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**THE MACROECONOMICS OF AGEING, PENSIONS AND SAVINGS:
A SURVEY
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ABSTRACT/RÉSUMÉ

The effect of pension systems on public and private saving is important - savings are a crucial link between decisions today and living standards tomorrow. This paper, following a brief overview of pension systems in some OECD countries, reviews the empirical literature. Two important questions are: do unfunded public pension schemes reduce national saving? Do tax-favoured private saving schemes increase national saving? Quantitative estimates are highly uncertain, but the answers appear to be, "yes, by up 30 per cent of the funding gap"; and "yes, but often not by very much when the fiscal effects are considered."

L'impact des systèmes de retraite sur l'épargne public et privée est important -- l'épargne établit un lien essentiel entre le comportement d'aujourd'hui et le niveau de vie de demain. Après un rapide suivi des systèmes de pensions dans certains pays de l'OCDE, cet article passe en revue la littérature empirique. Deux questions fondamentales se présentent : le taux d'épargne national est-il diminué par un système de pensions par répartition (sans fonds) ? Les comptes d'épargne bénéficiant d'avantages fiscaux, augmentent-ils ce taux national d'épargne ? Il est très difficile de quantifier, mais les réponses semblent être : "oui, jusqu'à l'équivalent de 30 pour cent de la dette implicite"; et "oui, mais souvent peu sensiblement compte tenu des effets fiscaux".

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THE MACROECONOMICS OF AGEING, PENSIONS AND SAVINGS: A SURVEY¹

I. AGEING, PENSIONS AND SAVING: SOME BACKGROUND

1. The average age in OECD countries is increasing, because people are living longer and, especially, because birth rates have fallen in the past few decades. Citizens are likely to spend a longer proportion of their lives living on retirement income², the retired population will rise as a proportion of the total and the goods and services that the retired population will be able to purchase, irrespective of the source of their income, will be produced by relatively fewer workers. Average living standards (excluding the leisure enjoyed by the retired population) are bound to be lowered, *ceteris paribus*.

2. Population ageing also has well-known implications for current state-run “Pay-as-you-go” (PAYG) pension systems, which have recently been reformed in a number of OECD countries. Prior to these reforms, it was clear that if benefits and contribution rates remained unchanged, deficits on the PAYG account would rise steadily, to several percentage points of GDP annually in some countries. If reforms were introduced only on the contribution side, the future working population would have to pay pension contribution at rates so high that negative impacts on labour supply would become likely. Hence countries have started to introduce reforms on the benefits side, implying that individuals now in their prime working years will receive lower pensions than they previously expected or will have to work for a longer period (Table 1). This raises two questions:

- will change to PAYG systems induce changes in private savings behaviour if individuals seek to rebuild their future pension wealth?
- what would be the likely impact of such changes on future living standards?

1. This paper is based on work carried out in the Economics Department as part of the horizontal project on Ageing Populations.

2. Unless working lifetimes increase at the same rate as life expectancy, reversing the trend of the post-war period.

Table 1 Public pension schemes in selected OECD countries: directions of reform

	USA	Japan	Italy	France	UK	Sweden	Canada
Peak public pension payments (% GDP) ¹	8	17	16 ⁷	15	6	15	10
Year of peak ¹	2070	2050	2035	2035	2035	2035	2035
Unfunded liabilities ^{1,2} (Net Present Value as % of 1994 GDP) ¹	-23	-70	-60	-102	-24	-132	-101
Statutory retirement ages (male/female)							
1990	65/65	60/60	60/55	60/60	65/60	65/65	65/65
2020	67/67	65/65	65/60	60/60	65/65	65/65	
Contribution ⁴		increased contribution rate	increased contribution rate				planned increases in contribution rate
Benefits ⁴			Change in benefit indexation rules; cut in replacement ratio	Change in benefit indexation rules; cut in replacement ratio	Change in benefit indexation rules; cut in replacement ratio	Change in benefit indexation rules	
Other ⁴	increase in retirement age	increase in retirement age	increased contribution period, incentives to postpone retirement	increased contribution period			
Average gross replacement rate ^{5,6,8}	43%	47%	80%	70%	40%	55%	35%
Type of financing ⁵	"buffer" fund	partially funded	pay-as-you-go	pay-as-you-go	pay-as-you-go	partially funded	"buffer" fund
Social security benefit lowered by legislation	1984	1985/94	1992/95	1993	1986/95	1994	

Notes :

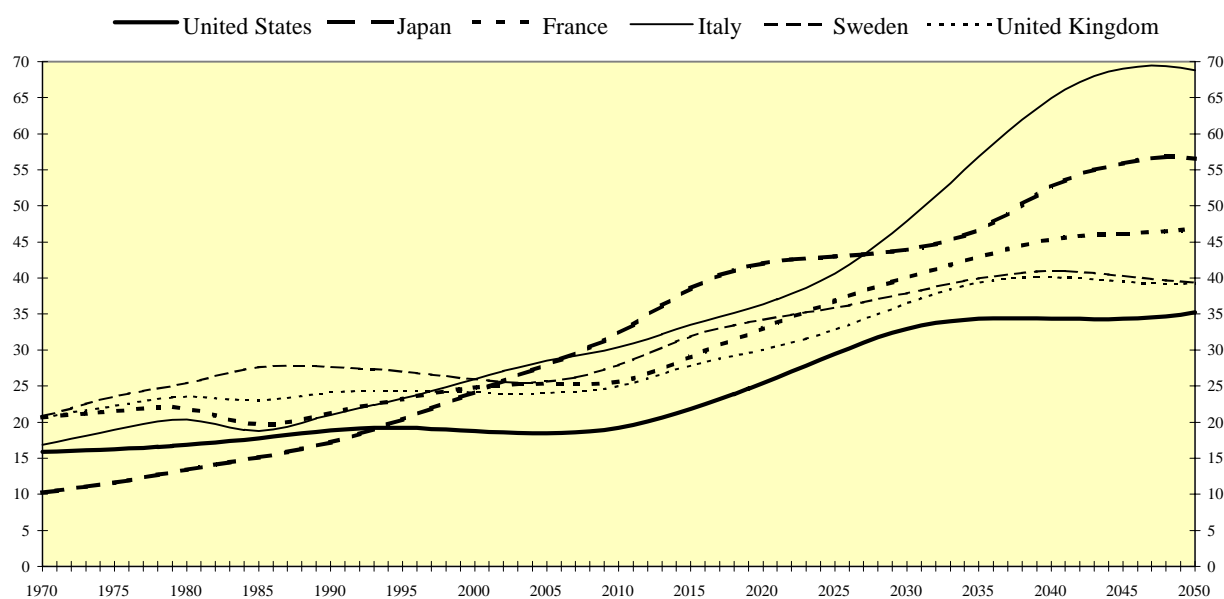
1. From Roseveare *et al.*, 1996. Note that these figures are based on stylised assumptions about pension systems which do not match the detailed structures in individual countries; hence estimates by national authorities may differ substantially. See also footnote 9 in the text.
2. From Table 2, p.15, Roseveare *et al.*, 1996. Base case, discount rate 5%, Productivity growth 1.5%.
3. From EUROSTAT (1995a); Besseling and Zeeuw (1993).
4. For more details on recent pension reforms, see Davis (1997), Table 7.1, p.24.
5. Turner and Watanabe, from Table 2.1, p.12.
6. For more detailed data on replacement rates, see Davis (1997), Table 4.1.
7. OECD (1997), *Economic Survey of Italy 1996*.
8. OECD Secretariat.

3. This chapter provides some summary background material on the demographic changes facing OECD countries, the development of pension systems, and analyses of private savings behaviour. It also gives an overview of the survey in Chapter II of the empirical literature on the interaction between public pensions and private savings, and between savings incentives and outcomes. A separate paper (Hviding and Mérette, 1998) summarises the results of an analysis for selected countries, using an overlapping generations model (OLG) approach to examine the implications of a stylised pension system reform on national savings and output. Policy conclusions are drawn at the end.

Demographic trends

4. Figure 1 illustrates the prospective demographic transition in some representative OECD countries: a large and rapid increase in the old-age dependency ratio³ -- the ratio of older people to those of working age -- using current conventions for definitions of working age. To the extent that population ageing occurs because people live into a longer and healthier old age, the label “dependency” ratio is misleading -- many older people could be working and economically dependent on no-one. For example, participation rates among older Japanese workers rose between 1987 and 1995⁴. However, with a major contribution to population ageing coming from the ageing of the baby-boom generation, a considerable increase in the dependency ratio, however measured, is inevitable.

Figure 1 **Old-age dependency ratios in selected OECD countries**



Source: World population prospects (1996 revision), United Nations.

3. For many purposes the overall dependency ratio (including children of school age, as well as the old, as dependants), or a “needs adjusted support ratio” (see Cutler *et al.*, 1990), is a more useful measure. In the context of pensions, the measure used here is the simplest and most easily standardised across countries, and is also that used in the OLG models discussed in Chapter IV. The text thus uses “dependency ratio” to mean “old-age dependency ratio.”

4. Yashiro (1997).

5. Forecasts for the middle of the 21st century are subject to wide margins of error, but in many cases it seems that the dependency ratio may still be increasing 50 years from now and will also be rising quickly in non-OECD countries⁵. Hence, even at the end of the 5-decade period considered in this paper (Chapter III), OECD economies will not yet have settled down to a steady state. The analysis is thus of an ongoing transition, not a path from one equilibrium to another. The conclusions from the analysis need to be interpreted against this background. Viewed over a long time scale, all OECD countries appear likely to experience a major increase in dependency ratios, particularly Japan and Italy.

Pension systems

6. At the beginning of the 20th century, most employees started their working lives in their early or mid-teens and worked for 50 years or more. Those who could afford to retire typically died soon thereafter. In the past, most of those who were not working and not supported by a working spouse were either relatively rich and living off property income, or relatively poor and supported by relatives, or living in poverty. Over the past 100 years the proportion of people over 65 who work has declined steadily⁶. Declining activity rates were accompanied by increasing wealth, longer life expectancy and a vast expansion of pension provision. In its early phases, much of this expansion was a social policy response to the increasing numbers of old people with low savings, or living on fixed incomes that were being eroded by the sustained high rates of inflation after World War II. Continued population growth, especially the post-war baby boom kept old-age dependency ratios relatively low, which, together with rapidly rising productivity, made pension promises appear relatively cheap. This expansion, along with still-rising longevity and increasing independence of older people from their families, now means that a large and rising proportion of the population is dependent on state-run old-age pensions.

7. As public pension provision has expanded, implicit public debt has grown as well. This was initially because pensions for those already retired when the systems were introduced were financed by the then current workers, with *their* pensions to be provided by future workers; subsequently population ageing and increases in the generosity of pension promises have resulted in current outlays of many public pension systems growing much more rapidly than annual revenues and the annual increase in accrued liabilities exceeding likely future revenues. The debt represented by these increases in net liabilities is not recognised in public accounts, perhaps because it can be altered to a significant degree by changing the pension promises made^{7,8}. However, although not the same as explicit debt, pension liabilities do need

5. Long range population forecasts depend crucially on predicted changes in age-specific fertility rates, which have been changing noticeably in recent years, but also on forecasts of life-expectancy.

