Pensions Policy: Evidence on Aspects of Savings Behaviour and Capital Markets

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Contents

List of Figures

List of Tables

Foreword

CEPR was delighted to be selected as the host of a new research node in the ESRC's EvidenceNetwork initiative, intended to advance the methodology of evidence-based policy (EBP) assessment and to apply it to a wide range of policy issues.

The CEPR node is called the Centre for Comparative European Policy Evaluation†, and its aim is to consider cross-country evidence as the basis for assessing the impacts and opportunities for economic policy. The Centre will address policy issues that involve decision-making at the EU level (for example, competition policy and trade policy) as well as UK policy issues for which the experiences of other European countries are highly relevant and where comparative work across countries is likely to prove illuminating.

The Centre will produce a series of reports, of which this is the first, with the goal of offering informative evidence-based analyses that may serve as useful inputs into policy formulation. This report examines evidence of relevance for pensions policy. Against a backdrop of an ageing population and the shift away from state pensions and employer defined benefit plans to private saving and defined contribution plans, the authors have chosen to focus their analysis on possible capital market effects of these changes, and on factors affecting the supply of private savings and the provision of employer-based plans. The evidence suggests that policy-makers should be particularly concerned with the functioning of annuities markets and with encouraging further primary research on the effects of tax incentives on personal savings.

Thanks for exceptional efforts in the production and dissemination of this Report are due to Publications Manager Anil Shamdasani and his team, Programme Officers Brian Leitch and Lisa Bournelis, and Press Officer Robbie Lonie. CEPR and the authors also wish to thank Carl Emmerson at the Institute for Fiscal Studies, Annette Boaz, Deborah Ashby and the team at the coordinating node of EvidenceNetwork at Queen Mary University of London for feedback and support, and Robert Laslett, at the Department of Work and Pensions, for the involvement of his team in the formulation of this study. The opinions expressed herein are those of the authors alone, and do not reflect the views of the institutions with which they are affiliated, nor of CEPR, which takes no institutional policy positions of its own. However, the Centre is delighted to afford the authors this forum for presentation of issues of major significance for the future economic health of the UK and Europe.

Hilary Beech
Chief Executive Officer
CEPR

November 2003

3 The Employer and Pensions

Many countries around the world have seen significant changes in their second tier pension systems. In the United Kingdom and the United States, and in many other countries, there has been a significant shift from defined benefit (DB) schemes to defined contribution (DC) schemes, which may be offered by the employer or which may be more individual in nature. DB schemes have variable costs but benefits that are defined in advance – often as a function of wages and length of service – while DC schemes have fixed contributions that are invested to produce a benefit that depends on the returns. This section will examine economic evidence underlying the interaction between pensions and labour markets in order to understand why employers contribute to pensions for their employees. A brief section will also examine some effects of DB pension on the capital structure of firms and evidence on the effects of the introduction of DB pension insurance in the United States.

3.1 Pensions in the labour market

3.1.1 Theory

Essentially there are two bodies of theory concerning pensions in the labour market. The simpler model considers the labour market to be an auction market that clears on a spot market basis in each period at the marginal productivity of each worker. Bulow (1982) was one of the first economists to examine the interaction between labour markets and pensions in this context. With this view of the labour market, it is difficult to explain any form of pension other than a classic DC pension scheme. Several features of labour markets suggest that this model may be inappropriate. These include observed wage premiums for long-serving workers, and evidence of long job duration. Kotlikoff and Wise (1985, 1987) were able to reject the auction model of the labour market in the context of pensions by failing to observe spikes in cash wages to compensate for time-varying pension benefits as this theory would suggest. A spot labour market implies that any compensation arrangement which impedes workers' abilities to switch jobs to where their marginal product is highest is efficiency reducing – and hence cannot explain many aspects of pension plans as they currently exist.

Two crucial features of DB pension plans are 'backloading' and the pension capital loss that is suffered by members who leave DB plans early. Typically, a DB pension scheme pays members who retire a pension that is defined by a formula such as:

Annual Pension = Accrual Rate x Years of Service x Final Salary

The backloading effect happens because the annual increase in benefits caused by working an extra year is worth much more to older individuals than it is to younger individuals. This is caused by compound interest – older workers will collect the pension sooner – and by the fact that older workers usually earn higher salaries than younger workers. Little evidence has been found that the cash wages of older workers fall to reflect fully the increased value of their pension benefits, meaning that the increased benefits of older workers in DB schemes are probably paid for over the whole working life of plan members.

This has implications for workers who leave DB pension schemes before retirement age. When workers leave, they have already paid higher pension contributions than are necessary to pay for the pensions they actually get: they have paid for part of the expensive pensions they would have accrued in later years. They therefore suffer a loss, called the pension capital loss (PCL). Depending on the legal jurisdiction, revaluation of the benefit for workers who leave may reduce but will not eliminate the capital loss.

A second view of the labour market has been developed partly to explain this phenomenon. According to this theory, the labour market is characterized by longer-term, implicit contracts. These theories are based on the existence of productivity gains from long tenure, asymmetric information between firms and employees, and large search costs for new staff. Productivity gains may be due to accruing firm-specific human capital – as a result of learning on the job or training (Becker, 1964 and Oi, 1962). This view of the labour market provides several explanations for the existence of DB pensions, but says very little about why DC pensions have become so popular. By tying the compensation an employee receives to the length of their tenure at the firm in this way, the firm gives existing workers an incentive to stay at the firm and gives a greater incentive for 'stayers' to join the firm than 'movers'. The saved training and recruitment costs – as well as the higher marginal product of the long-tenured worker – will be shared by the employee and the employer, resulting in higher lifetime compensation for the worker than if the compensation were only on a spot-wage basis. Ippolito (1997) has called this extra payment an 'indenture premium'.

Another group of theories, which may explain the existence of DB pensions, consists of the 'shirking' model of Becker and Stigler (1974) and the similar monitoring theories of Lazear (1979, 1983). These models propose that the employee posts a bond with the employer early in the career (the overpaid DB pension contributions), which is forfeited if the employee is caught shirking or cheating the employer. This bond, these theories propose, is posted in the form of a tilted compensation profile relative to the worker's marginal product – the worker is underpaid in early years and overpaid in later years. DB pensions, it is argued, fulfil this role well, because they are naturally backloaded as the wage tilt hypothesis suggests. In addition, the employer's promise to pay higher wages later on is credible because of the segregated fund of pension assets. A similar argument is that by tying the pension to final compensation, the typical DB plan gives workers an incentive to ensure that their final salary is as high as possible – and thus to work harder.

Consistent with both the spot market and the implicit contract view of the labour market is the sorting theory of pensions. This theory can be used as a justification for both DC and DB pensions. The underlying premise is that workers who place less weight on the future ('high discounters') when making their economic decisions are likely to invest less in firm-specific human capital, to be less reliable and to leave the firm sooner than workers who place a greater weight on the future. Therefore, by credibly deferring a portion of the workers' compensation, an employer can make a given pay package more attractive to 'low discounters' than to 'high discounters'.

Therefore, the argument runs, the firm will attract more desirable and effective workers.

Other theories underlying DB pensions include the control of individual exit from the labour force. According to this theory, DB pensions allow employers to force employees to leave once they have become too old to fulfil their job responsibilities. This theory was introduced by Lazear (1979, 1983) as a part of his shirking model, to model the shirking of workers later in the life cycle. A further group of theories concerns moral hazard on the part of various agents in the pension arena. It is alleged that unions are supporters of DB pension plans because they distribute resources from younger employees to older employees, who are likely to be in charge of unions. It is further alleged that senior management may be supporters of DB plans because these plans transfer resources from poorer workers to richer workers.

