

THE RATIONALE FOR OCCUPATIONAL PENSIONS

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Employers and employees have no incentive to include pensions as part of employment contracts unless the pension completes a missing market, or ameliorates an imperfection in existing capital or labour markets. We examine the influence on the choice and design of occupational pensions of capital- and labour-market imperfections. In capital markets, we focus on basis risks, taxation, employer default risks, transactions costs, portfolio restrictions, and liquidity constraints. Aspects of labour markets affecting occupational pensions may be the presence of firm-specific human capital, asymmetric information between firms and potential hires, the presence of moral hazard, and internal labour markets in firms which cause employers to attempt to control the retirement behaviour of workers. The implications of this analysis of occupational pensions for public policy towards pensions are briefly examined.

I. INTRODUCTION

An important source of retirement income for older people is occupational pension schemes—in other words, pension arrangements that form part of the employment contract between employers and employees. The importance of occupational pensions differs significantly from country to country. For instance, in the UK and the USA, occupational pension schemes make up a significant fraction of

the retirement wealth of households. In much of Continental Europe, however, occupational schemes are virtually unknown, while in many developing countries occupational pension coverage is limited to a small fraction of the working population, if occupational plans exist at all.

Relatively little academic work has evaluated occupational schemes from an economic standpoint, in marked contrast to the intense academic debate on

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state pension design. This omission is surprising given the importance of occupational pensions in retirement portfolios in some countries.

This paper attempts to explain the existence and design of occupational pension schemes in terms of economic theory. The fundamental insight, presented in section II of the paper, is that occupational pension schemes owe their existence either to missing markets (financial economists call these ‘incomplete’ markets) or to imperfections in existing capital and labour markets. Section III focuses on employees, and analyses how the different types of market imperfections they face might affect their preferences for cash wages and for occupational pensions with different designs. Section IV focuses on employers, and discusses how pensions may add value to employment contracts by ameliorating imperfections in labour markets.

II. COMPLETE MARKETS FRAMEWORK

In a seminal paper on occupational pensions, Blinder (1983) found that with no uncertainty, no taxes, and perfect capital markets, pensions are perfect substitutes for cash wages. McCarthy (2005) generalizes this result and shows that in complete capital markets (which have uncertainty), the same result obtains.

In complete markets, workers can perfectly replicate their pension payments with a portfolio of financial assets that are traded in public markets. They may hold unlimited quantities of this portfolio, allowing them to remove completely their exposure to their pension (by selling the portfolio short) or to increase their pension (by buying the portfolio). This means that, at the margin, employees must value their pensions at precisely the market price of the replicating portfolio, otherwise they would adjust the quantity they hold until this is the case. Hence, if employers provide workers with a pension as part of their employment contracts, the employees will only accept this contract if the wages they give up in exchange for the pension are less than the value of the replicating portfolio.

If, in addition, we assume that labour markets are perfect, then employers will not be willing to pay

employees a compensation package greater than their marginal product in any period. If we assume that employers and employees trade in the same capital markets, the employer must pay the same price to buy pensions for employees that employees would receive if they sold their pensions. Hence, occupational pensions can create or destroy no value in employment contracts, and employees and employers must be indifferent to the mix of compensation between cash and pensions. This result applies regardless of the generosity of state pensions, whether the pension is funded or unfunded, or invested in bonds, equities, or cash, or linked to wages.

If capital markets are incomplete, or labour markets are imperfect, then this result no longer obtains. In incomplete capital markets, the preferences of market participants for risk and return will affect the value they ascribe to pensions and if employers and employees have different preferences, pensions may create or destroy economic value. If labour markets are imperfect, pensions may be used to add value by reducing some of these imperfections. These cases are discussed in the next two sections.

III. IMPERFECT CAPITAL MARKETS: EMPLOYEES

This section examines the implications of some types of capital-market imperfections for occupational pensions. Imperfections in capital markets affect employees because they often imply that employees are unable perfectly to hedge any risks they face by trading securities in capital markets—in other words, they cause capital markets to be incomplete.