6. See Costa, 1998. At the beginning of the century, over-65 male participation rates were between 60 and 70 per cent in the United States and the United Kingdom; 55 to 60 per cent in Germany and France. Declining steadily since then they had fallen by 1990 to 20 per cent in the USA and under 10 per cent in those three European countries.

7. Note that many of these public schemes were not initially intended to be entirely PAYG schemes, apart from the initial debt resulting from paying pensions to initial retirees; for example, the trust fund for the US Social Security scheme was intended to accumulate revenue from a payroll tax set at a level that would balance the revenues and expenditures of the scheme over a 75 year period. Partly because of forecasting optimism tax levels have not been sufficient for this since the 1970s.

8. See Roseveare *et al.* (1996) for calculations of the level of these unfunded pension liabilities for most OECD countries as at 1994. They have not in general been recalculated since that publication to take account of subsequent changes to pension systems. Such changes can make a big difference to estimates of unfunded liabilities: it is estimated that for Italy, for example, recent changes in the law (partly

financing once they fall due, and in nearly all countries this threatens to put substantial and increasing pressure on public finances.

Savings behaviour

8. Although economic analysis of private savings behaviour is not very successful in explaining differences between countries and changes over time, it is certain that one motive is to provide for one's old age. Hence improved health and earlier retirement, which lengthen time spent in retirement, are likely to modify private savings behaviour at the individual level. The large cohort of "baby-boomers" is currently in its high-earning high-saving years, swelling total private savings. As this cohort moves into retirement in the early decades of the twenty-first century, it will start to run down its savings and will be replaced by significantly smaller cohorts. It is generally, though not universally expected that private savings will tend to fall, possibly steeply. The effects of policies that would tend to increase private savings, *ceteris paribus*, need to be assessed against this backdrop of a possibly sustained decline when ageing gets under way. Changes to pension systems which affect contributions or benefits, or the way the pension system is financed, are also likely to affect private savings at both the individual and macro level, and also public savings⁹. These changes would probably tend to increase national savings *ceteris paribus*.

9. This paper focuses on private sector saving behaviour, and its response to ageing and pensions changes. Hence the system of provision for private pensions is important. Unfortunately this is extremely complicated. It encompasses the range of employer-offered schemes, which vary widely both within and between countries, and is crucially dependent on the tax treatment of private saving (including life insurance and other vehicles) and pension income¹⁰, which usually varies considerably according to the form in which savings are held (with New Zealand a recent and radical exception). Table 2 summarises the main characteristics of such provision in selected countries.

10. There are few countries where a simple description of the incentives attached to the decision to defer or not to defer consumption at the margin is possible. The tax treatment of saving can vary according to the amount saved, the type of asset acquired, how long it is held, the form of income from which it is taken, the overall level of income, or the occupation of the saver. "Private" pension saving may be legally compulsory, or a condition of employment. Independently of variations in rates of return on invested assets, the return from contributions to pension schemes can depend on career path, even after any particular contribution has been made (in occupational schemes), and on the age of retirement (where early or late retirement provisions are not "actuarially fair"). Taxation of the income derived from saving can depend on age and the nature of the income-generating asset, quite apart from "normal" variation according to overall income. Most OECD countries also have schemes to facilitate private saving for retirement¹¹ and both public and "private" schemes can be expected to affect the overall¹² level of private saving.

incorporated in the publication referred to) reduced implicit pension debt by as much as 100 per cent of GDP.

9. The international ramifications of changes in *ex ante* national savings propensities will be reported on in a separate paper.
10. See Taxation and Household Savings, OECD 1994.
11. See Chapter II for a brief survey.
12. The design of pension schemes can have important differential effects on the behaviour of different groups of people. This study concentrates deliberately on aggregate saving, because of its link with the evolution

Table 2 Private pensions in selected OECD countries

	USA	Japan	Italy	France	UK	Sweden	Canada
Assets of pension funds (% GDP) ¹							
1970	14	1		1	9		
1980	22	3	0	1	14		18
1989	35	8	0	2	26		25
1994	65	6	2	4	69		
Autonomous pension funds ² (1994)	50	0	4	0	67	2	42
Non autonomous pension funds ² (1994)	0	0	1	0	0	35	0
Coverage, ^{3,4} (% of employment)	50	37	5*	10	70	90	41
Tax ⁵	EET ⁹	ETT	EET	EET	EET	ETT	EET
Portfolio regulations ^{4,6}	Prudent man concept	Guidelines	Most schemes are insured	Half of assets in govt. bonds; less than 33% in loans to sponsors	Prudent man concept; 5% self investment limit	Majority to be in listed bonds	Prudent man concept
Defined benefit/Defined contribution ⁵ (db/dc)	db/dc	db	db	db	db (occupational); dc(personal)	db	mostly db
Reforms					Tax to ETT, 1997		
Type of system	voluntary	voluntary; some contributions offset against payroll tax	voluntary	voluntary	voluntary; some contributions offset against payroll tax	voluntary	voluntary
Average gross replacement rate ⁷ (including social security)	68	60	60	67	68		70
Type of financing ⁵	Funded	Funded Unfunded Book reserve	PAYG; Book reserve	PAYG	Funded		Funded
Marginal Tax Rate ⁸							
Pension savings (deductible premium)	0	n.a	n.a	0	-10.2	11.1	0
Other Savings (bank deposit)	22.5	20.0	30.0	27.1	25.0	30.0	41.5

Notes :

1. From Turner and Watanabe (1995), Table 6.3, p.102 and EFRP (1996), national data.
 2. From OECD, *Statistics on Institutional Saving and Investment* [DAFFE/CMF/RD(97)1].
 3. From Turner and Watanabe (1995), Table 2.1, p.12.
 4. H.J. Blommestein, "Impact of Institutional Investors on Financial Markets in OECD Countries", in OECD (1998) *Institutional Investors in the New Financial Landscape*.
 5. From Turner and Watanabe (1995), Table 2.1 and Davis (1997), Table 8.3.
 6. Davis (1997), Table 8.3.
 7. For more detailed data on replacement rates, see Davis (1997), Table 4.1.
 8. See Table 5.6 in *Taxation and Household Savings*, (OECD, 1994).
 9. EET etc. refers to the income tax status of pension contributions, returns and payouts, respectively. E:Exempt; T:Taxable.
- * Mainly only for executives.

of aggregate productive capacity and thus average living standards. Nevertheless, a number of issues related to heterogeneous behaviour are dealt with in Chapter II.

11. Economists would normally doubt that such a structure could generate “optimal” saving decisions. While some complications are unintended by-products of, for example, the desire to limit the fiscal cost of tax-deductibility, some are more or less explicitly based on the assumption that many individuals, especially, but not exclusively, younger members of society, will not make “optimal” decisions on saving, and will in general save too little without specific encouragement.

Pensions and private savings: empirical evidence

12. A number of empirical regularities in respect of the influence of pensions appear from the survey of the literature in Chapter II¹³:

- Private saving is an imperfect substitute for public pension promises and empirical estimates of the degree of substitution vary widely. The most recent and methodologically sophisticated studies covering Japan, Italy and the United States suggest that the net implicit stock of public pensions has lowered the stock of private sector savings by between 10 and 30 per cent.
- All cross-section studies show that aggregate behaviour masks a large range of responses in different groups in society. Generally speaking the relatively well-off and better-educated are more responsive. This is partly because many on lower incomes do practically no saving at all so cannot respond to increases in public pension provision by reducing saving.

Concerning the impact of private retirement pension wealth, there are only very few econometric studies. Tentative conclusions from those that exist are:

- Private pension wealth has a larger displacement effect on saving than public pensions, perhaps as much as 50 per cent in the United States and Canada, rather than the 10 to 30 per cent mentioned above.

Studies of tax-favoured retirement savings accounts (such as IRAs in the United States), exist only for the United States, Canada, Denmark and the United Kingdom. They show that:

- Tax incentives do stimulate some new private savings, around 20 to 25 per cent of total contributions, but the specific effect is sensitive to the design of the scheme, such as ceilings on contributions and limitations on eligibility and marginal tax rates. The net effect on national saving is smaller because of the fiscal costs, and could even be negative.
- Ease of access, such as through a payroll deduction scheme, and increased awareness were more important factors explaining the rapid growth of savings in instruments like the United States 401(k) programme than the higher after tax rates of return due to tax incentives.

13. Studies surveyed in Chapter II cover the United States, Japan, Canada, Italy, Germany, the United Kingdom, Denmark, Norway, Sweden, the Netherlands, in addition to three cross-country studies. Not all studies cover all the issues dealt with here.

Results from overlapping generations model analysis

13. The overlapping generations models used in the companion paper¹⁴ have many restrictions, in particular it is assumed that individuals are identical, and that an individual is efficiently forward-looking and should thus treat changes in public pension rights as equivalent to changes in personal wealth. However, the literature on savings implies that there is heterogeneity of individual response across social classes and the response is less than full. The OLG models nevertheless indicate on the one hand the maximum size of the likely impact of changes in future pension rights and population age structures on savings, and on the other as giving the most optimistic estimates of the extent to which intertemporal substitution by the private sector can offset some of the effects of ageing populations on future living standards, in a closed economy. Useful conclusions are:

- Even quite large changes in public pension provision, phased in over 20 years or so, would not have measurable impacts on *private* saving rates or interest rates for some time.
- The consequent changes in the capital stock and labour productivity arising from changes in *national* saving rates could nevertheless be quite substantial by the middle of the next century -- when the most acute effects from ageing populations on average living standards appear likely to be felt.
- Pension changes and consequent effects on savings on their own -- without changes in the effective retirement age -- cannot do more than partially alleviate the need for substantial increases in tax rates as dependency ratios rise.

Policy conclusions

14. Few policy conclusions follow directly from this paper. In part they are cautionary: while it is concluded that reductions in public provision of pensions, through reduced benefits or increased contributions, will increase aggregate private saving somewhat, the size of this effect remains uncertain -- it could be large only for very major reductions in public provision; furthermore, some of these measures may have already been discounted, at least by part of the population. Gains to national saving from pension reform will come only if public saving, defined to include changes in the net deferred liabilities of PAYG schemes, is increased. Furthermore, the simulation work, though based on primitive models, implies that although plausible changes in saving will moderate the impact of ageing on living standards, the effect on future living standards may be modest relative to changes due to continued trend productivity growth. Nor should it be forgotten that while the benefits of most reforms designed to increase saving will accrue mostly to future generations, the costs in terms of reduced consumption will inevitably be borne by current generations of workers; exactly which generations these are depends on the precise reform.

15. This is not to imply that reforms of public pensions are not necessary: the public finance case for this remains compelling (presenting public budgets, or at least that part dealing with pension finance, on an estimated accruals basis may be one way of making reforms more acceptable). But measures which make it easier for people to lengthen their working lives (or elimination of existing measures which implicitly or explicitly encourage early retirement¹⁵) may well be more important than measures to

14. See Hviding and Mérette (1998) for details.

15. See Blöndal and Scarpetta (1998) for a detailed discussion of the interaction between pensions (and other income transfer) systems and employment behaviour.

increase aggregate saving. Indeed, as the simulation work illustrates, such changes may reduce aggregate saving while still making a big improvement to public finances.

