The Shift from Defined Benefit to Defined Contribution Pension Plans - Implications for Asset Allocation and Risk Management

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Contents

Executive Summary

Traditional DB pension plans are gradually losing their dominance in the occupational pension systems of many countries; over the past few decades there has been a gradual shift towards DC pensions and, in some countries, DC plans now account for the majority of invested assets in private sector occupational pension plans. It is widely anticipated that recent and prospective regulatory and accounting reforms in the pension sectors of a number of countries will accelerate the ongoing shift from DB to defined contribution (DC) plans. In this note we have examined the shift from DB to DC plans with a view to assessing the implications for asset allocation and risk management.

The transition from DB to DC plans in private sector pensions is shifting investment risk from the corporate sector to households. Households are therefore becoming increasingly exposed to financial markets, and retirement income may be subject to greater variability than before. This is not only the case in countries with a mature occupational pension system, but also interestingly in emerging markets, where pension reforms (aimed at either setting up private occupational pension schemes or funding pay-as-you-go systems) are adopting a structure predominantly based on that of DC or hybrid schemes.

A number of explanations have been offered for the shift from DB to DC pension plans. From a long-term perspective, factors such as increased workforce mobility associated with demographic and industrial change appear to have been important drivers of the shift away from DB pension plans, which has been particularly pronounced in the U.S. All else being equal, mobile workers have less of a preference for DB pensions because traditional benefit formulas are "backloaded", favouring long-tenured employees, and because DB benefits are not portable from one employer to another. The recent acceleration of the trend towards DC plans appears to be linked to a confluence of factors (e.g., pension under-funding and its persistence due to a decline in long-term interest rates, the move to more market-based accounting, increasing regulatory burden and uncertainty and recognition of the effects of increased longevity on plan costs) that has prompted plan sponsors to improve their management of the financial risks in DB plans. It is also linked to regulatory and accounting reform that is making these risks more transparent. Since DC contributions can be fixed as a predictable share of payroll, migrating to a DC plan offers employers a means of reducing balance sheet and earnings volatility at least over the long term.

The shift towards DC pensions does have some positive aspects, both for employees and for sponsor companies. Among them, it favours labour market mobility because it decreases so-called "accrual risk", ie the fact that pension benefits in DB plans tend to be

backloaded, so that workers who change employers can lose a great portion of expected benefits if these are not transferable from one employer to another. However, such a shift also reallocates investment risk within the financial system from the corporate to the household sector, which may have implications for financial stability.

Aggregate pension sector data available for Australia, Canada and the U.S., shows that asset allocations are quite similar for DB and DC plans, particularly in Australia where there are no differences of note. Both DB and DC plans hold most of their assets in equities and fixed income securities. One key difference noted in the asset allocations of U.S. and Canadian plans is that DC plans tend to hold a greater share of assets in mutual funds while DB plans tend to have higher weightings in directly held securities. In the US this applies to holdings of fixed income and equity. In Canada, the fixed income weightings for DB and DC plans are similar for both direct holdings and mutual funds. In both countries DC plans tend to hold a smaller share of equities in international stocks. DC plans also tend to have a larger share of assets in guaranteed insurance company contracts and other 'stable value' instruments, although, aggregate sector weightings in money market and stable value funds are not that high.

Despite the similarities in aggregate asset allocations, households do not necessarily manage risks in the most appropriate way. There is a large body of evidence to suggest that there is considerable inertia and myopia regarding retirement decisions, which may ultimately threaten the capacity of DC plans to provide retirement security. For example, research has shown that in some DC plans employees are generally investing too heavily in their own company's stock. Furthermore, employees tend to remain in a plan's default option even if it does not provide sufficient portfolio diversification. Finally, employees in DC plans may not have a sufficient number of investment options to create a portfolio suited for their investment objectives, risk tolerance and constraints. Retirement security for some households is threatened by a lack of participation, low contribution rates, suboptimal asset allocation, early withdrawals and a failure or inability to annuitise plan assets at retirement that may reflect well documented behavioural biases and a lack of basic financial literacy. Thus it is important for policymakers to address these issues. The experience of some institutional investors in emerging markets that created mandatory private pension funds some time ago may also be relevant for other countries moving from DB to DC schemes.

Introduction

In a number of countries the pension sector is in the midst of regulatory and accounting reform[1]. The reforms are largely a response to the deterioration in the funding of defined benefit (DB) pension plans from about 2001[2] and longstanding concerns regarding the effect of complex, opaque pension accounting methods on the valuation of the DB pension plan and the sponsoring firm. Recent and prospective reforms, in particular those aimed at introducing fair-value measurement and improved transparency in pension accounting, are expected to introduce greater volatility in the financial statements of sponsors. This is likely to provide more of an incentive for sponsors to adopt investment strategies such as asset-liability management, that are aimed at reducing wide fluctuations in the value of the DB plan surplus (the plan assets-the plan liabilities). Most expect that the reforms will also accelerate the ongoing shift from DB to defined contribution (DC) plans. This note addresses the latter, examining the shift from DB to DC plans with a view to assessing the implications for asset allocation and risk management.

Traditionally, funded occupational pension systems were designed around DB pensions; DC plans accounted for a small fraction of employer-sponsored pensions and were typically offered by smaller firms or as supplementary plans for high income earners. Over the past three decades there has been a gradual shift, predominantly in the private sector, towards employee-directed DC plans and hybrid arrangements that combine features of both DB and DC plans. Few new DB plans have been created and the majority of countries that have recently introduced funded occupational pensions have based them on DC or hybrid schemes. While in many countries DB plans remain the dominant form of pension, in some others DC plans are the most common type of pension and represent the majority of sector assets.

Historically, the shift towards DC pension plans has largely been a response to changes in industrial structure and labour force composition that have given rise to an increasingly mobile workforce. DB plans, which are often not portable across employers, can penalize mobile workers since the expected pension benefit generally accrues only to employees who remain with the same employer throughout their career. DC plans avoid the accrual losses that can be associated with DB plans and provide mobile workers with much a more flexible means of managing their retirement savings.

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[1] The specific nature of the reforms that have been implemented or proposed in various countries and an assessment of their impact on asset allocation are discussed in two other reports of the Working Group: Broadbent, Palumbo, Santaella and Zanjani (2006) and Drudi, et.al (2006).

[2] The deterioration in the funded status of DB plans occurred following the 3-year decline in global equity markets (2000-2002) which acted somewhat as a catalyst for regulatory and accounting reform by drawing attention to existing weaknesses in traditional DB pension fund design, legislation, regulation and accounting. However, in some cases the reforms were underway earlier. For example, the move to FAS 17 in the United Kingdom was announced in 2000 even though it did not become effective until 2005.

Over the past several years the shift from DB to DC pensions has gained momentum, most notably in the United Kingdom (U.K.) where many large DB plans have been closed to new employees.[3] The recent acceleration appears to be mainly employer driven, and is largely a response to a confluence of factors (e.g., pension under-funding and its persistence due to a decline in long-term interest rates, the move to more market-based accounting, increasing regulatory burden and uncertainty and recognition of the effects of increased longevity on plan costs) that have reduced the incentives for employers to offer DB plans. Within the pension sector there has been much greater focus on managing pension fund assets relative to liabilities rather than market benchmarks. And, as is evident from the U.K. experience, this shift in focus is also linked to regulatory and accounting reform that is making the financial risks associated with DB plans more transparent. Since DC contributions can be fixed as a predictable share of payroll, migrating to a DC plan offers employers a means of reducing balance sheet and earnings volatility, at least over the long term.

While the evolution towards DC pension plans can be beneficial for both employees and employers, it nevertheless reallocates risk within the financial system. In DB pension plans, responsibility for funding and investment management rests with the firm sponsoring the plan. In a DC plan these tasks and the associated risks are typically assumed by the employee. This shift of responsibilities and risks from the corporate sector to the household sector has potential implications for financial stability.

In examining the shift from DB to DC pension plans and assessing the implications for asset allocation and risk management we first describe the main features of each type of plan and how risk is distributed between the employee and the employer. We then examine the extent of the shift towards DC plans and some of the factors driving it. To narrow the scope of our paper we focus on those countries with mature funded occupational pension systems originally designed around traditional DB plans and which currently account for the majority of global pension assets.[4] We focus in more detail on four countries: Australia, Canada, the United Kingdom (U.K.), and the United States (U.S.)., in which the shift to DC plans has progressed at different rates and has been driven by somewhat different factors. Where the data permits, we also examine aggregate asset allocations for DB and DC pension plans. We then turn to a review of the literature to examine how well households are managing the new set of risks that arise in DC pension plans. We conclude by raising some potential implications for financial market efficiency and stability and a few of the policy responses that have been proposed in the literature.

[3] Even in the U.S. where the shift towards DC plans is part of a well established long term trend, recent closures are unusual in terms of their frequency and the large size of some employers. See EBRI (2006).

[4] As noted earlier the shift towards DC plans is a global trend that is tied, in many respects, to recent pension reforms moving many countries to a model of funded pensions managed by the private sector.

II. Main Features of DB and DC Pension Plans and Distribution of Risks

In most countries with mature pension systems, employer pension plans are typically voluntary and workforce coverage may therefore be quite limited. These plans can be sponsored by an employer, an industry association or a labour union or professional organization. Employer pensions are generally governed by legislation and regulation intended to protect employee benefits[5] and they may offer tax advantages to the employer and/or employee to encourage sponsorship and participation respectively. Traditionally, most pension plans were structured to provide the employee with a life annuity at retirement. This is gradually changing, however. Some DC plans, for example, permit early withdrawals, loans, and/or lump sum distributions at retirement. It is also more common for DB plans to offer the retirement benefit as a lump sum rather than a life annuity.[6]

Despite many common elements there is considerable cross-country variation in the design of retirement income systems. Differences in tax policy, social security programs, legislation, regulation and culture have given rise to a wide array of approaches to the pension system and to the design of DB and DC pension plans, both within and across countries. This in turn influences the distribution of risks assumed by employers and employees in each type of plan and may have implications for asset allocation. In this section we focus on the most common features of traditional DB and DC plans, with a particular emphasis on Australia, Canada, the U.K. and the U.S. We examine the key features of DB and DC pensions and consider how risks are distributed between employers and employees in each type of plan. It must be kept in mind that in some countries DB and DC plans may have unique features with somewhat different implications for the distribution of risks. As indicated earlier, our focus is private sector pensions; in most countries very little migration to DC plans has occurred in the public sector.

A. Defined Benefit Pension Plans

In a traditional defined benefit (DB) pension plan, workers accrue a promise of a regular monthly payment from the date of their retirement until their death, or, in some cases, until the death of their spouse. The promised life annuity (deferred) is commonly based on a formula linked to an employee's wages or salary and years of tenure at the sponsoring firm. In a typical DB plan the member earns a unit of pension, usually expressed as a percentage of nominal earnings, for each year of credited service/participation. The DB pension may be indexed to inflation but in a number of countries such as the U.S. and Canada this is uncommon in private sector pensions. Various measures are used for the earnings base; in Australia, the U.K., the U.S. and

[5] In some countries such as Canada and the U.K. employer pension plans have historically been structured as trusts and hence are subject to trust law as well as pension legislation.

[6] Indeed, although this report addresses the shift from DB to DC pension plans it is important to keep in mind, that the traditional distinction between DB and DC plans is becoming less meaningful.

Canada, the most common is 'final salary' – generally the employee's average earnings over a specified period of time prior to retirement or earnings during a specified period of highest earnings.[7] In final salary plans the expected benefit is generally designed to replace a pre-determined percentage of 'final salary' based on a specific employment tenure that is typically ranging from about 35 to 40 years. The replacement rate varies considerably across plans; the most generous DB plans are designed with a salary replacement ratio of between 60-70 per cent of final salary.

Employers are generally legally obligated to make the promised payments once they have accrued and have been vested; firms are under no obligation to pay benefits that might be expected but have yet to actually accrue. Under certain conditions employers may also terminate pension plans[8] in some countries (e.g., the U.S.) but prohibitive tax penalties typically persuade employers to transform the pension plan rather than terminating it. In other countries such as the U.K. and Canada, the DB plan text may prohibit the termination of the plan (Yermo, 2003). In practice, a full plan termination is often difficult to implement outside of corporate insolvency, particularly in highly unionized industries where a DB pension plan is usually a negotiated benefit. A full plan termination is therefore the least common of the three types of DB plan closures generally available to plan sponsors. These are 1) a hard freeze or termination (no additional benefits will accrue to any current plan members from either additional tenure or increases in compensation); 2) a soft freeze (generally limits increases for current plan members in accrued benefits due to increases in tenure but may allow the definition of compensation to increase); or 3) a partial freeze (plan is frozen for some but not all members).[9] The shift from DB to DC plans is, therefore, generally a gradual process incorporating a transition period in which the employer will offer two types of pension plans; a DB plan for existing employees and a DC plan for new hires.

Employees in DB pension plans may face insolvency risk if the sponsoring firm declares bankruptcy at a time when the plan is less than fully funded. Solvency risk has been partially mitigated in some countries through the creation of a pension benefit guaranty agency such as the U.S. Pension Benefit Guaranty Corporation (PBGC)[10], or

[7] Career average is generally used less extensively. In the Netherlands there has been a substantial shift from final salary to career average plans since the late 1990s and these plans currently apply to about 2/3 of total private sector pensions. Flat benefit plans, which specify a dollar amount of benefit for each year of service are also used by some employers.

[8] In case of DB terminations, firms are obligated to pay accrued and vested benefits.

[9] See Employee Benefits Research Institute (2006). The precise form of DB plan terminations could differ somewhat across countries.

[10] In the U.S., firms that declare bankruptcy generally face much less stringent conditions for terminating their plans; in recent years this process has resulted in quite a number of large plan "failures," particularly among firms in the steel and air transportation industries. When a bankrupt firm terminates its DB plan the PBGC assumes ownership of assets that had been set aside for funding pension benefits and takes over responsibility for making the promised payments to eligible retirees. As firms sometimes enter bankruptcy with under-funded pension plans the PBGC has seen its financial position deteriorate substantially over the past few years: the PBGC reported that for the end of its

more recently, the U.K. Pension Protection Fund. In the event of bankruptcy these agencies will take over the responsibility for making some portion of the promised payments to retirees. In these types of arrangements the risks assumed by the guaranty fund may ultimately be passed on to taxpayers.