(i) Taxation

In many countries, pension compensation is taxed in the hands of employees at a lower rate than other types of compensation. It is often the case that the presence of taxation alters the pay-offs of securities in such a way as to make employees unable to hedge their risks perfectly by trading them. This implies that workers will have preferences for pensions relative to cash because they are no longer indifferent to their risk characteristics. However, even if we assume that the presence of taxation

differentials does not alter the ability of employees to hedge pay-offs held inside tax-preferred accounts by trading securities held outside them, then the tax preferences given to pensions makes employees prefer to be compensated in the form of pensions rather than cash. In this case, like the complete markets case, workers will still be indifferent to the risk of the pensions compensation—whether they are paid in bonds, equities, or final salary form, and whether they are default-free or not. If tax privileges are rationed, as they are in the UK, then employers will minimize their wage bill by paying the maximum compensation they can in the form of pensions, and the rest as cash or in other forms. Poterba (2004), Dammon *et al.* (2004), and others have examined the value of assets in tax-deferred accounts in the USA.

Governments may choose to provide these tax benefits because individuals are myopic (see, for example Laibson *et al.*, 1998), or because governments wish to mitigate moral hazard caused by the presence of means-tested benefits (see, for example, Hubbard *et al.*, 1995).

(ii) Basis Risk

A second problem—a form of market incompleteness relevant to pensions—is that some risks to which workers are exposed cannot easily be traded on markets. Good examples are the wage risk to which individual employees are exposed and the long-term longevity risk of young employees. Employees cannot hedge themselves against exposure to untraded risks by trading securities in financial markets.

McCarthy (2005) shows that, in this case, there may be an optimal sharing of risk between employers and employees in their pensions if attitudes to risk differ between employers and employees, or if employers are able to diversify untraded risks that employees cannot. For instance, if employers are risk neutral and employees are highly risk averse, then the optimum allocation will have the employer bearing most of the untraded risk. In this situation, the employer effectively sells insurance to employees as part of the employment contract. The risk aversion of employees allows employers to charge a high insurance premium for this insurance, by implicitly reducing employee wages by more than the ex-

pected cost of the risk, thus reducing employer wage costs.

However, it is important to realize that the employer can only be the optimal provider of insurance against a risk if there is some imperfection in public insurance markets which prevents a third party from selling insurance to employees at the price the employer would charge, or if the employer benefits from externalities if employees are insured. For instance, if there are significant asymmetric information problems which the employer is able to mitigate because it has information about its employees that a third insurance company could not have access to, if the employer could save transactions costs by dealing with employees as a group, or if the insurance itself may expose the third party to greater moral-hazard problems than the employer, then the employer may be the optimal place for the insurance. A common non-pension example is medical insurance, which is often provided by employers as part of employment contracts, presumably because individual employees who wish to buy medical insurance must pay large premiums because of asymmetric information in voluntary insurance markets.

In the UK and the USA, employers providing defined benefit (DB) occupational pensions are giving their workers insurance against annuity price risk at retirement by effectively offering them annuities at rates fixed well in advance of retirement. Annuity price risk may be the result of fluctuations in interest rates or mortality rates, both of which employees might find it difficult to hedge against. It is difficult to find an economic rationale which justifies why employers should be better at providing this coverage than third parties, except perhaps the moral hazard a third party would be exposed to if insured claims linked to wages, as most DB pensions are.

(iii) Employer Default Risk

An important source of market incompleteness to employees is the virtual absence of long-term credit insurance to protect workers against the bankruptcy of their employers. This is important given the widespread practice in the USA and the UK of paying employees with partly unfunded pension promises. If these pensions are to be paid, they

require the ongoing support of the employer, which will not be forthcoming if the employer defaults. This risk may be fully or partially covered by pension insurance such as the Pension Benefit Guaranty Corporation (PBGC) in the USA or the Pension Protection Fund (PPF) in the UK.