16. The survey of empirical studies of the effect of tax-favoured savings accounts on overall saving highlights the difficulty of reconciling perceived inadequacies of aggregate saving with individual behaviour. In most countries different forms of saving are taxed at very different rates, with saving in pension vehicles receiving very large implicit subsidies in most cases. Despite this, there remain large numbers of people with negligible retirement savings and it seems likely that the effects of the tax subsidies on private saving are largely offset by their effect on public saving.

Links with other work; a note on terminology

17. Moving away from the narrow focus of this paper, it seems clear that there will be moves in most countries towards further reliance on individual private pensions, with the assets held much more in equity than is typically true at the moment. This is likely to lead to an ownership structure with a larger proportion of the capital stock held explicitly by financial institutions on behalf of individuals. At the same time population ageing is likely to increase the aggregate capital:labour ratio in most countries, reducing, *ceteris paribus*, rates of return. These tendencies may have implications for regulatory policy and corporate governance, for financial markets and for international capital flows. These are the subject of other work in the OECD Department for Financial, Fiscal and Enterprise Affairs and the Directorate for Education, Employment, Labour and Social Affairs as well as in the Economics Department.

18. Some terminology can be misleading in discussion on pensions. While in some countries much of the popular debate about reform of pension provision refers to “privatisation” of public pensions, it is worth noting that there is not always a clear distinction between private and public provision. The word “private” may be no more appropriate for a scheme with compulsory contributions at rates set by the government into funds managed by private sector companies but where the majority of the assets must be held in government debt, than for a compulsory state-run scheme where contributions are held in a fund invested largely in equity markets. The difference between defined benefit and defined contribution schemes is not always so clear either: where a defined benefit is linked to earnings over a long period and contributions are also linked to earnings the incentives for a worker to undertake additional saving are similar to those for a worker faced with a compulsory defined contribution scheme, though the nature of the risks is different. Furthermore, while a private defined contribution scheme is likely to be fully funded almost automatically, a public defined benefit scheme is not necessarily unfunded and a private defined benefit scheme is not necessarily fully funded¹⁶.

16. A defined benefit scheme can never be exactly fully funded, except in expected value, and therefore subjective, terms.

II. REVIEW OF THE EMPIRICAL LITERATURE ON PENSIONS AND PERSONAL SAVING

Introduction

19. This chapter reviews the existing econometric literature on the effects of pensions systems on savings. It focuses on two types of pension systems -- pay-as-you-go (PAYG) and tax-favoured savings accounts (TFSAs) -- and asks whether they have stimulated or displaced private, and particularly private household savings¹⁷. This survey also includes a brief discussion of the impact of occupational pensions and corporate savings on household savings. Throughout this review special effort is made to include as wide a sample of OECD member countries as possible, although most of the literature deals with the United States.

20. This chapter begins with a cursory review of economic theories of saving. It summarises what these theories imply are the effects of PAYG pension systems on saving and analyses how these theoretical implications are modified by the presence of capital market imperfections and population heterogeneity. In general, this section concludes that there are no *a priori* expectations for the size or even the sign of the effect of pension systems on private savings. It does suggest that effects are more likely to be detectable when there is, or, more importantly, individuals perceive there to be, a large change in expected pension wealth and when economic conditions are present which increase the substitutability between expected pension wealth and other types of savings.

21. This chapter then reviews the empirical literature on the effects of PAYG pension systems and TFSAs on private savings. It finds a wide variety of empirical results and shows that these can be explained by three factors: (1) whether the study covers a particular time period during which there was a large change in expected pension wealth; (2) differences in the relative importance of institutional factors, market imperfections and population heterogeneity across countries and across time; and (3) differences in the methodology used in the various studies. Applying these results to the implications for future pension reforms suggests that reforms to PAYG pension systems are likely to have small but visible effects on private savings. The size of these effects will increase directly and disproportionately with the size and degree of public awareness of changes in pension wealth, and will vary with individual country characteristics and the type of pension systems by which PAYG is replaced or supplemented. It signals that caution must be used in extrapolating from historically-based empirical studies, especially as the best evidence is drawn from cross-section studies and as savings behaviour itself is very likely to be changed by significant pension reforms.

17. The literature reviewed does not directly address the questions of greatest interest to policy makers: what are the effects of the conversion of PAYG pension systems to fully-funded (FF) systems on national savings; as well as what are the effects on national savings of supplementing or replacing PAYG systems with occupational or personal pensions. Some of these shortcomings are addressed in the next chapter, which reviews the existing literature simulating the effects of pension reform and presents the results of the Secretariat's own simulations for several OECD countries.

1. Theories of savings and the determinants of displacement effects

Theories of savings

22. This section considers three theories of savings, though they are not mutually exclusive. All, in their simplest form, assume perfect capital markets and a homogenous population, but differ principally in their assumptions about an individual's time horizon as well as who is in an individual's utility function.

1. *The life cycle (LC) model*

23. The LC model is based on the assumption that the primary motive for saving/dissaving is smoothing their consumption over their lifetime, of which retirement savings is the major example. The simple LC model assumes that individuals' utility depends on only their own consumption and their time horizon is their own lifetime. In this model, the introduction of a PAYG pension system, or a change in the generosity of an existing PAYG system, will cause a 100 per cent displacement of private household savings if, and only if, net pension benefits, i.e. the expected net present value of benefits less contributions, are perceived to constitute a change in net expected wealth¹⁸. In extended LC models this first round effect is offset by a number of second order factors, the most important of which is an induced change in labour supply. Labour supply changes depending on the traditional income and substitution effects. Assuming that the income effect dominates, then individuals will increase their demand for leisure and retire earlier, leading them to increase their savings rate during their -- now shorter -- working life in anticipation of a longer retirement¹⁹. The net displacement effect will be less than 100 per cent and could be zero, depending on the size of this and other offsetting factors²⁰.

2. *The bequest model*

24. The bequest model assumes that individuals have a multi-generational time horizon and that they maximise not only their own utility but those of parents and children, giving rise to bequest motives. In this model, the introduction of PAYG pension systems, or of changes in their generosity, implies no

18. For a PAYG system, this can occur in several cases. First, in a sustainable PAYG system, benefits can grow with population growth and productivity growth. Second, in any PAYG system, the first generation(s) to retire tends to receive a positive net transfer i.e. higher rates of return because they have not contributed for their full worklife. Third, political decisions can raise net benefits above the sustainable level, though presumably at some point future beneficiaries begin to doubt whether they will receive the promised level of benefits, increasing their subjective discount rate and eliminating any wealth increases.

19. As Aaron (Aaron, 1982) argues, the predominance of the income effect assumes that increases in net wealth occur because of an increase in benefits for any given level of pre-retirement income. If the change in benefits was due to benefit rights depending on number of years of contributions, then substitution effects would be more likely to predominate. The implications of the extended life cycle theory were first developed by Feldstein in his seminal 1974 article "Social Security, Induced Retirement and Aggregate Capital Accumulation" (Feldstein, 1974). A good discussion and critical review of these theories is found in (Aaron, 1982).

20. A variant of the LC model is the myopia model, wherein individuals maximise over time horizons shorter than their life time. The myopia model has the same implications for displacing savings as the LC model; the only likely effect is to change the age-savings profile. Myopia tends to reinforce the hump-shaped age-savings profile induced by the age income profile, because individuals become "aware" of their need to save as they approach retirement age.

displacement of private savings, whether or not there is a change in expected net pension wealth²¹. In this model a change in net pension wealth is perceived by individuals as inducing a deviation from their optimal level of bequests. In response they will adjust their private bequests and therefore their savings to offset the transfer implied by the PAYG system, offsetting the impact on contributors to the pension system, leaving no net effect on savings over time²².

3. *Precautionary motives*

25. Precautionary motives for savings include saving in the face of uncertain death, extraordinary health expenditures or income disruptions²³. The presence of precautionary motives for savings will modify displacement effects by affecting the degree of substitutability between PAYG pensions and other savings instruments (and the same will be true for the presence of bequest motives).

Modifying the assumptions

26. The implications of the three basic models are sensitive to changes in their basic assumptions.

1. *Capital markets*

27. The introduction of capital market imperfections, such as liquidity constraints, substantially alters the implications for displacement effects of both the LC and bequest models of savings. In general, the deeper and more complete are domestic financial markets the greater will be the displacement effects of PAYG pension systems on private savings. In the LC model, the presence of liquidity constraints will decrease the displacement of private savings. This occurs because individuals will be less able, or completely unable, to borrow in order to reallocate their future pension wealth to current consumption. Under the bequest model liquidity constraints will create displacement effects, because individuals are limited in their ability to transfer wealth to other generations²⁴.

2. *Population heterogeneity*

28. Relaxing the assumption of homogenous individuals can change the implications of savings theories for the displacement or stimulus effects of pensions. This is particularly true if income inequality is introduced. Income inequality can have different channels of influence on displacement of personal savings, especially when combined with the redistributive aspects commonly found in PAYG pension systems. It is a stylised fact that the propensity to save increases with income and that many low-income

21. The development and application of bequest models to pensions is largely due to the work of Barro following his work on Ricardian equivalence. Cf. (Barro, 1978).

22. This effect is not to be confused with traditional Ricardian equivalence and in fact this analysis assumes that traditional Ricardian equivalence does not hold.

23. Precautionary motives are widely regarded as important component of actual savings behaviour. See for example Hubbard, Skinner and Zeldes (1995).

24. Barro has pointed out that transfers need not only be financial in form: provision of in-kind care and household size may change as well, though this will not be picked up in any empirical tests on savings. (Barro, 1978). (Aaron, 1982) has suggested that the substantial decline in household size in general and multigenerational households in OECD countries after WWII was partly driven by the growth in generosity of public pension schemes.

households save little or nothing. Indeed, some researchers suggest that, prior to the existence of public pensions, such low-income households were not able to retire at all, and therefore undertook no private retirement savings. The advent of PAYG pension systems, and increases in their generosity, is likely to have provided a sufficient minimum retirement income to make retirement possible for more and more people when combined with marginal personal retirement saving, stimulating saving. On the other hand PAYG pensions often contain clauses decreasing benefits as other income increases, creating poverty traps and discouraging saving, increasing displacement effects. If low income households do not save for retirement, regardless of PAYG pensions, then displacement effects will be limited to the fraction of the population which does save.

29. Another example of heterogeneity (independent of other characteristics) is “vintage” effects; these would occur if different generations have different savings propensities at the same point in their life cycle. Vintage effects make the impact of changes in expected net pension wealth quite uncertain as income may be transferred from a low to a high savings generation, or vice-versa²⁵.

3. *Macroeconomic feedback mechanisms*

30. The three models of savings are microeconomic models which take as given parameters like tax and interest rates. In the aggregate, any pension-induced change in private saving will result in changes in interest rates, investment, the capital stock, labour productivity and incomes. The net impact on saving will depend largely on how sensitive saving is to interest rates and to income, how domestic interest rates are determined, and how sensitive investment and ultimately incomes are to changes in domestic rates.

Application to tax incentives

31. Most of the same theoretical considerations which applied to the displacement effects of PAYG pension systems can be equally applied to the question of whether tax incentives on private pension accounts stimulate private savings. Tax incentives effectively raise the rate of return to savers, though the rules covering them usually include restrictions on liquidity, contribution size and eligibility which limit their attractiveness and therefore their impact. Whatever the perceived net change in rates of return, this will generate income and substitution effects, as well as portfolio reallocation, with indeterminate effect.

