Risk-sharing Alternatives for Pension Plan Design: An Overview and Case Studies

Anna M. Rappaport and Andrew Peterson

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Pension Research Council
The Wharton School, University of Pennsylvania
3620 Locust Walk, 3000 SH-DH
Philadelphia, PA 19104-6302
Tel.: 215.898.7620 Fax: 215.573.3418
Email: prc@wharton.upenn.edu
http://www.pensionresearchcouncil.org

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Abstract

Pension plan designs range from those that place virtually all of the risk on the plan (and plan sponsor) to those that place all of the risk on the individual covered by the plan. Traditional plans include designs that are at both ends of this spectrum, but there is increasing attention to plans that share risk. This chapter identifies different risks and discusses methods of sharing risk, both traditionally and in recent plan designs. Two case studies illustrate recent developments. We include a discussion of future directions.

Key words: Pension plan risk, risk sharing, pension plan design, defined benefit, defined contribution, risk adjustment, hybrid plan

Anna Rappaport
Anna Rappaport Consulting
17 E. Division Street
Chicago, IL 60610
Email: anna@annarappaport.com

Andrew Peterson
Society of Actuaries
475 North Martingale Rd., Suite 600
Schaumburg, Illinois 60172
Email: apeterson@soa.org

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Pension plan designs range from those that place virtually all of the risk on the plan (and plan sponsor) to those that place nearly all of the risk on the individuals covered by the plan. Traditional defined benefit (DB) plans may be found at one end of this spectrum, while defined contribution (DC) plans are at the other. Neither is ideal, so new alternatives are needed to provide better retirement security on a sustainable and affordable basis. Fortunately, there is increasing attention being given to new plan types that increase risk sharing and thus fit more in the middle on the risk-sharing spectrum (Fuerst 2015; Blitzstein 2015). This chapter identifies the various risks and discusses methods of sharing them, both in traditional DB plans and in hybrid plan designs. Next we discuss different methods of risk sharing and provide considerations when adopting them. Two case studies identify recent developments. We also discuss future directions for funded plans and offer a framework for selecting ideas that will work well in the future.

Our focus is on the perspectives of various stakeholder groups, primarily the plan sponsor (who is often the employer), and the benefit plan participant or retiree. Other stakeholders include financial services companies and the public at large, who also have an interest in this topic, but these broader considerations are beyond the scope of the paper.

Context and Background

The United States retirement system is made up of a combination of Social Security, employer-sponsored pension plans, personal savings, and (increasingly) continued work during retirement. Employer support for pensions has shifted over time, from DB plans to DC plan arrangements. The current system has a number of problems, including the fact that traditional DB plan costs are perceived to be too volatile. Also, many organizations are either closing traditional

DB plans to new entrants or freezing benefit accruals for all with the intention of terminating the plan when it is financially viable to do so. These actions indicate that such plans are often viewed as unsustainable. Some DB plans are in financial trouble and may not be able to pay the full promised benefits. In addition, some well-funded DB plans have moved into a state of financial trouble because they granted too many benefit increases and subsidies at early retirement.

Many individuals do not have the motivation, knowledge, or skill to provide a satisfactory retirement income on their own. Many DC plan participants will not have adequate benefits at retirement because of contributing too little, using the money too early, or not earning enough investment income due to overly conservative or poorly timed decisions. While lifetime income is the most secure way to deliver benefits during retirement, few DC plan benefits are paid as lifetime income, and many plans do not offer such an option.

There has been a major shift to DC plans underway for a number of years. The structure of DC plans has been changing to improve the benefits that they are delivering and to make them less reliant on individual decisions. At the same time, experts discussing the pension system have pointed out that risk pooling is very desirable, and that other options may better serve the societal need for a well-designed and functional retirement system.

Research Findings

Several recent projects have explored principles for better plan design along with new approaches to evaluate pension systems. The American Academy of Actuaries AGES report (2014) looks at four factors necessary for an effective and strong future pension system. These include alignment, governance, efficiency, and sustainability. While the report does not directly propose specific plan designs, several of the issues it raises are linked to plan design. Alignment