Many of these different theories have been tested with data. The evidence on pensions in the labour market can be summarized as follows:

- There is no direct evidence that workers with pensions are any more productive than workers without pensions. There is, however, indirect evidence that this may be the case. There is very little evidence to suggest that workers with DB pensions are more productive than workers with other types of pensions.
- Many studies have shown that workers with any type of pension plan are more strongly bonded to their employers than workers without pensions. The evidence that workers with DB plans are more strongly bound to their employers than workers with other types of pensions is equivocal, however. It is difficult to say whether the lower mobility of workers with pensions results in a less efficient labour market outcome.
- Pensions of all kinds may be an important tool used by employers to select certain types of workers from the labour pool of available workers.
- Strong evidence suggests that DB pension plans influence the timing of worker exit from the labour force.
- There is little evidence that employers systematically renege on the implicit pension contracts associated with DB pensions by firing workers who are nearing retirement, although there have been individual instances where this has happened. Many employers in the United States, however, have reneged on the DB implicit contract by terminating their plans, often as a result of a hostile takeover.

3.1.2 Evidence on pensions, productivity and mobility

There is very little direct econometric evidence that workers with pensions are any more productive than workers without pensions. In fact, it would be fair to say that there is relatively little evidence on the effect of compensation policies in general on productivity. This is due to the difficulty of estimating productivity relationships and the considerable data needs caused by the potential endogeneity of the employment and pension contract. Perhaps because of these difficulties, Allen and Clarke (1987) were unable to reject the hypothesis that there is no relationship between pension coverage and productivity at an aggregate industry level. Other similar studies have come to the same conclusion. No studies have examined the incentive effects of deferred compensation policies at the individual level (Dorsey, Cornwell and Macpherson, 1998).

There is, however, indirect evidence that workers with pensions may be more

productive than workers without pensions. Notable is the wage premium associated with pension coverage. If there were no productivity effect of pensions, workers without pensions would be compensated for the missing pension in cash wages on a dollar-for-dollar basis. Most studies, summarized in Table 3.1, have soundly rejected this conclusion.

Table 3.1 Estimated wage effects of pensions

Study	Data set	Wage effect of pensions
Even and Macpherson (1990)	1983 CPS	+13% – +15%
Gustman and Steinmeier (1995)	Various	positive
Allen and Clark (1987)		+38%
Mitchell and Pozzebon (1987)	1983 CPS	positive
Dorsey (1989)	Various	+12% – +29%
Montgomery, Shaw and Benedict (1992)	1983 SCF	negative*

Note: CPS = Current Population Survey. SCF = Survey of Consumer Finances, both representative US data sources.

* often not significantly different from 0

Source: Adapted from Dorsey, Cornwell and MacPherson (1998).

These findings show that workers covered by pensions earn more than workers not covered by pensions, after controlling for other factors. This is indirect evidence that workers who have pensions are more productive than workers who do not – although there may be other factors that explain these findings. Further evidence in favour of this hypothesis is provided by Dorsey, Cornwell and MacPherson (1998), who find a strong relationship between pension status and receiving on-the-job training. They also compare the productivity of labour in manufacturing firms who offer DB pensions to that of manufacturing firms who offer DC pensions or no pensions using Compustat and PBGC data. They find that while there was a significant productivity differential in 1981 (around 15%), by 1992 this differential had fallen to 0. Their analysis is, however, unable to reject the hypothesis that this differential is the result of a package of human-resource policies that are signalled by the presence of a DB pension, or that the differential is the result of efficient job matches caused by sorting effects.

A part of the pension-productivity analysis that deserves a more comprehensive treatment is the pensions-mobility literature. This literature examines the effect of pensions on job turnover. These studies fall into two main groups. The first examines the relationship between pension coverage on a particular job and the length of service in that job or the probability of leaving that job. These studies have usually found significant negative effects of pension coverage on turnover. A detailed survey is given in Allen, Clark and McDermed (1993). Early studies by Ross (1958) and the US Department of Labor (1964) are early examples which both show that pensions are associated with an approximately 50% reduction in job turnover. A more recent example is Mitchell (1982), who used data from the 1973 and 1977 Quality of Employment Surveys. She estimated a probit model of job turnover, and finds the results shown in Table 3.2.

Table 3.2 Determinants of job turnover (I)

Independent variable: Job change (mean 0.35)	Probit regression co-efficient	Asymptotic standard error
Constant	1.569	0.406
Race	0.005	0.237
Education	0.028	0.023
Union	0.016	0.134
Experience	-0.014	0.007
Tenure	-0.027	0.010
Wage	-0.608	0.163
Pension	-0.700	0.155
-2 ln*L*	551.1	
N	512	

Note: Results shown for males. Job change = 1 if respondent changed jobs between 1973 and 1977. Race variable = 1 for non-whites. Education is years of full-time education. Union = 1 if respondent is a member of a union. Experience is number of years of work experience. Tenure is years in job left. Wage is in logs. Pension = 1 if employee has a pension. Pension plan reduces probability of job change by 20%.
Source: Mitchell (1982).

Her analysis indicates that the presence of a pension reduces the job mobility of males in this sample by 20 percentage points. It should be noted that she makes no distinction between DB and DC pensions in this survey, although it is expected that most of these individuals will be covered by only DB pensions. Other variables show that increased job tenure and increased wages are both associated with a significant reduction in turnover. These last two results are both consistent with human capital models of the labour market, as described by Becker (1964). In this paper, Mitchell also models the effect of pensions on worker quits (as opposed to job changes, shown here, which include involuntary quits) and finds that pensions have a much greater negative effect on the probability of layoffs than on voluntary quits. This finding has been replicated in other studies.

There are two potential problems with this analysis. The first is that, although Mitchell has controlled on both wages and pensions, we know that higher wages are associated with the presence of a pension. This would suggest that a more complicated specification of this aspect of the problem might be required. Second, Mitchell does not account for the sorting element of pensions: if taking a job with a pension is associated with a potential significant capital loss when jobs are changed, jobs with pensions will be more attractive to individuals who intend to stay with the company – a selection bias. The same problems are true of rough analyses of data sets such as the Survey of Income and Program Participation (SIPP) and the Current Population Survey (CPS), both of which show large differences in tenure and job turnover between workers in jobs with and without pensions. See Gustman and Steinmeier (1995) for a discussion of these results.

The second type of study in the pensions-mobility literature examines the direct relationship between the potential capital loss on job change and job turnover. A good example of this type of study is Allen, Clark and McDermed (1993). They use data from the Panel Study of Income Dynamics (PSID) between 1978 and 1982, which is representative of the US working population. The PSID does not collect individual pension data and so they used the 1983 Employee Benefit Survey to impute the pension plan characteristics of PSID respondents, based on occupation and industry matches. They use these imputed pension plan details to calculate the pension capital loss (PCL) faced by individuals should they move jobs. They fitted a

3-equation probit model of job change. Three equations are necessary to separate out the effects of self-selection on job choice and the capital loss associated with pension coverage. The first equation models the job-selection effect, the second models the job mobility of workers who choose jobs with pensions and the third models the mobility of workers who choose jobs without pensions. Summarized results are shown in Table 3.3.