Uninsurable pension default risk is very similar to other forms of basis risk: differences in risk aversion between employers and employees make it possible that an optimal division of the risk between the two parties could exist. Although there is some evidence that employees often seriously misjudge their exposure to employer default risk (see, for example, Mitchell and Utkus (2003), who examine the extent of 401(k) pension plans invested in employer stock), employees should probably be very averse to default risk in their pensions because they lose their jobs and their pensions at the same time. Employers, on the other hand, are likely to be close to risk neutral about the extra pension payments they would make if they stay in business long enough to make them: these payments are perfectly hedged by firm income. This means that the optimal risk allocation is that the employer bears all of the default risk. The only way in which the employer can credibly do this, if third-party insurance markets are not available, is fully to fund their pension plans. McCarthy (2005) shows that paying employees underfunded pensions is expensive for companies because they have to pay employees extra cash wages—more than the expected cost of the default—to compensate them for the risk to which they are exposed. If employees do not assess the probability of corporate default accurately, then paying workers with underfunded pensions and not compensating them elsewhere represents a transfer of wealth from employees to employers. In most countries with occupational pensions, there are requirements that employers guarantee the pensions they promise, either by funding them or by purchasing insurance against their own default. The presence of such regulations suggests that employees do not accurately assess the risk of default or do not receive compensation for risky pensions promises in their wages.

If there is pension insurance for DB pension plans such as the PBGC, there will be no wage premium for underfunding pensions and the optimal compensation strategy depends on the size of pension insurance premiums for underfunded pension

schemes relative to the cost of fully funding pensions. This situation has been examined by Sharpe (1976) and others.

(iv) Transactions Costs

An important type of market imperfection is transactions costs. These cause markets to be incomplete because, in the presence of transactions costs, employees can no longer trade securities to hedge themselves perfectly against the risks they face. Many researchers—see, for example, Gomes and Michaelides (2005)—have found that a fixed cost associated with entering the equity market has a substantial effect on individual portfolios. One argument in favour of occupational pensions is that they reduce this cost, allowing employees easier access to capital markets. Further, by pooling investment funds, employers are usually able to pay lower management fees than if employees invested their funds individually. Transactions costs may also determine the design of occupational pensions, if they differ substantially by pension type. For instance, it is often said that DB pensions are cheap to run for large employers, and defined contribution (DC) pensions for smaller employers, as discussed by Aaronson and Coronado (2005).

Transactions costs in capital markets may also have a large impact on the investment of pension assets. This may have unintended consequences for employees. For instance, if the costs of raising capital on external markets is high, it may make sense for companies to invest their pension assets in the company itself. This is one rationale given for, say, the German book-reserving system, where pension money is used as a source of capital for the company. This investment approach relies on efficient credit insurance markets to protect employees against default risk.

(v) Portfolio Restrictions and Liquidity Constraints

Another type of financial market imperfection is portfolio restrictions that affect the ability of employees to reach their optimal portfolio holdings. These restrictions may prevent employees from reaching their optimal portfolio holding, and therefore from hedging themselves perfectly against any risks they might face. For example, individuals are

usually unable to take large short positions in most assets (a mortgage against a house is a significant exception to this). They are also unable to sell their rights to their occupational or state pensions. Occupational and state pensions of the DB type represent a forced holding in illiquid bonds. Employees may hold more bonds than they otherwise would wish to as a consequence. This is costly for employees—they lose out on the risk premium they would wish to earn by holding risky assets. Employers wishing to offer extra pensions to employees in this environment will have to compensate employees for the lost risk premium in the form of higher wages or higher pensions benefits.

However, the most important type of portfolio restriction is liquidity constraints that bind when individuals are unable to borrow against future labour or pension income in order to finance current consumption. Liquidity constraints prevent individuals from shifting consumption from retirement to earlier periods in life. If pensions are too large and represent forced savings, then they decrease the consumption of individuals when they are young, reducing overall lifetime utility. These pensions will be undervalued at the margin by employees, making them a very expensive way for employers to compensate employees.