The traditional DB pension framework imposes different types of risk on employers and employees.[11] In a DB pension fund the employer bears the risk of providing the employee with a pension benefit that, as noted earlier, is typically expressed as a specific replacement rate of pre-retirement gross earnings. The employer also bears market timing or temporal risk, in that DB plan assets may fall short of what is required to meet this obligation at the time of the employee's retirement. Through pooling of plan contributions across a number of employees, not all of whom will retire at the same time, the employer is able to manage market timing risk much better than an individual would be able to. In managing the overall financial risk associated with a DB pension plan the employer bears 'investment' risk, the risk that actual returns on the assets set aside to fund accrued pension benefits may fall short of expectations; this could force employers to raise contributions if poor asset returns leave their pension plans sufficiently under-funded. Note that we use the term investment risk to encompass market, credit and other types of risk that might arise from investing plan assets. Employers can hedge market risk by investing in fixed income securities that match the duration or cash flows, of their accrued liabilities; and if they use highly-rated fixed income securities they can also limit credit risk. In practice, the majority of DB plans are heavily invested in publicly-traded equities (one-half to two-thirds of assets), accepting the exposure to market risk and the equity premium that serves as compensation to hold down expected pension contributions.[12] Employers also bear "longevity" risk because they are generally obligated to offer DB benefits as a deferred life annuity. Longevity risk is the risk that plan beneficiaries will live longer, on average, than originally expected, increasing the time period for paying the benefit .

Employees, on the other hand, typically bear the brunt of inflation risk, because private DB plans generally do not index benefit payments for post-retirement increases in

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2005 fiscal year the agency's liabilities exceeded its assets by about $23 billion, implying that about 30 percent of its current liabilities were unfunded.

[11] The precise nature and magnitude of risk assumed by employers and employees is obviously a function of many factors that may be country specific. Yermo (2003) explains some of the additional types of risks encountered in the pension arrangements of various countries.

[12] In addition, the traditional pension accounting standards for DB plans have encouraged sponsors to shift their investments toward corporate equity. FAS 87 and CICA 3461which apply to U.S. and Canadian firms respectively, allow sponsors to book *expected* portfolio earnings on pension assets as income and to amortize over several years any difference between expected and *actual* portfolio earnings. On average, this allows sponsors to bring an assumed equity premium into income while smoothing through, or even disguising, the associated portfolio risk. See Coronado and Sharpe (2003); Wiedman and Goldberg (2002).

the general price level.[13] While inflation risk can be substantial, perhaps the greatest source of risk in DB pensions is "accrual" or "portability" risk, which reflects the fact that benefits have traditionally been loaded toward long-tenured employment relationships. Since benefit payments (nominal) are often computed as the product of earnings and tenure (both of which tend to increase each year) the accrual pattern is nonlinear in dollar terms (and in present value), with much of the final benefit accruing in the final years before retirement.[14] Therefore, any changes affecting benefit payments that may occur toward the final years of work – including changes to the benefit formula, plan terminations, or an employment separation – can result in accrued benefits actually falling far short of a worker's expectations. And, pension "shortfalls" are a risk not only for long-tenured workers - accrual risks are also caused by fairly lengthy vesting periods[15] during which workers typically forfeit all of their DB benefits if their plan terminates or their relationship with the employer is severed.

Unless the DB pension plan is portable, which is uncommon in private sector plans, the backloading of DB plan benefits is significant for employees who change employers during their working career. Blake (2003) estimated the accrual losses from DB pension schemes under various assumptions. He found that a typical U.K. worker who changed jobs at the average level of 6 times during their working career would suffer a loss of 25-30 per cent of the full service benefit they would have received had they remained with the same employer throughout their career (see also Bodie, et.al, 1985). Accrual risk is less of an issue in multi-employer plans where the pension plan is generally portable across the employers belonging to the plan. In the Netherlands, for example, the majority of employer pension plans, apart from those of some of the largest firms, are industry-based.

The distribution of risks for employers (ultimately the shareholders in private sector plans) and employees in DB pension plans are summarized in Table 1. Generally, the employer bears all the investment risks related to investing DB plan assets and funding shortfalls that arise for various reasons. DB pension plans are not without risk to employees, who typically bear inflation risk, vesting risk and the risk that the actual benefit received falls short of the expected salary replacement level at retirement. Outside of industry or multi-employer DB plans, accrual risk is high for employees who do not remain with the same employer throughout their working career.

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[13] Exceptions include the U.K. where Limited Price Indexation, introduced in 1997, required price indexation to a maximum of 5 per cent per year, although this was recently reduced to 2.5 per cent (Blake (2003), IMF (2004). In the Netherlands the extent of benefit indexation is related to the level of plan solvency so the inflation risk is linked to investment risk.

[14] The accrual pattern for DB payments is typically linear in terms of replacement rates as these tend to rise by one percentage point per year. However, as workers gain more and more tenure with the sponsoring firm, the present value of DB pension benefits as a share of earnings tends to accelerate sharply in the years just before retirement, as the timing of the benefit payments approaches.

[15] Traditionally, it was common to have vesting periods as high as 10 years. The trend in recent years has been towards shorter periods. In most Canadian provinces vesting is generally less than two years.

Table 1: Risk Distribution in a DB Pension Plan

Type of Risk	Who Assumes it?
Investment	Employer
Inflation	Employee / Employer
Longevity	Employer
Market timing (temporal)	Employer
Accrual (portability)	Employee
Vesting	Employee
Employer insolvency	Employee / taxpayers
Salary replacement risk	Employer

B. Defined Contribution Pension Plans

In a defined contribution (DC) pension plan, workers accrue funds in individual accounts administered by the plan sponsor. The contributions of employees are typically deducted directly from their pay and frequently some portion of these contributions is matched by the employer. Since contributions to DC plans are generally a fixed percentage of earnings, DC assets build at a fairly steady rate over time (abstracting from the time-pattern of investment returns) – avoiding the backloading of accrued benefits that is a hallmark of DB plans.[16] So in contrast to a DB plan, it is the contributions rather than the benefit that is fixed in a DC pension plan; the retirement income that will be provided is unknown in advance. The pension benefit accumulated during the employee's working career will depend on the contributions made while working *and* the investment returns earned on the plan balances.

Similar to DB pension plans, there is considerable variation in DC plan design, legislation, regulation, and taxation; these differences influence the risks that plan members assume. Australian DC plans are somewhat unique. Participation is mandatory for all workers and their employers and minimum contributions are fixed by legislation. The most common type of DC plan in Canada and the U.K. is a traditional money purchase plan (MPP) organized as a trust[17]. In the U.S. MPPs are less popular than the 401(k) plan which, according to Borzi (2005) accounts for 75 per cent of DC plan members. [18]

Nonetheless these plans have many features in common. Within specified limits, plan contributions and investment income are not subject to personal income tax although withdrawals are taxed.[19] The plans are also governed by pension legislation and regulation. The main difference between a MPP and 401(k) plan is that the latter has features of both a traditional occupational pension plan and an individual retirement

[16] There are some DC pension plans in which contribution rates increase with tenure.
[17] A less common form of regulated DC plan is an employee profit sharing plan in which the benefit is linked to corporate profits rather than employee earnings.
[18] MPPs are the traditional form of DC plan in the U.S. but have proven less popular than 401(k) plans due to a difference in tax treatment; contributions to MPPs are not tax deductible for the employee.
[19] Australian superannuation funds are an exception. Since the 1980s, lump sum benefits, contributions and investment income are all taxed, albeit at a lower marginal rate. See Bateman and Piggott (2000).

savings plan.[20] Early withdrawals from a 401(k) are permitted but are taxable and subject to certain conditions and penalties (prior to age 59 ½). Also, lump sum distributions are permitted at retirement and when an employee changes jobs. In the U.K., Australia and Canada pension balances are locked-in until retirement age. Early withdrawals are not permitted and the purchase of an annuity is compulsory at age 69 in Canada and age 75 in the U.K.. In Canada, investment in a 'locked-in' retirement savings account where annual withdrawal limits are pre-specified is also permitted.[21] Employees in Australian DC plans typically have the choice of purchasing an annuity or taking the entire balance as a lump sum withdrawal (as early as age 55); early withdrawals are only permitted in exceptional circumstances.

Under pension legislation, DC plan assets belong to the worker, meaning that previous contributions are portable across employers or through employment spells. In a DC plan this generally means that the DC plan assets are controlled by the worker. A worker may be able to leave the plan assets under the administration of a previous employer, transfer the assets to a new employer's plan or transfer the assets to an individual retirement savings account. Similar to DB plans, DC plan benefits must be vested. If the plan is terminated prior to the vesting date, only employee contributions and interest are returned. By definition a DC pension plan is always fully funded and the employer typically has no financial obligation other than to make periodic payments into the plan, and, relative to a DB plan, the accounting treatment is quite simple; payments to a DC plan are treated as any other corporate expense (Yermo, 2003).

Thus, the constellation of risks facing workers covered by a DC plan is quite different than in a DB plan (See Table 2): in a DC plan, workers bear investment and longevity risks, but do not face accrual risk.[22] Given that there is typically no mechanism for pooling investment risk in DC plans, the employee is also exposed to market timing risk at the point of retirement; this applies not only to the amount of cash balances available at retirement but also to the amount of annuity that can be purchased with this sum. A market downturn at the time of retirement could substantially erode the cash balance in a DC plan. For example, DC plan members who retired during the severe bear market in global equities from 2000-2002 are likely to have retired with a much smaller plan balance than individuals who retired during the stock market boom of the late 1990s. Likewise the level of interest rates at the time of retirement influences the amount of the

[20] According to Brown and Warshawsky (2000) 401(k) plans are not considered 'pension' plans under U.S. law because they are not required to provide an annuity.
[21] Recent changes to U.K. pension legislation permit a lump sum distribution of up to 25 per cent. Retirees previously had to purchase an annuity at age 65. The increase to age 75 was implemented to permit some flexibility in the timing of an annuity purchase, helping retirees to avoid periods of very low interest rates.
[22] Individuals can avoid exposure to longevity risk by purchasing a fixed annuity with their DC plan assets upon retirement, but in many plans they must take this action explicitly (and bear the cost, as well).

retirement benefit if the employee is required (under pension legislation) or voluntarily decides to purchase an annuity.

Table 2: Risk Distribution in a DC Pension Plan

Type of Risk	Who Assumes it?
Investment	Employee
Inflation	Employee
Longevity	Employee
Market timing (temporal)	Employee
Accrual (portability)	DC plans are portable
Vesting	Employee
Employer insolvency	DC plans always fully funded
Salary replacement risk	Employee
Fiduciary / legal risk	Employer

In a DC plan the employee assumes salary replacement risk as well. Employees must not only calculate the amount of savings needed to retire but must also make a series of complex investment decisions to achieve their retirement goals. In many DC plans employees have considerable flexibility over participation, contribution amounts, portfolio allocations, and, in some countries, the timing of withdrawals; however, it would appear that a considerable fraction of workers have been dismayed by the wide array of options and decisions DC plans usually entail. In other cases, DC plan members may bear investment risk without having control over the asset mix, or, alternatively are provided with a limited choice of investment options that may make it difficult to design an optimum portfolio reflecting their unique investment objectives and constraints. Ultimately, plan regulation and design influences the extent to which DC plan members are able to manage financial risk.

Employers offering DC plans escape financial and longevity risks associated with DB payments, but then are denied access to the opaque accounting of pension assets and liabilities in DB plans common in many countries, including the U.S., Canada, and until recently the U.K.. Pension accounting seems to have, at times, allowed some firms to obscure the costs of their pension plans and even the actual volatility and level of net income.[23] One risk that the employer may be forced to retain is the potential fiduciary/legal risk facing sponsors of DC pension plans. If employees retire from DC pension plans without sufficient retirement income this may be grounds for future lawsuits. [24]

[23] For example, Coronado and Sharpe (2003) show how the accounting of DB pension assets and investment returns tended to substantially boost the net incomes of U.S. plan sponsors during the market boom of the late 1990s. See also Wiedman and Goldberg 2002.

[24] To some extent, U.S. employers are protected against this risk by the safe harbour provisions contained in the U.S. Employee Retirement Income Security Act (ERISA) which specify the minimum requirements an employer must meet when establishing a DC pension plan.

In principle investment returns should generate sufficient income for the average DC plan holder to retire with a comfortable income, provided contributions are made at a steady rate over the plan holder's career. A recent research paper by Andrew Samwick and Jonathan Skinner (2003) used simulations from a life cycle model calibrated to include realistic experiences for earnings, investment returns, and other key variables to compare whether typical DB plans or DC plans might leave workers better prepared for retirement.[25] Their study focused on the U.S. pension sector, using data from the Pension Provider Survey (PPS) that was part of the Survey of Consumer Finances in 1983 and 1989 to gather information about key characteristics of DB and DC plans in place at that time. What they found was that by 1995 the typical DC plan (one that fell into the 401(k) classification) would be expected to yield about the same retirement income for the median worker and higher income for the average retiree compared with the typical DB plan that was offered in the mid-1980s. The intuition behind their result is that investment returns, to a large extent, are uncorrelated over time, so that over the worker's career periods of low returns tend to be offset by periods of high returns and overall "market" risk is not such a big problem for many workers. By contrast, DB plans tended to tie retirement benefits strongly to earnings in the final years of work and, as discussed above, disproportionately to tenure at the firm, so workers were exposed to a significant degree of "accrual" risk. Across a typical range of risk aversion parameters, Samwick and Skinner found the costs of accrual risk tended to outweigh the costs from market risk. An important caveat to their main result is that failure to participate in an employer's DC plan would, of course, cut significantly into expected retirement income from that source.

C. Hybrid Pension Plans

Even within the DB category of pension plans, a shift has been underway, with quite a number of traditional DB plans having converted to hybrid plans that combine the features of both DB and DC plans. Under these types of arrangements the plans are typically treated as DB plans for tax, accounting and regulatory purposes but the benefits are expressed in terms of notional account balances which are often payable as a lump sum on retirement. The most popular of these is the so-called cash balance (CB) plan which was introduced in the U.S., but has become popular in some other countries (e.g., Japan and the U.K.) as well. In the U.S. model, participants in CB plans hold "notional accounts" that build with annual pay credits ("contributions") plus interest. The pension benefit is expressed as a lump sum amount that can be redeemed upon retirement, at plan-termination, or if a worker changes employers. In addition, pension benefits in CB plans typically accrue much more evenly over time compared with "back-loaded," traditional DB benefits. Thus, like DC plans, CB plans allow workers to avoid the "accrual risk" associated with traditional DB plans, thereby providing more value to workers who might anticipate changing employers or moving in and out of the labour force over their career. Employers bear the responsibility to maintain funding for benefits accrued under CB

[25] This paper is summarized in Samwick and Skinner (2004).

plans, so workers also avoid "investment risk." In the U.S., some sponsors of DB plans were motivated to convert their traditional DB plans to CB plans to mitigate a portion of the costs of benefits that would soon accrue to their oldest workers. But, according to research by Coronado and Copeland (2003), the primary motivation for sponsoring firms to convert their traditional DB plans to CB plans was to design pensions for a more mobile workforce that particularly values the portability of retirement benefits.