Table 3.3 Determinants of job turnover (II)

	Job selection equation (mean 0.70) A	Job mobility: with pension (mean 0.39) B	Job mobility: without pension (mean 0.61) C
Controls	X	X	X
Tenure	0.016	-0.043	-0.181
	(0.034)	(0.056)	(0.064)
Union	0.599	-0.057	0.085
	(0.119)	(0.154)	(0.424)
Hourly wage before tax	0.162		
	(0.033)		
Hourly wage after tax		0.030	-0.178
		(0.043)	(0.195)
Already vested		0.090	
		(0.393)	
Became vested		0.153	
		(0.222)	
CL		-0.054	
		(0.017)	
ln *L*		-1177	
N		1111	

Note: Dependent variable for equation A = 1 if worker is in a job with a pension. Dependent variable for equation B = 1 if worker leaves job, estimated only for workers with pensions. Dependent variable for equation C = 1 if worker leaves job, estimated only for workers without pensions. Controls include age, tenure squared, number of children, black, years of schooling, male, not married and federal tax rate. Tenure is job tenure in years. Union = 1 if respondent is a member of a union. CL is pension capital loss on job change. Figures in parentheses are asymptotic standard errors.
Source: Allen, Clark and McDermed (1993).

Evidence of selection into jobs is shown in two ways. First, the control variables (not shown) are significant in equation A but not in B or C. These include variables such as sex, race and marital status. The same pattern can be seen in the variable on union membership. Second, the coefficients in equations B and C are quite different. Turnover in pension-covered jobs is mainly related to age, industry and PCL, while turnover in other jobs is affected by tenure and occupation.

Evidence that PCL affects turnover is strong: the variable PCL is significant at the 5% and the sign is correct. The model seems to suggest that around 40% of the reduction in turnover in pension-related jobs is due to the pension capital loss suffered with job change.

Other results in this paper not reported here confirm the findings of Mitchell (1982) and others that pension capital losses are more closely related to layoffs than to quits. It should be noted, as with Mitchell (1982) that Allen, Clark and McDermed (1993) do not report any results separately for DB and DC plans. As very few DC plans impose any capital loss on job change, this is an important distinction to make. In their 1975-82 data, DC plans were still in their infancy in the United States and hence

they were probably ignored. Even and MacPherson (1996) confirm the negative pension loss-mobility relationship for large firms, but find no such result holding in smaller firms, suggesting that it is DB plans (still prevalent at large firms in the United States in the early 1990s) which were causing the effect.

Gustman and Steinmeier (1995) present contradictory evidence on this issue. They find that DC plans are as likely to impede worker mobility as are DB plans, casting some doubt over the hypothesis that PCLs are causing the decline in mobility. It should be noted that their specification does not include the effects of self-selection, which may bias their results if the self-selection effect is different for DB and DC pension plans. Tables 3.4 and 3.5 show the effect of pension coverage on job mobility from two of the three data sets Gustman and Steinmeier examine:

Table 3.4 Estimated effect of pensions on job change: SIPP

	Model 1		Model 2	
Dependent variable: job change (mean 0.11)	Probit regression marginal effect	Asymptotic *t*-statistic	Probit regression marginal effect	Asymptotic *t*-statistic
Pension coverage	-0.09	6.50		
DB Pension			-0.092	5.87
DC Pension			-0.087	4.93
Ln *L*	-748.38		-748.31	
N	2545		2545	

Note: SIPP data from 1984-85. SCF data from 1978-93. Dependent variable is 1 if individual separates from employer. Some control variables included.
Source: Gustman and Steinmeier (1995).

Table 3.5 Estimated effect of pensions on job change: SCF

	Model 1		Model 2	
Dependent variable: job change (mean 0.29)	Probit regression marginal effect	Asymptotic *t*-statistic	Probit regression marginal effect	Asymptotic *t*-statistic
Pension coverage	-0.57	10.90		
DB Pension			-0.062	10.23
DC Pension			-0.069	3.77
Ln *L*	-242.21		-239.85	
N	581		581	

Note: SIPP data from 1984-85. SCF data from 1978-93. Dependent variable is 1 if individual separates from employer. Some control variables included.
Source: Gustman and Steinmeier (1995).

In both data sets, likelihood ratio tests cannot reject the hypothesis that there is no difference between the effect of DB and DC pensions on job mobility. These results are confirmed by Even and MacPherson (1996).

Gustman and Steinmeier show that the PCL on job change is likely to be only a few percentage points of the remaining lifetime income of employees – implying that a salary increase of only a few percentage points in the new job is likely to compensate a worker for the pension loss. This suggests that the PCL should not be a significant deterrent to mobility. They instead argue that the higher wages of pension-covered jobs (which they link to an 'efficiency wage' – the higher

productivity of workers in good job matches) are the cause of the observed lower mobility of workers. The easiest way to present their results is to show how their model predicts turnover rates would change if various aspects of the employment contract were changed (see Tables 3.6 and 3.7, below).

Table 3.6 Estimated effect of employment contract changes on job mobility: SIPP

	Original mobility rate (%)	Post-change mobility rate (%)	Number of observations
Effects of eliminating PCLs on			
All individuals with pensions	5.71	6.39	1678
46-50 year olds	4.35	5.35	359
Union members	5.70	6.49	590
Non-union members	5.72	6.34	1088
Effects of dropping pension compensation entirely			
All individuals with pensions	5.71	10.38	1678
Effects of eliminating pension job compensation premiums, as estimated by compensation equation			
All individuals with pensions	5.71	14.39	1678

Source: Gustman and Steinmeier (1995).

Table 3.7 Estimated effect of employment contract changes on job mobility: SCF

	Original mobility rate (%)	Post-change mobility rate (%)	Number of observations
Effects of eliminating PCLs on			
All individuals with pensions	10.3	11.6	286
46-50 year olds	9.8	12.3	54
Union members	11.8	13.3	143
Non-union members	8.9	9.8	143
Effects of dropping pension compensation entirely			
All individuals with pensions	10.3	15.7	286
Effects of eliminating pension job compensation premiums, as estimated by compensation equation			
All individuals with pensions	10.3	52.3	286

Source: Gustman and Steinmeier (1995).

With the results shown in Tables 3.6 and 3.7, Gustman and Steinmeier find that most of the effect of pensions on mobility is due to the compensation premium that jobs with pensions have. Eliminating the PCL has a much lower effect on mobility than either dropping pension compensation entirely or eliminating the compensation

premium of a job with a pension. These results suggest that making pensions very portable should have little effect on job turnover.

UK evidence on the effect on pensions on job mobility is sparse. Mealli and Pudney (1996) test the impact of pension coverage on job tenure in the United Kingdom and find that, like the United States, DB pension-covered jobs are associated with longer job tenure. Their econometric technique allows them to conclude that this is not exclusively the result of sorting effects. Henley, Disney and Carruth (1994) find that membership of an occupation pension scheme significantly reduces hazard rates of leaving a job, but that transferability of pensions rights increases it. This study ignores selection into jobs with different pension schemes, however. Disney, Emmerson and Smith (2003) present some evidence which suggests that individuals in the United Kingdom who opt out of occupational pension schemes and purchase personal pensions may be more mobile than individuals who do not opt out of their occupational schemes – although their analysis is not persuasive. They also demonstrate the tremendous volatility in pension coverage in the BHPS, a result that has tremendous implications for pensions policy and design in the United Kingdom.