speaks to linking plan management to the capabilities and needs of each of the stakeholder groups, so as to have the plan work well for both plan sponsors and participants. It also implies a plan design that works for participants with long service with a single employer as well as for those with a series of jobs or with periods in and out of the labor force. Governance refers to a plan structure that has direction and controls as part of the overall design. If adjustments are built into expectations for the plan, the combination of both design and governance is needed to make it work well. Efficiency speaks to grouping smaller plans into larger multiple-entity arrangements, providing opportunities for retirement asset accumulation through a working career, minimizing leakage during the payout and accumulation phases, encouraging pooling of risks and appropriate risk sharing, keeping expenses low, and assisting in narrowing the variability of benefits by fostering hedging of risks to support guarantees. Efficiency lowers costs and allows more contributions to be used for benefits rather than covering plan expenses. Sustainability speaks to intergenerational equity, appropriate cost allocation among stakeholders, weathering market shocks, and achieving an appropriate balance between these results while providing adequate benefits. In addition, self-adjusting systems are proposed as a method of achieving sustainability.

The Society of Actuaries Retirement 20/20 project served as a precursor to and background for the Retirement for the AGES project. It brought together a variety of stakeholders in several forums and collected papers to identify some of the best ideas internationally for building a pension system absent current regulatory constraints. Alignment of stakeholder interests, self-adjusting systems, and risk sharing were among the ideas explored. Six themes identified in that project are: (1) systems should consider new norms for work and retirement and the role of the normative retirement age; (2) systems should align stakeholders' roles with their skills; (3) systems should be designed to self–adjust; (4) systems should be better aligned with financial markets; (5) systems

should clarify the role of the employer; and (6) retirement systems will not succeed without improvements in the health and long–term care systems (Society of Actuaries 2007). The discussions in the Retirement 20/20 project point to several ideas that enter the discussion on risk sharing and plan design: the importance of appropriate retirement ages, using self-adjusting features, recognizing workplace realities, and understanding the roles of various stakeholders.

The Melbourne Mercer Global Pension Index reviews the operation of the overall pension system in 20 countries and grades the systems on overall categories of adequacy, sustainability, and integrity (Mercer 2013). The ratings include both public benefits (social insurance) and the private system. The scores are based on responses to questions in each category. The degree of variation in the responses by country is much greater for some questions than for others. An individual country may be rated highly on some questions and poorly on others. Several issues raised in the index study are important to plan design and risk sharing. The areas for improvement frequently refer to retirement ages and how people retire, including raising the minimum age for retirement benefits, raising state pension ages, and improving labor force participation at older ages. There is a wide variation in ratings, and Denmark is currently the only country rated with an A grade.

Both the Melbourne Mercer index and the Society of Actuaries Retirement 20/20 project recognize the importance of retirement ages in the long-term future of retirement systems. The former study asked about time of retirement in terms of the gap between retirement ages and life expectancy today and in 2035. The low scores for average period of pension payment today are 7.3 in India and 12.4 in Mexico. The high scores are 19.7 in France and 21.4 in Korea (Mercer 2013:50). The 2013 index report also included a new question to explore phased retirement. In response to questions about whether employees could receive private plan benefits, continue

working part-time, and continue accruing benefits or contributing to their plans, six of the 20 countries received a maximum score, six received a score of zero, and eight were given something in between (Mercer 2013). Additional demographic questions focused on fertility rates and expected old age dependency rates in 2035. Another major area of focus is the method used to pay benefits during retirement with a focus on the extent to which lifetime income is used. The discussion of private plans is heavily focused on DC plans. Noteworthy for this chapter are the wide variation in systems by country, the importance of sustainability, the importance of lifetime income payouts, and the recommendation for adjusting retirement ages and options with demographic changes.

Considerations Affecting Plan Design in the Future

When designing a retirement plan, a wide range of risks should be considered, both pre- and post-retirement. While investment, inflation, and longevity risk are always important, several additional risks are worth noting: these include employment risk, business risk, and the risk of poor choices. Some, such as the risk of family change, do not directly impact plan design and will not be discussed. In Table 6.1 below, we summarize the list, along with factors facing plan sponsors and participants in retirement and when they generally apply—whether in the pre- or post-retirement phase. Failure to focus on the range of risks when considering alternatives may result in incorrect conclusions.

Table 6.1 here.

In the debate about the future of the United States pension system, questions arise as to whether these plans should be voluntary or mandatory and universal. Moreover, a system can be mandatory at the employer level, but still optional for individual employees. Another area of

disagreement is whether lifetime income should be mandated, or instead strongly encouraged for all or some part of retirement assets.