Implications for empirical studies

1. *Empirical evidence of displacement effects will only be found under certain circumstances*

32. Most of the qualifications that have to be introduced into simple theories of saving, to make them more realistic, might have the effect of lowering the expected size of displacement effects. Differences between countries, or for the same country over time, in economic conditions and institutions will affect the size of displacement effects by affecting the relative importance of retirement, bequest and precautionary motives. Such factors could include differences in average household size and composition, and differences in the ways that countries deliver health, income and other types of insurance, whether by the public or private sector, and the scope and generosity of such coverage. Finally, as noted above,

25. One reason for differences of savings across generations appears to be related personal experience with income uncertainty. Dean *et al.* (Dean, 1990, p.36) cited studies of the United States and France which indicated that post-Depression cohorts had lower propensities to save at the same age than their parents.

displacement effects will vary with liquidity constraints, which may change over time with capital market liberalisation or innovations.

33. Measurement of expected pension wealth will also affect displacement estimates. These measures may be gross or net of tax contributions, depending on whether contributions are seen as a tax or as forced savings, and need to be combined with the appropriate measure of income (see Box 1). Estimates of pension wealth need to incorporate expected longevity, retirement age, current and future income levels, and current and future tax rates, and be discounted using a risk-free rate plus a risk factor which accounts for uncertainty over the credibility of pension promises. King and Dicks-Mireaux showed that changes in the assumptions of real discount rates and inflation rates can substantially alter the size of estimated coefficients on (non-indexed) private pensions. Hence, displacement effects in practice might be both small and variable.

Box 1. Methodology

Empirical estimates of pension displacement effects are largely based on the LC model, though many equations are defined so as to also allow for the possibility of bequest effects. Saving or the inverse of consumption is modelled as a function of current income - Y , non-pension “permanent” income or wealth - W , (often broken down into financial, non-financial and housing wealth to control for differences in substitutability), pension wealth -- pension wealth (total, public, or private), and often the labour force participation rate of older cohorts - LFP . Alternatively some studies divide S , W , and pension wealth by Y . Some studies include a separate equation explaining LFP , estimated either simultaneously or sequentially, as in Equation 1a, so that pensions have a direct effect and indirect effect through the LFP equation.

Studies have been made at the level of individual country and pooled aggregate time series, and microeconomic cross-section studies. The most common approach, following Feldstein’s original 1974 article, is to analyse macroeconomic aggregate time series for individual countries, using aggregate household saving or consumption as the dependent variable. The explanatory variables implied by the LC model are supplemented by other variables controlling for short-run conjunctural movements such as unemployment - U , and for factors which may or may not be seen by individuals as being part of their wealth: government spending or the government budget deficit (to control for Ricardian equivalence effects) - GS , BD , and corporate retained earnings - RET . The few cross-country studies include various demographic measures to control for the population’s age profile, such as life expectancy - $LIFE$, the youth and old age dependency ratios - $YDEP$, $OADEP$, and some other institutional measures.

$$(1) \quad S, 1-C = s(Y, W, SSW, LFP, [U, GS, BD, LIFE, YDEP, OADEP])$$

$$(1a) \quad LFP = l(SSW \text{ or } SSB, Y)$$

where SSW and SSB are social security pension wealth and benefits, respectively.

Microeconomic cross section studies include the basic measures implied by the LC model. They differ from the time series studies in that often the dependent variable is net wealth or the change in net wealth rather than saving, and in that they include a number of variables controlling for fixed effects of individual or household characteristics likely to affect saving. Among the latter, the most common are age or age bands, education levels, gender, race, household size, marital status, urban or rural, head of household status, and retirement age.

Comparing the results of the different studies is problematic, most importantly because the cross-section and time series studies are measuring different things. The cross-section studies generally estimate the effect of the *stock* of pension wealth on the *stock* of non-pension wealth whereas the time series studies measure the effect of the *stock* of pension wealth on the *flow* of saving (Equations 2A and 2B). These can be made equivalent in a steady-state by letting $S_t = W_{t+1} - W_t = gW$. Substituting equation 2B and dropping the time subscripts yields equation 3.

2A. Cross-section $W_y = a - b*SSW_i/Y_i + BZ_i$ for individuals $i = 1$ to n

2B. Time-series $S/Y_t = c - d*(W_t + eSSW_t)/Y_t$ for time period $t = 1$ to T

3. $W/Y = c/(g+d) - (d*e)/(g+d)*SSW/Y$

Thus Equation 3 implies that the time series coefficient $d*e$ must be adjusted for the trend growth of wealth, which in the steady state should be equivalent to the growth of income. (If the income measure used includes capital income, then an additional adjustment must be made.) The estimated coefficients from the cross-section studies have been corrected using the inverse of this method and are included in Table 2I.B.

These equations suggest that models estimated in sample periods where the stock of savings is not in equilibrium (cross-section) or never reaches equilibrium (time-series) are not likely to find displacement effects. A second source of incomparability is differences in the measurement and calculation of the key variables of the life cycle model -- S , PY , and W -- and social security wealth -- SSW . Most studies use deflated per capita personal saving or consumption, but some attempt to remove consumption of consumer durables and the inflation effects on asset prices or interest earnings. For wealth, some studies use financial wealth, some separate out financial and housing wealth, and a few attempt to estimate total wealth. In practice pension wealth is recorded in four different ways which are sometimes used in combination: the level of current benefits, the level of current contributions, gross SSW and net SSW . Some studies included in pension wealth other public transfers, such as disability insurance or veterans benefits, or private pensions. Whichever is used, it is important to avoid double counting of pension contributions in both the income and SSW measure¹. Though the majority of studies which used household disposable income for Y used gross SSW , some did not, casting doubt on the validity of their results. In two studies the authors were able to obtain data on individual's own expectations of pension wealth, retirement age and life expectancy.

Finally, in comparing coefficient estimates, a distinction must be made between *marginal* and *total* effects. The majority of time series equations are estimated such that the coefficients on social security wealth (pension wealth) represent the effects of an additional unit of SSW on the flow of saving. Converting marginal to total effects can be done by multiplying the estimated coefficient by the total stock of SSW , and comparing it to the annual flow of saving. Given the disproportion between the two measures, this means that apparently small coefficients on pension wealth imply very large displacement effects on the flow of personal saving: Feldstein (1996) estimates a marginal effect of 3 to 4 per cent and a total effect of nearly 60 per cent. However, this assumes that SSW is truly independent of the other independent variables. This is clearly not the case in the time series equations, where variables such as r , W , and Y would all be affected by large changes in PAYG pension wealth. Nonetheless, a similar methodology was applied to calculate the displacement effects for the other time series studies, which are reported below.

1. See Rossi and Visco (1996) for a discussion of this and related points.

34. As noted in Box 1, the principal difference between time series and cross section studies is that the former measure the effects of the stock of implicit PAYG pension wealth on the flow of saving, while the latter mostly measure the impact of the same stock on the stock of savings, i.e. non-pension wealth²⁶. In addition, these studies differ in that:

- Cross-section studies can more precisely take into account fixed effects and how individual differences affect savings propensities (see Box 1). They are able to measure more precisely pension wealth, based on information on individuals' current age and income, though they still must make assumptions about inflation and discount rates.
- Time series studies do not take into account induced labour supply effects and implicitly macroeconomic feedback effects which will lower displacement effects.
- The relationship between saving and approximations of pension wealth is likely to be unstable over time, biasing time series coefficients on pension wealth, though the direction of the bias is unknown²⁷.
- Cross-section studies do not measure the displacement effect on aggregate saving(s) or aggregate pension provision as generally their sample is not representative of the entire population: it excludes retirees and therefore only measures the saving-reducing effect on the active population without identifying the saving-enhancing effect on retirees.

2. The effects on private savings of PAYG pension systems: empirical results

35. Reflecting the conclusions of the previous section, it can be expected that empirical analyses of the impact of pensions systems on private savings will yield a variety of results, depending on the methodology used, the time period covered, and the economic institutions of the country or countries studied. This is indeed the case, as will be shown below. Allowing for these factors the empirical studies support the hypothesis that PAYG pension systems, when they are perceived to create net wealth, do displace private savings to some extent.

36. It is convenient to group existing studies into time series analyses, single country or pooled, and cross-section analyses²⁸.

26. An exception is Rossi and Visco (1995), who used the flow of saving in both time series and cross section.

27. This occurs for three reasons: i) time series regressions either ignore or have difficulty in correcting for underlying population heterogeneity in savings propensities, so that they will track poorly changes in savings behaviour caused by changes in demographic composition. Such changes can include the age profile of the population, distribution of the population by household type (dual income, single male or female head of household, etc.), and the relative importance of farmers and the self-employed, who tend to have savings propensities different from wage and salary earners; ii) expected net pension wealth is calculated using constant parameters for wage growth, inflation and real interest rates. These are likely to change over time as individuals take into account changes in tax rates and discount rates as well as factors which affect the probability of receiving currently promised pension benefits; and iii) the degree of substitution between public and private pensions, and pensions and non-pension wealth will be unstable as the aggregate measures used will not capture changes in the underlying portfolio composition.

28. The summaries provided in the following discussion relies heavily on the previous literature reviews of (Magnussen, 1994) and to a much lesser extent (Hughes, 1996).

Time series studies

37. The results of times series studies vary widely (see Table 3). Several studies found no displacement of private saving by PAYG pension systems, and one of the pooled studies even reported that PAYG systems stimulated private saving. However these types of findings were largely confined to the older, less methodologically sophisticated studies (see the discussion in Box 1 and below). The latest studies did find substantial displacement effects in Italy and Japan as well as the United States but not in Norway.

Table 3 Time Series and Pooled Country Studies

Country Author	Sample Period	Dependent Variable	Equation Form	Pension Definition	Displacement Effect on Savings			Independent variables		Comments
					Estimated Coefficient	One unit increase	Total Effect	Statistically significant	Not Statistically significant	
Feldstein (1996) USA	1930-80	Consumption/ Disposable Income	Levels on levels	GSSW	0.041 OLS Stat. Sign. 0.028 AR1 Stat. Sign.	4.1% OLS 2.8% AR1	64% (OLS) 56.5% (AR1)	YD Wealth		No effect of using NSSW or adding retained earnings
Makowski and Palmer (1979) Sweden	1952-75	Household Savings/ Income	Levels on levels	GSSW	-35.322 OLS Not Stat. Sign. Nonlinear LS Stat. Sign.	Cannot be calculated	30+%	Y	Inflation	
Boyle and Murray (1979) Canada	1954-75	Household Savings	Levels on levels	NSSW for Old Age Security NSSW for CPP	-0.02 to 0.005 Not Stat. Sign.	Not Stat. significant	Not Stat. significant	Corporate earnings Inflation Unemployment YL LFP	Interest rate	Non-SSW independent variables introduced individually
Pfaff, Hurler, and Dennerlein (1979) Germany	1952-75	Household Savings/Income	Levels on levels	Public Pension income SSC SST	from -0.199 to 0.738	Not Stat. Significant	Not Stat. Significant	OADEP Income ceilings Y	Income taxes Active to Total Population ratio	Variables included individually, no LC model
Yamada (1992) Japan	1950-82 men 60+	Personal Savings rate	Levels on levels	GSSW NSSW SS Taxes	-0.004 OLS Stat. Sign. -0.004 TSLS Stat. Sign.	0.4% OLS 0.4% TSLS	GSSW 38% NSSW 34% SST 9%	YD LFP Life; Corporate earnings; Education	Unemployment	Simultaneous equation model of LFP and Savings
Feldstein (1978) USA	1929-74	Private Savings	Levels on levels	GSSW	-0.003 GSSW Stat. Sign. 0.10 PP Not Stat. Sign.	3.3% for SSW	63% in 1974	YD Corporate earnings	Wealth Private Pension Savings Unemployment	
Munnell (1974) USA	1929-69 1946-69	Personal Savings	Levels on levels	NSSW	-0.033 (29-69) Not Stat. Sign. -0.12 (46-69) Stat. Sign.	3.3% 12%	48.9% in 1974	YD	Net Worth Unemployment LFP	Later papers by Munnell indicate total effect on savings near 0.