It is difficult to say whether the reduced mobility of workers with pensions of either type results in an inefficient labour market outcome or not, as discussed by Dorsey (1995). Even if the results of Allen, Clark and McDermed (1993) are correct, DB pensions may still cause workers to be more productive in their existing jobs, allowing them to accumulate firm-specific human capital and to earn an efficiency wage. On the one hand, reduced mobility may prevent workers from reallocating their efforts into the job with the highest-valued employment, resulting in a less efficient economy. On the other hand, if Gustman and Steinmeier (1995) are correct, changing pensions from DB to DC will have little impact on job turnover because current levels of job mobility are determined by non-pension economic factors related to the employment contract.

3.1.3 Evidence on pensions and sorting

A constant theme running through the evidence on pensions and mobility is the effect that a pensions contract has on the type of worker that chooses to work at the firm. Allen, Clark and MacDermed (1993) noted that a non incentive-neutral contract will be differentially attractive to workers with different tastes or characteristics and will hence give rise to a sorting effect. In their paper they propose that DB pensions make a job more attractive to individuals who believe that they are likely to stay at a given job for a long time than individuals who are intending to move jobs quickly. They present the coefficients in their sorting equation (column A in Table 3.3) as evidence that pensions do exert a sorting effect on potential workers based on observable characteristics. Ippolito (1997) has expanded this theory to include 'low' and 'high' discounters. 'High' discounters place low weight on the future, and, according to theory, make worse employees than 'low' discounters because of the lower value they place on deferred gratification. Ippolito (1997) presents the evidence shown in Table 3.8 to support this conclusion.

These results show that workers who save up their sick leave tend to earn more than workers who use it up; that workers who are non-smokers at age 50 tend to earn more than smokers; that workers who have longer self-reported planning horizons for financial decisions tend to earn more per hour and have a higher probability of being a supervisor. Ippolito then uses these 'low discounter indices' and correlates them with various savings metrics, as shown in Table 3.9, which show that even after controlling for wage rate differences, there are significant differences in savings behaviour that are captured in these discounter indices. Non-smokers with long planning horizons are more likely to have pensions, more likely to make IRA

contributions, and more likely to have non-zero IRA balances, while those with a high proportion of unused sick leave are more likely to have higher 401(k) contribution rates than others. Ippolito shows that individuals who quit from firms that offer lump sums from the pension plan to quitters display characteristics of high discounters, as the theory would predict. He shows that individuals who quit with longer tenure are more likely to roll over their lump sums into IRAs than those who quit with shorter tenure. He also uses a change in the US federal government retirement plan to test whether high discounters are more likely to quit than low discounters, and finds evidence in favour of this hypothesis.

Table 3.8 'Low discounter indices' and employment outcome

Independent variable	Log annual wage (1)	Log hourly wage (2)	Log hourly wage (3)	Supervisor (yes=1) (4)
Mean dependent variable	10.30	2.52	2.52	0.17
Sick leave balance, cumulative	0.146			
	(16.29)			
Non-smoker at age 50		0.038	0.024	-0.007
		(2.32)	(1.41)	(0.67)
Log of planning horizon			0.018	0.052
			(2.27)	(3.33)
Other variables	X[a]	X[a]	X[a]	X[a]
R-squared	0.49	0.47	0.43	
N	13560	4868	4523	4566

Note: Estimates made using OLS (1)-(3) and logit (4). Sample for (2)-(4) is HRS: workers aged 51-61 in 1992. Sample for (1) is federal workers in October 1993 with more than 10 years service. Numbers in parentheses are *t*-values. Sick-leave balance represents the proportion of accrued sick leave that was unused in October 1993.
a See Ippolito (1997) for other variables.
Source: Ippolito (1997), adapted.

Table 3.9 'Low discounter indices' and pension outcome

Independent variable	Mean	Pension (yes=1) (1)	IRA cont (yes=1) (2)	IRA balance positive (3)	401(k) cont (% wage) (4)
Non-smoker at age 50	0.67	0.046	0.015	0.035	
		(3.22)	(1.61)	(2.52)	
Log planning horizon	1.12	0.062	0.035	0.082	
		(3.11)	(2.59	(4.72)	
Sick-leave balance	0.40				0.013
					(12.23)
Wage rate	12.76	0.31	0.01	0.06	0.028
		(19.78)	(2.17)	(7.72)	(16.78)
Other variables		X[a]	X[a]	X[a]	X[a]
N		4544	4544	4544	13315

Note: Estimates made using logit. Sample for (1)-(3) is HRS: workers aged 51-61 in 1992. Sample for (4) is federal workers in October 1993 with more than 10 years service. Numbers in parentheses are *t*-values. Sick-leave balance represents the proportion of accrued sick leave that was unused in October 1993.
a See Ippolito (1997) for other variables.
Source: Ippolito (1997).

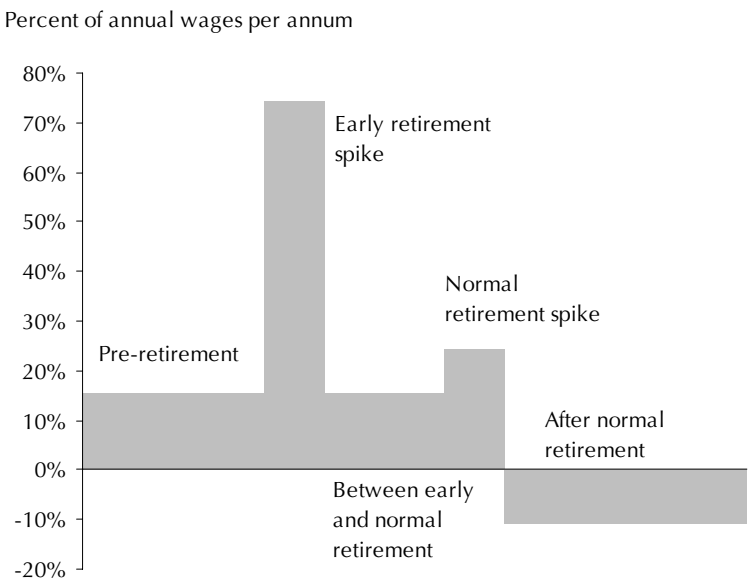
Ippolito (1997) pursues the idea that 401(k) plans perform the same kind of sorting function as classic DB plans. The mechanism by which this is accomplished is the employer match to the employee contribution. A typical 401(k) plan has a provision that the employee can decide his or her own contributions, but that the employer will match the employee contribution up to a certain maximum. This causes high discounters (who are inclined to save more than low discounters) to have a higher compensation than low discounters – making the job relatively more attractive to them. He finds that higher 401(k) contribution rates are associated in matching plans with higher pay increases, higher scores on his low discounter index variables and lower quit rates, even after controlling for wage rates.

3.2 DB pension plans

3.2.1 Retirement

There is a substantial literature on the incentive effects of DB plans on retirement and individual responses to them. This literature is summarized in Kotlikoff and Wise (1989), Gustman and Steinmeier (1989), Quinn, Burkhauser and Myers (1990) and in Ippolito (1997). Work has examined the incentive effects provided by both the US Social Security System and those given by occupation DB plans in the United States. The almost universal conclusion of these studies is that individuals tend to respond to these incentives in planning retirement. This review will therefore concentrate on early work in this field, by Fields and Mitchell (1982).

Figure 3.1 Retirement incentives offered by DB pension plans



Source: Adapted from Gustman and Steinmeier (1989).