Liquidity constraints underlie the significant crowding out of occupational pensions by state pensions (see, for instance, Disney and Whitehouse, 2003). If employees already have large state pensions, and are unable to borrow against either state pensions or occupational pensions to finance current consumption, then any occupational pension will represent forced savings and so will be not be very highly valued by employees. Employers respond to the valuation of pensions by employees and choose not to provide them.

In summary, imperfect capital markets cause workers to value pensions differently from the amount that firms pay to provide them. This opens up the possibility that pensions can increase or reduce value in employment contracts, and gives employers an incentive (or a disincentive) to provide them. The extent of value creation or destruction depends on the type and size of market imperfections faced by employees.

IV. IMPERFECT LABOUR MARKETS: EMPLOYERS

We now turn to the role that pensions play in labour markets, viewed from the point of view of employers. If there were a ‘spot’ labour market, there would be no long-term employment contracts and perfectly rational employees would sell their labour to firms each period on an open market. Wages would always adjust to ensure that there would be no involuntary unemployment and no internal labour markets in firms—such as regular pay scales, promotion, or retirement. If this model of the labour market were correct, firms would only offer pensions as part of employment contracts because of employees’ preferences. Factors discussed in the previous section, such as taxation, which make providing for retirement cheaper inside pensions than outside them, and the different types of market incompleteness, would affect how employees value pensions relative to cash, and the cost-minimizing employer would respond to these preferences and pay employees in their preferred way. However, employers might benefit in other ways by paying pensions. For instance, pensions may reduce labour-market transactions costs, they may encourage long tenure, and they may incentivize employees—all of which affect the cost–benefit trade-off of an employer choosing to pay pensions or cash.

These imperfections in the labour market mean that pensions may have benefits and costs for employers in addition to the cash wages they substitute for and the cost of the pension itself. Employers may not be able to hedge these additional costs and benefits away on capital markets, even if they can hedge the cost of the pension. For instance, pensions may cause employees to remain longer at the firm than they otherwise would, saving employers the costs of finding and training new staff. They may give workers an incentive to work harder by providing larger pensions to workers who do well at the firm. Underfunded pensions may change the incentives of unions in labour negotiations. Pensions may also help employers to attract staff with desirable characteristics, by attracting staff who value pensions compensation more. Pensions may also influence employees’ retirement decisions—very useful if internal labour markets in the firm pay older employees more than their marginal product of labour.

More detailed treatments of the role that pensions play in labour markets can be found in Gustman *et al.* (1994), and McCarthy and Neuberger (2003).

(i) Job Turnover

Many studies have examined the connection between pensions and job turnover. Some have investigated 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 have usually found a significant negative association between pension coverage and job turnover: workers with pensions stay longer in jobs. A detailed survey is given in Allen *et al.* (1993).

Much econometric work has focused on trying to identify the relationship between pensions and job mobility more precisely. Some researchers, for instance Allen *et al.* (1993), have argued that the pension capital loss (PCL) associated with receiving a deferred pension, which is based on the level of wages when the worker leaves the job, rather than a pension based on the final wages the worker receives, deters workers from leaving. Other researchers contend that the lower job mobility is caused by workers self-selecting into jobs with compensation arrangements that suit their own expectations about their future, or the higher wages of workers in jobs with pensions (Gustman and Steinmeier, 1995). Firms are probably more concerned about the effects of pensions on job turnover than about the source of the effect, although if the lower mobility is caused by higher wages, firms may prefer to pay higher wages than to pay pensions, because higher wages are less risky. Furthermore, if the job-turnover effect does not depend on pension design, firms may prefer to pay workers with DC pensions than with DB pensions, because DC pensions expose the firms to fewer risks.

