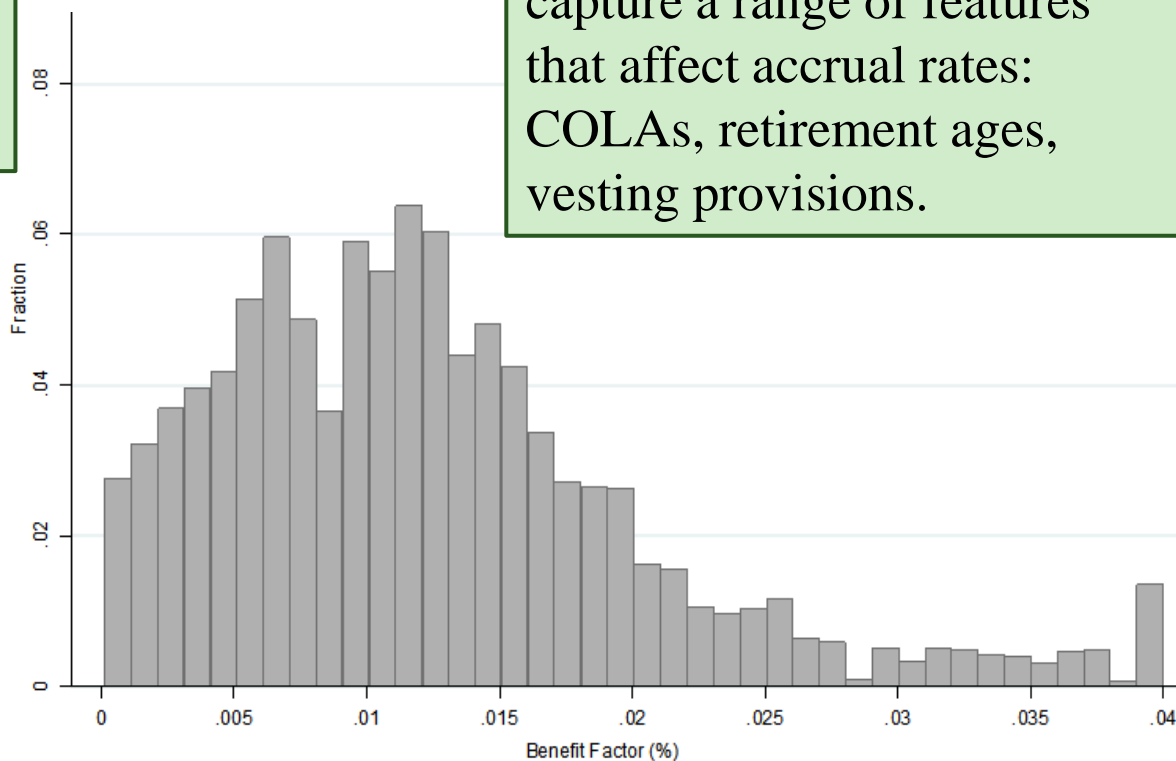
Calibration (k= benefit factor)

$$\widehat{SC}_t^2 = \sum_a \sum_s SC_{w,t} = k \sum_a \sum_s Z_{t,R} [N_{w,t+1} Y_{w,t+1} - N_{w,t} Y_{w,t}]$$

We use past reported service cost (i.e. accruals at the plan level) and the benefit formula to extract the benefit factor.

Note: the k s we estimate also capture a range of features that affect accrual rates: COLAs, retirement ages, vesting provisions.

	Freezes	Non-Freezes
Benefit Factor	1.33%	1.23%
Discount rate	6.15%	6.26%
Salary Growth	4.45%	4.36%



Accrual comparison (freeze vs. non-freeze)