Figure 3.1, adapted from Gustman and Steinmeier (1989), shows average pension accrual rates from DB plans covering 530 individuals in the 1983 Survey of Consumer Finances, a nationally representative sample of the US population. The vertical axis shows the annual accrual rate of pension wealth as a percentage of annual wages. It can be seen that the marginal effect of an additional year's work on lifetime wealth is non-linear and quite bumpy. Workers are given strong incentives to stay until the early retirement date, and to retire at or before the normal retirement date. Fields and Mitchell present an empirical analysis of the connection between the date of retirement and three variables: the level of lifetime wealth at age 60, the marginal effect of work on lifetime wealth between ages 60-65, and the marginal effect of work on lifetime wealth between the ages of 65 and 68. Despite the fact that their methodology allows only a crude estimation of the effects of these incentives on retirement, their variables turn out to be surprisingly important determinants of retirement behaviour. Their results are shown in Table 3.10.

Table 3.10 Determinants of retirement behaviour

Independent variable: age of retirement	Mean	(1)	(2)
Lifetime wealth at age 60	57.47	-0.028	-0.029
		(3.45)	(3.68)
Effect of work on lifetime wealth, 60-65	33.12	0.077	
		(7.47)	
Effect of work on lifetime wealth, 65-68	43.50		0.053
			(8.37)
Constant		62.32	62.65
R-squared		0.17	0.20

Note: Variables measured in $000s. Figures in parentheses are *t*-statistics.
Source: Adapted from Fields and Mitchell (1982).

It can be seen that wealthier individuals retire earlier than poorer individuals, and that the higher the marginal wealth effect of working, the later individuals retire. Many authors have replicated these results. Ippolito (1997) concludes his discussion of DB pension plans and retirement by saying:

> 'Workers covered by defined benefit plans face nearly universal penalties for leaving the firm too early or too late … Firms act as though particular tenure and age distributions are important to firm productivity and they seemingly use the flexibility inherent in defined benefit pension plans to help them attain some of their desired labor force characteristics.'

There is a relative lack of UK evidence on retirement behaviour. Blundell and Johnson (1997) examine the retirement incentives provided by the state pension system in the United Kingdom to individuals approaching retirement using the Retirement Survey Data from 1988 to 1989. They find that the incentives embodied in the state retirement system provide significant incentives for the lower paid to retire early – once easy access to the incapacity benefit is allowed for in the calculations. They also find that occupational pensions – which in 1997 were still largely of the DB type in the United Kingdom – exert considerable influence on retirement behaviour in the United Kingdom. They find that occupational pensions change retirement patterns dramatically, narrowing the distribution of ages and causing bunching at ages at which individuals become eligible for retirement. Their

analysis is, however, not detailed enough to permit further conclusions. Another recent study on retirement behaviour in the United Kingdom by Meghir and Whitehouse (1997) estimated the determinants of retirement for a sample of men born between 1919 and 1933 in the United Kingdom. This study confirms the results of Blundell and Johnson (1997), but emphasizes the role of bad health and aggregate unemployment, as well as age and occupational pension schemes, in influencing the date of retirement. As with Blundell and Johnson (1997), they find that public old age payments in the United Kingdom exert relatively little influence on retirement.

3.2.2 Abuse by employers and unions

The implicit contracts inherent in DB pensions offer unscrupulous employers several avenues for abuse: employers can make pension promises they do not intend to keep instead of paying current wages, they can dismiss workers just before retirement, reduce wage increases for older workers in order to save on pension costs, or close the pension scheme and pay members termination benefits (which are usually lower than final-salary benefits). As the discussion above suggests, most of the literature on job mobility and pensions suggests that DB pensions actually reduce the probability of layoffs. Therefore, we would expect that layoffs of older workers are likely to be the exception rather than the rule. Cornwell, Dorsey and Mehrzad (1991) examine this question using the National Longitudinal Survey of Mature Men. They examine the effect of pension provision on the probability of being laid off by the firm. They find that the size of the pension capital loss (which is a pension gain for the employer) bears little relationship to the probability of being laid off for older workers. There have, however, been isolated examples of such events, such as the Continental Can company case reported in Gustman, Mitchell and Steinmeier (1994) and elsewhere.

Many US firms terminated their DB plans in the 1980s. Although this is a breach of the implicit contract, it does not violate explicit employment contracts and is therefore not illegal. Orr (1998) states that many of these terminations followed leveraged buy-outs (LBOs) by hostile corporate raiders. In an analysis of pension plan terminations following leveraged buy-outs, Ippolito and James (1992) found that pension terminations were much more likely after a leveraged buy-out than at any other time, and that pension plan terminations following leveraged buy-outs were four times more likely to break implicit employment contracts than those not associated with leveraged buy-outs. They also found, however, that around 40% of pension terminations did not involve breaking implicit contracts, and that many of the remainder were business-related rather than the result of opportunistic behaviour on the part of shareholders. They also found little evidence suggesting that the presence of substantial implicit-contract-related surpluses in a pension plan made a company more vulnerable to a leveraged buy-out. Pontiff, Schleifer and Weisbach (1990) concur with this analysis. They find that pension reversions explain about 11% of the takeover premium in cases where they actually occur – too small to be a dominant source of takeover gains. They report that firms involved in hostile takeovers were five times more likely to terminate their DB plans than other firms with similar characteristics. Gustman, Mitchell and Steinmeier (1994) state that only a small fraction of the surpluses that could have been claimed were actually claimed by employers – implying that the implicit contract was largely honoured. Thomas (1989) and Stone (1987) report that firms who terminated their DB plans and were not involved in hostile takeovers often did so in order to access cash to save the company from bankruptcy, and that available evidence suggests that managers will try several other sources of cash before choosing to terminate the pension plan. Contrary evidence is provided by Petersen (1992), who shows that plan

characteristics – and not only financial characteristics – affect the likelihood of termination. He finds that the older the plan members, and the more retired members there are in the plan, the more likely the plan is to be terminated – suggesting that termination was partly motivated by the resulting transfer of the pension bond from members to shareholders. This may be true if there are significant *ad hoc* cost of living adjustments in the implicit contract, but not in the formal contract. He found that the probability of an overfunded plan being terminated was about 2% per year over the period 1980-86.

Overall, these studies suggest that terminating a pension plan is not an easy decision for managers to make – perhaps, as some authors have suggested, because of the reputational cost that this has for the company and the effects that it has on labour relations after the termination.

3.3 Evidence on pensions and saving

Evidence about the effect of pensions on employee saving and on the determinants of employee pension participation and contribution behaviour is included in the section of this report that deals with saving. A brief summary:

- Evidence suggests that DB and DC pension plans do not reduce, or only slightly reduce, employee savings outside the pension plan.
- The probability of participating in a 401(k) plan increases with age, income, job tenure, home ownership, if the 401(k) plan is the sole pension plan, and if employees are allowed to control investment allocation.
- Evidence on contribution rates conditional on contributing is weaker, but it seems to increase with age, income, wealth and investment choice.
- An employer match rate seems to increase participation, but – conditional on there being an employer match – the effect of a higher match rate on contributions seems to be neutral or negative.
- There are surprisingly strong default effects in the participation decision and in the investment decision. 401(k) participation and contribution behaviour is also very durable over time.