Table 3 Time Series and Pooled Country Studies (continued)

Country Author	Sample Period	Dependent Variable	Equation Form	Pension Definition	Displacement Effect on Savings			Independent variables		Comments
					Estimated Coefficient	One unit increase	Total Effect	Statistically significant	Not statistically significant	
Heming (1978) UK	1948-73	Consumption	Levels on levels	GSSW NSSW	-0.004 GSSW Not Stat.Sign. -0.015 NSW Stat. Sign.		30-35% Increase in Savings	YD	Wealth	Combines YL with NSSW, not correct
Darby (1977) USA	1929-74 1947-74	Consumption	Levels on levels	NSSW	0.025 (29-74) Not Stat.Sign. 0.003 (46-74) Stat. Sign.	2.5% 0.3%	38% in 1974	YP, YT Consumer Durables Interest rates (+?)	Money Stock	
Rossi and Visco (1996) Italy	1954-93	Net consumption corrected for inflation	Δ log on Δ log, log, and levels	GSSW	0.658 Stat. Sign.	2.17%	54%	YD Non-pension transfers Govt. consumption Real interest rates		
Browning (1982) UK	1962-79 quarterly	Consumption	Δ log on Δ log, log and levels	Gross Public and Private pension wealth	0.036 Stat. Sign.	0.16%		Y Inflation Wealth		Significant results only in change in log form, not in log levels
Lee and Chao (1988) USA	1947-77	Personal savings and Labour Force Participation (LFP) rates	Levels	NSSW SS Taxes Net PPW	-0.21 SS Not Stat. Sign. 0.003 through LFP rates	Not Stat. Sign; Indirectly 0.03%	Indirectly 1.7%	Y Inflation Corporate earnings		
Knut A. Magnussen (1994) Norway	1962-91	Consumption, separate equations for workers and pensioners	Δ Levels on levels and Δ levels	Current pension income. Expected pension income	Workers:-0.01 to -0.02; Not Stat. Sign.	Not Stat. Sign.	Not Stat. Sign.		YL Unemployment Real After-tax interest rates. Wealth Consumption	Separate equations for workers and pensioners

Table 3 Time series and Pooled Country Studies (continued)

Country Author	Sample Period	Dependent Variable	Equation Form	Pension Definition	Displacement Effect on Savings			Independent variables		Comments
					Estimated Coefficient	One unit increase	Total Effect	Statistically significant	Not statistically significant	
Kune (1981) Netherlands	1952-78 and 1957-78	Savings	Levels on levels	SS Old Age and Total Contributions Gross PPW	Total SS contrib. 0.17- 19; Old Age SS Contrib. 0.41-.51. Not Stat. Sign.	SS - Not Stat. Sign. PPW near 1001%		Y Unemployment Inflation Interest rates		
Guletkin and Logue (1980) USA	1947-74	Personal Savings	Levels on levels	NSSW Pension Assets	-0.046 to -0.058 SSW Not Stat. Sign. -0.095 to -0.14 PPW Not Stat. Sign.	4.6 to 5.8% SSW 9.5 to 14% PPW	56% in 1974	YD Financial Wealth SS contribution Retained earnings	Govt. budget Unemployment Personal Education Real interest rates	
Feldstein (1979) Pooled	12 countries. 1969-75 averages	Household savings/Income	Levels on levels	Benefit-earnings replacement ratio	-0.37 Stat. Sign.	2.09%	Not available	OADEP, YDEP	Life expectancy earnings test	
Kopits and Gotur (1981) Pooled	14 OECD and 40 developing countries. Most data from 1969-71	Household Savings/ Income (real, per capita)	Levels on levels	SS Old-Age Benefits Other SS benefits	0.50	Separate		Income Age of SS System; Labour Productivity growth YD		
Barro and MacDonald (1979) Pooled	16 OECD countries 1951-60	Consumption /GDP	Levels on levels	SS Benefits	From -0.12 with common intercept to 0.07 with fixed effects. Not Stat. Sign.	7.0%	For positive, same as Feldstein (1977), 30-50%	Government Unemployment Y.		

* Income measure used is net of taxes and social security contributions.

Notes: SSW – Social Security Wealth: Gross (NSSW) is benefits only; Net (NSSW) is benefits net of contributions; PPW – Private Pension Wealth; NPW – non-pension wealth; TPW – total pension wealth; YDEP, YOA, TDEP – Youth, Old age and Total dependency ratio, HH – head of household type (single male - SM, dual -D, single female -SF); Y - income; YD - disposable income; YL - labour income; YP - permanent income; YT - transitory income.

1. *North America*

38. For the United States, rather large offsets are found by Feldstein in a series of articles which estimated a simple LC model plus some variables for short-term macroeconomic dynamics (see the results reported in Table 3). In his early studies he found total displacement effects of 30-50 per cent²⁹, whereas in his most recent work (Feldstein, 1996) he reported a marginal displacement effect of 4 per cent and a total displacement effect of 60 per cent. A number of studies followed the original work of Feldstein, making various corrections to his data -- Leimer and Lesnoy -- and to his methodology -- Munnell and Lee and Chao (both included measures of the labour force participation of older workers). Based on these corrections, Munnell found smaller displacement effects than those reported by Feldstein, while the studies by Leimer and Lesnoy and Lee and Chao found no effect at all. Boyle and Murray performed a similar study for Canada replicating the methodology of both Feldstein and Munnell³⁰. They found no effect of PAYG pension systems on personal saving. They also found that corporate retained earnings increased private savings, the opposite of what would be expected. Like Lee and Chao's study of the United States, they did find that the labour force participation rate of older workers positively affected private savings.

2. *Europe*

39. Time series studies of European countries vary widely in their findings of displacement effects. A very recent study of Italy by Rossi and Visco (Rossi, 1995), found a significant displacement effect, with an estimated semi-log elasticity of 0.658 for pension wealth on saving. Based on these figures, they calculated that public pensions accounted for 3 percentage points of the 9 percentage point drop in the national saving rate between the 1960s and the 1990s. By contrast Magnusson, in his 1994 study of Norway (Magnussen, 1994), found no effect of expected public pension income on workers' consumption³¹.

40. Only older studies -- dating from 1978-81 -- exist for the United Kingdom, Sweden, Germany and the Netherlands (Kune, 1981; Pfaff, 1979; Markowski, 1980). These all used variants of Feldstein's original simple LC equation. These studies found no displacement effects for Germany nor for the Netherlands. The studies of the United Kingdom reported marginal displacement effects of 1.5-3.6 per cent and total displacement effects of 30 per cent. In Sweden, the total displacement effect was also around 30 per cent.

3. *Japan*

41. Yamada, Yamada and Liu (Yamada, 1992) estimated joint equations for saving and the labour force participation (LFP) rate for males over 60 for Japan. They found marginal displacement effects of 0.4 per cent on the saving rate and a total gross displacement of 34-38 per cent for Japan. However they also found that the possibility of early retirement increased savings; they reported that the elasticity of

29. As is discussed in Box 1, total displacement effect is used here and elsewhere to refer the effect on the total flow of saving of total PAYG pension wealth. The marginal effect, represented by the estimated coefficient on pension wealth, is the effect of a \$1 increase in expected pension wealth on the annual flow of saving.

30. Their definition of public pensions included both the basic Old Age Security system (OAS) which is financed from general revenues and the earnings-related PAYG Canada Pension Plan (CPP).

31. Aggregate income data in Norway is available for workers, the self-employed and pensioners, depending on where the majority of their income is derived from. Magnusson found that workers' propensity to consume out of labour income was higher than pensioners' propensity to consume out of pension income.

over-60 LFP with respect to savings was between -3.0 and -4.0 . For the period from 1960-80, this appears to have increased total savings by about 8 to 9 per cent, so that the net total displacement effect was closer to 25 to 30 per cent³².

4. *Pooled country studies*

42. Three pooled cross-country time series studies were reviewed, all of which used benefits rather than wealth as a measure of PAYG pensions, so that coefficient estimates are not comparable to the other studies (see Table 3). Feldstein (Feldstein, 1980) reported results essentially similar to those of his studies for the United States alone. Kopits and Gotur (Kopits, 1980) studied 14 OECD countries for 1969-71. They included in their model labour productivity, interest rates, corporate earnings, Gini coefficients, dependency ratios, life expectancy of the elderly, and the age of the social security system itself, though many of these measures proved not to be statistically significant. Of particular interest is that they split public pensions into three parts: the old age benefits, other transfers, and contributions. They found that old age pensions had a positive effect on savings, but the proxy they used is a poor approximation of expected wealth³³ and this result should probably be interpreted as showing that the elderly have relatively high savings rates. They found that other types of public transfers did displace savings, suggesting that precautionary effects were important. They also found that private savings decreased with the age of the social security system, presumably because of greater confidence in, or awareness of, the system. Unlike Feldstein and several of the US studies, they found no effect of corporate earnings on savings.

43. Barro and McDonald (MacDonald, 1979) studied 16 industrialised countries for the 1951-60 period. They found a significant negative correlation between consumption and PAYG pension benefits, implying that pension wealth stimulated savings. However when they included individual country fixed effects in their model the sign on pension wealth reversed³⁴. They concluded that the effect of pension wealth on savings differed between cross section and time series for countries: countries with higher levels of pension wealth had higher savings, while increases in pension wealth over time lowered private savings³⁵.

Cross section studies

1 *North America*

44. Cross-section studies of the United States and Canada³⁶ reported total displacement effects of pension wealth on the stock of non-pension wealth ranging from about 30 to 100 per cent, with most

32. Total savings and SSW were both statistically significant in the over-60 LFP equation, implying that higher levels of personal savings permitted earlier retirements. The elasticity of LFP with respect to savings was low, about 0.05 per cent.

33. They used the ratio of current transfers to income, adjusted for the size of the elderly population.

34. So did the sign on the old-age dependency ratio, which became negative, contrary to expectations and suggesting coefficient instability.

35. One possible explanation for the cross-section result is that the populations which are particularly risk-averse prefer both higher private savings rates and more generous pension programmes. Also, as noted above, the creation or strengthening of pension systems in the 1930s-1950s, depending on the country may have made people confident of their ability to retire, inducing private retirement savings.