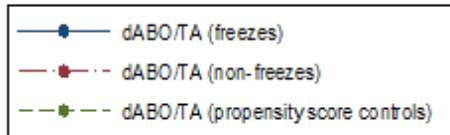
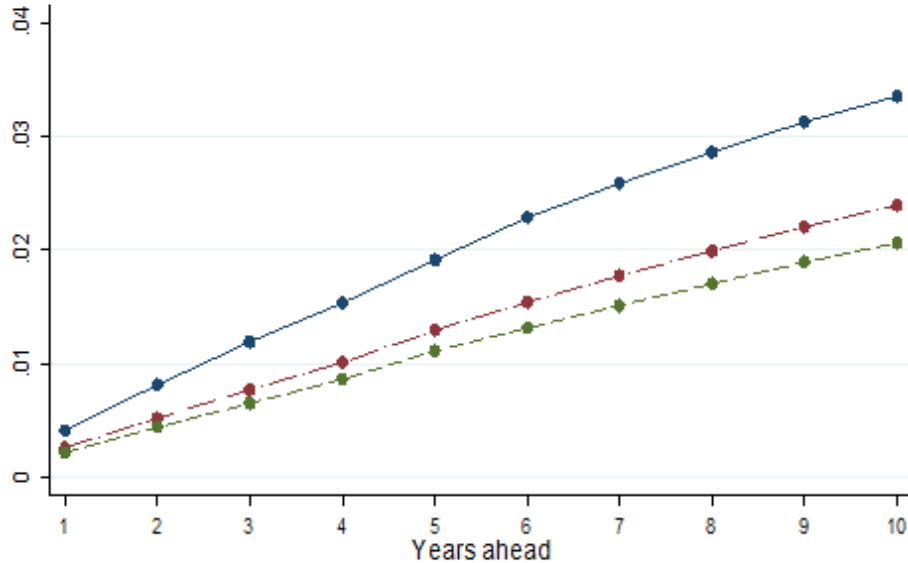
	N	Sig.(diff)	Year +1	Year +5	Year +10
Freezes	116	***	0.0041	0.0185	0.0335
Non-freezes	4,896	***	0.0026	0.0124	0.0239
<u>Ind</u> Controls	1,634	***	0.0026	0.0125	0.0245
PS Match1	116	***	0.0022	0.0108	0.0213
PS Match2	116	***	0.0023	0.0112	0.0221
PS Match3	116	***	0.0022	0.0106	0.0206

DB accruals are **at least 35% lower for non-freeze firms.**

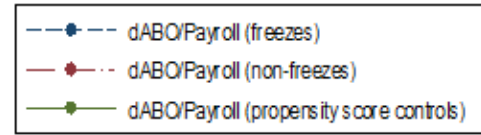
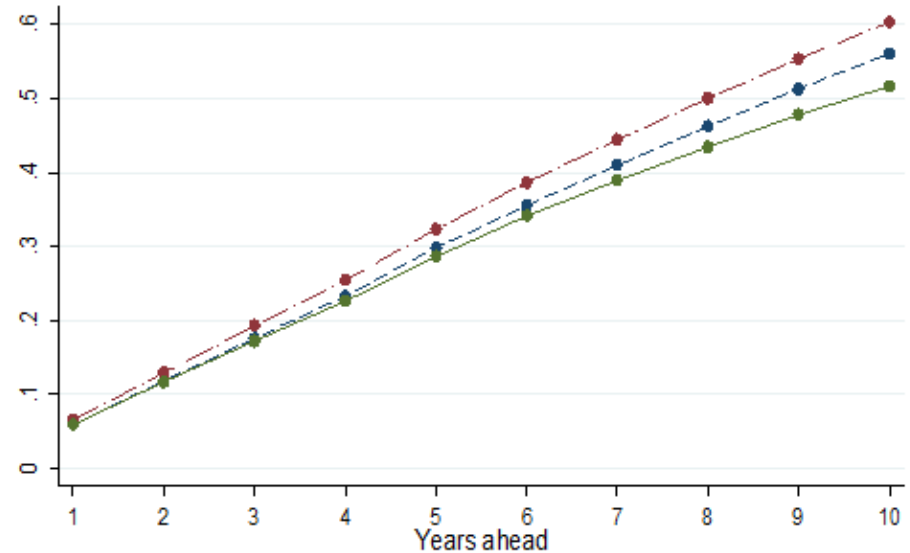
The potential savings for freeze firms are therefor larger.