3.4 Insuring DB pensions

3.4.1 The US experience

As the existence of pension insurance in the United States is so closely connected with the issue of default on pension promises, it will be examined in a separate section. The Pension Benefit Guaranty Corporation (PBGC) was set up when the US Congress passed the Employee Retirement Income Security Act (ERISA) in 1974. Its main mandate is to insure the benefits of private-sector DB pension plans. Much of the information in this section comes from the PBGC (2003a, 2003b, 2003c). The PBGC initially charged a set premium of $1 per participant in each DB plan, whether the pension plan was underfunded or not. This premium was raised several times and in 1988 a variable-rate premium (which depended on the funding level of the plan) was introduced. Currently, fully funded plans pay $19 per participant per year for cover while underfunded plans pay an additional $9 per $1000 of unfunded liability

per year. This liability is measured using assumptions set by the PBGC. Premiums are paid by the pension plan and insurance is mandatory for all single-employer DB pension schemes. Currently, the PBGC insures about 44 million members in about 32,500 pension plans. The guarantee covers the vested benefits of the plan up to an age-dependent annual limit currently around $45,000 for those aged 65. Benefit improvements that are less than five years old are only partially guaranteed, although longstanding benefits in respect of service accrued up to the time of termination will be honoured. Historically, around 80-90% of promised benefits have been covered. The PBGC will cover benefits if the pension plan is terminated as a result of the bankruptcy of the employer, or if the PBGC judges that intervention is necessary to protect the interests of members or the PBGC itself. Initially, the PBGC was allowed to claim only up to 30% of the net assets of a company terminating a pension scheme to cover unfunded liabilities. Later this was extended to include a claim on the rest of the assets of the firm on a par with claims of other unsecured creditors. The corporation is given fairly wide monitoring and executive powers to enforce its mandate. Since inception, the PBGC has taken on approximately $17 billion dollars of unfunded pension liabilities in nominal terms. These have been disproportionately concentrated in certain industries: together airlines and the steel industry account for about 5% of covered employees but have been responsible for more than 75% of nominal claims over the history of the PBGC.

3.4.2 The theory of pension insurance

Typically in the corporate finance literature, the pension fund is viewed as being part of the corporate balance sheet (Sharpe, 1976; Treynor, 1977; Bulow and Scholes, 1983; Mittlestaedt and Regier, 1990). As pointed out by Bulow (1982), this interpretation rests on a legal view of the obligations of the firm, rather than on an implicit contract view: the firm has the legal right to terminate the pension plan if it wishes to do so and since the passage of ERISA, the shortfall in the pension fund (and any surplus assets in the pension fund) are the responsibility and the property of the firm in law. Before ERISA, any shortfall in the pension fund reduced the benefits of employees but any surplus was the property of the firm (Bulow, Scholes and Menell, 1983). It should be noted that, to some extent, this legalistic view contradicts the available evidence on implicit contracts presented in the previous section. The balance sheet of the firm/pension fund after ERISA can be represented as below:

Table 3.11 Stylised firm balance sheet

Assets		Liabilities	
Firm assets	A	Firm liabilities	L
Pension fund assets	I	Pension fund liabilities	B
Guarantee	G	Shareholders interest	E

There are two trade-offs that are important in this diagram. The first is the trade-off between the assets that are in the pension fund, I, and the assets held directly by the corporation, A. By making pension fund contributions, the company reduces A and increases I, but A+I remains the same (in the absence of taxes). The second trade-off is between the pension fund liabilities and firm assets. If employees are rational and value $1 of pension fund benefits as equal to $1 of cash, then any increase in B should be matched by an equal reduction in cash wages and therefore by an equal increase in firm assets A. Since the value of the firm, E, is defined as the balance of assets over liabilities (E=A-L+I-B+G), these two tradeoffs only change the residual interest of the shareholders if they change the value of the government guarantee G.

The original PBGC guarantee G was a guarantee that if the pension plan was terminated, the PBGC would top up the pension fund assets I with 30% of the remaining net assets of the firm, and out of its own funds would pay the balance necessary to ensure that there were sufficient assets to pay benefits B. Thus, the PBGC would pay B-I-0.3 x max(A-L,0) if the pension fund was terminated and there was a shortfall of assets.

Originally, firms could voluntarily terminate their pension funds and did not need to declare bankruptcy. After some high profile cases in which solvent firms terminated their pension plans and passed the bill to the PBGC, this practice was restricted.

Sharpe (1976) found that with this corporate structure and a flat PBGC premium, companies had been given a 'put' option to pass discretionary liabilities on to the PBGC. He found that if there are no corporate taxes, companies had an in-built incentive to underfund their pension plans (not transfer money from A to I) in order to maximize the value of the guarantee G. If companies were forced to fund their pension schemes (i.e. to keep I close to B), then he suggested that they would have an incentive to maximize the value of G by investing in the riskiest possible assets and possibly also by following a risky corporate strategy. This is because the option value of G increases with the level of risk of the assets underlying it – a standard result of options pricing theory. These two effects are perverse effects caused by the flat premium structure initially adopted by the PBGC. The current premium structure does not entirely eliminate these effects. This is because it may still be cheaper for a company to underfund the pension plan than to borrow on the capital markets to keep the pension fund fully funded – especially because the pension underfunding is effectively a loan from the employees, at a cost of 90 b.p. over the AA rate (the effect of the PBGC premium of $9 per $1000 underfunding), which is guaranteed by the PBGC. A capital market loan increases the gearing of the company and may well cost more than 90 b.p. above the corporate rate.

If, however, corporate taxes are included in the Sharpe model, the value of the tax incentive to fund the plan (effectively a transfer from the government to E if contributions are taken from A and put into I) may outweigh the PBGC put value for well-funded and healthy firms. Only weaker firms that do not pay corporate tax and that have underfunded pension plans (in the corporate finance sense) will then derive any value from the PBGC put. This was pointed out by Black (1980) and Tepper (1981). Some of this theory was also discussed by Treynor (1977).

In summary, the creation of the government guarantee should cause an increase in the shareholders' interest for very weak firms and a large transfer of wealth to the members of underfunded pension plans. In addition, weak firms should adopt funding strategies and investment strategies that maximize the value of the guarantee. There should also be evidence of opportunistic transfers of pension liabilities onto the PBGC.

The potential transfer of wealth from strong firms to weak firms could in theory destabilize DB pension provision. Well-funded firms who, with their employees, derive no value from PBGC insurance but who are forced to pay PBGC premiums may regard the premiums as a tax and would therefore be more likely to close their DB pension schemes and replace these with DC pension schemes that do not need PBGC insurance.

A great deal of evidence highlights the connection between union plans and pension underfunding in the United States. Ippolito (1985) presents a model describing why firms may have chosen to underfund pensions in unionized industries before the introduction of DB pension insurance in the United States. He proposes that firms use underfunding as a mechanism to align the interests of the

union and the shareholders – effectively making the union part owners of the firm. According to this theory, the existence of pension insurance removes any incentive effect from an underfunded pension scheme as scheme members are protected from default. This theory would therefore predict that union pension plans were underfunded before 1974 and that after 1974, unions were offered other incentive arrangements to recreate the lost incentives. Cherkes and Yaari (1988) suggest that union plans are underfunded because the firm pays out wealth to shareholders as dividends rather than using it to fund the pension plan. They hypothesize that this protects shareholder wealth in the event of possible bankruptcy caused by union hold-up. Bronars and Deere (1991) present a similar model in which firms should attempt to protect shareholder wealth in the event of union formation by increasing their debt-equity ratios. One way of increasing a debt-equity ratio is by underfunding a DB pension plan. Bulow, Scholes and Menell (1983) present a model in which they find that there is only an incentive for firms not to terminate underfunded DB plans if salaries are negotiated on a group basis and employees possess firm-specific human capital.