Growth in U.S. CB plans has slowed significantly in recent years, although this is related more to uncertainty about the legality of specific CB conversions than to firms having changed their minds about the net benefits of those types of pension plans. That said, according to researchers, a significant fraction of the DB universe converted their traditional plans to CB plans in the mid-to-late 1990s, including plans that had accounted for more than 10 percent of all DB sponsors and around a quarter of DB sponsors in the S&P 500. All told, something like a quarter of DB assets and nearly a third of workers in the DB system saw their plans convert to the cash balance form.[26]

III. Extent of the Shift Away From Traditional DB Pension Plans

A. Within the member countries of the OECD

In this section we look briefly at the extent of the shift from DB to DC pension plans. The focus is mainly on OECD countries because the data are readily available, however, there has been considerable growth in the DC pension sector outside the OECD. Within the OECD, eight countries have already accumulated over 50 per cent of pension sector assets in DC plans, some of them having a relatively short history with funded occupational pensions. In contrast, there are a number of countries where DB plans remain the dominant form of pension, representing virtually all of sector assets in some cases (e.g., Norway). In one of these countries, the Netherlands, there has been considerable support for modifying and maintaining the DB pension system; regulatory reform has encouraged greater risk sharing between employees and employers, such as linking indexation of benefits to the funded status of the plan[27]. In tandem with the shift towards DC plans in many established pension systems, a DC or hybrid model has been widely adopted in other countries that have reformed their pension systems in recent years. Countries that have recently moved to funded occupational pensions (e.g., Spain and Italy within the OECD and Poland, Czechoslovakia and Hungary within eastern Europe) have tended to favour a system based on DC or hybrid arrangements.[28] Within emerging market countries Malaysia has recently adopted a DC arrangement and Chile and Singapore are noteworthy in having longstanding DC pension systems.

[26] The figures cited in the text are taken from Coronado and Copeland (2003).
[27] In recent years, however, many final salary DB pensions have been converted to career average. According to Vlaar (2006), the proportion of final salary schemes declined from 67% in 1998 to 54% in 2003 and 14% in 2004.
[28] Some countries have implemented (Mexico) or have considered adopting (the U.S.) DC-style individual accounts for public pensions.

Estimates of the relative share of assets and members in DB and DC pension plans are shown in Table 3 for selected OECD countries. Note that the data are for combined public and private sector plans and therefore tend to underestimate the extent of migration to DC plans in the private sector where it has mainly been occurring.

Table 3: Relative share of assets & members in DB & DC funded occupational pension plans (public & private sector) in selected OECD countries

Country	Assets		Members [1]	
	DC plans	DB plans	DC plans	DB plans
Australia*	90	10	n/a	n/a
Austria	75	25	75	25
Belgium	25	75	0	100
Canada	9	91	5	95
Denmark*	97	3	50	50
Finland* (partly funded)	0	100	21	79
Germany (book reserve)	0	100	5	95
Greece	50	50	50	50
Iceland*	82	18	92	8
Ireland	98	2	34	64
Italy	75	25	92	8
Japan	1	99	6	94
Korea*	0	100	54	46
Netherlands	9	91	5	95
New Zealand	53	48	n/a	n/a
Norway*	0	100	n/a	n/a
Portugal	2	98	54	46
Spain	97	3	90	10
Sweden*	5	95	50	50
United Kingdom	22	78	16	84
United States	35	65	70	30

Source: OECD Global Pension Statistics
* indicates mandatory coverage; Sweden, Germany and Austria use book reserve systems, not autonomous pension funds

- The table exhibits data on assets for 2004 except for Australia (2005), Italy (2005), Japan (2003), Korea (2005), New Zealand (2005), Portugal (2005), Sweden (2003) and the United States (2005). In Canada the share in DC plans includes combined DC/DC plans. The DB/DC split for Australia was estimated by the Reserve Bank of Australia.
- Data on relative share of plan members taken from Pension Markets in Focus, June 2005. Data are mainly for 2004 and include OECD staff estimates.

[1] These figures should be considered rough estimates. Data from administrative sources can be affected by double counting (e.g., in situations where an individual has changed employers and has more than one pension) and/or classification difficulties arising when an employer offers more than one type of plan.

What does the shift to DC pension plans mean in terms of the overall distribution of global pension sector assets? At the present time, the majority of pension sector assets (public and private sector) are held by countries with mature funded occupational pension systems originally based on traditional DB plans. Six of these countries - Australia, Canada, Japan, the Netherlands, the United Kingdom and the United States - account for

about 92 per cent (US$14.4 trillion in 2004) of occupational pension sector assets within the OECD (see Appendix 1). In these countries, DC plans represent an estimated one-third of total sector assets, but as noted earlier the share in private sector plans is much higher. Over time as more countries move to funded pension schemes and as more employers adopt this type of pension plan the pace of asset accumulation in DC pension plans could increase considerably. If the trend towards DC plans continues, the assets held in DC pension plans will eventually exceed those held in DB pension plans, making DC plans one of the largest institutional investors. However, for the foreseeable future it is the investment decisions of DB pension plans that will have the greatest influence on global financial markets.

B. Trends in Australia, Canada, the United Kingdom and the United States

In this section we examine the shift from DB to DC pensions in somewhat more detail for Australia, Canada, the U.K. and the U.S. In contrast to the previous section we focus on private sector plans wherever possible. The narrative in subsequent sections of this report draws heavily on information available for these countries.

For *voluntary* employer pensions, the shift toward DC pension plans is most pronounced in the U.S. (Table 4). The number of active participants in U.S. DB plans was essentially flat from about the mid-1970s through the mid-1980s, while the number of DC participants grew rapidly. By 2004, about 65 million workers were covered by DC plans compared to about 25 million in DB plans. Similarly the size of assets in DC plans has shown considerable growth. According to data in the U.S. Flow of Funds Accounts, in 1985, private-sector DB plans held about US$800 billion in total financial assets, while private-sector DC accounts contained around US$425 billion. The latter is a conservative measure because members leaving an employer's DC pension plan are permitted to "roll over" their assets into an Individual Retirement Account (IRA).[29] IRAs amounted to about US$250 billion in 1985. Whereas assets in private-sector DB plans had more than doubled to nearly US$2 trillion by year-end 2004, assets in private-sector DC accounts had soared to US$2.7 trillion and IRA balances to US$3.5 trillion. As shown in Chart 1, the value of assets held in DC plans, excluding IRA balances, had exceeded the value of assets held in DB plans by the mid-1990s.

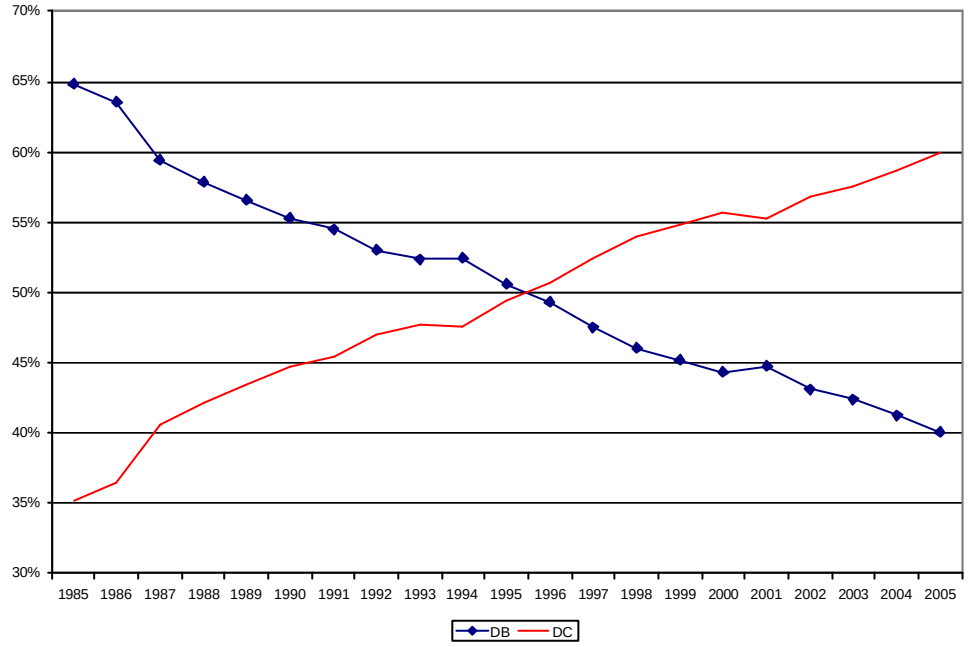
[29] These are individual retirement savings accounts rather than an employer pension plan.

Table 4 Percentage Share of Assets and Members in DB and DC Pension Plans Private Sector (unless otherwise specified)

	DC only		DB only		Combination	
	Assets	Members	Assets	Members	Assets	Members
Australia (both sectors)	50	66	4	2	47	32
Canada	4.4	7.6	81.9	77.1	12.6	11.9
United Kingdom	20	22	80	78	n/a	n/a
United States	60	72	40	28	n/a	n/a

Sources: Australian Prudential Authority, June 2005; Statistics Canada, 2004; U.S. Federal Reserve Board, 2005; UBS 2005; U.K. Government Actuary Department, 2005.
The totals do not include assets rolled-over from pension plans into individual tax-free accounts such as IRAs
Data is for trusteed plans and does not include insurance contracts, personal pensions or RRSPs

Chart 1: Percentage Share of Assets in US DB and DB Pension Plans: 1985-2005



In Australia, the shift towards DC pension plans is more advanced than in the other countries and coverage is extended to most of the workforce. A change in pension legislation that introduced mandatory employer pensions is the main factor contributing to the shift from DB to DC pension plans.[30] Prior to this, employer pension coverage was limited to a small share of the workforce, similar to the experience of other countries such as the U.K., Canada and the U.S. The transition to DC pension plans began with the introduction, in 1986, of award superannuation which required that part of an employee's pay increase would take the form of a superannuation payment. It accelerated markedly

[30] Australia is one of the few countries in the OECD with a mandatory occupational pension system, although unlike many other OECD countries it does not have a public earnings-related pension. Award Superannuation has been a success in Australia, increasing pension coverage dramatically (to about 90% of the workforce by 2002 according to Australia's statistical agency). See Bateman and Piggot 2000.

under the compulsory Superannuation Guarantee (SG) introduced by the Australian government in 1992. Under SG employers were required to make contributions (currently at 9% of earnings) on behalf of their employees. These innovations were designed around a DC framework; employers with existing DB plans have, over time, downsized and closed off these plans. Consequently, the type of pension benefit offered by employers has shifted markedly towards DC pension plans. Data from the Australian Prudential Regulation Authority (APRA) shows that as of mid-2005, 66 per cent of pension plan members were in DC plans compared to two per cent in DB plans and 32 per cent in combination plans (the majority of these would be plans where the firm is sponsoring both a DB and DC pension plan, rather than true hybrid plans). In terms of sector assets, only four per cent remain in "DB only" pension plans; 50 per cent are in "DC only" plans while 47 per cent are in combined DB/DC plans. The Reserve Bank of Australia estimates that most of the latter are assets held in DC plans. In total, an estimated 10 per cent of assets in combination plans are held on behalf of DB schemes.

In the U.K., the shift towards DC pension plans began in the 1990s. By most accounts the pace has increased considerably since 2000, reportedly driven in part by changes in pension regulation and accounting. While there is considerable evidence to support the shift towards DC plans, its precise magnitude is somewhat uncertain; the results of various membership surveys are at times inconsistent and difficult to interpret. According to the 2005 survey of regulated occupational pension plans by the Government Actuary's Department (GAD), 42 per cent of active members in DB pension schemes belong to plans that have been closed to new members.[31] The GAD surveys show that membership in private sector DB plans declined considerably between 1995 and 2005, from 5.16 to 3.66 million members. At the same time, information from the Employers' Pension Provision Survey shows only 2.5 million workers in DB pension plans. The GAD survey also shows the number of DC plan members falling from 1.06 to 1.02 million.

Data inconsistencies aside, there is little doubt that the shift away from DB pension plans has accelerated in recent years. The Pensions Commission (2004) estimates that while active membership in DB plans has fallen 60 per cent since 1995, most of the shift has occurred since 2000. The National Association of Pension Funds survey (2005) found that DC plans have become the most common form of private sector employer pension: 62 per cent of employers offer a money purchase plan; 24 per cent offer a stakeholder pension; and 46 per cent offer a DB plan. Private sector consultant surveys are consistent with these findings showing that most U.K. employers now offer DC pension plans, including many large employers.[32]

[31] GAD 2006. In the same report the GAD reported that nearly 50 per cent of DB pension plans were either frozen or closed to new members.

[32] For example, Watson Wyatt (2005) notes that the shift towards DC plans has increased in recent years and is not just limited to smaller employers. In their survey of FTSE 100 firms they found that 81 per cent (of 83 respondents) offer a DC plan to which the employer contributes. See also Greenwich 2005.

Unfortunately, administrative and/or survey data showing the share of pension sector assets held in DC pension plans is not available for the U.K.. A widely cited estimate is included in a recent report by UBS Global Asset Management (2006) in which it was reported that DC plans account for about 20 per cent of U.K. pension sector assets. In contrast, a survey of a limited number of U.K. pension funds conducted by Greenwich Associates (2005) found that for the 82 per cent of survey respondents offering a DC plan, only 3 per cent of total assets were invested in DC plans. It is possible that these firms had only recently made the shift to a DC plan and hence few assets had accumulated.

In Canada, the shift from DB to DC pension plans is considerably less evolved than it is in the U.S., despite the close integration of the U.S. and Canadian economies and the many similarities in their pension systems. Anecdotally, many industry professionals attribute this to differences in culture, one reflection of which is a higher level of workforce unionization. Brown and Liu (2001) argue that a higher level of unionization in Canada relative to the U.S. is one factor supporting the persistence of DB pension plans. They also note that differences in pension regulation and tax policy have been important as well. While there are a number of possible explanations, it is clear that a large migration towards DC pension plans has not yet occurred in Canada. At the same time there is evidence that few new DB plans have been created over the past decade or so.

In 1992 about 6.8 per cent of private sector trusteed[33] pension plan members were in a DC plan, less than one per cent were in combination (DB and DC) plans and 92.5 per cent were in DB plans. By 2004 the share of members in DB plans had declined to 77.1 per cent while the share in DC plans showed a slight increase to 7.6 per cent. The main change over the period was an increase, to nearly 12 per cent, in the number of members belonging to a combination plan. This is likely a reflection of the fact that in Canada, the principal means of "freezing" a DB pension plan is to close the plan to new members while maintaining the DB plan for existing members.[34] In terms of assets, less than four per cent of sector assets are in 'DC only' plans, however, similar to Australia, the total share of sector assets in DC plans is somewhat higher because some portion of the 13 per cent of assets in combination plans belong to DC plan members.

Anecdotal and survey evidence suggest that the shift towards DC pension plans may have increased in recent years.[35] Hewitt Associates (2004) in a survey of a diverse group of 174 Canadian firms sponsoring a DB plan, found that while 49 per cent of

[33] Excludes occupational pension plans organized as insurance contracts.

[34] Current reporting practices do not distinguish between true hybrid plans and multiple DB/DC plans covering different groups of employees at the same firm. The category 'combination plans' may capture some hybrid plans but in most cases it is likely capturing the situation where employers offer a DC plan to new hires while continuing to maintain the older DB plan. See Anderson, 2005.