Projected benefit accruals (freeze and non-freeze plans)

Projected Benefit Accrual/Total Assets



Projected Benefit Accrual/ Payroll



Accrual comparison (freeze vs. non-freeze)

Cash Balance Plans Freezes

	N	Sig.(diff)	Year +1	Year +5	Year +10
Freezes	49		0.0026	0.0126	0.0247
Non-freezes	1,641	*	0.0018	0.0091	0.0177
Ind Controls	338	**	0.0015	0.0072	0.0140
PS Match1	49	*	0.0018	0.0093	0.0181
PS Match2	49	*	0.0019	0.0095	0.0186
PS Match3	49	*	0.0019	0.0097	0.0187

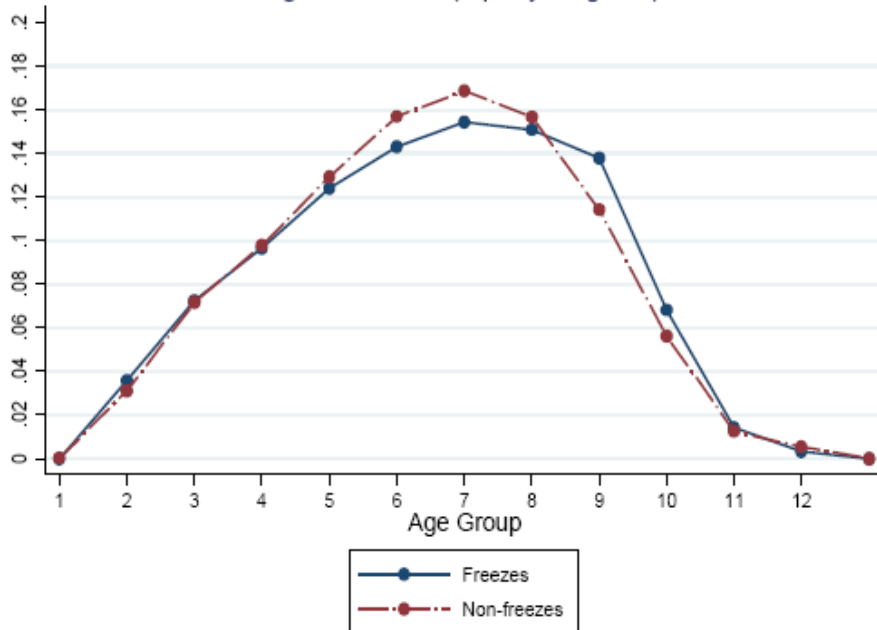
DB accruals are at least 8% lower for non-freeze firms.

Similar calculations for CBPs lead to similar results.

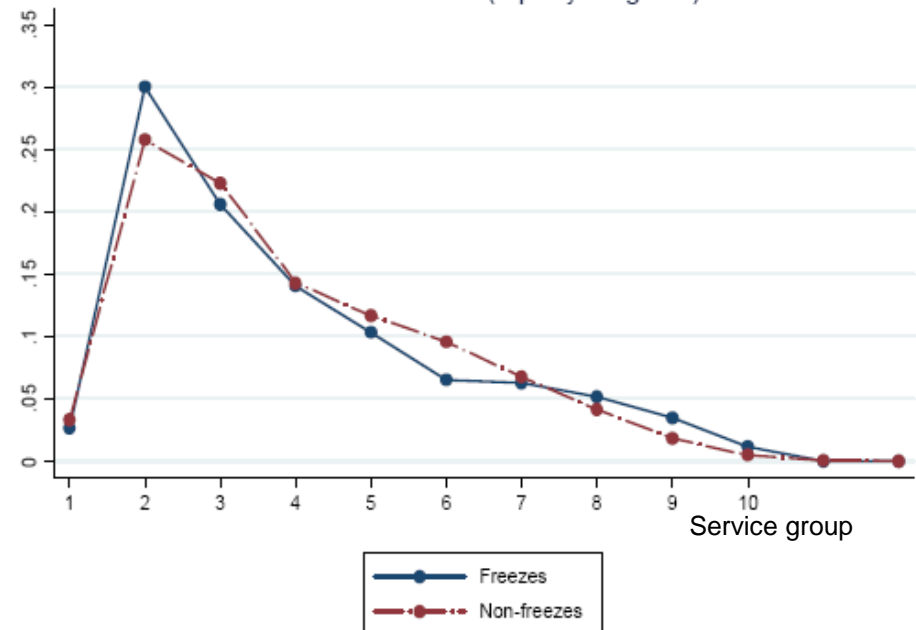
Where do costs savings come from?