The available evidence on the effects of the PBGC on pension provision suggests that:

- The introduction of the PBGC increased the value of weaker firms, consistent with the theory.
- The evidence that the pension put caused some distortion of pension policy for weaker firms is equivocal, although several different types of study do find effects in line with the theoretical predictions.
- Evidence indicates a strong relationship between unionization and DB pension underfunding. There is also a very strong relationship between unionization and making a PBGC claim: union members have been large beneficiaries of PBGC transfers.
- Although there has been a marked decline in the provision of DB pensions since the passage of ERISA, it is unlikely that the cost effect of pension insurance has been a major factor driving the decline. At least some of this decline can, however, be attributed to the increased relative cost of running DB versus DC plans – particularly for smaller DB plans – only part of which is the PBGC premium.

3.4.3 Evidence on the effects of pension insurance in the United States

Studies have examined the effect of ERISA on the net worth of companies, and on the asset allocation and funding status of their pension plans. No single study presents conclusive evidence in favour of the theory presented above, although different studies of many different types seem to find effects that are at least broadly consistent with the theory. Some of the fault may lie with the empirical needs of many of the issues posed by the theory – when ERISA was passed in the early 1970s, data was much sparser than it is today, there are difficulties in the consistent measurement of pension liabilities across firms and time averaging may be important. On the other hand the ambiguity of the empirical investigations is surprising given the strength of the theoretical results.

Chen and Kang (1988) analysed the returns of 124 publicly traded companies during the period around the passage of ERISA. Using an event-study methodology,

they find that the stock of firms with underfunded pension funds significantly outperformed the stock of firms with mid-funded or fully funded pension funds.

These results seem to indicate that the passage of ERISA caused a transfer of wealth to the shareholders of firms with underfunded pension plans, in line with the predictions of the theory above. This transfer presumably represents the expected discounted present value of the reputational and labour relations costs associated with a firm terminating an underfunded pension plan less the 30% transfer of net equity to the PBGC.

Bodie (1987) and Friedman (1983) examine the funding and investment policies of DB pension plans around the time of the passage of ERISA. Friedman (1983) uses 1977 IRS pension disclosure data. He finds that US corporations appear to manage their pension fund assets and liabilities as though these are a part of the firm, in line with the predictions of the theory. He finds, however, that the pattern of the relationships found is often inconsistent with specific theoretical predictions. In particular, he finds that basic aspects of the firm's risk and return position have no apparent effect on the pension funding decision and that firms invest pension assets so as to offset business risk rather than to maximize the value of the PBGC put.

Bodie (1987) use a sample of companies' FASB 36 (pension) accounting statements in 1980. They regress the funding level of the pension fund on the profitability of the firm (measured as return on assets employed), the taxes paid by the company (expressed as a proportion of assets of the firm) and the bond rating of the firm (to proxy for risk). They find the results shown in Table 3.12.

Table 3.12 Determinants of DB funding level (I)

Dependent variable: funding level of DB pension fund (mean 1.687)	Mean	(1) All firms	(2) Firms with below-average bond rating	(3) Firms with above-average taxes paid
Profitability	0.069	1.323	1.221	0.359
		(2.4	(1.8)	(0.4)
Taxes paid	0.05	1.177	1.792	2.925
		(1.5)	(1.4)	(2.1)
Bond rating	7.797	0.016	0.122	0.031
		(0.7)	(2.0)	(1.0)
Constant		1.282	0.684	1.049
		(7.5)	(2.0)	(3.6)
R-squared		0.05	0.09	0.07
N		226	74	81

Note: Profitability = return on assets. Taxes paid = taxes paid as a proportion of assets. Bond rating = Standard & Poors bond rating. (10=AAA, 1=D)

Source: Bodie (1987).

The results show some evidence of the weak firm effect: for firms with below-average bond ratings, the bond rating is an important determinant of funding rates, while for firms that pay a great deal of tax, the bond rating is unimportant and the tax paid is significant in determining the funding ratio. The proportion of variation in funding rates that the studied variables explain is very low, however, indicating that some important variables have been omitted. Bodie (1987) and Friedman (1983) find different and contradictory effects of firm profitability on funding strategy, both of which contradict the underlying theory. Thies and Sturrock (1988) essentially confirm the result that firms with low effective tax rates and riskier cash flows underfund their pension plans. Differently from Bodie (1987), they use a four-year

panel data set. They calculate the average and standard deviation of the return on assets over 6 years (where Bodie (1987) uses only one year and the bond rating, respectively). They find an effect that is consistent with the predictions of the theory:

Table 3.13 Determinants of DB funding level (II)

Dependent variable: funding level of DB pension fund	(1) All firms	(2) All firms
Constant – 1980	-1.051	3.885
	(8.464)	(7.867)
Constant – 1981	3.803	8.740
	(9.450)	(9.018)
Constant – 1982	17.487	22.423
	(8.635)	(8.066
Constant – 1983	28.030	32.966
	(8.603	(8.035)
Average return on assets	0.748	
	(0.491)	
Standard deviation of return on assets	-4.472	-4.619
	(1.029)	(1.033)
Tax rate	0.527	0.561
	(0.154)	(0.154)

Note: Figures in brackets are standard errors. *R*-squared and *N* not reported.
Source: Thies and Sturrock (1988).

Bodie (1987) also examined the asset allocation of pension funds, and found the results presented in Table 3.14:

Table 3.14 Determinants of DB Asset allocation

Dependent variable: % pension fund invested in bonds (mean 0.536)	Mean	(1) All firms	(2) All firms	(3) Firms with bond rating below BB+
Plan size	n.r.	-3.58×10^{-5}	-2.25×10^{-5}	-1.74×10^{-5}
		(-1.8)	(-1.5)	(-2.0)
Plan funding ratio	1.687	0.064	0.051	0.214
		(1.8)	(1.5)	(1.9)
Bond rating	7.797		-0.0151	
			(1.5)	
Constant		0.440	0.539	0.272
		(10.7)	(5.4)	(1.4)
R-squared		0.04	0.04	0.14
N		369	215	30

Note: Plan size is vested pension liabilities measured in $000s. Plan funding ratio is reported pension assets over vested pension liabilities, adjusted to common discount rate. Bond rating is Standard & Poor's bond rating. (10=AAA, 1=D). n.r. = not reported.
Source: Bodie (1987).

The analysis shows that companies with underfunded pension plans do indeed hold fewer bonds in their pension plans as the theory predicts. The results for the

subsample of firms with poor bond ratings suggests that this effect may be larger for these firms. Surprisingly, the effect of a poor bond rating in the global sample seems to be the reverse of what one would expect if firms were exploiting the PBGC: firms with poor bond ratings invest a greater proportion of their pension funds in bonds. Once again it should be noted that these variables only explain a small proportion of the variability in investment strategy: something important has been left out.

A different set of studies poses the same question in a different way. These studies examine the effect of underfunded pension liabilities on the market value of the corporation. If shareholders value the PBGC put, one would expect that underfunded pension plans only affect corporate value up to the level of the PBGC put. Any liability below that point should not affect corporate value.

Feldstein and Seligman (1981) estimate the effect of unfunded pension liabilities on corporate value. The theory would suggest that the PBGC insurance effect causes shareholders to ignore all pension liabilities that are greater than 30% of residual corporate value. They test explicitly for a PBGC-effect by including a quadratic term in their valuation equations. They are unable to reject the hypothesis that this term is 0, implying that they find no significant PBGC effect. Feldstein and Morck (1983) do not test explicitly for this effect, but their results can be interpreted to indicate that they find no evidence that especially weak firms are valued taking into account the PBGC put. In fact, they find that an underfunded pension plan reduces corporate value more than a dollar-for-dollar basis.