UK evidence on the effect of pensions on job mobility is sparse. This may be the result of compulsory preservation laws in the UK—deferred pensions must be indexed to the lower of the Retail Price Index and 5 per cent—which lowers the PCL to which workers who change jobs are exposed in the UK. Mealli and Pudney (1996) test the impact of pension coverage on job tenure in the UK and find that, like the USA, DB-pension-covered jobs are associated with longer job tenure. Their economet-

ric technique allows them to conclude that this is not exclusively the result of sorting effects. Similarly, Henley *et al.* (1994) find that membership of an occupational pension scheme significantly reduces hazard rates of leaving a job, but that transferability of pensions rights increases it. However, this study ignores selection into jobs with different pension schemes. Disney *et al.* (2003) present some evidence which suggests that individuals in the UK 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.

(ii) Pensions and Productivity

Another reason firms might choose to offer workers pensions is because pensions might make workers more productive at their jobs by offering them an incentive to work harder. One way to test this theory is to observe the productivity of workers with pensions, and compare this to the productivity of those without.

Unfortunately, as a practical matter, it is very difficult to observe directly how productive a particular worker is in a particular job. Consequently, there is little econometric evidence that workers with pensions are any more productive than those without, and, in fact, relatively little evidence on the effect of compensation policies in general on productivity. For instance, in common with other aggregate studies, 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.

However, the problem can also be approached indirectly: if workers value their compensation contracts rationally, and workers are as productive in jobs with pensions as in jobs without, it stands to reason that there should be a pension–wage trade-off: after controlling for job type, a job which offers a pension should pay a lower cash wage than a job which does not. Most studies that have compared wages in jobs with pensions and similar jobs without pensions have, surprisingly, observed a wage premium associated with pension coverage up to 29 per cent, summarized in Dorsey *et al.* (1998). These findings show that workers covered by pensions earn more than workers not covered by pensions,

after controlling for other factors. This may imply that workers who have pensions are more productive than workers who do not. The source of this difference may be a human-resource strategy associated with pensions, good job matches caused by the presence of pensions, or longer job tenure associated with pensions, all of which might cause higher productivity in employees.

(iii) Underfunded Pensions

Several studies have examined the effect of underfunded pensions on employee–employer relationships. Underfunded pensions make employees unsecured bondholders in the firm, because any pension underfunding is effectively a loan from employees to the employer. If the employer declares bankruptcy, employees lose the loan. This may create an incentive for employees to work harder than they otherwise would to prevent bankruptcy. However, most voluntary incentive schemes tend to make employees equity holders in the firm, rather than debt holders, because the value of equity is more sensitive to the value of the firm than the value of debt, unless the firm is in severe trouble. Further, pension wind-up rules, which determine the allocation of pension assets between different classes of workers if the firm winds up the pension plan, would tend to reduce any incentive effect faced by workers. This is because workers would not know in advance which class they would fall into if the firm defaulted, and hence the correlation of the pension pay-out and firm success is lower than other possible forms of incentive compensation, probably lowering its effectiveness.

(iv) Pensions and Sorting

Pensions may be useful because they provide a mechanism by which employers can make a given compensation package more attractive to workers who have characteristics that the employer finds desirable. Workers who value pensions compensation will be more likely to accept a job that offers a pension than other types of workers. If workers who value pensions are also likely to have other desirable characteristics from the point of view of the firm, then offering a pension may cause these workers to self-select into jobs with pensions. For instance, DB pensions may make a job more attractive to individuals who believe that they are likely to

stay at a given job for a long time, than to individuals who are intending to move jobs quickly. Ippolito (1997) has expanded this theory to DC plan design, too, using the ‘matching contributions’ feature of DC pensions. If firms use pensions to attract better workers, then they will be more productive than other firms, and hence will be able to pay their workers more.