Higher k + higher g + lower i + larger payrolls + **Age/Service Distributions**

Age distribution (equally weighted)

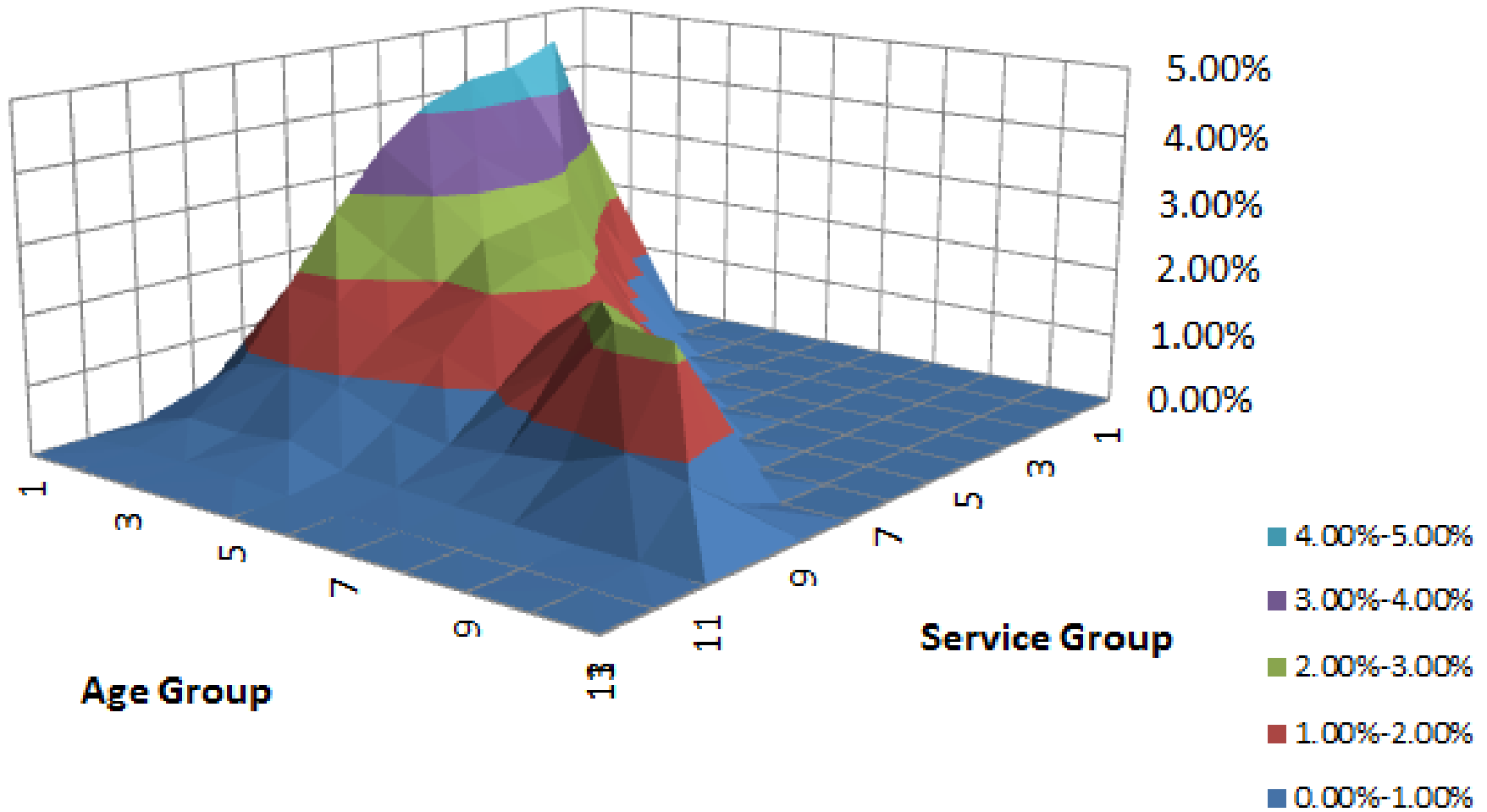


Service distribution (equally weighted)