Essentially anecdotal evidence concerning the PBGC is provided by Utgoff (1991), who was Chief Executive Officer of the PBGC in the 1980s. She points out that the PBGC created a dual-track incentive system, which ultimately resulted in a transfer of wealth from successful, well-managed companies to inefficient and poorly managed companies, especially in the steel and airline industries. She notes that the immediate effect of the PBGC was a large increase in the number and the average size of pension fund terminations. In particular, she states that pension funds were terminated by ongoing, solvent employers, an event unheard of before the passage of ERISA. She notes several features of the PBGC insurance system that exacerbated the inherent dangers of the guaranty system. These included funding waivers which were effectively a loan from the pension plan to the sponsor guaranteed by the PBGC, shutdown benefits which were granted to workers when plants were closed, the limitation of the PBGC claim in bankruptcy, the funding rules governing pension plans and the separation of pension plans from active companies. Her discussion of various individual pension fund terminations – in particular LTV Steel, International Harvester-Wisconsin Steel and Continental Steel make for educational reading. The relative speed with which many of these loopholes were closed by the PBGC illustrates the seriousness with which they were viewed by the corporation at that time.

In summary, therefore, the evidence that the PBGC caused a systematic distortion in the pension policy of weaker firms is not strong. The extent to which the lack of consistent results may be due to the underlying issue or due to data problems is unknown, although the paucity of empirical evidence is surprising in the light of the firmness of the theory. The theory itself also seems to contradict the implicit contract view of employment contracts, a point first made by Bulow (1982).

Anecdotal evidence suggests unequivocally that some firms have been guilty of abusing the PBGC put which indicates the extreme care that needs to be taken to ensure that any pension guarantee system's cost is immune to this type of moral hazard.

One area where the theory itself may be incomplete is the issue of unionization. Ippolito (1985) finds substantial evidence that union plans are more likely to be DB

than non-union plans in similar companies, that pension compensation is a much higher fraction of total compensation for union members than for other workers, and that DB pension plans that are associated with unions are much more likely to be underfunded than similar non-union DB plans. Some of his results are given in Table 3.15.

Table 3.15 Determinants of DB funding level (III)

Dependent variable: log of funding ratio	(1)	(2)
Year plan created	0.0023	-0.0017
	(3.86)	(2.68)
Plan participants (100,000s)	-0.013	-0.35
		(1.17)
Firm's employees (100,000s)		0.021
		(1.89)
Union	-0.306	-0.238
	(23.70)	(15.91)
3-digit industry controls:		
Wage ($000s)		-0.08
		(0.1)
Demographic controls		X
Occupational distribution		X
Industry dummies		X
Intercept	-0.203	0.66
	(5.38)	(0.80)
R-squared	0.085	0.155
N	6138	5375

Note: Union = 1 if plan members are unionized. See source for a description of the control variables. Figures in parentheses are *t*-statistics.
Source: Ippolito (1985).

The results show that under a wide variety of specifications and controls, the fact that a plan is unionized has very strong effects on the funding status of the plan. This evidence is confirmed by Bodie *et al.* (1987), who regress the plan funding ratio on the plan type. They find the results shown in Table 3.16.

Table 3.16 Determinants of DB funding level (IV)

Dependent variable: funding ratio	(1)
Fixed	0.106 (2.0)
Unit	0.025 (0.5)
Flat	-0.335 (6.1)
Intercept	1.793 (39.8)
R-squared	0.012
N	10124

Note: Fixed = 1 if fixed benefit plan; Unit = 1 if unit benefit plan; Flat = 1 if flat benefit plan. Most union plans are flat benefit plans. Figures in parentheses are *t*-statistics.
Source: Bodie *et al.* (1987)

Most union plans in the United States are flat-rate plans. Bronars and Deere (1991) find that this effect is not limited to pension plans: firms in unionized industries tend to have significantly higher debt-equity ratios than similar firms in other industries.

It is relevant to note that unfunded pension plans are a form of debt from the point of view of the corporation.

Ippolito (1985) found evidence suggesting that unionized firms were much more likely to create profit-sharing or other incentive contracts than other firms after the passage of ERISA removed the underfunding incentive effect from union plans.

Bulow, Scholes and Menell (1983) point out that it was not unusual for a firm that sponsored separate plans for union workers and salaried workers to have seriously underfunded the union plan but not the salaried plan. They note that after the passage of ERISA, union negotiations concentrated on improving benefits (which were then insured) whereas before this they concentrated on improving funding ratios.

Ippolito (1989) states that approximately 90% of PBGC claims in the period 1974-86 were in respect of union members; it is unlikely that this has changed. It therefore seems to be an unavoidable conclusion that the introduction of PBGC involved a large transfer of wealth to unions. Part of this transfer has also been to shareholders if union pension plan underfunding is a strategic attempt by firms to protect their capital against union hold-up.

Substantial evidence examines the change in the US pension system from DB pension plans to DC pension plans. Work by Ippolito (1997) shows that approximately half of the decline in DB pension coverage is due to the changing structure of the US economy from industries mainly covered by DB plans to industries mainly covered by DC plans. Further information cited by him shows that the difference in administrative costs per participant between running DB and DC plans is very large (about 10 times the PBGC premium for a fully funded plan) for small DB plans but not very significant for large DB plans. This would suggest that the PBGC premium can only be a small part of the decline in popularity of smaller DB plans, but may be important for larger plans. Other evidence from the American Academy of Actuaries shows that very few larger plans cite cost as a reason for termination. Hustead (1998) essentially confirms this picture. Data from the PBGC (2003c) shows that much of the decline in DB pension provision has been in smaller DB plans.

Overall, it should therefore be noted that pension insurance needs to be introduced with great care to avoid opportunistic transfers to unions and shareholders. US evidence suggests that managers view any default on implicit pension contracts seriously. An unsuccessful insurance scheme may have the unintended consequence of destabilizing the entire DB pension system by adding to the taxation burden of successful firms who offer DB pension schemes, and possibly even of giving inefficient and unprofitable industries government subsidies.

3.5 Conclusion

This review examined the available economic evidence concerning the role of the employer in pension provision. The study finds that pensions of any type seem to be associated with higher paying jobs. Indirect evidence suggests that pensions of any type may be associated with higher worker productivity, and that they may therefore have some incentive effects. Pensions of any type seem to deter job mobility, bonding workers more strongly to their employers. DB pensions in particular exert tremendous incentives on retirement behaviour at the end of working life. DB pensions seem to be associated with implicit employment contracts, and while these have been abused by employers in the United States, this was not a common

occurrence. Pensions of any type seem to have a sorting effect in the labour market, allowing employers to select workers with desired characteristics. Overall, this review would suggest that there is little reason for an employer to select a DB pension plan over a DC pension plan unless employers are particularly worried about controlling retirement behaviour. Evidence from 401(k) plans suggests that employers should look carefully at the default options they offer their employees as these have a surprisingly large effect on behaviour.

From a public policy point of view, it would seem desirable to encourage occupational pension provision as it does not seem to result in decreased overall employee saving. The difficulties of insuring DB pension plan members against default would, however, mitigate against this type of pension provision.

Evidence from 401(k) plans suggests that employer pension costs have negative effects on employee contributions, but that employee participation in pension plans is positively affected by the presence of an employer matching contribution.

A striking finding of this review is the lack of quantitative economic analyses of many pension related issues outside the United States. This review could therefore serve as a useful guide to the wide range of questions and possible approaches that could be adopted by researchers once better data become available.

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