36. The studies covered were those of (Feldstein, 1978; Gale, 1995; Dicks-Mireaux, 1984; Leimer, 1992; Hubbard, 1986; and Kotlikoff, 1979). The sample for Feldstein and Pellochio's 1978 study covered 126

studies in the range of 60 per cent [Table 4 and see also the summary by Munnell (1992, pp.125-127)]³⁷. However in several studies these large figures probably resulted from the fact that private pensions were included in the pension measure used. In two of the more recent and thorough studies, those of Gale (1996) and Hubbard (1986), private pension wealth was included separately. They reported total displacement on non-pension wealth effects for public pensions of 11 and 33 per cent, respectively.

couples aged 55-64 and Feldstein's 1983 study covered 2087 couples aged 58-63 as of 1969. Gale's sample was taken in 1983 and covered households with full-time workers aged 40-64 and excluded farm and self-employed households. The sample for Dicks-Mireaux' study was drawn from 1977 and covered 8279 households, excluding those headed by single women and below a certain income level. Leimer used a large sample of over 200 000 individuals aged 18-89 drawn in 1982-83. Hubbard's sample was from 1979 and covered 4 500 households, excluding female head of households. Kotlikoff's sample dates from 1966 and covered 2 500 households aged 45-59.

37. Again, measured as a proportion of what non-pension wealth would be without pension wealth. Thus a total displacement effect on non-pension wealth of 50 per cent implies, *ceteris paribus*, a doubling of the latter if pensions were removed.

Table 4 Cross Section Studies

Country Author	Dependent Variable; Data source/ nature	Form	Pension Definition	Estimated Coefficient	Marginal Effect of SSW on flow, stock of saving(s)	Total Effect on Flow of Saving	Statistically Significant	Not Statistically Significant	Comments
Kotlikoff (1979) USA 1966	Wealth; 2500 households aged 45-59. Natl. longitudinal sample	Levels on levels	SS Taxes NSSW	0.666 for SS Taxes 0.237 for SSW wrong sign and not sign.	None	Not applicable	YP; YP ; HH; Race Age; Retirement	Marital status; PP as dummy	Estimates separate retirement equation
Hubbard (1986) USA 1979-80	Wealth to income; President's Commission on Pension Policy	Log on levels	NSSW NPPW	-0.18; SSW -0.15 PPW Stat. Sign.	0.15% on flows 15-18% on stocks	33% SSW; 16% PPW	Age cohorts; YP; self-employed child; farm	Unemployed	
Mariger (1986) USA 1962-63	Consumption; 623 pre-retirement individuals		SSW from cumulated tax contributions	0.595-0.847 Stat. Sign.	Not calculable	Not calculable	YD, Home and auto equity, net worth, age education		Found liquidity constraints for 20% of families, but did not affect displacement
Rossi and Visco -1996 Italy 1991, 1993	Savings to Income; 5,600 HH Survey of HH Income and wealth	Level on Levels	Actual and calculated Gross SSW	-0.9 elasticity	-0.9 elasticity		YP; Age; Region Child; PP dummies	Household size	Age effects very important
Japelli (1994) Italy 1989, 1991	Wealth to Income; Survey of HH Income and Wealth	Levels on Levels	GSSW 1989 1991	-0.15 to 0.22 -0.11 to -0.19	0.2% on flows 15-22% for 1989 11-19% for 1991 on stocks	Not calculable	Age cohorts: YP; education; region; presence of PP	Child	
Gale (1995) USA 1983	Non-Pension Wealth; Financial Wealth 638 HH headed by full time workers 40-64 from Survey of Consumer Finances	Levels on levels	NSSW, N PPW, and TPW	0.10	0.1% on flows SSW - 11% PPW - 49% TPW - 39% on stocks;		Age, Age/Y; Y; Education: Marital Status; Family Size		SSW both expected and calculated, adjusted for life expectancy. Large effects of savings plans, higher education

Table 4 Cross Section Studies (continued)

Country Author	Dependent Variable	Form	Pension Definition	Estimated Coefficient	Marginal Effect of SSW on flow, stock of saving(s)	Total Effect on Flow of Saving	Statistically Significant	Not Statistically Significant	Comments
Leamer and Richardson (1992) USA 1982-83	Consumption; Consumer Expenditure Survey, 2884 households	Levels on levels, non-linear	GSSW SS Taxes	0.609	61% on flows 96% on stocks	18%, 7% if risk-adjusted	FW; YL; Private T; Govt. T; Age cohorts; risk premiums		SSW has negative risk premium, implies strong role as annuity
Takayama (1990) Japan 1979, 1984	Consumption to YD; National Survey of Family Income and Expenditure		GSSW NSSW	0.011 1979 0.024 1984	1.1 - 2.4% on flows avg 58% on stocks	12% in 1984	YD; Age; family size; FW, RW		Estimates range with Age from 1.2 to 18%
Kings & Dicks-Mireaux (1984) Canada 1977	Assets to Income; 8279 HH; single-women and low-income excluded	Log on log	SSW PPW	-0.19 to 0.23 -0.07 to 0.12	0.2% flows 17 to 21% SSW 28 to 51% PPW		Age; YD; region; urban; farm; life insurance; no. of adults	Unemployed	Provide range of estimates based on prior beliefs as to what actual estimate should be
Bernheim (1987) USA 1969	Wealth; 5300 couples, 1600 individuals. Longitudinal Retirement History Survey	Levels on Levels	SSW with two types of discounting -actuarial -simple	-0.77 actuarial -1.24 simple for couples -0.70 actuarial -0.80 simple for individuals	9.9% on flows 80 to 124% on stocks		Age; YD; Agè Age x SSW	Age x YD Age x SSW (individuals)	High offset rates for annuities likely affected by age group used

Notes: GSSW, NSSW - (Gross, Net) Social Security Wealth: Gross is benefits only; Net is benefits net of contributions; PPW - Private Pension Wealth; NPW - non-pension wealth;

TPW - total pension wealth; Y, YD, YP, YL - Total, Disposable, Permanent and Labour income respectively; YDEP, OADEP, TDEP - Youth, Old age and Total dependency ratio,

HH - head of household type (single male - SM, dual-D, single female-SF); Child-Number of Children

Conversions from effects on flows to effect on stocks were made by adjusting the coefficient by the average growth rate of GDP, and depending on the income measure used, interest rates and the marginal propensity to consume (assumed to be 0.7).

45. Displacement effects on the stock of non-pension wealth appear to be much larger for private pensions than for public pensions³⁸. Gale (1995) reported in his study of the United States a total displacement effect of 11 per cent for Social Security, versus nearly 50 per cent for private pensions. Avery, Elienhausen and Gustafson reported a total displacement effect of 100 per cent offset of private pensions on thrift accounts in the United States³⁹. King and Dicks-Mireaux's study of Canada (Dicks-Mireaux, 1984) reported similar differences, 17.1 versus 50.1 per cent, respectively. The Canadian study also found that coefficients on (non inflation-indexed) private pensions varied substantially depending on the assumptions on inflation and real discount rates used to calculate pension wealth⁴⁰.

2. *Other countries*

46. Few cross-section studies are available for countries outside North America, but those available yield similar results (see Table 4). Takayama's study (Takayama, 1990) of Japan, based on two samples drawn from 1979 and 1984, found a total displacement effect of public pensions on personal savings of about 60 per cent. Rossi and Visco (Rossi and Visco, 1995), analysing a sample of 5 600 Italian households from 1991 and 1993, found a displacement elasticity of 0.9. Alessi, Kapteyn and Klijm's study of the Netherlands (Alessi, 1994) covered 5 000 households sampled between 1987 and 1991. They found no effect of pension wealth on savings, but attributed this largely to noisy data and high multicollinearity between measures of pension wealth and current income levels.

Evaluation and conclusions

47. This review of the literature reveals a wide variety of estimates of the effect of the introduction and increased generosity of PAYG pension systems on private saving, with total effects ranging from 100 per cent displacement of non-pension wealth to no effect, or even to providing a small stimulus. Other literature reviews⁴¹ have concluded on the basis of similar evidence that little can be said about

38. The literature suggests that agents are more "aware" of the stock of their private pension wealth, are better able to estimate it, and that agents who have private pensions have a higher savings propensity, controlling for other variables.

39. The sole exception is Hubbard (Hubbard, 1986), as is discussed below. The larger displacement by private pensions is also indirectly supported by the fact that in many studies the coefficients on financial wealth, including private pensions, were much higher than those on Social Security (or non-financial wealth such as housing).

40. They reported displacement effects of 21 per cent versus 28 per cent, respectively, when a larger set of fixed effects variables were included. They also found that coefficients for both types of pension wealth were sensitive to the prior beliefs as to the size of these effects implied in the regression. They estimated two additional sets of coefficients, based on the prior assumption that there was no displacement effect and that the displacement effect was expected to be 100 per cent. Combining all three alternatives, they established confidence intervals of 8 to 40.8 per cent for public pensions and -1.3 to 56.6 per cent for private pensions.

41. As cited above (Hughes, 1996; Magnussen, 1994). Magnusson concluded that the evidence on time series studies was too mixed to arrive at any general result, whereas the cross-section results did show some displacement. Hughes went further, arguing that cross-section results are essentially meaningless in a policy context and that the impact of reforming PAYG pensions must include an analysis of what they will be replaced with. He contends that the literature on IRAs and similar private schemes show substantial tax costs so that national savings is left unchanged. Both these studies reached this conclusion by simply comparing the number of studies which found a displacement with the number of studies which did not,

them. However, looking carefully at the results it is also possible to conclude that the impact of PAYG pension systems on private savings varies depending on the particular features of a country during the sample period of study, as well as the success of the particular study in minimising biases in measurement and omitted variables.

48. A study by Auerbach and Kotlikoff suggests one reason why empirical research is so inconclusive. They showed, using time series regressions run on artificially generated data, that changes in the sample period around the date of inception of PAYG pension systems changed the size, statistical significance, and even sign of displacement effects. They found similar results for substantial increases in generosity⁴². More generally, empirical techniques will only pick up effects when there is a significant change in explanatory variables. Hence it is not surprising that studies which covered sample periods in which there was little change in net pension wealth, or when such changes were sufficiently gradual that “awareness” was low, found little effect. Thus studies which covered immature PAYG systems, i.e. when public pension wealth was rapidly increasing, should have found effects, whereas studies which covered mature PAYG systems should have been less likely to find effects. Similarly studies which covered pensions whose payouts were more certain, (i.e. partially or completely funded systems, or those which included (funded) private pension wealth in their pension variable), should tend to find higher displacement effects.

1. *Countries where displacement effects were found*

49. In Europe the clearest displacement effects were found in Sweden and Italy. Both these countries had very high levels of pension benefits and experienced rapid increases in PAYG pension wealth during the postwar period; Italy had at its peak the highest replacement rates of any country in the OECD, well above median levels. In addition the Swedish study used as its definition of pension wealth only supplemental earnings-based pensions (ATP), not Social Security. During the sample period the ATP was almost completely funded⁴³ and was not a PAYG system, therefore this study was not an a test of the effects of PAYG pensions.

50. Substantial displacement effects were found in both of the Japanese studies reviewed. The Yamada’s time series study, which covered a period of rapidly increasing pension wealth, found a displacement effect twice that of Takayama’s study which used a sample period with little increase in pensions.