[35] The available administrative/survey data suffers from a lack of timeliness and fails to explicitly capture some changes occurring in DB plans, e.g., when existing DB plans are closed to new members.

respondents provided a DB plan to new employees in 2000, only 47 per cent offered one at the end of 2003 and only 39 per cent expected to offer one by 2006. Forty-three per cent of respondents offered a DC plan in 2000, and by the end of 2003, 48 per cent offered a DC plan to new employees. Fifty-three per cent of plan sponsors planned to offer a DC plan by 2006.

Information gathered in interviews with actuarial consultants and DC service providers (March 2006) is consistent with the findings of Hewitt Associates. Interviewees reported that there is growing interest in DC pension plans among plan sponsors. While many employers prefer DB plans for various reasons, there has, at the same time, been a sharp increase in the number of employers engaging consultants to determine how best to implement a transition to a DC plan. The consultants view the shift towards DC plans as a global trend that is partly a response to changes in the workplace, including greater labour mobility and, for multinational firms, a need to harmonize pension plans across jurisdictions that have complex and unique DB pension legislation and regulation. They noted that in recent years the shift is mainly employer-driven and based on a combination of factors including: the increasing complexity and cost of DB plans; the misalignment of incentives away from DB plans, particularly with regard to uncertainty of surplus ownership (as articulated in pension legislation and case law)[36]; concerns regarding the impact of potential pension accounting reform; and the impact of pension fund volatility on the financial results of firms with large, mature pension plans.

IV. Factors Contributing to the Shift to DC Plans in Private Sector Pensions

Private sector occupational pension plans (DB and DC) are, in most cases, voluntary.[37] Employee demand for these plans and the employer's willingness to offer them are influenced by a wide variety of factors, including tax policy, pension legislation and regulation, and accounting. Historically, a change in industrial composition and workforce demographics, seem to have played a major role in the shift away from DB pension plans. This is one of the findings of a study by Aaronson and Coronado (2005) that examines the key factors behind the shift away from DB pension plans in the U.S. The highlights of the study are summarized in Box A. In this section we briefly mention a number of other explanations offered for the shift, mainly written from a U.S. perspective.

[36] Pension law was reformed in the 1990s to make it more difficult for employers to gain access to pension surplus; even if regulators agree that surplus can be distributed union approval is required.
[37] As a source of retirement income, these plans supplement state pensions (both pay-as-you-go and earnings-related schemes) and individual savings and wealth. Since the plans are voluntary, workforce coverage is not comprehensive, often limited to workers in higher paying occupations.

BOX A - Demand/Supply Factors Contributing to the Shift to DC Pension Plans in the United States (1)

In a recent study, Aaronson and Coronado (2005) explore the demand and supply factors contributing to the shift from DB to DC plans using data on pension coverage for 40 industries.[1] Many of the factors they examine – and find to be statistically and economically important to the shift in pension coverage –relate to increases in the mobility of workers between employers and in-and-out of the labour force. On the demand side, demographic trends in the labour force may have made the accrual risk of DB plans a more important consideration for workers. For instance, workers in dual-earner couples are likely to prefer pensions with benefits that are portable across employers because their employment decisions depend on the opportunities of their spouses. In addition, women with children may prefer the steady accrual in DC plans because family concerns are likely to affect their labour force participation and lead to greater-than-average job turnover, which is penalized significantly in back-loaded traditional DB benefit formulas. On the supply side, previous studies have suggested that recent technological changes may have reduced the importance of forging long-term relationships between firms and workers, which would also mitigate the incentive to offer "back-loaded" compensation through nonlinear DB benefit schedules.

Indeed, the researchers find that factors associated with a weakening of long-term employment contracts have played a significant role in the shift from DB to DC pensions. Industries that saw a rise in the proportion of employees with less than 5 years of tenure - a proxy for the mobility of their workforce - experienced significantly larger than average decreases in DB coverage and increases in DC coverage. Also, industries that experienced larger rises in the share of female employees with children and in the share of workers in dual-earner couples reduced their provision of DB pensions more than other industries[2]. Finally, industries that experienced relatively faster growth of multi-factor productivity and a greater rise in the share of professional and technical employees – both meant to serve as proxies for the industry's pace of technological change – increased DC coverage and reduced DB coverage compared with other industries (holding other factors constant).

The authors also reported that aggregate factors that were likely to have affected all industries – such as a stricter regulatory environment, increased life expectancy and a shift in the average age of the workforce, and improvements in financial sophistication of employees probably also played a role in explaining the changing mix of pension coverage.

Aaronson and Coronado concluded that the shift from DB to DC pension coverage in the U.S. since the mid-1970s seems to have been importantly associated with structural shifts in the labour market, such as changes in industry mix of employment and increasing labour mobility, as well as changes in the regulatory environment and demographic composition of the workforce. Some of the aggregate shift was accounted for by a relatively subdued pace of growth in certain industries that had relied heavily on traditional DB plans in the past and as employers sought to curtail pension costs in light of workforces that were growing significantly older, on average. Still, a very important factor operating on the demand side is that labour markets in the U.S. seem to have become characterized by greater mobility, leading workers to derive less value from DB plans that traditionally have given disproportionate reward to long-tenured employees.

(1) This section summarizes results and conclusions from Aaronson and Coronado (2005).

(2) Industries with an increased share of dual-earner couples also boosted their provision of DC pension plans, while industries with an increased share of female workers with children did not boost DC pensions in a statistically significant way.

A. Regulatory and tax changes

DB pension funds are governed by rules contained in pension legislation, regulation, and tax policy that over time have become increasingly complex and costly to administer. The U.S. Employee Retirement Income Security Act of 1974 (ERISA) replaced a patchwork of federal and state laws with a complex set of rules regulating almost every aspect of private pensions, including reporting, disclosures, coverage, vesting, and funding. ERISA also established the Pension Benefit Guaranty Corporation (PBGC) and imposed premiums on all DB plans to fund the insurance provided by the PBGC. Finally, ERISA was accompanied by a significant change in tax rules, including a comprehensive set of non-discrimination requirements (essentially, to keep employers from offering retirement plans only to executives).[38] Many analysts have suggested that these tax and regulatory restrictions have reduced the incentive for firms to sponsor DB plans, by increasing the cost of administering the plans, and by limiting firms' flexibility in providing benefits (e.g., by regulating funding and limiting the extent to which companies can target benefits to particular employees).[39]

The influence of changes to pension legislation, regulation and tax policy on employer incentives to offer DB pension plans has also been raised in other jurisdictions. Some analysts have attributed recent closures of DB pension plans in the U.K. to the increase in regulatory burden since the 1980s (e.g., Davis, 2004). The Myners Report (2001) concluded that the shift is a result of numerous factors including increased labour mobility and cost but that regulatory changes such as the Minimum Funding Rule, the removal of the tax credit on dividends and the requirement to guarantee Limited Price Indexation have created disincentives for employers to offer DB plans. In Canada it is argued that over time the evolution of pension legislation, regulation and case law, particularly in the area of surplus ownership, have reduced the incentives for employers to sponsor DB pension plans (Armstrong and Selody, 2005).[40]

B. Increasing costs of DB plans

DB plans are implicit contracts in which the expected present value (discounted) of wages and pension payments must be at least equal to the expected present value (discounted) of wages a worker can earn in the spot market. As the workforce has aged, the costs of funding a DB plan have risen because the level of accrued benefits is higher and the post-retirement period has lengthened due to early retirements[41] and increased

[38] Another important tax policy related to the shift towards DC plans is the introduction of tax-deferral in the 401(k) plan introduced in the U.S. in 1978.
[39] In the Hewitt Associates survey (2004) of Canadian firms, administrative/regulatory complexity ranked in the top 3 threats to DB plans along with funding requirements and stock market volatility.
[40] Nonetheless, Brown and Liu (2001) argue that a less restrictive regulatory regime, relative to the United States, is one factor favouring the retention of DB plans in Canada vis-à-vis the U.S.
[41] Private DB plans typically do not reduce the annuities paid to early retirees in order to maintain the same expected present value. The result is an early retirement subsidy that firms have used to encourage retirements among older workers.

longevity.[42] In theory, these factors should not be a problem; firms forecast the post-retirement payments and set the wage schedule and benefit parameters to keep the present discounted value of compensation equal to the productivity of the worker over the life of the contract. In practice, it may be difficult for firms to adjust compensation in response to shocks to forecasted values of longevity, benefit costs, or asset returns.[43] Reasons for this difficulty include regulatory constraints, litigation risk, and the impact on employee morale. In addition, some evidence has suggested that workers value a dollar of DB pensions less than a dollar of wages (despite the tax preference for DB pensions), which may limit the ability of firms to substitute across types of compensation. Thus, increasing costs could give firms an incentive to terminate DB plans. However, the longevity increase has also raised the cost of funding worker retirement via DC plans. If workers had full information and valued DB and DC plans the same way, the value of the two plans would essentially be the same in equilibrium, and firms would be unable to reduce costs by switching to a DC plan. Thus, in order for increased longevity to lead to a shift from DB to DC plans, workers must value DB and DC plans differently.

C. Change in the industry composition of employment

Many of the largest DB plans have been in manufacturing industries such as steel and auto production, and in other heavily unionized industries. As these industries have declined, the prevalence of DB plans has diminished.

D. Increase in labour mobility

Although there are a range of opinions, the preponderance of the evidence in the U.S. suggests that worker mobility has increased over the past 30 years. Explanations include changes in the industry composition of employment, technological change, and changes in the demographic composition of the labour force toward workers with less stable labour supply. More-mobile workers find DC plans relatively advantageous because benefits in these types of plans accrue more evenly through their career and are entirely portable should the worker separate from the sponsoring firm or leave the workforce for a period.[44]

E. Introduction of 401(k) plans

Since the IRS affirmed the applicability of section 401(k) of the tax code to non-executive employees in 1983, this type of plan has accounted for the bulk of growth in

[42] Longer life spans increase the cost of providing an annuity. However, this effect can be muted somewhat if DB retirement payments are not indexed to general price inflation.

[43] There is some evidence that firms may have underestimated the increase in longevity, but more important reasons for current funding problems are low interest rates and volatile asset returns. Interestingly, the 1983 U.S. Social Security forecast somewhat *over*estimated the increase in life expectancy.

[44] One might have expected the increase in mobility to have lowered worker accruals, and thus offset the higher DB costs associated with the aging workforce. However, the mobility increase has been less pronounced for older workers, in part because the increased attachment of women to the labor force has led to rising tenure for women in that age group.

U.S. DC plans. Unlike other DC plans, which emphasize tax-deductible employer contributions, 401(k) plans allow employees to defer their own taxes by allocating a portion of their wages to a DC account. As indicated earlier, 401(k) plans also permit withdrawals, a feature typically not provided in DC money purchase plans (MPPs). Although this feature potentially results in a more variable retirement income than comparable MPPs, the advantage is that it is a more flexible tool for managing lifetime income and savings. The 401(k) plans have proved popular with workers who have found them a convenient, tax-advantaged way to save for retirement. In addition technology has made these plans increasingly easy and inexpensive to administer over time.

F. Increasing familiarity with the stock market

Since mutual funds and individual retirement savings accounts became more mainstream financial assets in the 1980s, an increasing number of households have become familiar with stock-market investing. The sharp rise in equity prices in the mid to late 1990s coincided with rapid growth in 401(k) and other DC plans, in most countries. Analysts have speculated that workers have become increasingly interested in directing their retirement savings through DC plans, albeit this interest may have waned somewhat in the wake of portfolio losses suffered when global equity markets declined from 2000 to 2002.

G. Actual or Proposed Changes to Pension Accounting

The acceleration in DB pension plan closures in the U.K. since 2000 has been attributed primarily to the change in pension accounting towards market-based standards.[45] Indeed the increase in DB plan closures in the U.K. following the introduction of FRS 17 has led many observers to conclude that the reforms to pension accounting being considered in the U.S. and internationally will accelerate the trend away from DB pension plans due to the greater volatility in financial statements that proposed reforms are expected to create.[46]

V. Implications of the Shift from DB to DC Pension Plans on Asset Allocation

In this section we examine the aggregate asset mix of DB and DC pension plans where the data are available. Historic data is available that shows the asset mix of the Australian DB and DC pension plan assets but unfortunately no breakdown is available for the relative share of DB and DC plan assets within the 'combination' category which accounts for about 50 per cent of sector assets. Consequently, we examine only the most recent period using estimates prepared by the Reserve Bank of Australia of the relative share of combination plan assets in DB and DC plans. Unfortunately, data on the asset

[45] See Fore (2004) and Klumpes and Li (2003). Byrne (2004) reports that in the 2002 National Survey of Pension Funds, 82 per cent of respondents thought that FRS 17 made it less attractive to offer a DB pension plan.

[46] As mentioned earlier, pension accounting reform is dealt with in more detail in Broadbent, Palumbo, Santaella and Zanjani (2006) and Drudi, et.al (2006).

mix of U.K. plans is not available. Historic data is available for the U.S. and Canada. Also, in the U.S., DC pension plans account for a large share of total sector assets. It is therefore useful to examine whether the change in sectoral aggregate asset allocations (1985-2005) can be explained by differences in the asset mix of DC and DB plans. It is important to note that the available data for all countries is highly aggregated and does not adequately reflect investment in alternative assets such as hedge funds, private equity and infrastructure, nor does it provide a breakdown into asset sub-classes such as international and emerging market equities or corporate and high yield bonds.[47]

A. Aggregate Asset Allocation in DB and DC Pension Plans in the United States

As noted earlier, a large share of private sector pension assets are held in DC pension plans. Between 1985 and 2005, three trends are observed in the aggregate asset allocation across private sector DB and DC plans combined (Table 5): an increase in the share of assets invested in mutual funds; a net increase in the share of assets directly held in corporate equity shares and a decline in direct holdings of directly-held Treasury, agency-backed, and corporate and foreign bonds. As indicated in Tables 6A and 6B, the shift from coverage in DB plans to coverage in DC plans over the past 20 years can account for a significant portion of the increase in the share of total private-sector pension assets invested in long-term mutual funds. By contrast, the net increase in the share of total assets directly held in corporate equity shares has occurred despite the fact that this category has represented a much smaller portion of DC plan assets than DB assets in recent years. In general, the aggregate asset allocations in both DB plans and DC plans have shifted away from direct holdings of Treasury, agency-backed, and corporate and foreign bonds since 1985. However, DC assets have been shifted into long-term mutual funds, while DB assets have been shifted more heavily into direct holdings of corporate equity.

[47] Furthermore, the data are based on physical assets and do not adequately reflect risk, as for example when derivatives are used to create synthetic asset classes.