Sustainability, the ability of a retirement system to last through economic cycles and demographic changes, is critical to the long-term success of the retirement system (American Academy of Actuaries 2014). What is needed to maintain sustainability varies with the regulatory climate and method of accounting used by plan sponsors. The move to more transparency and use of market values has increased the focus on short-term results. While this move has not changed the underlying economics of retirement plans, it has made it more important that there be safety valves enabling pension plan sponsors to deal with extreme economic conditions. Self-adjusting systems, to be discussed below, offer examples of safety valves.

The effectiveness of a retirement system for participants depends on accumulating enough resources for retirement and on using them effectively in retirement. Lump sums are generally an inefficient way of using resources in retirement, because these eliminate the efficiency of risk pooling and place longevity risk on participants. In addition, they provide more funds to those who die earlier rather than to those who live long. This is an issue in both DB and DC plans (Mercer 2013; Society of Actuaries 2007). A discussion of designs for the future and methods of risk sharing needs to include the post-retirement period. Table 6.1 includes information on when risks apply and identifies which risks are applicable to the post-retirement period.

Different Ways to Share Risk

By risk sharing, we mean the distribution of risk between various plan or system stakeholders. The Society of Actuaries Retirement 20/20 report identified four primary stakeholders: society, employers, participants, and markets (2007). In the present context we

slightly expand these categories to identify stakeholders as employer plan sponsors, participants, financial service companies, policymakers, guarantee organizations, and the public at large. Risk can also be shared by different groups of plan participants, between participants and employers, between participants and financial service companies, etc. As laid out in Table 6.2, risk can be shared in different ways, through plan design or benefit structure, financing structures, self-adjusting systems, pooling, multiple entity arrangements, third party guarantees, and backup guarantee funds. Next we offer a discussion of how risk sharing approaches can be used in pension systems, either one at-a-time or in combination.

Table 6.2 here.

Using plan design to define risk sharing and allocation. Methods of defining risk sharing and allocation through plan design include allocating risk directly in the method of determining benefits, adjusting benefits based on funding level or some other defined trigger (self-adjusting system), and/or including contingent benefits in the plan.

DB and DC plans allocate risk directly as part of plan design. Traditional DC plans with lump sum payouts place essentially all risk on plan participants (although some plans do pool investment risk in the pre-retirement phase). Variable annuity policies may include a floor guarantee on investment returns or on income to be paid out, thereby sharing risk between an insurance company and the policyholder. These plans put most risk on the individual but do place some risk on the insurance company. A charge is levied for each guarantee purchased. If the variable annuity policies are used to fund an employer-sponsored plan, the employer may share some of this risk.

Traditional non-contributory final average pay DB plans which do not offer indexing of benefits after retirement place most risk on the plan sponsor, but the post-retirement inflation risk

is held by the participant. The participant is also at risk in the event of plan sponsor bankruptcy or failure to provide needed funds to the plan.[1] In addition, the participant is at risk with respect to future benefit accruals.[2] This is an important issue since the benefit accrual pattern in these plans provides for much higher accruals as the participant nears retirement. These plans involve risk pooling, so that mortality and investment risk are shared within the risk pool. The plan sponsors bear all risks assigned to these risk pools. In a single employer plan, one employer bears the risk, whereas in a multiple entity arrangement, the risks may be shared between entities depending on the structure of the arrangement. Traditional career average pay pension plans allocate investment and longevity risk to the plan sponsor, and inflation risk, both pre- and post-retirement, to the participant. The custom for many organizations that sponsored such plans was to provide for periodic *ad hoc* updates to the career average benefit, shifting some of the inflation risk to the plan sponsor. Increases were at the discretion of the plan sponsor, providing for a different method of risk allocation.

Table 6.3 provides more detail by contrasting how plan sponsors and participants face risks in the most common types of retirement plans. Table 6.3 also shows that both groups bear some risk, even in traditional DB and DC plans. Traditionally, larger employers balanced the risk borne by the individual and the employer by offering both DB and DC plans. Such combinations could be tailored to the needs of the organization and also provide some balancing between employees of different ages. Traditional final average pay DB plans provided relatively small benefits for those who left the firm early in their careers, and much better benefit accruals later, particularly at the point of approaching unreduced retirement benefits. By contrast, DC plans provided significantly greater retirement benefits for early career participants, due to investment income

expected to accumulate over the many years during which the account balances were invested prior to retirement.

Table 10.3 here.