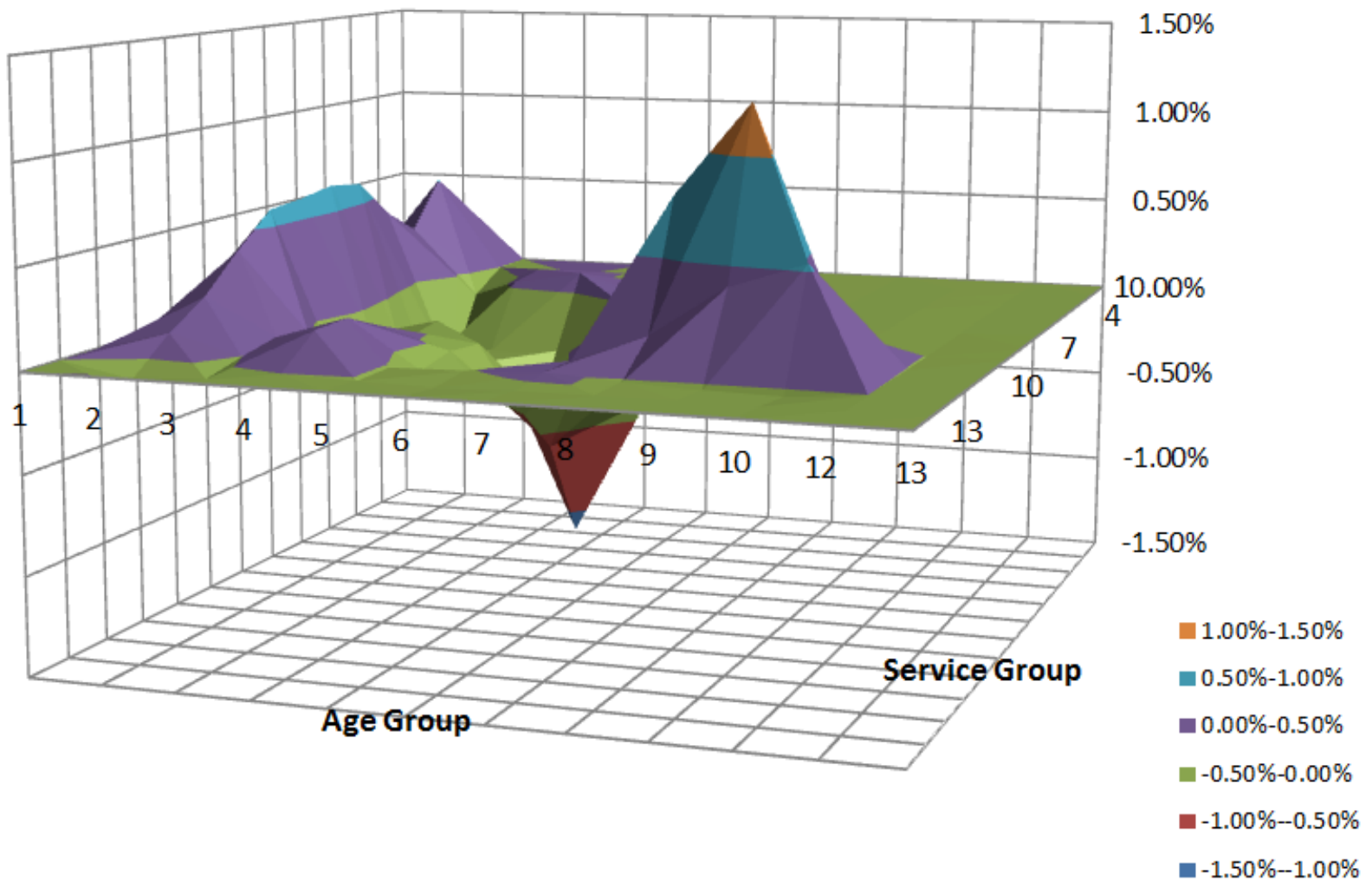


Age Group	1	2	3	4	5	6	7	8	9	10	11	12
Age	<20	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74
Service Group	1	2	3	4	5	6	7	8	9	10	11	12
Service	<1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40	45	50