2. *Countries where no displacement effects were found*

51. No displacement effect was found in the study by Pfaff of Germany nor in the study by Kune of The Netherlands. In large part this may be a result of the methodology of these studies: both used public

without making any distinctions about the quality of the methodology used or how the results might be affected by the sample period or country specific characteristics.

42. They simulate, respectively, the effects of changing the sample period from 10 years before inception, at inception and 10 years after inception, and of raising the replacement rate from 0.45 to 0.60.

43. Funded pensions are likely to have a higher displacement effect. This programme was funded to the extent that current benefits were covered by interest earnings. Contributions exceeded benefits in all years so that the impact on public savings was positive and greater than the displacement effect on private savings, so that the estimated impact on national savings was positive.

pension contributions, rather than any estimate of public pension wealth, to measure the effects of PAYG pensions, had very small sample size and also suffered from a number of other methodological problems⁴⁴. However, as with other countries, there is strong evidence to suggest that the presence, or in this case the lack, of any significant changes in generosity within the sample period -- early 1950s to mid-1970s -- was also important⁴⁵.

3. *Countries where mixed evidence of displacement effects were found*

52. Feldstein's findings of high displacement effects for the United States are suspect for several reasons. He did not include the labour force participation rate of older workers nor any measure of private pension wealth in his regressions, variables that have been important in other studies. Munnell's correction for this significantly lowered Feldstein's estimates, and Lee and Chao, using a simultaneous equations approach including labour force participation rates for a sample of 1947-77, found no effect of pension wealth on savings. Re-estimation of Feldstein's equations showed that his findings were very sensitive to the sample period used. Large and statistically significant displacement effects were found only when periods including large changes in SSW were included. These were: (a) the period up to the mid-1950s (the first generation effect), or (b) the period following the mid-1970s, when generosity increased substantially⁴⁶.

Comparing US Cross-section study results

Author	Sample period	Private Pension Displacement	Public Pension Displacement
Kotlikoff	1966	None	None
Hubbard	1979	16 per cent	33 per cent
Gale	1983	49 per cent	11 per cent

53. Sensitivity to sample period also explains the differences in results of the three US cross-section studies reviewed (Kotlikoff, 1979; Hubbard, 1986; Gale, 1995). In Kotlikoff's study, neither private nor

44. The Pfaff study (Pfaff, 1979) reported only the findings of a series of regressions with 1, 2 or 3 independent variables, but did not estimate a comprehensive multivariate regression where all appropriate independent variables are included. Neither study included any measures of permanent income or non-pension wealth, private pensions, or elderly labour force participation rates.

45. The German pension system has existed since 1884, eliminating the possibility of any first generation effect, and there was a minimal increase in generosity between 1950 and 1973. The household savings rate increased steadily until the mid-1970s, suggesting that German households were engaged in a long-term rebuilding of household wealth levels. Under these circumstances, pension wealth would not displace private savings until long-term equilibrium had been re-established.

46. This latter period was one when US social security pensions were adjusted for inflation in 1973-75 -- providing a large one-time transfer of wealth -- and then indexed for inflation, becoming one of the few indexed assets available. Over the same period, the availability of consumer credit and home equity loans and the number of dual income households increased; all factors which would be expected to increase the displacement effect.

public pension wealth were found to have any effect on savings -- consistent with the lack of any change in generosity around the sample year of 1966. In Hubbard's and Gale's studies there was a complete reversal of the relative effects of public and private pensions. A number of factors might help to account for these varying results. First, there was a sharp decline in inflation between 1979 and 1982 -- from 13.3 to 3.8 per cent -- so that the importance of inflation-indexing of public pensions decreased while a number of private pensions made ad hoc adjustments for inflation. Second, widespread concerns in the 1970s about the underfunding of private pensions had been mitigated to a large extent.⁴⁷ Third, concern was increasing about the viability of Social Security -- the President's Commission on Social Security was established in 1983. Fourth, financial innovations in terms of the introduction of IRAs and 401(k)s (defined in Section 3 below) and the continued growth of credit cards and home equity loans is likely to have made traditional occupational pensions much closer substitutes for other assets than previously.

54. The inclusion of first generation effects also seems to explain the UK results. Hemming's study using 1948-73 data found a significant displacement effect in levels, whereas Browning's study of the period 1962-79 found no effect in log level and the effects using the change in logs was only of marginal statistical significance, despite the fact that he used total -- private and public -- pensions which should have increased his estimates.

55. Boyle and Murray's finding of no effect for Canada might be accounted for by three factors, the first two of which are similar to the German case. First, there was a relatively small increase in total pension wealth in Canada during the sample period of 1954-1975, despite the author's claims to the contrary⁴⁸. Second, there was a steady increase in the household saving rate up until 1975, which may have washed out any displacement effects until households had achieved "equilibrium" levels of wealth. Third, the sample period roughly coincided with the introduction (in 1957) and subsequent rapid growth of tax-favoured retirement accounts over the same period, yet the authors did not include any measure of these accounts or private pension wealth in general in their regressions. By contrast, King and Dicks-Mireaux's (Dicks-Mireaux, 1984) study of Canada, which explicitly included measures of private pension wealth as an explanatory variable, found displacement effects using 1977 data, after the saving rate had stabilised.

Other findings

56. Two studies included cross-effects between the public pension measures and specific household characteristics to see whether these characteristics affected the displacement of savings by pension wealth, as opposed to just the overall level of savings. Those that did, e.g. (Rossi, 1995; Gale, 1995) generally found significant results. Gale found that educated households had nearly twice the displacement rates of uneducated households. Households which did not use personal retirement accounts (IRA or 401Ks, discussed below) had no displacement effects, compared with over 60 per cent for households with such accounts. In Italy, Rossi found significant variations in displacement effects by age cohort (higher for over 64), region, urban residence (higher), household size (inversely related), number of children and of income recipients per household (inversely related), and for those households with occupational pensions

47. Funding increased with the impact of fiduciary legislation (ERISA) which included an insurance fund, along with an accelerating shift towards defined contribution plans.

48. Boyle and Murray claim that there were substantial increases in pension wealth in their sample period because: (1) the CPP (PAYG) system was created in 1966; (2) OAS retirement age was lowered from 70 to 65 and benefits were indexed to inflation. Analysis of their data shows that there was a one time jump in wealth in 1966, but after that net pension wealth grew more slowly than household disposable income per capita.

(higher rates for state employees and the self-employed, lower rates for managers). These findings suggest that variations in saving rates across group characteristics can be largely translated into variations in displacement effects.

Conclusions

57. Interpretation of these results requires caution. As noted above, both time series and cross-section results were sensitive to the sample period chosen. The more robust results, from cross-section studies, were often based on truncated samples limited to certain types of households and age groups likely to have higher savings and displacement effects. Cross-section studies inherently omit feedback mechanisms and typically exclude retirees. Furthermore, as Barro has noted, results based on differences across individuals at a given time may change when an entire life cycle is included, and so do not necessarily apply to changes in the wealth of the overall system across time. On the other hand, many of the time series results were methodologically flawed, casting doubt on their results.

58. These caveats notwithstanding, the most recent and methodologically sophisticated studies, using either cross-section or time series, found similar results. The marginal effects of SSW on the flow of saving appear generally quite small (although there may be different views on what “small” and “large” mean in this context), with a 100 unit increase in pension wealth decreasing saving by less than 5 units. On average, the marginal effect of 100 units of wealth in public pension schemes is somewhat larger; it appears to result in a reduction of 10 to 30 units in the stock of savings, depending on whether the sample period covered large changes in pension and on the presence of institutional and demographic factors associated with larger displacement effects. Estimates from the time-series equations were slightly higher. Moreover, in either case, when the total impact of these marginal effects are multiplied by the total stock of pension wealth the implied effects are substantial, though such a conversion is very problematic. Most of the trends across the OECD over the past two decades and likely to continue in the near term suggest that these historical examples will provide a lower bound for displacement effects: population ageing, capital market liberalisation and decreases in the number of children per family⁴⁹ to increase displacement effects in the future.

3. The effects on private savings of tax incentives for retirement saving

59. This section reviews the literature of the effect on personal and national savings of tax incentives⁵⁰ on certain types of savings accounts, hereafter tax-favoured savings accounts (TFSAs). As noted above, *a priori* the effect of tax incentives is indeterminate; the implied higher rates of return give rise to both substitution and income effects on total saving. The marginal rates of return themselves for individuals will be determined by the progressivity of the tax system, their income and their age, and thus the effects for countries should vary accordingly.

49. Along with increases in women’s labour force participation and the importance of dual income households.

50. Taxes will effect saving and its components through a variety of mechanisms, including the deductibility of mortgage interest, the tax exemption contributions and earnings of employee pensions, or differential tax rates on income from dividends, interest and capital gains. This section focuses specifically on tax incentives on private savings accounts.

*Empirical results*1. *The US experience*

60. In the United States there are two TFSA programmes, IRAs⁵¹ (Individual Retirement Accounts) and 401(k)s⁵². Both programmes were created in the 1970s and became important vehicles for personal savings in the early 1980s after a loosening of eligibility requirements⁵³, with IRA contributors in general being on average older and wealthier than contributors to 401(k)s. Most studies of these programmes have been conducted by two groups of authors -- Gale, Enghen and Sholz, on the one hand, and Poterba, Venti and Wise in various combinations -- who have arrived at opposite conclusions about whether TFSAs stimulate saving, though they concurred that the use of TFSAs increased with income, wealth or the ratio of wealth to income. Gale, Enghen and Sholz found that personal savings accounts had little measurable effect on personal saving. They inferred that higher saving in these accounts was mostly asset reallocation and that any positive saving effect was largely explained by the increase in income implied by the tax transfer involved. Poterba, Venti and Wise found in nearly all of their studies that the sample population participating in these programmes increased their total assets over time, that nearly all of this increase was in TFSAs, and that at the same time non-TFSA savings did not decline. This was true even after controlling for age and income effects. They also found that the savings of contributors tended to grow much more rapidly than those of non-contributors. Venti and Wise estimated that 45-66 per cent of IRA contributions constituted new saving financed by a reduction in consumption (rather than tax liability); they did not provide estimates for 401(k)s⁵⁴.

51. IRAs allow individuals to have tax-deferred (contributions and earnings) savings accounts, with substantial penalties for withdrawals. The annual contribution is as of this writing limited to \$2,000 with no inflation adjustment. Eligibility for IRAs was universal following the reforms of 1982 up until 1986. The 1986 made the tax-deductibility of IRA contributions and earnings subject to tests on income levels and participation in occupational pension plans.

52. So-called after the authorising paragraph number in the Internal Revenue Code. 401(k)s are effectively a form of defined contribution plan and differ from other defined contribution plans in that the employee's contribution is tax-deductible. They must be sponsored by an employer. Technically 401(k) refers to plans only in for profit firms but there are similar plans (authorised in different paragraphs) for non-profit, Federal, state and local government employees; 401(k)s are used generically to refer to all of these types of plans. In these plans, both employers and employees may contribute; the ceiling on employee contributions was \$9,235 in 1995 and is adjusted annually for inflation.