Table 5: Allocation of Private-Sector Pension Assets in the U.S., 1985 and 2005

		Share of total assets in:		
	Asset category	1985	2005	Difference
		percent		*percentage points*
1	Deposits and money market mutual funds	9	4	-5
2	Directly-held credit market instruments (primarily Treasury, Agency-backed, and corporate bonds)	27	13	-14
3	Directly-held corporate equity shares	42	47	5
4	Long-term mutual fund shares	1	26	25
5	Guaranteed insurance contracts (GICs) and other insurance contracts	11	7	-4
6	Miscellaneous assets (including about half from contributions receivable)	10	3	-7

Note. Estimates are from the Flow of Funds Accounts of the United States, and reflect upward revisions to the share of directly-held corporate equity and mutual fund shares for private DB plans that will be included in the Federal Reserve Board's June 8, 2006, Z.1 statistical release.

Table 6: Allocation of Assets in Private-Sector DB and DC Pension Plans in the United States, 1985 and 2005

A. Asset Allocation in Private-Sector Defined Benefit Pension Plans

		Share of total assets in:		
	Asset category	1985	2005	Difference
		percent		*percentage points*
1	Deposits and money market mutual funds	7	3	-4
2	Directly-held credit market instruments (primarily Treasury, Agency-backed, and corporate bonds)	32	21	-11
3	Directly-held corporate equity shares	42	61	19
4	Long-term mutual fund shares	1	10	9
5	Guaranteed insurance contracts (GICs) and other insurance contracts	10	4	-6
6	Miscellaneous assets (including about half from contributions receivable)	8	1	-7

B. Asset Allocation in Private-Sector Defined Contribution Pension Plans

		Share of total assets in:		
	Asset category	1985	2005	Difference
		percent		*percentage points*
1	Deposits and money market mutual funds	12	5	-7
2	Directly-held credit market instruments (primarily Treasury, Agency-backed, and corporate bonds)	18	7	-11
3	Directly-held corporate equity shares	42	36	-6
4	Long-term mutual fund shares	1	37	36
5	Guaranteed insurance contracts (GICs) and other insurance contracts	12	10	-2
6	Miscellaneous assets (including about half from contributions receivable)	15	5	-10

Note. Estimates are from the Flow of Funds Accounts of the United States, and reflect upward revisions to the share of directly-held corporate equity and mutual fund shares for private DB plans that will be included in the Federal Reserve Board's June 8, 2006, Z.1 statistical release.

The key points to be noted with regard to the change in asset allocations in each type of plan (1985 - 2005) are as follows:

- *Small decline (5 percentage points, "pp") in the share of assets held in deposits and money market mutual funds.* From 1985 to 2005, the share of assets held in these instruments fell in both DB plans (from 7 percent to 3 percent) and DC plans (from 12 percent to 5 percent). Moreover, the share of assets in these instruments remained slightly higher in DC plans than in DB plans over this time period.
- *Decrease (14 pp) in the share of private-sector pension assets held directly in credit market instruments (primarily Treasury, Agency-backed, and corporate bonds).* A small portion of this aggregate portfolio shift can be accounted for by the shift toward DC pension coverage. Since 1985, DC accounts have consistently tended to hold a smaller share of assets as bonds – in 2005, the share was 7 percent in DC plans compared with 21 percent in DB plans. That said, the more important factor for the aggregate shift would be that assets in both DB plans and DC plans have shifted out of bonds since 1985. As mentioned above, assets in both types of plans have shifted significantly toward long-term mutual funds and DB plans have shifted a lot of assets from bonds to directly held corporate equity.
- *Small increase (5 pp) in the share of private-sector pension assets held directly in corporate equity.* This shift has occurred despite the move from coverage in DB plans to DC plans. In 1985, DB plans and DC plans had the same asset allocation for directly held corporate equity – 42 percent. However, by 2005, this allocation had edged *down* to 36 percent for assets held in DC plans, which should have exerted downward pressure on the aggregate portfolio share. A more-than-offsetting trend has been the appreciable *increase* in the share of DB plan assets invested directly in corporate equity shares – up to 61 percent in 2005.
- *Large increase (30 pp) in the share held in long-term mutual funds.* The surge in the share of private-sector pension assets held in mutual fund shares seems mainly to reflect the shift toward DC plans. DB plan managers have raised their allocation to mutual funds from virtually nil in 1985 to 15 percent of assets in 2005 (around $270 billion), but, with more than $1 trillion in mutual fund assets, DC plans are the bigger part of the story. In 1985, DC plans had only a negligible portion of assets in mutual funds, but this category represented about 37 percent of assets in 2005.

In comparing the aggregate asset mix of each type of plan in the most recent period (2005) it can be noted that the principal difference is that DC plans tend to hold a larger share of assets in mutual funds than DB plans, while DB plans tend to have a larger share of assets in direct holdings of securities (equities and fixed income). As noted in Section VI (c) Holden and Vanderhei (2005) show that corporate equity shares account

for about two thirds of assets in US DC plans (i.e., taking into account direct holdings and the equity share in mutual fund holdings), similar to the share held by DB pension funds (assuming that some percentage of the mutual funds held by DB plans is invested in equities). Relative to DB plans, US DC plans tend to hold a smaller share of bonds and a larger share of cash and the guaranteed insurance contract category (GICs), which includes other "stable value" products offered by insurance companies.

B. Aggregate Asset Allocation in DB and DC Pension Plans in Canada

In Canada 'DC only' pension plans account for less than 5 per cent of total private sector pension sector assets while combination plans account for less than 12 per cent. It is therefore unlikely that a change in the asset allocation of DC plans would be reflected in the aggregate asset mix for the sector. Table 7 shows the share of assets in DB, DC and combination plans in 1992 and 2004. For the purposes of the discussion that follows we will focus only on DB and DC plans.

Between 1992 and 2004, the most noteworthy change in the asset mix for both DB and DC plans is an increase in equity holdings and a decrease in bond holdings (directly held and mutual funds). This is similar to the findings for U.S. plans. Over time the share invested in cash and short-term securities has also been reduced, primarily in DC plans which historically had a larger weighting than DB plans. This is likely attributable to the substantial decline in interest rates over this time period. Other things to note are the decline in mortgages, real estate and miscellaneous assets in both DB and DC plans.

Table 7: Aggregate Asset Mix of Canadian Private Sector Pension Plans (per cent of total assets)

	Defined Benefit			Defined Contribution			Combination		
	1992	2004	*Diff.*	1992	2004	*Diff.*	1992	2004	*Diff.*
Equities	40.6	53.3	12.8	24.0	47.9	23.9	31.6	52.6	21.0
Bonds	37.1	34.3	-2.7	42.7	32.5	-10.2	32.8	35.0	2.2
Mortgages	3.5	1.6	-2.0	3.7	0.4	-3.3	0.9	1.3	0.4
Real estate	2.7	2.3	-0.5	0.5	0.3	-0.2	0.2	1.2	1.0
Cash, deposits, short-term	6.5	4.3	-2.2	9.3	5.1	-4.2	7.3	4.5	-2.8
Miscellaneous	9.5	4.1	-5.4	19.8	13.8	-6.0	27.2	5.4	-21.8

Source: Statistics Canada

Looking at the current (2004) asset mix, it doesn't appear that there are any material differences in the asset mix of the two types of plan. The equity weighting is somewhat lower for DC plans (48%) than DB (53%) but this likely reflects classification issues arising from the use of the "miscellaneous" assets category which is comprised

mainly of 'other funds'.[48] The weighting in bonds is similar for DB and DC plans. DB plans tend to hold more assets in real estate and mortgages while DC plans hold slightly more in cash and short-term investments. Disaggregated data for cash holdings shows that DC plans tend to hold the majority of cash assets (76%) in money market funds, cash deposit and GICs while DB plans hold the majority of cash assets (70%) in Government of Canada treasury bills and other short-term paper. The category "miscellaneous assets" is substantially lower (4.1%) than in DC plans (13.8%) however, as mentioned this may be related to classification issues with regard to 'other funds'.

In contrast to the U.S., both DB and DC pension funds have a large share of their assets in mutual funds. This can be seen in Appendix 3 which provides a breakdown of Canadian pension plan assets, that includes funds as a distinct asset class, similar to that provided by the U.S. flow of funds accounts.[49] As indicated, there is a slightly greater tendency for DB pension funds to invest directly rather than in mutual funds, however, DB pension funds also routinely invest in institutional pooled funds; particularly small- to mid-sized pension funds; these tend to outsource asset management to a greater extent than larger pension funds. DB pension funds held 39 per cent of their assets in pooled funds (mainly equities) in 2004 compared to about 48 per cent for DC pension plans and 39 per cent for combination plans. Taking into account mutual fund holdings and direct investment in equities, Canadian DC plans hold around 55% of their assets in equities, similar to DB plans (53%). However, unlike US DC plans, direct holdings of fixed income securities are similar for both types of plans (about 22%), as are mutual fund holdings of fixed income securities (10-12%). Sector data also show that the aggregate equity holdings of Canadian DC pension plans are less diversified internationally (15%) than those of DB plans (23%).

C. Aggregate Asset Allocation in DB and DC Pension Plans in Australia

In Australia, the asset allocations are generally quite similar for both types of plans, with the majority of assets held in equities and fixed income securities. Table 8 compares the average asset mix of private sector DB and DC pension plans. The asset allocations of both types of plan are quite similar, with equities accounting for over half of total assets and debt securities accounting for around one-fifth of total sector assets. While the 'Other' category in the DC funds appears much larger, it probably largely reflects the allocation to alternative investments, the majority of which are related to the equity market. Overall, therefore, the portfolio allocations to DB and DC plans seem very similar.

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[48] Statistics Canada does not indicate precisely what 'other funds' refers to. It is quite possible that they are funds by insurance companies rather investment firms. In Canada, some plan assets are invested by insurance firms.

[49] The specific category used in Canada is 'pooled' funds, a somewhat broader category than mutual funds; because it includes funds managed by insurance firms as well as those managed by investment companies.

Table 8 Aggregate Asset Allocation in Private-Sector Pension Plans in Australia, 2005

Asset Category	Defined Benefit	Defined Contribution
Cash	6	7
Debt	20	19
Equities	63	56
Property	9	8
Other	2	10
Total	**100**	**100**

Source: APRA, RBA estimates

In summary, in Australia, Canada and the United States, the aggregate asset allocations of DC funds do not appear to be significantly different from those of DB schemes.

VI. Issues for Retirement Security Posed by the Expanded Role of DC Pensions

Clearly, the structure of occupational pension systems is changing. In large part, companies used to address their workers' retirement needs solely by paying fixed pensions from retirement until death; today, more and more workers are participating in DC plans. Within DC plans employees are assuming new responsibilities that frequently require them to make a variety of often complex financial decisions in both the asset accumulation phase and in the retirement or asset decumulation phase; the most important of these decisions are summarized in Table 9. Employees must first decide whether to participate in their employer's plan. Then they must determine how much of their own earnings to contribute, ideally based on a calculation that incorporates their expected salary replacement ratio at retirement. They may also have to decide how to invest plan contributions, whether to make early withdrawals of funds (if permitted), how to adjust contributions to account for withdrawals, when to rebalance their portfolio, what to do with balances when changing jobs and eventually, how to tap their accounts in retirement. During the asset accumulation phase and in retirement, employees are exposed to various risks, including market risk, longevity risk and inflation risk as discussed in section II.

Table 9: Decisions Made By Employees in DC Pension Plans [(1)]

Accumulation Phase:

- Participation
- Determination of expected salary replacement level at retirement
- Contributions (level, frequency) / Early withdrawals (level, frequency; repayment)
- Asset Allocation (often may be constrained by plan sponsor)
  - initial decision
  - maintenance
    - periodic portfolio rebalancing
    - adjustments over time to reflect changes in risk tolerance, etc.

Decumulation Phase:

- Retirement income vehicle
  - annuity
  - locked-in account (retain asset allocation decisions)
  - regular investment account (retain asset allocation decisions)
- Withdrawals (frequency and size)

[(1)] The actual array of decisions that must be taken by DC plan members varies across and within countries, depending on how the retirement system and individual DC pension plans have been designed.

Whether DC pension plans will provide members with an adequate income in retirement is crucially linked to their understanding and management of the tasks outlined in Table 9 and the associated risks. In this section we discuss some of the main findings of research examining how well employees have been managing with their DC pension plans. Most of the available research is based on the U.S. experience given that country's long history with the migration to DC plans in voluntary private sector pensions. Nonetheless, many of the issues raised in this literature are pertinent to the experience of other countries, including the U.K. and Canada. In Australia, employees in DC pension plans are exempted from making some of the more crucial decisions because worker participation and the amount of contributions are predetermined through legislation. Since the literature is far too extensive to provide a comprehensive review, we focus on drawing out some of the key issues raised in four areas: participation, contribution rates, asset allocation and withdrawal patterns.

A. Participation

The majority of DC pension plans are structured as a match of employee contributions; even though the plan is offered by an employer, the employee has to decide whether to participate and how much to contribute. According to research, around one-quarter of U.S. workers eligible to participate in a 401(k)-type of DC pension plan fail to take up their employer's offer, even when the employer matches a portion of the worker's

plan contributions.[50] Take-up rates in 401(k) plans have generally been found to be higher for older workers, those with higher earnings, or those employed in larger firms.[51] Although on the surface non-participants in 401(k) plans with an employer match would seem to be leaving compensation on the table, some research has shown that the combination of low matching rates and long-enough vesting periods might reasonably offset the benefits of participating in the DC plan for young workers with low earnings and highly variable employment prospects. Indeed, David Love has shown that the broad patterns of participation in DC plans are roughly consistent with optimal decisions from a life cycle model that accounts for the main features of employer-sponsored plans and patterns of earnings and employment estimated for workers in the U.S.[52] Love's simulations suggest that the design of 401(k)-type plans matters quite a bit for the take-up rate of forward-looking workers. In particular, employers that match a portion of their worker's contributions and that set up plans allowing loans against account balances and with relatively short vesting periods can expect significantly higher participation rates.

B. Contribution rates

Research has indicated that, on average or at the median of the distribution, U.S. DC participants contribute around five percent of gross salary to their accounts, and that about a quarter of participants contribute less than four percent of pay.[53] To put these figures in perspective, note that an annual contribution of six percent would be sufficient to replace about 75 percent of earnings in retirement if those contributions were made consistently for 40 years, if employers matched one-half of the worker's contributions each year, and if the account were to earn a 7-1/2 percent annual (nominal) return.

In fact, participation in and contributions to U.S. DC plans have tended not to be so steady over time, and, though the system is not fully "mature," generally workers covered by these pension plans have not entered retirement with account balances large enough to reach high replacement rates. The previously cited paper by Samwick and Skinner concludes that "the trend toward 401(k) plans has strengthened the retirement security of current workers." But, this has occurred mainly because the tendency for many workers to switch employers has meant that traditionally-designed DB plans also frequently failed to deliver great retirement security, not necessarily because DC plans have tended to achieve such terrific results for very many workers.