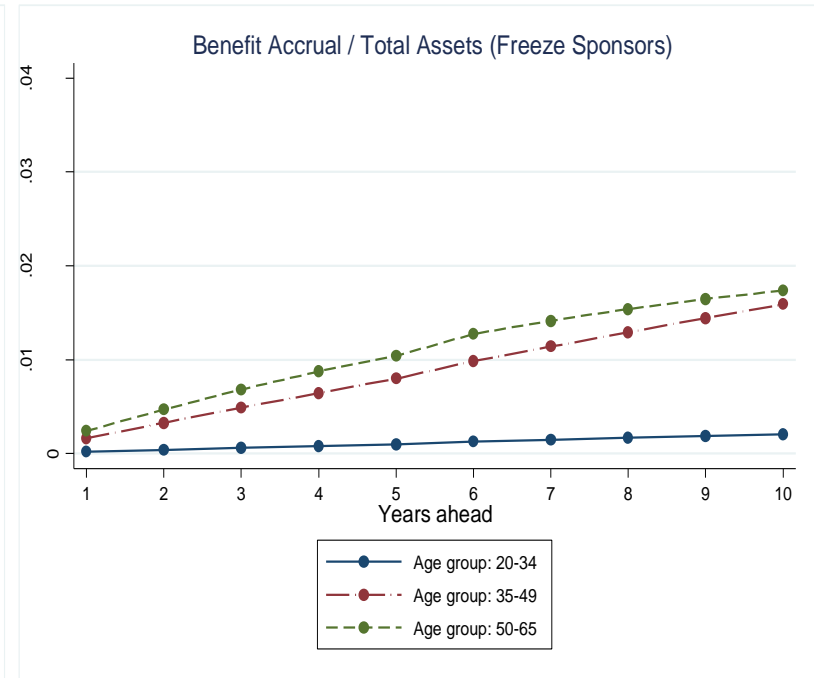
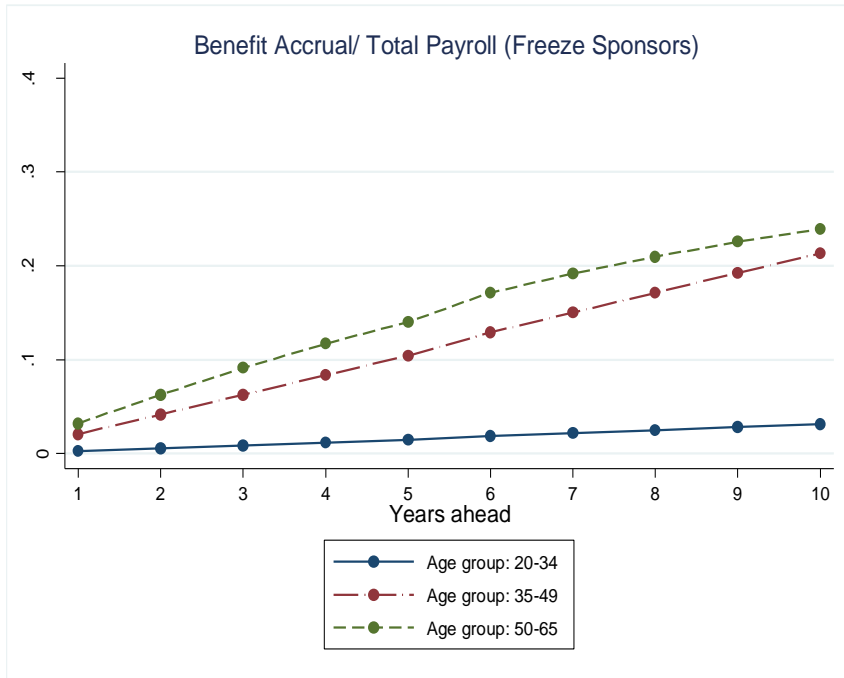
Age Service Distribution (Freezes)



Difference Age Service Distribution (freezes- non freezes)



Benefit accruals by age groups



Decomposition of Accrual Differences

	<i>dABO/TA</i>		
	Year +1	Year +5	Year +10
Freezes	0.0041	0.0185	0.0335
<i>Sequential Changes in Characteristics (to PS Match1)</i>			
Plan level scaling			
Sponsor Assets	0.0057	0.0275	0.0537
Total Participants	0.0031	0.0151	0.0312
Plan age service distribution			
Cell participants	0.0026	0.0133	0.0282
Cell salaries	0.0027	0.0131	0.0261
Plan level assumptions			
g (salary growth)	0.0026	0.0125	0.0247
i (discount rate)	0.0025	0.0123	0.0241
k (accrual factor)	0.0022	0.0108	0.0213

Do cost savings motivate freezes?