(v) Pensions and Retirement

Barr and Diamond (this issue) discuss the incentive effects of DB pensions on retirement and individual responses to them—see also Kotlikoff and Wise (1987), Gustman and Steinmeier (1995), and Ippolito (1997). The almost universal conclusion of these studies is that individuals tend to respond to these incentives in planning their retirements. The evidence tends to be USA-based, although there is some evidence that workers in the UK respond strongly to the retirement incentives provided by their pension plans, as presented in Blundell and Johnson (1997), and Banks and Smith (this issue).

One reason why firms may be willing to pay pensions to control the retirement behaviour of their employees is the presence of internal labour markets in firms. Bewley (1999) presents convincing evidence that firms operate internal labour markets—pay scales, seniority pay, and lay-offs, rather than pay reductions—as a response to employee concerns about fairness, and to align the incentives of workers with those of their employer. Workers who are near retirement or very senior may not wish to retire because they earn more than their marginal product. Therefore, firms may actually save money by offering workers strong incentives to retire at certain ages. Pensions, and DB pensions in particular, are one way of doing this. Along with preferential taxation of pensions, Blinder (1983) presents this as one of the primary motivations for occupational pensions in general.

V. CONCLUSION

The first section of this paper showed that, in complete markets, the pension compensation decision is irrelevant. The second section examined different types of capital market incompleteness which might affect how employees value pensions

compensation relative to cash compensation, and the third section examined how different features of real-world labour markets, such as asymmetric information, transactions costs, and internal labour markets, might cause employers to derive value from paying pensions rather than cash to their employees.

The existence of occupational pensions is, therefore, entirely explained by these deviations from perfect capital and labour markets. Public policy towards pensions has typically ignored the economic role played by pensions in helping individuals and firms lessen the effects of market imperfections. This work suggests two main public policy objectives in pensions. The first is general: to ameliorate the market imperfections that give rise to pensions by encouraging the free flow of information to individuals and firms, and to encourage the development and use of markets for different risks. The second is more focused on pensions: to assess how well existing pension designs continue to meet the needs of workers and firms given that labour and capital markets are in continual change.

For instance, this work suggests that there may be an optimally efficient pension scheme design, which could differ by type of employee and employer. By specifying models of employee and employer preferences, McCarthy (2005) finds an economically optimal pension contract if capital markets (but not labour markets) are imperfect. His work also allows researchers and public-policy analysts to estimate how imperfect labour markets need to be in order to make different pension designs optimal.

It would be fair to say that the existing work on occupational pension scheme design has just scratched the surface. Arguably, until we clearly understand the rationales for providing occupational pensions in the first place—work that needs to go beyond tax considerations and embrace both the theory and empirical aspects of imperfect capital and labour markets—it will be impossible for us to understand the determinants of occupational pension scheme designs. In order to do this, we need a better understanding of employee savings behaviour and employee behaviour in other areas.