53. IRAs were an important component of personal saving in the early 1980s -- in 1984 IRA contributions accounted for \$35 billion or 40 per cent of personal saving -- but since the 1986 reforms the importance of IRAs has declined. By contrast, growth in 401(k)s has been explosive and they now singly account for the largest share of US personal saving: the US Federal Reserve estimates that 49 per cent of the workforce is covered by a 401(k) as of 1992, up from 40 per cent in 1989, which in the majority of cases exists as a supplement to another employer sponsored pension. Taken together, as of 1992 IRAs and 401(k)s accounted for a greater amount of saving than all non-401(k) employer provided pension plans.

54. Though they do not adjust their figures for the fact that withdrawals from PSAs are subject to tax, whereas consumption of other savings are not. Thus equivalent current nominal saving in PSAs and non-PSAs do not have identical post-tax PDVs nor equivalent offsets on public saving.

Box 2: Tax incentives and methodological considerations

Empirical studies of TFSAs are faced with the problem of satisfactorily controlling for individual preferences for saving which are independent of any identifiable individual characteristics, often referred to as “saver heterogeneity”. Individuals who have a greater preference for saving are also more likely to avail themselves of tax incentives. Attributing all the difference in saving between users and non-users of TFS to tax incentives overstates their actual effects.

This can be controlled for by:

comparing the saving behaviour of users and non-users over time where both samples start with similar initial levels of financial assets;

comparing the saving behaviour of different samples of randomly selected individuals at different moments in time, where each sample has identical non-savings characteristics;

comparing saving behaviour of the same households over time;

comparing the saving behaviour of identical age cohorts in periods where TFSAs did and did not exist, or alternatively identical age cohorts which differed in the length of time they had access to TFSAs.

comparing the saving behaviour of participants in programmes where participation is open only to those working in certain firms.

All of these approaches are subject to the criticism that saving preferences may not be stable over time: the creation of tax-incentives may raise household awareness and therefore savings preferences. Even for studies which track the same individuals or households, the decision to make use of such accounts may reveal a change in savings preferences, especially if households are faced with changes in exogenous factors such as broad movements in housing prices, stock market returns, or the credibility of public pension systems (which may be the reason why TFSAs have been initiated in the first place.) Where access to TFSAs is dependent on holding a certain job, there is evidence that individuals with high saving propensities may select jobs that offer them better saving opportunities, or demand that their employers offer such accounts.

To deal with such criticisms several authors compared the saving behaviour of new and current participants in the same program. A review of three such studies is provided in this section. However, in this case a second problem remains, which is how to distinguish between portfolio shifting and new saving. Two studies of the United States did this by estimating saving equations which include specifications for identifying substitution effects, while a Danish study imposes restrictions based on theoretical considerations.

61. In separate studies, Joines and Manegold (Joines, 1995) and Attanasio and De Lieure (Attanasio, 1994) compared the behaviour of new and pre-existing contributors to IRAs at different points in time, using previous contributors essentially as a control group. Joines and Manegold compared saving behaviour before and after the change in IRA eligibility in 1982⁵⁵. They did simple tests comparing the

55. They estimated their model using IRS panel data of 5 786 taxpayers over an eight-year period, 1979-86, which included the change in eligibility in 1982.

distribution of contributions between non-contributors, old, and new contributors and found that contributors had a substantially larger increase in savings than non-contributors, but that the difference between new and older contributors was marginally statistically significant and implied an increase in savings of about 19 per cent. Their regression estimates of the effect of IRA limits showed that IRAs increased savings between 25 to 30 cents for every increase of one dollar in the contribution limit, but correcting for the effects of reduced tax liabilities reduced this estimate to between 19 and 26 cents. They also found that “The responsiveness of saving to limit changes declines with the number of dependants, increases with the marginal tax rate, may be lower for female taxpayers than for males, and is not significantly related to marital status or the presence of a mortgage” (Joines, 1995, p. 24).

62. Attanasio and De Lieure found no evidence of a change in consumption over time for either group, nor any sign of a difference in overall consumption behaviour between groups, but they did find evidence of a difference between groups in the extent of asset reshuffling⁵⁶. Based on two assumptions -- that pre-existing contributors had already completed any desired reshuffling of their stock of savings and that no new IRA saving came from flows which would have occurred even without IRAs -- they calculated that about 40 per cent of contributions by new contributors were new private saving. After netting out the lost tax revenue (for the current year only), they arrived at an upper-bound estimate of net new national saving of 20 cents for every dollar invested in an IRA.

63. All the US studies of TFSAs found that these programmes did not have any negative effects on the **stock of private** savings, i.e. the elasticity of savings to rates of return is non-negative. The findings of Attanasio and DeLieure and Joines and Manegold, that around 20-25 per cent of IRAs represent new private saving, is consistent with consumer survey results: respondents stated that they considered about 31 per cent of their IRA contributions to be new saving.

64. The criticisms by Gale, Engen and Sholz notwithstanding, it also appears that a large proportion of the stock of 401(k)s represent new private savings. In one of their studies, Poterba, Venti and Wise compared the total savings behaviour of participants and non-participants in 401(k) accounts over time. At the beginning of their sample period, shortly after the introduction of 401(k)s, participants and non-participants had identical asset holdings (controlling for demographic variables). They found that several years later participants’ assets had increased substantially while non-participants’ assets were flat and that all of the increase in the stock of savings of participants occurred in the form of either 401(k)s or IRAs.

65. The US studies also provide evidence of the importance of age, income and awareness effects on the amount of new saving created by TFSAs. The degree to which inflows into TFSAs represent portfolio reallocation is strongly and positively correlated with age and income. The normal life-cycle (and myopia) tendency towards high saving rates of pre-retirement cohorts is reinforced by the substantial penalties imposed on withdrawal of funds in these accounts prior to retirement⁵⁷. Perhaps most important were awareness effects and ease of access. Poterba, Venti and Wise found that the major reason for the widespread participation and rapid growth of 401(k)s was the availability of payroll deduction plans and informational seminars by employers; their tax-free status and, where available, matching employer contribution were of secondary importance.

56. They estimated separately a consumption/savings equation and an asset equation to test the hypotheses whether IRAs caused a change in consumption (i.e. new savings) or simply a reshuffling of assets.

57. The implicit cost of early withdrawal penalties decreases with age as the remaining time to penalty-free withdrawal declines, favouring older contributors.

2. *Other countries*

66. Venti and Wise [Venti, 1994 #79] studied the effects of Registered Retirement Savings Plans (RRSPs) in Canada⁵⁸, using the same methodology they used in their studies of the United States. In all of their tests they found that increases in saving were largely in RRSPs and no evidence that RRSPs displaced other types of private saving. They concluded that RRSPs increased personal saving, largely based on the argument that Canadian saving rates rose after the introduction of RRSPs and that RRSP-based saving rates held up after the mid-1970s when other types of saving declined. However, while they have shown that there was no substitution effect with the existing stock of savings, this does not imply that there has been no substitution with new flows of saving, and the conclusion that RRSPs caused an increased flow of saving is unconvincing.

67. Florentsen (Florentsen, 1997) studied the lump-sum pension (KP) accounts of Denmark⁵⁹. He found that the use of KPs was highly correlated with age, income and liquidity, and that the 1987 reforms (which widened eligibility) created substantial awareness effects⁶⁰. He calculated⁶¹ that 60 per cent of KP savings was financed by the implicit income tax saving, and only 30 per cent of the remainder (or 13 per cent of total contributions) were new saving -- the rest was tax arbitrage. This sum was less than the total fiscal cost of the tax subsidy, implying a negative effect on national saving.

68. Banks *et al.* (Banks, 1994) analysed three types of tax favoured saving plans in the United Kingdom. These are PEPs (Personal Equity Plans) and TESSAs (tax-exempt Special Savings Accounts), and PPPs (Personal Pension Plans) all of which were created over the period 1987-1991. The first two allow for tax-exempt earnings on equity and savings, respectively, subject to minimum one and five year holding periods⁶², respectively, so that they are medium-term savings instruments rather than retirement vehicles. By contrast, PPPs are explicitly retirement instruments -- similar in some respects to US 401(k)s -- which permit individuals to opt out of the existing UK public pension if they create their own retirement accounts⁶³.

69. Banks *et al.* found that the introduction of PEPs and TESSAs resulted in no net new private saving, but simply portfolio substitution. They do not provide any estimates of the tax expenditure

58. RRSPs permit individuals to make pre-tax contributions up to a certain limit to a personal savings account, with an annual carry forward provision. The annual limit is much higher (C\$15,500 in 1996) than that of US IRAs, is indexed for inflation, but the ceiling applies to total pension contributions, including employer contributions. Like PSAs in the United States, RRSPs account for a high share of total personal saving, about 1/3, and are now larger in aggregate than employer pensions.

59. KP accounts have been around for 60 years, and in 1995 held the equivalent in assets to about 1/4 of all funded pension schemes in size. Tax deductible contributions are permitted to a maximum ceiling of DKK 26,000 (in 1995) which is inflation indexed. Unlike US IRAs earnings on assets held in KP accounts are taxable. Reforms in 1987 expanded coverage from wage earners to all households. KPs have substantially greater incentives than IRAs for portfolio shifting by wealthy and older individuals: there are no limits on the income of contributors so that individuals in the top tax brackets are eligible for KPs and withdrawals are taxed at rates well below the highest income tax brackets.

60. He based this interpretation on the fact that individuals who were participants prior to the 1987 reforms increased their contributions substantially even though this group faced no change in incentives.

61. Florentsen based his calculations on the assumption that increases in KP savings by certain categories of older and high income/liquidity individuals were simply portfolio reallocation.

62. TESSAs actually lose their tax-exempt status after five years, but can be rolled over into a new TESSA.

63. There are several other investment options open to them as well.

involved, but presumably the impact on national saving is negative⁶⁴. For PPPs, they concluded that about 60 per cent of individuals with PPPs “are at present making no contribution in excess of the contracted out rebate [of their public pension contribution], incentive payment and income tax relief” and so are probably engaged in no new saving. They infer that the remaining 40 per cent probably are engaged in some new saving but provide no specific measure.

Conclusions

70. The results reported in this chapter suggest several lessons for pension reform. Eliminating, or reducing the generosity of PAYG systems is likely to stimulate small increases in private saving. The size of this effect will depend on the particular demographic composition and economic institutions of individual countries and whether it is accompanied by other reforms, particularly in social insurance schemes and capital markets. The estimates of displacement effects provided by the empirical studies probably constitute a lower bound; the size of these effects is likely to increase in light of a number of demographic trends and changes in institutions -- including ageing and capital market liberalisation -- which are common to OECD countries. These tendencies will be reinforced by the importance of awareness effects: pension reforms themselves heighten awareness of retirement issues so that individuals will recalculate their savings and portfolio decisions more frequently. The impact on national saving will depend on what, if anything, PAYG systems are replaced by or supplemented with (apart from the important issue of funding whatever unfunded liabilities are outstanding). The studies of tax incentives suggested that net private saving increase by 20 to 25 per cent of the total amount placed in a TFSA, depending on the specific features of these types of accounts. However, TFSAs generate increased tax expenditures and lower government saving, and are likely to leave national saving little changed. The fact that all the empirical studies found a very strong correlation between displacement effects and income or wealth levels indicates that the introduction of mandatory pension schemes, either as a replacement for or supplement to the existing system, will also stimulate saving by forcing poor households to save.

64. They also found that participation in these programmes was strongly and positively correlated with education, income, homeownership and age.

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