According to Papke's research (and the research of others, as well), contribution rates to DC plans seem to be affected significantly by particular design features of the plans: in particular, contribution rates tend to rise significantly when employers match a

[50] A Greenwich survey of selected U.K. pension funds found that fewer than 60% of eligible U.K. employees are participating in their firm's DC plans even though the firms, on average, are contributing 8% of participants' salaries.
[51] For example, see Huberman, et.al (2004); Clark and Schieber (1998); and Kusko, et. al. (1998).
[52] See Love (2006).
[53] For example, consider Papke (2004).

portion of the worker's contributions, offer provisions for workers to take loans against account balances, and give workers a range of investment options to choose from.[54]

In the U.K. low contribution rates have been highlighted as a cause for concern for retirement security in DC plans.[55] The Pensions Commission (2004) citing data from various surveys, found that current DB plan contributions are in the 16-20 per cent range compared to about 7-11 per cent for DC plans.[56] Blake(2000) notes that a modest contribution rate will still provide an adequate retirement income, but this outcome is contingent upon a long period of sustained contributions. He estimates that a contribution rate of 11 per cent will provide a retirement income of two-thirds of final salary, for a male retiring at age 65, assuming an average annual increase in salary of 3 per cent and a nominal rate of return on plan contributions of 6 per cent per year. This requires that the individual join the plan at an early age (25 years) and maintain continuous contributions to retirement at age 65. The required contribution rates rises sharply with the age at which contributions commence; by age 40 the required contribution exceeds the maximum permitted under U.K. pension regulation.

In Australia mandatory participation in employer-sponsored plans (DC) has increased the participation rate to over 90 per cent of employees (from about 30 per cent in the mid-1980s) and contributions are made at a steady rate throughout an employee's working career. Although the Australian pension reform has had remarkable success in broadening the share of the workforce covered by an employer pension plan, there is some concern that the current minimum contribution rate of nine per cent may be too low.[57] The Australian DC pension system is based on government estimates that a nine per cent contribution with continuous workforce participation (and access to the social security age pension) will deliver an adequate retirement income. However, as Bateman and Piggott (2000) note this is no longer the norm and, under the current policy design, taxation and administrative charges are increasingly eroding the mandatory contribution.

C. Asset allocation

The aggregate asset allocations in DC pension plans in the U.S. were discussed in Section V. To repeat, the majority of assets are invested in long-term mutual funds and directly-held corporate equity shares and a minority is allocated among deposits and money market funds, directly held bonds (Treasuries, agency-backed securities, and corporate bonds), and Guaranteed Insurance Contracts (GICs) and other "stable value"

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[54] Choi, et al (2006) found that a substantial fraction of employees fail to make contributions up to their employer's match threshold even among older employees who were not subject to factors such as liquidity constraints, early withdrawals and incomplete vesting. The average foregone match in the year of study was 1.3% of annual pay.

[55] We were only able to find anecdotal evidence to support this finding in Canada.

[56] DB and DC plan contributions are not strictly comparable since DB plan contributions can vary over time depending on the funded status of the plan. The main point made in the report is that DC contributions are likely too low to ensure retirement security.

[57] See Bateman and Piggott 2000.

products offered by insurance companies. According to tabulations by Holden and VanDerhei (2005; 2006) corporate equity shares account for about two-thirds of assets in DC plans (taking into account direct and indirect holdings, i.e., the equity portion of mutual fund investments).[58] These researchers have found that the overall share of assets accounted for by corporate equity tends to be highest for the youngest account-holders and much lower in accounts held by workers nearing retirement. Older workers seem to shift their investments toward fixed-income securities.

In a survey of over 1000 U.S. pension plans, Greenwich (2006) found that one of the main differences between DC and DB pension plans is that DC plans tend to have a lower allocation to international stocks (7.8%) than DB plans (16.5%). They also found a 10 per cent allocation to own company stock, five per cent to GICs and 11 per cent to stable value[59] investments. The average fixed income investment was lower in DC plans (18%) compared to 27.6 per cent in DB plans, suggesting that DC plan holders tend to invest in lower yielding fixed income investments (GICs, stable value funds, etc.) than DB funds. This finding is consistent with the Canadian data for aggregate asset mix as discussed in Section V.

Although the broad investment patterns identified by Holden and VanDerhei would not seem to suggest major problems in U.S. DC accounts, some other researchers have emphasized more troubling patterns.[60] For example, Brown, Liang, and Weisbenner document that quite a number of employers match their workers' DC-contributions with stock in their own companies and place rather strict limits on the ability of workers to divest those shares. Partly as a consequence (and partly for other reasons, such as an apparent confidence in their own firms), many workers end up with a large portion of assets in company stock – probably not a good idea from a diversification perspective, and a situation that worked out particularly poorly for employees of Enron and WorldCom, to cite well-known examples. Holden and Vanherhei (2006) also looked at own stock holdings, finding that, on average 13 per cent of DC plan assets were allocated to own company stock. The good news is that the share allocated to own company stock has been declining and there is less tendency for new plan members to hold own company stock.

In Canada and in the U.K. inadequate portfolio diversification because of inappropriately high investment in own company stock is less of an issue. In U.K. legislation there is a five per cent limit on 'self investment' by pension funds (see Byrne, 2004) In Canada, pension plans cannot hold more than 10 per cent of their portfolio in a

[58] The database that they analyzed is reportedly the largest, most representative repository of information on 401(k) plans representing an estimated 37% of members, 11% of plans and 42% ($1.0 trillion) of assets.
[59] Stable value investment products are those with some type of guaranteed rate of return.
[60] A few of the research papers relevant for this paragraph's discussion would be: Choi, et.al. (2004); Brown, et.al. (forthcoming); Bernatzi and Thaler (2001); Madrian and Shea (2001).

single holding (including own stock, which also must be publicly listed on an exchange).[61] In contrast, under ERISA, only DB pension funds are subject to a cap on own company stock holdings.

A heavy reliance on company stock is not the only troubling investment pattern in DC plans: Many workers take the default asset allocation when they sign up for their employer's DC plan, and, for "safety", this default is often a money market fund[62], which may not be the best allocation for many workers. Recently, the Department of Labor announced its consideration of guidance that would allow qualifying plans "safe harbor" for establishing default investment options in 401(k) plans.[63] One reason that revamped default options might help workers more than, say, further widening the array of possible investments is an empirical tendency for workers to roughly split their contributions evenly among all of the options given – the so-called "1/n" result. Coupled with evidence that most workers change their contribution-allocations or portfolio-allocations quite infrequently (even when asset prices are moving asset-shares around substantially), there is concern in the research community that many workers need more guidance with these key investment decisions.

New financial products, designed to simplify the investment process offer one means of addressing the needs of employees lacking the skill, interest or time to effectively manage their DC plan assets. For example, employers are increasingly making use of life-cycle funds (target date and target date maturity). In these funds (which are marketed under a variety of different names) plan members make very few decisions, mainly limited to determining their risk tolerance and expected date of retirement; this limited information is then used to determine the plan member's appropriate asset mix. These products, in particular those targeting the investor's risk tolerance, have been available in the U.S. market for many years, but to date, there has been limited take-up in DC pension plans. In a recent survey of over 1000 U.S. 401(k) plans (March 2006) Greenwich Associates found that less than 10 per cent of plan assets were held in the category 'balanced funds, target date and lifecycle (i.e., target risk) funds'. However, about 55 per cent of plan sponsors are currently offering life cycle funds while an additional 27 per cent plan to offer them; only 17 per cent of plan sponsors offer target date maturity funds. A survey by Deloitte found similar results. Forty-four per cent of plan sponsors offered time-based lifecycle funds while 31 per cent offered risk-based lifecycle funds. Lifecycle funds are discussed in more detail in Box B.

[61] This restriction may not apply to other types of retirement savings plans.
[62] During interviews held in May a consultant with a large Canadian DC practice, estimated that just under half of DC plans have money market funds as the default option but that most of the employees in these plans do not stay with the default.
[63] For arguments favoring "safe harbor" for DC sponsors offering qualified automatic investment arrangements, see Gale and Iwry (2005).

BOX B - Lifecycle Funds

An increasing number of DC pension plans offer products, broadly referred to as lifecycle or lifestyle funds, that are designed to simplify the investment process for plan members. Lifecycle funds are designed to reduce the number and complexity of decisions that the investor would typically be required to make in a DC plan. Lifecycle funds are managed funds that are typically designed to become more conservative as the investor approaches retirement**.** They are based on the principal that investors should decrease their portfolio weighting in riskier assets as they age, to mitigate the effects of market timing risk.

Lifecycle funds can be classified into two broad categories: "target date" funds that target a specific retirement date and "target risk" funds that target the investor's risk tolerance (e.g., conservative income fund). In principle, both categories of funds target risk using various asset mixes and investment strategies. Pure target date funds automatically adjust the fund`s asset mix as the DC plan member approaches retirement. Each family of funds offers a limited range of target dates that the plan member can choose from; the member simply chooses the fund date closest to their own expected retirement date. Over time the fund automatically adjusts from a fairly aggressive asset mix consisting of mainly equities to one consisting primarily of fixed income securities by the time the plan member is ready to retire. Some funds have additional features such as a guaranteed minimum value but the basic structure is the same. Target date funds have been criticized for offering a range of target dates that it too limited and hence may not provide a precise match to the plan member`s expected retirement date. More importantly, there appear to be a lack of concensus within the investment management industry regarding the appropriate asset mix at various stages of an individual's lifecycle. In practice there is considerable variation across providers in terms of the asset mix offered at various stages.

Target risk funds operate in a similar fashion but the investor is making the decision based on an assessment of his/her personal risk tolerance (e.g., conservative, moderate or aggressive). Most target risk funds have a "fund of funds" structure that often holds about 6 to 12 offerings from the same fund family. Each portfolio represents a broad range of asset classes and investment styles linked to its long-term investment objective. In contrast to a target date funds that automatically adjust the asset mix over time, a target risk fund requires that investors make periodic adjustments to reflect changes in their risk tolerance.

Target risk funds have been available for a long time. Target date funds were first offered in the U.S. in the mid-1990s but it wasn't until after 2002 that they became quite popular. These funds have only recently been introduced into Canada. In U.K. pension funds a lifestyle option is frequently the default choice, however there has been some criticism that the shift from equities into bonds is undertaken too mechanistically without taking into account factors such as increased longevity and differential risk appetites (See for example, Myners, p. 101). These issues are of broader concern within the DC pension industry and it is possible that there will be further innovation of these products to address some of these concerns.

In theory, since plan members bear all of the investment risk in a DC plan they ought to have access to a sufficiently diverse array of assets and/or funds to permit the creation of a diversified portfolio that incorporates their particular investment objectives and risk tolerance. In actual practice, even though the employee bears the investment risk it is the employer or trustee who determines which classes of assets or funds that the employee can invest in. Importantly, this choice, can affect the actual asset allocations of plan holders considerably. Holden and Vanderhei (2005) show that in plans where company stock and 'GICs/other stable value funds' are offered the average asset

allocation to one or both of these options (where both are offered) is high; where only company stock is offered its allocation is 29 per cent and where company stock is not offered the allocation to GIC/other stable value funds is 23 per cent. In plans where both options are available the allocation to company stock is 25 per cent and the allocation to the stable value option is 21 per cent. As might be expected in plans where neither of these options is available the allocation to equity funds is much higher (59 per cent compared to between 36 and 52 per cent for the other options).[64] The average allocation to bond, money market and balance funds are also lower than in plans that do not offer stable value funds or own company stock.

The universe of assets available to DC plan members may also be much less diverse than that available to DB pension funds. In Canada, for example, alternative assets are typically not offered in DC pension plans. The Myners report criticized U.K. DC plans for offering too few investment choices and for restricting plan member access to private equity and other alternative assets. On the other hand, the literature has shown that faced with a lot of choice DC plan members can suffer from choice overload which affects motivation and even plan participation (Iyengar, et. al. 2003). Particularly in the U.S., where under ERISA employers are afforded some legal protection and encouraged to offer employees at least three alternative investments, (see Papke, 2004, p.4-5) there has been a tendency in recent years to increase the choice offered in DC plans. Rather than improving the chances that the DC plan member will be able to choose an optimum portfolio it may simply lead to confusion, discourage participation and increase the likelihood of not choosing optimally. As Bodie (2003, p.26) notes rather than making DC plan holders better off it may "…make them vulnerable to exploitation by opportunistic salespeople or well intentioned but unqualified professionals".

At the same time, given that employees are exposed to investment risk they must be provided with enough choice to create a sufficiently diversified asset portfolio. Those employees with sufficient knowledge, skill and time to manage their own DC plan investments should have access to sufficient asset class choices to permit them to do so. In practice, while many DC pension plans offer a confusing array of choice, the opposite appears to be true as well. Byrne (2004) notes that the 2001 National Association of Pension Funds survey found that 41 per cent of U.K. pension plans offer only 1-3 investment options. A Watson Wyatt study cited in the Myners report showed that 23 per cent of plans offered only one fund, however, there is some evidence that selection is improving. In their 2006 survey Watson Wyatt reported that 80 per cent of DC plans surveyed offered more than five options. Employees in DC plans that offer a limited number of options may have difficulty creating a portfolio with the appropriate asset mix and adjusting their portfolio over time to reflect their changing risk preferences and other factors.

[64] The choices examined are equity funds, balanced funds, bond funds, money funds, GICs and other stable value funds and company stock.

D. Withdrawal patterns for DC pension accounts

As mentioned, traditional DB plans have been structured to provide a monthly annuity during retirement until the death of a worker or his or her spouse. By contrast, DC plans are structured to provide a balance of assets to provide income during retirement and in U.S. 401 (k) plans it is generally left to workers to decide how to schedule withdrawals from their accounts or whether to purchase an annuity from a life insurance company.[65] Research has indicated that, to date, a relatively small proportion of retirees have elected to annuitize their DC account-balances upon retirement. Moreover, although there is usually a significant penalty for doing so, workers can withdraw their 401(k) balances much before they retire (only when changing jobs or in case of financial "hardship") and can withdraw from their accounts penalty-free upon reaching 59-1/2 years of age. Thus, some analysts have been concerned about what patterns of withdrawal will emerge from a mature DC pension system and how much retirement security might ultimately be delivered from these plans.

Regarding very early withdrawals, until quite recently, when a worker with a DC-balance below $5,000 left his or her firm, the employer was permitted to "cash out" the account; only a small share of workers in this situation took the action needed to ensure that the account balance was rolled over to an Individual Retirement Account (IRA) or into a DC plan offered by their new employer.[66] Recently, new legislation has taken effect that will require employers to roll over just about all 401(k) balances into an IRA when their workers leave the firm, which analysts generally think should help preserve a significant portion of these retirement assets.

It is unclear just what workers did with these "cashed out" DC balances, but recent research by Gene Amromin and Paul Smith (Federal Reserve Board) has examined the circumstances under which some households have chosen to pay the 10 percent penalty assessed by the Internal Revenue Service to gain early access to assets in DC accounts. These researchers "conclude that a significant portion of early withdrawals from retirement accounts reflects more of an attempt to smooth consumption expenditures by liquidity-constrained households who experience financial shocks than some more imprudent decision-making."[67] Although this research indicates that DC balances may play another key role earlier in the life cycle for many households, it would not allay the concerns of some that DC funds may not survive to finance their retirements many years down the road.