Many employers have adopted hybrid plans, and innovative ideas for new designs are emerging. A recent study on hybrid pension plans identified a wide range of hybrid arrangements and a broad range of risks (Turner 2014). The study included both actual arrangements in existence and proposed new ideas, including types of hybrid plan designs that divide risks between those that apply to the pre-retirement period versus after retirement. It also split plans between those that shift risk to participants in pre-retirement, to participants at retirement, to participants post-retirement, and to participants both pre- and post-retirement. Hybrids can be structured to start from a DB design and shift some of the risks to participants, or to start from a DC design and shift some of the risks to a third party or plan sponsor. That study also created a pension risk index and rated several plans with respect to both participant and employer risk.

Risk sharing adjustments built into plan designs may include provisions such as cost-of-living increases that are temporarily discontinued, if funding levels drop below a threshold; alternatively, cost-of-living additions can be discretionary or contingent on some funding level. This combines benefit design and financing to achieve risk sharing. Other benefit adjustments—permanent or temporary—can be used when funding levels cross certain barriers. Some newer designs, such as plans offered in the Netherlands (Bovenberg et al. 2015) and New Brunswick (Leech 2013) offer this type of risk adjustment. If funding levels return to the threshold levels, benefit adjustments may be temporary.

The participating group annuity plans used from the 1930s to the 1960s provided that insurance companies could assume most of the risk, while still sharing some with policyholders. The purchase price included a margin for adverse experience, and this amount was returned to the policyholder in the event of good experience. In this way, these plans shared risk between the insurer and the plan sponsor policyholder. They could also increase benefits in the event of good experience, and in that situation, the participant also became part of the risk sharing arrangement.

Using plan financing structure to share risk. Plans that include both employee and employer contributions can share risk through financing adjustments, when the plan's financial status influences contributions to the plan, benefits levels, or both. This is a form of sharing risk across stakeholders. If contributions are set as a level percentage of pay, risk is also shared among the current group of participants, with younger employees paying more than their current share of the cost in DB plan arrangements.

Benefits can also be adjusted up or down based on built-in adjustment rules and/or funded status. Adjusting benefits based on share values or investment returns, or indexing retirement ages with changes in life expectancy are examples of such adjustments. Benefits may also be adjusted based on funded status thresholds. These adjustments share risk across stakeholder groups and may also share risk within stakeholder groups.

Using self-adjusting systems to manage risk. The studies discussed above emphasize self-adjusting systems. Self-adjusting systems refer to programs that include built-in features that respond to specified conditions (usually adverse experience) without direct involvement of the plan sponsor. These adjustments can link to both design and funding and can be embedded in a variety of risk management strategies, which can be important when there are shifts in demographic, economic, or business conditions. For example, participating insurance contracts

were an early form of self-adjusting systems. Cost-of-living increases that are contingent on the funded status of the plan, and provisions that reduce benefits or increase contributions based on funded status, are also forms of self-adjustment.

To date, many retirement systems have not responded effectively to demographic changes (Rappaport 2014). Retirement age increases are needed to enhance the system sustainability in many countries (Mercer 2013), which can also be an adjustment mechanism, if retirement ages automatically increase with life expectancy. It will be very helpful to focus on expanding opportunities for older persons to continue to work and opportunities to phase into retirement (Mercer 2013).

Using risk pooling. Risks that are most readily poolable are those which members do not control and cannot predict (such as life expectancy). When members of a risk pool can control or predict the occurrence of the event being protected, there is the potential for anti-selection.

In a mandatory system such as Social Security, mortality risks are pooled across all beneficiaries, and benefits are paid for life. Those who live longer receive benefits longer, while those who die early receive less in lifetime benefits. The mortality experience reflects the entire population. By contrast, the employer-sponsored DB plan with only an income option pools risk over the employee population that qualifies for benefits. The mortality experience reflects the types of workers in the plan sponsor organization. For example, a coal mining company will have very different mortality from a law firm. The immediate annuity business of an insurance company pools the mortality risk of its policyholders. Since healthier people tend to buy annuities, the insurer's mortality experience must recognize that this group lives longer than Social Security beneficiaries or all employees. It is possible to set up multiple risk classifications and risk pools

for annuities to reflect these differences in risk levels. For annuities, this approach is used in both the United Kingdom and in the United States, though it is more common in the former.

The challenges of setting up a risk sharing arrangement using a risk pool include achieving a reasonable spread of risk and being able to charge a reasonable price for the arrangement. When life insurance is sold to individuals, it is priced according to the age and health status of the purchaser. Through a process known as underwriting, the risk is evaluated, and people in poor health may be refused personal life insurance or charged an extra premium. When life insurance is provided to an employer group, it is priced according to the demographic and industry characteristics of the group. The group, rather than the individual, is underwritten.