VARIABLES	ME	ME	ME	ME	ME	ME
<u>dABO/TA</u>	1.428*** (0.358)	1.797*** (0.352)	1.428*** (0.358)	1.563*** (0.341)	1.565*** (0.397)	1.147*** (0.316)
ABO (log)		-0.006*** (0.001)		-0.005*** (0.001)	-0.005*** (0.001)	-0.004*** (0.001)
ACTIVE PARTICIPANTS (%)	0.019* (0.010)		0.019* (0.010)			
PLAN FUNDING	-0.042*** (0.011)	-0.036*** (0.010)	-0.042*** (0.011)	-0.037*** (0.010)		-0.033*** (0.010)
UNIONIZED				-0.014*** (0.003)	-0.015*** (0.003)	-0.014*** (0.003)
EBITDA/ SALES					-0.009* (0.005)	-0.003 (0.004)
INTEREST COVERAGE						-0.000*** (0.000)
Cluster SE (firm level)	YES	YES	YES	YES	YES	YES
Observations	5,123	5,123	5,123	5,123	5,051	4,710
pseudo-r2	0.0354	0.0515	0.0354	0.0655	0.0444	0.0754

Estimated cost savings (sponsor level)

	N	Year 1	Year 5	Year 10
dABO/ payroll [counterfactual]	114	0.0625	0.2902	0.5434
d401k/ payroll [estimated actual]	114	0.0262	0.1251	0.2365
Difference		0.036	0.165	0.307

- Contributions to 401k plans are extracted from Form5500 (Schedule H) and aggregated at the sponsor level.
- d401(k) is the additional contribution to 401(k) plans that is attributed to the accounts of DB participants now included into these plans.

$$\text{d401(k)} = \text{post-freeze contribution} - \text{pre-freeze contribution} \times (1+g)$$

Difference (DB accrual- extra DC contribution)
= **cost savings realized** (in the absence of salary offsets)

Estimated cost savings (sponsor level)

	N	Year 1	Year 5	Year 10
dABO/ payroll [counterfactual]	114	0.0625	0.2902	0.5434
d401k/ payroll [estimated actual]	114	0.0262	0.1251	0.2365
Difference		0.036	0.165	0.307
Break even condition		3.63%	3.10%	2.71%

Break even condition

- = the annualized, compounded additional yearly pre-tax compensation as a percentage of payroll that *would be required* as a supplement to the post-freeze benefit;
- = shortfall from the perspective of the employee;
- = cost saving from the perspective of the firm.

The workers would have to value the structure, choice, flexibility or portability of DC plans by 2.7-3.6% of payroll to experience welfare gains from freezes.

Panel A: Defined Benefit Plan Freezes

	N	Year 1	Year 5	Year 10
<u>dABO</u> / payroll [counterfactual]	114	0.0625	0.2902	0.5434
d401k/ payroll [estimated actual]	114	0.0262	0.1251	0.2365
Break even condition		3.63%	3.10%	2.71%

<u>dABO</u> / TA [counterfactual]	114	0.0044	0.0195	0.0353
d401k/ TA [estimated actual]	114	0.0005	0.0022	0.0042
Break even condition		0.39%	0.34%	0.31%

Panel B: Cash Balance Plan Freezes

	N	Year 1	Year 5	Year 10
<u>dCB</u> / payroll [counterfactual]	45	0.0275	0.1348	0.2686
d401k/ payroll [estimated actual]	45	0.0024	0.0115	0.0222
Break even condition		2.51%	2.35%	2.23%

<u>dCB</u> /TA [counterfactual]	45	0.0026	0.0130	0.0254
d401k/ TA [estimated actual]	45	0.0006	0.0027	0.0051
Break even condition		0.20%	0.21%	0.20%

Are there any offsets? (Ex-post Salary growth)

	N	Previous Years		Year +1	
		MEAN	MEDIAN	MEAN	MEDIAN
Freezes	72	4.35%	4.40%	2.56%	3.14%
Industry controls	1,150	4.41%	4.41%	4.86%	3.78%
Freezes	72	4.35%	4.40%	2.56%	3.14%
PS Match1	72	4.44%	4.53%	5.72%	4.91%
Freezes	72	4.35%	4.40%	2.56%	3.14%
PS Match3	72	4.07%	4.26%	5.31%	3.90%

We find no evidence that employees' lost pension is returned in higher salaries.

Conclusions

- Firms that have frozen pension plans **have reduced their costs** of providing retirement benefits to workers even net of increases to 401(k) contributions over horizons ranging from 1-10 years: 2.7-3.6% of payroll per year or 3.7% of total firm assets for a 10-year horizon.
 - Employees of these firms, on the other hand, have seen **decreases** in the net present value of their **retirement benefits**. The foregone accruals and net cost effects are generally larger for older employees.
 - The probability that a firm freezes a pension plan is positively related to the value of new accruals as a share of firm assets.
 - The results are consistent with firms renegeing on implicit contracts and also with the view that employees value less the DB plans relative to equal DC cost arrangements.
-