Canadian data on individual retirement savings plans (similar to U.S. 401 (k) plans in that early withdrawals are permitted) shows that retirement savings may be used

[65] Brown and Warshawsky (2000) report that in 1997 91% and 41% of 401(k) participants had access to a lump-sum and installment option respectively; only 27% had the option to purchase a life annuity.
[66] This paragraph draws heavily from a discussion in Munnell and Lee (2004).
[67] See Amromin and Smith (2003).

to smooth income over the life cycle. Researchers at Statistics Canada (Giles and Maser, 2004) examined withdrawal patterns in Canadian tax-deferred registered retirement savings plans (RRSPs). [68] They showed that approximately 25 per cent of taxfilers in all age groups and across income groups, made early withdrawals from their plan. Furthermore, they found that withdrawn funds were unlikely to be replaced; less than 40% of those making a withdrawal in 1993 had replaced the funds by 2001 and only 22% of those aged 50-59 had done so. They also found that withdrawals frequently coincided with certain life events such as death of a spouse and that for those making large withdrawals, it often coincided with involuntary job loss or starting a business.

There is relatively little empirical research about the patterns of withdrawals from U.S. DC plans near or in retirement, but a recent study by Andrew Bershadker (Treasury) and Paul Smith (Federal Reserve Board) has focused on IRA withdrawals.[69] This study estimated that just under half of IRA owners first withdrew assets from their IRAs within two years of retirement (some just before retirement and some just after), and that, on average, these annual withdrawals accounted for about one-tenth of their retirement income. A minority of IRA owners – just over ten percent – began withdrawing assets from their accounts more than two years before retirement, and the somewhat-limited evidence suggested that for these households IRA balances seem to have been depleted within a ten-year period after the first withdrawal. [70] The rest of IRA owners – nearly half the total in 2002 – delayed first withdrawing IRA balances until at least two years after retiring and many waited until required to do so by law (usually around 70 years of age). To be sure, the data underlying this study covers a cohort of retirees for whom DC coverage was not necessarily the norm during their careers. Future research will be needed before this study's rather sanguine conclusions about the ability of retirees to spread out their IRA withdrawals throughout retirement might be confidently thought to apply to subsequent cohorts.

As indicated in Section II, "early" withdrawals from regulated occupational DC pension plans are not permitted in the U.K., Canada and Australia. At retirement an annuity must be purchased no later than age 75 in the U.K. In Canada, by age 69 the DC plan holder must either purchase an annuity or invest the funds in a "locked-in"

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[68] RRSPs are individual accounts but may be offered and administered by employers as a group RRSP; withdrawals are permitted at any time provided the individual pays tax in the year the withdrawal is made and on a tax-free basis in special circumstances (home purchase; education). In the latter case the withdrawal must be paid back into the plan within a specified time period.

[69] See Bershadker and Smith (2005). Many 401(k) balances are rolled into IRAs by the time workers near retirement age, so this study of withdrawal patterns probably is quite relevant for thinking about DC plans more generally. That said, as is noted later in the text, the study examines data from a cohort of retirees for whom DC plans were unlikely to have been the most important source of retirement income.

[70] Withdrawals can be made penalty-free from IRAs once a person is aged 59-1/2 years of older, regardless of his or her retirement status.

investment account.[71] Employees in Australian DC plans typically have the choice of purchasing an annuity or taking the entire balance as a lump sum withdrawal (as early as age 55); early withdrawals are only permitted in exceptional circumstances. The fact that most payouts at retirement take the form of a lump sum, rather than an annuity, has meant that "double-dipping" has been seen as a problem in Australia. In some cases, retirees quickly spend their lump sum superannuation and then turn to the generous age pension for ongoing support.

E. How might DC outcomes be improved along some key dimensions?

As we have seen there is a large body of research that demonstrates that financial planning and investing for retirement is not something that comes easily to most people; there is considerable inertia and myopia regarding retirement savings. At the same time that employers and governments are advocating pension systems designed around greater participant choice, researchers have been questioning the assumptions underpinning this view, i.e., that the "…employee is a well informed economic agent who acts rationally to maximize his self interest" (Mitchell and Utkus, 2003, p.1). The literature calls into question the notion, as posited in the lifecycle model of savings, that individuals are rational planners of their consumption and savings needs over their lifetimes. While the lifecycle theory is thought to do a reasonable job of explaining patterns of household saving behaviour, researchers have found that there are some savings behaviours that appear to be at odds with the theory. Furthermore, financial literacy surveys find that many individuals lack even the basic knowledge required to successfully manage their own retirement plans. Consequently, in recent years, industry professionals and academics have focused their efforts on applying the insights drawn from behavioural finance research to the design of retirement systems and DC plans.[72] We look briefly at some of this literature in this area. Note that we raise a number of pertinent questions without necessarily attempting to take a firm stand regarding just what should be done about them.

A number of researchers have come to the conclusion that employers may have the ability to guide workers to make "more appropriate" decisions about their DC plans – in terms of participation, contribution levels, investment allocations, and the disposition of assets upon retirement – by changing administrative features of their programs, such as the default options presented during employee orientation or, more recently, possibly removing default options altogether.[73]

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[71] In these types of accounts the funds continue to be invested in financial assets but a pre-determined share of the account balances must be withdrawn each year.

[72] Mitchell and Utkus (2003) provide an evaluation of the behavioural research related to pension funds from the perspective of what it offers regarding better ways to design and manage retirement systems. See also Bodie 2003, Byrne, 2004.

[73] There are many relevant citations; some examples used to research material in this subsection include: Beshears, Choi, Laibson, and Madrian (2006); Thaler and Benartzi (2004); Choi, Laibson, . Madrian, and Metrick (2005); Gale, Gruber, and Orszag (2006a/2006b).

Of course, for decisions as important as retirement saving, one might think default options for 401(k) plans should be irrelevant, as workers would choose those program parameters that best fit their specific financial situations. However, an impressive volume of empirical evidence demonstrates that DC plans that operate with an "opt out" default end up with many times the number of participants as others that leave their workers out of the program unless the "in" box on the registration form is checked. [74] Other research has shown that how contribution rates are framed in pension-orientation programs significantly affects what participants choose, and that quite a large fraction of participants passively allow their DC contributions to be invested in their plan's default allocation – often a money market or stable value fund, which may not be the best choice for long-term accumulation.

Based on their findings, several groups of researchers have developed administrative programs that they believe would improve retirement security for a large number of workers under DC and 401(k)-type pension plans. The specifics of these plans differ somewhat, but they share a view that employers can frame the options for their DC pensions to help employees find those that work best for them.

Shlomo Benartzi and Richard Thaler came up with Save More Tomorrow (SMarT), in which plan participants would be given the option of committing in advance to contribute increasing amounts of pay to their DC plans over time, with the rising contribution rates generally timed to coincide with pay-raises so that take-home pay also increases over time. In a few pilot programs testing SMarT, Benartzi and Thaler report some very favorable results: take-up rates for SMarT were quite high – appreciably higher than take-up rates for free advice on contributions that were offered by a consultant that the employer hired! Following their sample's fourth pay raise in the pilot program, contribution rates for SMartT-takers were higher than for any other group of workers, and contributions rates were more three times higher than they had been before SMarT was offered as an option.

James Choi, David Laibson, Brigette Madrian, and Andrew Metrick have proposed that DC plans be administered using a registration paradigm that requires workers to make "active decisions" about plan parameters. The crux of their idea is that employers should consider removing defaults in their DC-registration process. By compelling workers to "check a box" demarking their participation decision, contribution rate (if they decide to participate), and investment allocation, they will be encouraged to think about these important decisions and by removing defaults no particular set of parameters will receive an advantage in the process. These researchers argued that "active decisions" would probably be most appropriate for employers with heterogeneous workers (so that a single default option is unlikely to fit well for many workers) with a

[74] See, for example, Poterba (2002).

tendency to procrastinate or succumb to "inertia" (and fall into the default parameters). Choi, et al, examined data from a large employer's "natural experiment" that resulted from the inadvertent removal of an "active decisions" paradigm (that was replaced by a standard "opt in" registration program). These researchers determined that "active decisions" raised enrollment rates by almost 30 percent and quickly generated about as much DC pension saving as the "opt in" paradigm achieved in 3 years time.[75] They tentatively conclude that even though "active decisions" may not achieve the participation or contribution rates that "automatic enrollment" has sometimes delivered, it may help workers get closer to the set of plan parameters that is "right" for them.

William Gale, Jonathan Gruber, and Peter Orzag, of The Brookings Institution, have recently developed a new initiative called "Automatic 401(k)s" that they think would improve the "opportunities and incentives for saving by middle- and low-income households" in the U.S.. In their proposal, employees would be automatically enrolled in their company's 401(k) plan and employee-contributions would escalate automatically over time. Contributions would be automatically invested in "prudently diversified, low-cost vehicles, such as index funds that mimic the performance of the market, and would be rebalanced as necessary." Also, 401(k) balances would be rolled over automatically when employees change jobs. Gale, Gruber, and Orzag believe in allowing employees the option to override the "automatic defaults" at every step, if they decide to tailor their 401(k) to their own financial situation. Gale, Gruber, and Orzag go somewhat further in their proposal by arguing that the federal government substantially change the tax code to improve the incentives for middle- and low-income workers to participate in 401(k)s. They recommend replacing the current income tax deductions for 401(k) and IRA contributions – which are not so valuable for those in the lower marginal tax brackets – with a government matching contribution that was targeted to them (say, a 30 percent match up to a cap). Finally, these researchers propose that 401(k) balances generated by the government-match should automatically be annuitized upon retirement. Gale, Gruber, and Orzag's proposal is brand new, and it remains to be seen how much support it will garner in the broader policy sphere.

The perspective discussed so far has emphasized research suggesting the importance of "inertia," "procrastination," "myopia" (or something closely related to it), and other factors that seem to inhibit employees from getting the most out of their DC pension plans. However, some other researchers, including Annamaria Lusardi and Olivia Mitchell, for example, have emphasized research results that suggest how much good might come from helping many more employees improve their "financial literacy"

75 Choi, Laibson, and Madrian also found broadly similar results from field data gathered from a few employers that recently adopted Hewitt Associates' Quick EnrollmentTM program for their 401(k) plans, a design that shares some attributes of the "active decisions" paradigm.

or become better able to recognize what decisions best serve their retirement-interests.[76] Essentially, one might interpret Lusardi and Mitchell's empirical analysis as having delivered both bad news and good news for the efficacy of DC pension plans in helping to support retirement well-being. The bad news is that these researchers document rather widespread "financial illiteracy" among the cohort of 50-to-60-year Americans in 2004, in that fewer than half correctly answered questions about compounding interest and inflation and less than a third correctly answered questions about risk diversification. Moreover, these researchers showed that being at risk for "financial illiteracy" lowered the chances that a person had previously planned for their retirement income security or invested retirement assets in a broad array of financial instruments (stocks or mutual funds, for example). The good news from their research is that people who reported having planned for retirement in advance had accumulated significantly more assets than others, had invested in fairly diversified portfolios, and frequently viewed their retirement plans as having succeeded. Thus, although they recognize that causality could run in the other direction, Lusardi and Mitchell seem inclined to think that getting more people to think about and plan for retirement well ahead of time and targeting education programs to groups of workers particularly at risk of "financial illiteracy" holds the potential to raise the adequacy of retirement savings and narrow, to some extent, the distribution of wealth among American retirees.

These findings on financial literacy are relevant for other countries as well. In a recent report the OECD (2005) noted that the few countries that have undertaken nationally representative financial literacy surveys have found that "…many consumers do not have an adequate financial background or understanding and that they often overestimate their knowledge of financial issues."; furthermore they have difficulty finding and understanding financial information (ibid, p. 15). Given that individuals are assuming increasing responsibility for complex financial decisions the authors of the report argue that improving the level of financial literacy is a key policy issue. Given the shift towards DC pension plans, increased life expectancy and the proliferation and increasing complexity of financial products, it is more crucial than ever that policy-makers ensure that individuals are provided with the education and information that they require to make informed decisions.

To summarize, there are implications for financial market efficiency and stability arising from the shift from DB to DC pension plans. Of note, the household sector has become increasingly exposed to financial markets and prospective retirement income more subject to volatility. Through traditional DB pension plans households had access to a lifetime annuity and employers assumed the investment, market timing, and longevity risks. In a DC plan the household assumes these risks but is no longer subject to accrual

[76] Some evidence that the U.S. findings with regard to low levels of financial literacy and behavioural biases apply to Canada and the U.K. can be found in Deaves (2005), Gokul and Deaves (2006) and Byrne (2004).

and insolvency risk. While households are the ultimate owners or shareholders of all firms and bearers of the underlying risks, in DC plans, households nonetheless assume new risks and responsibilities that necessitate a variety of complex financial decisions in both the asset accumulation phase and during retirement. The question of whether DC plans will provide an adequate income in retirement is crucially linked to households' understanding of and ability to manage these new risks. As discussed earlier, there is a considerable body of research to demonstrate that for many households financial planning and investing for retirement is not something that comes easily; there is considerable inertia and myopia regarding retirement savings.

VII. Implications for Financial Markets

As we have seen there has been a growing trend towards DC pensions over the past three decades. If this trend continues, as appears likely, over time the assets in DC pension plans will exceed those in DB plans. As a result, the investment behaviour of DC pension plans will have a considerable influence on financial market efficiency and stability, eventually replacing DB pension plans as one of the largest pools of long-term investment capital. In this section we raise some of these issues and possibile policy response, looking first at overall financial market efficiency issues and secondly at issues specifically related to the development of individual life annuity markets.

A. Financial Market Efficiency

It is not yet clear what effect the shift from DB to DC pension plans will have on the allocation of capital within financial markets. Although, as we have seen, there is no evidence of a material difference in the asset allocations of DB and DC pension plans at an aggregate level, differences observed at a disaggregate level could, over time, influence a different pattern of capital allocation. It remains to be seen how the shift to DC plans ultimately influences asset allocation and risk management in both DB and DC plans. For example, if more DB pension funds adopt asset-liability matching and increase their portfolio weightings of long-term bonds, DC plans may eventually have considerably larger allocations to equities relative to DB pension funds than is currently the case. Also, over time, the continued role of financial innovation may have a considerable influence on the investment of DC plan assets. For example, although investment in target date funds should force investment into fixed income securities as plan members age, recently, providers of these funds are responding to the increase in longevity by delaying the date at which the DC portfolio becomes primarily invested in fixed income securities. This could reduce the supply pressure on long-term bonds that is likely to arise from the portfolio shifts of DB plans.