In a given population at a point in time, a fraction of the pool will be expected to die within the next year. Because life expectancies are changing over time, the number of people expected to die in a similar population a few years later will usually be different. When life expectancies are increasing, the number of deaths expected at each age will decrease over time. The terms ‘systemic risk’ and ‘idiosyncratic risk’ are used to understand risk related to changing mortality rates within the population. Idiosyncratic risk is the risk that a particular participant will live longer than expected. Systemic risk is the risk that life expectancy improves by more than expected for the entire cohort. Systemic risk is not poolable, whereas idiosyncratic risk is poolable. Pension and annuity plans that offer lifetime guarantees of income are subject to both types of longevity risk: idiosyncratic longevity risk is managed by pooling, but systemic risk is generally held to be unhedgeable, since few if any assets are widely available to hedge it (Turner 2014).

Establishing multiple entity arrangements. Multiple entity arrangements offer a means to share risk across groups of participants and a way to create larger pools by combining smaller entities. Employers range in size from single individuals and small employers with fewer than ten

employees, to major organizations with hundreds of thousands or even millions of employees. Large entities are able to achieve economies of scale, have resources to use strong professional help, and if they pool risk, create large risk pools. Small entities are able to access a greater variety of retirement plan options on a much more economical basis if they can join with a larger entity, provided it fits their needs. Multiple entity arrangements can offer DC and DB plans, or versions of newer hybrid plans. The legal structure of the jurisdiction in which they operate governs the options available to establish such plans. These plans differ in how they operate and in their resulting success. New types of multiple entity plans may be needed in the future, particularly if smaller employers are to have access to retirement plans.

Many United States and Canadian public pensions are multiple entity plans, covering several different entities. For example, the Illinois Municipal Retirement Fund (IMRF) covers 175,000 members linked to 2,900 employers within the state. The system administers a retirement, death, and disability plan in Illinois, and it is a DB plan, with contributions shared by employers and employees. Benefits are guaranteed by the Illinois Constitution, and municipalities and counties outside of the City of Chicago are required to participate in the plan. Many other local government entities can join the plan by choice (IMRF 2012). With this type of plan, a public plan administrator deals with many different entities and offers a variety of services. It may offer a single benefit program or multiple programs from which to choose. The public plans have choice about how they set up their operations and which risks they share and how.[3] They normally would have one set of pooled investments for DB plans and one risk pool for purposes of mortality risk. They also would normally reflect entity demographics in setting contributions. Such public plan systems may be viewed as offering many of the same services as an insurance company, though

they are not licensed as insurance companies. Public plans can be made mandatory for the eligible government units by action of the appropriate legislative body.

The pension operations of many religious denominations are also like multiple entity plans, again generally without being formally classified as insurance companies. They can be similar to some of the public pension entities, and if the plans are established as church plans in the United States, they are not subject to the same regulation as private plans. Two examples are the programs sponsored by the Episcopal and the United Methodist Churches (Church Pension Group 2014; General Board of Pensions of the United Methodist Church 2014).

Industry plans are used in the Netherlands (Bovenberg et al. 2015), unlike in the United States. Some U.S. observers view TIAA-CREF as similar to an industry plan for higher education (American Academy of Actuaries 2014; Richardson 2015). Multi-employer plans within the United States serve as industry plans within the unionized portion of industries including trucking and iron work.

U.S. multi-employer plans offer pension benefits to unionized employees, and they are jointly managed by employees and representatives of the company (or companies).[4] These plans negotiate contributions and provide benefits defined through a DB formula. Risk is shared across all participating entities, without any adjustment for differences in demographics or when the entity entered the plan. When an employer leaves the plan, it is assessed a withdrawal liability, with the basis of that liability set by law. Some of these plans have seen a major downward spiral as employment patterns have changed and particular occupations and/or industries represented by covered employees declined. For instance, milk deliverers and milliners are examples of occupations that have virtually disappeared today. Some of these plans did not work well, because

they were not structured to manage the risk well, particularly in light of demographic and industry challenges.

Third party guarantees and guarantee funds. Risk can also be shifted to third parties through the purchase of financial instruments such as insurance, with a market price set for the risk transfer. Risk can also be partly transferred to a back-up guarantee fund. State insurance pools provide guarantees to back up some insurance contracts. The U.S. Pension Benefit Guaranty Corporation (PBGC) provides guarantees for private sector pension benefits. Bank deposits in the United States up to certain limits are guaranteed by the Federal Deposit Insurance Corporation. In addition, there are various examples of guarantee funds in other countries, such as the UK's Pension Protection Fund. Each government-sponsored guarantee fund has its own method of financing. The existence of such funds changes the risk profile of specific benefits. It can also create moral hazard if companies take excessive risks, knowing they are protected.