REFERENCES

- Aaronson, S., and Coronado, J. (2005), 'Are Firms or Workers Behind the Shift Away from Defined benefit Pensions?', Federal Reserve Finance and Economics Discussion Series Paper 2005-17.
- Allen, S. G., and Clark, R. L. (1987), 'Pensions and Firm Performance', in M. M. Kleiner *et al.* (eds), *Human Resources and the Performance of the Firm*, Industrial Relations Research Association Series, Madison, WI, Industrial Relations Research Association.
- — — — — McDermed, A. A. (1993), 'Pensions, Bonding, and Lifetime Jobs', *Journal of Human Resources*, **28**, 463–81.
- Banks, J., and Smith, S. (2006), 'Retirement in the UK', *Oxford Review of Economic Policy*, **22**(1), 40–56.
- Barr, N., and Diamond, P. (2006), 'The Economics of Pensions', *Oxford Review of Economic Policy*, **22**(1), 15–39.
- Bewley, T. F. (1999), *Why Wages don't Fall during a Recession*, Cambridge, MA, Harvard University Press.
- Blinder, A. S. (1983), *Private Pensions and Public Pensions: Theory and Fact*, Ann Arbor, MI, University of Michigan Press.
- Blundell, R., and Johnson, P. (1997), 'Pension and Retirement in the UK', *National Bureau of Economic Research Working Paper 6154*, September. <http://www.nber.org/papers/w6154>
- Dammon, R. M., Spatt, C. S., and Zhang, H. H. (2004), 'Optimal Asset Location with Taxable and Tax-deferred Investing', *Journal of Finance*, **59**(3), 999–1037.
- Disney, R., and Whitehouse, E. (2003), 'The Economic Well-being of Older People in International Perspective: A Critical Review', in S. Crystal and D. Shea (eds), *Annual Review of Gerontology and Geriatrics: Economic Outcomes in Later Life—Public Policy, Health and Cumulative Advantage*, vol. 22, New York, Springer Publishing.
- — — — — Emmerson, C., and Smith, S. (2003), 'Pension Reform and Economic Performance in Britain in the 1980s and 1990s', National Bureau of Economic Research Working Paper 9556, March, available at <http://www.nber.org/papers/w9556>
- Dorsey, S., Cornwell, C., and Macpherson, D. (1998), *Pensions and Productivity*, Kalamazoo, MI, W. E. Upjohn Institute.

- Gomes, F., and Michaelides, A. (2005), 'Optimal Life-cycle Asset Allocation: Understanding the Empirical Evidence', CEPR Discussion Paper No. 4583.
- Gustman, A. L., and Steinmeier, T. L. (1995), *Pension Incentives and Job Mobility*, Kalamazoo, MI, W. E. Upjohn Institute.
- Mitchell, O. S., and Steinmeier, T. L. (1994), 'The Role of Pensions in the Labor Market: A Survey of the Literature', *Industrial and Labor Relations Review*, **47**, 417–38.
- Henley, A., Disney, R., and Carruth, A. (1994), 'Job Tenure and Asset Holdings', *The Economic Journal*, **104**(March), 338–49.
- Hubbard, R. G., Skinner, J., and Zeldes, S. P. (1995), 'Precautionary Saving and Social Insurance', *Journal of Political Economy*, **103**(2), 360–99.
- Ippolito, R. A. (1997), *Pension Plans and Employee Performance: Evidence, Analysis, and Policy*, Chicago, IL, and London, University of Chicago Press.
- Kotlikoff, L. J., and Wise, D. A. (1987), 'The Incentive Effects of Private Pension Plans', in Z. Bodie, J. B. Shoven, and D. A. Wise (eds), *Issues in Pension Economics*, National Bureau of Economic Research Project Report Series, Chicago, IL, and London, University of Chicago Press.
- Laibson, D., Repetto, A., and Tobacman, J. (1998), 'Self-control and Saving for Retirement', *Brookings Papers on Economic Activity*, 91–196.
- McCarthy, D. G. (2005), 'The Optimal Allocation of Pension Risks in Employment Contracts', Research Report 272, Department for Work and Pensions.
- Neuberger, A. (2003), *Pensions Policy: Evidence on Aspects of Savings Behaviour and Capital Markets*, Centre for Economic Policy Research, London.
- Mealli, F., and Pudney, S. (1996), 'Occupational Pensions and Job Mobility in Britain: Estimation of a Random-effects Competing Risks Model', *Journal of Applied Econometrics*, **11**, 293–320.
- Mitchell, O. S., and Utkus, S. P. (2003), 'The Role of Company Stock in Defined Contribution Plans', in O. S. Mitchell and K. Smetters (eds), *The Pension Challenge: Risk Transfers and Retirement Income Security*, Oxford and New York, Oxford University Press.
- Poterba, J. M. (2004), 'Valuing Assets in Retirement Savings Accounts', Boston College Working Paper 2004-11, available at www.bc.edu/centers/crr/wp_2004-11.shtml
- Sharpe, W. F. (1976), 'Corporate Pension Funding Policy', *Journal of Financial Economics*, June, 183–93.