Although DC plan members have the ultimate responsibility for asset allocation, well documented behavioural biases and a lack of financial literacy may lead to sub-

optimal asset allocation or make it difficult for DC plan members to assess whether they are paying a 'fair' price for financial assets. As a result, DC plan members may tend to be more risk-averse than DB plan sponsors, or alternatively, to assume risks they do not understand and for which they are not adequately compensated. In either case, this may have implications for market efficiency and the amount of capital available for various types of investments. For example, DC pension funds could tend to be more heavily invested in equities than is prudent, or alternatively invest a larger than optimal share of their portfolio in low risk assets. In recent years, DB pension funds are contributing to financial market efficiency in their increasing capacity to invest in complex, long-term assets such as private equity, commercial real estate, and infrastructure. While in principle DC pension plans could be invested in any of these types of assets, in practice this has not occurred to any appreciable extent. Ultimately, DC plan sponsors have considerable capacity to influence asset allocation through plan design, member education and so on.

Institutional or regulatory factors may also affect asset allocation in DC plans. As we discussed in Section VI, there is evidence that plan sponsors may limit the options available to DC plan members. Altmann (2001) argues that one means of improving the investment options available to DC plan members in the U.K. may be to introduce measures based on U.S.-style 'safe harbour' guidelines under ERISA. These guidelines, as discussed in Papke (2004) specify that the sponsor must provide sufficiently varied investment alternatives to allow the participant an opportunity to materially affect the potential returns on assets and account risk; allow the participant to choose from at least three investments, each of which must be diversified and each with different risk/return characteristics (employer's securities may not be one of the three); allow the participant to change investments with a frequency that is appropriate for the expected market volatility of the investment; and provide sufficient information for the participant to make investment decisions.[77]

Since DC plans are typically organized as individual accounts they may not always realize the benefits of asset pooling available to DB plans in terms of lower costs (economies of scale) and the ability to spread investment risk over a number of participants over a long time period. For example, DC plans are subject to higher record keeping and administrative costs, but may also face higher transaction costs and investment management fees (on a risk-adjusted basis) than DB pension plans. In a pension plan the cost to the participant is generally inversely related to the size of the plan balance, which can be very small in plan structures that are not designed to take advantage of asset pooling. In principle, it is possible to structure DC plans with fees comparable to those of DB pension plans, through asset pooling across many plans (e.g.,

[77] The Pension Protection Act of 2006 (PPA) provided further legislative support to DC pension plan sponsors; among other things plan sponsors are now permitted to offer plans with automatic enrollment and to provide investment advice to plan members.

industry plans), for example, or through the use of low cost financial products such as exchange-traded funds (ETFs). In practice, there is considerable variation in DC plan structures and fees and, as discussed earlier, plan members' access to various asset classes and to specific financial products such as ETFs is often limited by the plan sponsor.

One means of facilitating the use of appropriate fee structures for DC plans on a risk-adjusted basis is to improve transparency, which in turn could foster greater competition among plan providers and asset managers. Canadian regulators recently adopted new 'Guidelines for Capital Accumulation Plans' which cover DC pension plans and other types of savings vehicles including personal retirement savings plans. The new guidelines require that all fees associated with DC plans are to be disclosed in detail. Interestingly, in the United States, even though ERISA requires that plan sponsors provide plan members with sufficient information for the participant to make investment decisions, there are several lawsuits pending where plan sponsors have been accused of setting up DC plans with excessively high fees.

Increasing the level of financial literacy may also improve the efficiency of the DC pension market and financial markets overall. In particular, as noted in the previously cited report on financial literacy (OECD, 2005) financially educated consumers have a greater ability to compare the risk-return characteristics of different financial products offered by various intermediaries and in so doing enhance competition. Furthermore, by demanding products more responsive to their needs, financially literate investors also encourage providers to develop new products and services, thus increasing competition in financial markets, innovation and improvement in quality. While it is certainly an important initiative, there are limits to what can be achieved through financial education. As Bodie (2003, p. 26) notes, "…transaction costs, agency costs, and cognitive limitations provide important theoretical justifications for financial intermediaries to supply user-friendly, guaranteed retail investment products that have only a small number of well-understood options. A guarantee of a minimum rate of return is a good substitute for a course in statistics".

B. Annuity markets

The further development of annuity markets is important to the management of risk in DC pension plans. Until recently, the subject of asset decumulation in retirement has received little attention; research on DC plans has tended to focus mainly on the asset accumulation phase. Indeed the subject of individual life annuities within the context of DC pensions and retirement security is complex and somewhat controversial. In this section we briefly touch on a few of the issues raised in the literature.

In the asset decumulation or retirement phase, employees in DC pension plans face longevity risk, the risk that they may outlive their income by saving too little,

spending too quickly in retirement and/or retiring too early. Unlike some of the other risks assumed by employees, longevity risk can be hedged in financial markets. In exchange for an initial premium, DC plan holders are able to eliminate longevity risk (and investment risk) through the purchase of a life annuity that provides them with a guaranteed stream of monthly income until death.[78] And in some markets such as the U.K. where there are sufficient quantities of index-linked government bonds, it is also possible to purchase index-linked annuities that help individuals to manage inflation risk as well as longevity risk. Employees assume insolvency risk related to the insurer.

Over the long term, the shift towards DC pension plans is expected to increase the demand for annuities substantially, particularly in countries where public pensions are being replaced by individual accounts. In many countries individuals traditionally have had two sources of fixed retirement income - DB pension plans and public pension plans (pay-as-you-go and earnings related) - which paid the pension benefit as a nominal or inflation-linked life annuity. With one or both of these sources of retirement annuity eliminated, an increase in demand for individual annuities is expected. As Mitchell and McCarthy (2002) argue, in addition to diminished corporate and public pensions, increased longevity and the availability of new annuity-linked products will support increased demand for annuities even for risk averse elders who wish to keep some share of their assets liquid.

As discussed in Section VI, the demand for individual (or joint) life annuities has been limited to date; with the exception of a few OECD countries "…annuities markets either do not yet exist or are still in an incipient stage of development" (Yermo, 2002, p. 7). The main exception is the U.K. where compulsory annuitization of DC plans and personal pension plans has supported the development of the market. The U.S. has a well developed variable annuities markets but variable annuities are used mainly as an asset accumulation vehicle (Mitchell and McCarthy, 2002). In most countries the choice of whether to annuitize DC plan balances is left up to the individual and in practice few choose to do so. Furthermore, only 30 per cent of U.S. DC plans offer annuities as an option on retirement (Brown and Warshawsky, 2000).

Many economists attribute the small size of annuity markets to the high price of annuities resulting from adverse selection.[79] While the research does not appear to be conclusive, other factors that may influence the demand for annuities include the availability of pre-existing annuitized payments (e.g. DB pension plan, public pension plan), a need to set aside assets to meet unexpected large or lumpy expenditures (e.g.,

[78] There are a variety of different types of annuities but the focus here is on single premium life annuities (or alternatively, joint single premium life annuities which cover one's spouse as well).
[79] There has been some research that has shown that adverse selection was lower than expected and that annuities had reasonably high 'money's worth' ratios (See Cardinale, et.al, 2002 and Yermo (2202), although Yermo (2002) has suggested that since this research was completed prior to the current environment of low interest rates that this needs to be revisited.

health care or nursing home costs), irreversibility of annuitization decisions, self-insurance within families, the attractiveness of competing investments, and the desire to leave a bequest.[80] Brown and Warshawsky in reviewing the empirical and theoretical results on the value of annuities offer possible explanations as to why current annuitization rates in the U.S. are low when the welfare gains from annuities can be substantial. They provide similar explanations to those already mentioned but argue that even given these explanations there should be more demand for annuities than actually observed in the private market. They argue, as do others, that the limited market for annuities must be explained by other factors, including "…market imperfections, limited consumer understanding of the benefits of annuitization and institutional and regulatory barriers to the provision of annuities" (ibid, p. 20).

Particularly over the past several years, a decline in long-term interest rates, which increases the cost of annuities, has likely been another factor dampening demand for annuities. For example, Poterba cites research showing a decline in the value of annuities over time in both the compulsory U.K. market and in the U.S.. In the U.K. there has been a decline in the ratio of the typical monthly payout as a fraction of the premium, which in turn is related in part to the decline in long-term interest rates (Poterba, p. 15). The decline in nominal payouts has raised concern regarding the operation of annuity markets and has prompted some calls for changes to compulsory annuitization in DC pension plans.

An increase in the potential demand for annuities raises a number of issues on the supply side as well. Life insurers are the primary providers of annuities so when a DC pension plan member purchases an annuity the risk is shifted to the insurer. Employees in DC plans then assume insolvency risk but related to the insurer rather than the employee. It is important therefore that insurers do not mis-price annuities and that they have access to sufficient quantities of appropriately priced financial instruments to hedge their risks. With regard to the latter, the main risks facing life insurers who underwrite annuities are investment risk and mortality risk. Life insurers frequently manage investment risk, at least in part, through asset-liability matching, so access to a supply of high quality long-term bonds is crucial. A potential demand-supply imbalance brought about by an increase in asset-liability matching on the part of life insurers (or alternatively, DB pension funds) could lead to distortions in interest rates and influence the price of annuities. This subject is explored in more detail in the other reports prepared by the working group.

Annuity providers must also hedge mortality risk which takes two forms: the first is the risk that with a given life expectancy for the population as a whole the experience of a particular life insurer is adverse and the second is uncertainty about the life

[80] See for example, Poterba (2001), Ameriks and Yakoboski (2006); Brown and Warshawsky (2000); Mackenzie and Schrager (2004).

expectancy of the population as a whole. The first type of risk can be hedged by pooling – holding a sufficiently large portfolio of individual policies. The second form is extremely difficult for insurers to hedge not only because of the difficulty of accurately predicting mortality[81] but also because in many countries good information on mortality does not exist (Davis, 2002). Nonetheless, the second risk may be imperfectly hedged by issuing life insurance policies (Mackenzie and Schrager). Blake has argued that governments could create a hedge against mortality risk by issuing "survivor" bonds whose value would vary positively with the actual life expectancy of the population. In this case the risk would be transferred to the government sector. In short it is argued that there may be some scope for the development of new financial products to help insurers manage mortality risk. Blake argues that the state should kick-off this market as it did in supporting the development of inflation-linked bonds. This would in turn support financial innovation into survivor derivatives (options, swaps, etc.).

Other analysts have commented that governments may need to strengthen or support the development of annuity markets. Mitchell and McCarthy (2002) outline some of the measures (echoed elsewhere in the literature) that governments could take to strengthen and/or support the development of annuity markets:

- enhance consumer education and awareness of longevity insurance
- standardize cost reporting
- develop and disseminate high-quality mortality tables
- streamline tax policy to enhance the attractiveness of investing in sensible products
- encourage group annuities and consider mandatory annuitization of at least some DC plan balances in order to mitigate the effects of adverse selection
- assign a new role to oversight groups in terms of the annuity market
- sponsor new financial products that can help insurers provide annuities more efficiently; these include longer term (nominal) government bonds that match annuity liability patterns; inflation-linked bonds and possibly survivor bonds.

A number of researchers have argued that policy makers should consider compulsory annuitization of DC plans to mitigate the effects of adverse selection (Poterba, Brown and Warshawsky) a matter that has been considered by at times by the Australian government to mitigate the effects of "double-dipping" by DC plan members who spend their DC plan balance very quickly following retirement. However, given that annuitization is an irrevocable decision that considerably constrains the employee's financial flexibility this policy should be carefully considered. As mentioned above, it

[81] According to Davis (2002) British insurers have already underestimated the life expectancy of annuitants by 2 years or more.

may be more prudent to encourage partial annuitization, reduce costs through group annuitization or support the development of financial products that help insurers to more effectively hedge mortality and investment risks.

VIII. Conclusion

As we have seen the retirement landscape is changing. Traditional DB pension plans are gradually losing their dominance in the occupational pension systems of many countries. In principle, the shift from DB to DC pension plans offers many advantages to employees, particularly those who expect to change jobs several times during their career or those who take temporary but extended leaves from the workforce. Since DC plans are portable, the accrual risk associated with DB plans is not an issue, nor is risk of employer insolvency, once plan contributions have been vested. DC plans can also provide employees with much more control, choice and flexibility in terms of how they manage their retirement savings and investment, and indeed how they manage their financial assets over their lifecycle.

At the same time, however, the shift towards DC plans is presenting employees with many challenges that they did not face in DB plans. They continue to be exposed to inflation risk while assuming additional risks, most notably, market, longevity and market timing risk, formerly borne by the DB plan sponsor. And, as research has repeatedly shown, employees have not done so well at managing their new responsibilities. Many employees do not participate in their DC pension plan even if it means giving up the employer's match, contributions rates appear to be low, employees are not making optimum asset allocations, and in retirement, they may not be making use of available financial products to manage longevity risk. As Bodie has argued there is a role for financial intermediaries in providing simplified products that provide individuals with a guaranteed income.

From a retirement security perspective the challenge for employers and policy makers is to design pension system and DC pension plans that support a high level of retirement savings by 1) providing enough choice and flexibility to permit employees with the inclination, knowledge and skills to effectively manage their retirement savings and investments and 2) provide support to other employees to ensure that they are able to make the appropriate savings and investment decisions.

In terms of financial market efficiency there is a role for policy makers and regulators to ensure that there is sufficient market transparency and a lack of regulatory barriers to encourage an efficient DC pension market. There may be a further role for governments to play in strengthening the annuities market in ways that support the efficiency of both the annuities market and the DC pension market.

APPENDIX 1

Funded Pension Sectors by Financial Assets Invested and Share of GDP Selected OECD Countries 2004		
Country	Financial Assets of Pension Funds	
	($U.S. billions)	As a percent of GDP
Australia	464.6	72.7
Canada (1)	445.8	52.1
Japan	661.1	14.2
Netherlands (1)	545.2	106.2
Switzerland (1)	360.6	111.6
United Kingdom (1)	1,175.3	65.1
United States	11,090.4	95.0
Total	*14,743.0*	*n/a*
All OECD Countries	15,565.1	
(1) Data is for 2003.		
OECD Pension Markets in Focus, December 2005		

APPENDIX 2

Aggregate Asset Mix of Canadian Private Sector Pension Funds
Alternative Classification (per cent of total assets)

	Defined Benefit			Defined Contribution			Combination		
	1992	2004	*Diff.*	1992	2004	*Diff.*	1992	2004	*Diff.*
Pooled Funds	10.9	39.3	28.4	24.4	47.9	23.5	33.3	39.5	6.2
Equities	39.1	31.7	-7.4	21.8	26.5	4.7	27.0	29.3	2.3
Bonds	36.3	22.1	-14.2	40.7	22.4	-18.3	30.7	24.3	-6.4
Mortgages	3.3	0.8	-2.5	1.7	0.0	-1.7	0.3	1.0	0.7
Real Estate	2.6	1.7	-0.9	0.4	0.1	-0.3	0.0	1.0	1.0
Cash	6.5	3.4	-3.1	9.3	2.3	-7.0	7.3	3.1	-4.2
Misc	1.2	0.9	-0.3	1.7	0.8	-0.9	1.4	1.9	0.5

Source: Statistics Canada

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