Risk Sharing as Applied to Different Types of Risks

This chapter has defined the risks, general methods of sharing them, and their allocation to plan sponsors and participants. Table 6.4 offers a more detailed look by identifying specific methods of managing investment risk, interest rate risk, inflation risk, and longevity risk. Here we compare risk management methods available to plan sponsors with those available to participants, expanding on the ideas presented in Tables 6.2 and 6.3 by offering a range of methods for risk sharing.

Table 6.4 here.

Investment risk. DC plans in the U.S. allocate investment risk to participants who can select their own investment mix from a menu of choices. The plan administrator is responsible for structuring the choices and usually there is a default investment option viewed as suitable for participants who

do not make investment elections. Target date funds that vary the investment allocation according to the time to retirement are now a common default option in the United States. This is quite different from individual retirement accounts (IRAs) where individuals can choose any investment available in the market, and people can work with a variety of different service providers in establishing a plan.

Traditional DB plans allocate investment risk and choice to the plan sponsor. Liability driven investments offer one route to managing investment risk,[5] but this may result in a higher long-term cost, due to giving up higher expected equity returns. However, under some economic scenarios, this strategy could result in lower long-term costs.

There are variations in plan design that allocate the risk differently. For example, cash balance plans with crediting rates based on an economic index allocate investment choice and most of the investment risk to the employer, but they then share investment risk somewhat with plan participants depending on the index used for crediting investment returns and the method of linking actual fund investments to the interest credited to participant accounts. Variable annuity contracts with floor guarantees share risk between policyholders and financial institutions. The policyholder may be able to choose between funds but cannot choose individual investments. Collective DC plans such as those used in the Netherlands have a common investment fund and share investment risk across the group of plan participants.

Interest rate risk. Interest rate risk leads to changes in the value of defined plan liabilities, as well as changes in annuity prices. Current interest rates are also a major factor in immediate annuity prices as well as for returns on fixed dollar investments which may be an important component of retirement plan investments. Interest rates have been very low for the last several years; some

argue they are artificially low due to government intervention. This has made immediate annuities and bonds more expensive and resulted in increasing DB obligations.

Inflation risk. Inflation risk includes both pre- and post-retirement inflation risk. Inflation is a very important risk in funded retirement arrangements, whether DB, DC, or hybrid. Plans that use a final average earnings formula implicitly provide some coverage for pre-retirement inflation and place that risk on the plan sponsor; the latter have declined in prominence.

Most public employee plans, United Kingdom pensions, and the United States Social Security system offer benefits indexed for inflation during the payout period. Private United States plans rarely include such provisions, so inflation erodes the value of benefits. When benefits are indexed, all or part of the inflation risk rests with the plan sponsor. Inflation is often a consideration in setting investment mix. Other than inflation-indexed bonds, however, no investments offer a direct hedge against inflation.

Longevity risk. Plan sponsors can manage idiosyncratic mortality risk through pooling. Systemic risk is addressed in DB plans through the choice of actuarial valuation assumptions. When mortality improvements adequate to match experience are built into the valuation, that addresses the issue. Longevity risk can also be addressed by adjusting benefits or retirement ages if longevity changes more or less than expected. The Swedish notional DC plan adjusts benefits for changes in life expectancy as of age 65 (Turner 2014).

One way to address systemic longevity would be to increase retirement ages on an indexed basis. In the United States and Canada, there has been a gradual increase in retirement ages in the last few years, but lifespans have increased far more. An expert commission in Quebec summarized the impact of changes in work life and life expectancy (Rappaport 2014). In 1970, expected work life was 46 years, and expected retirement was 13 years. By 2009, expected work

life was 39 years, and expected periods of retirement were 23 years. The ten-year increase in periods of retirement is the result of a five-year increase in life expectancy and a five-year decrease in expected retirement ages (Rappaport 2014). The situation is further complicated because longevity and longevity improvement vary by economic status, occupation, and education. Long periods of retirement are creating a major challenge with regard to the sustainability of employee benefit and social benefit programs. The differences in longevity by economic status and occupation create equity concerns when there are discussions of raising or indexing retirement ages.

Business and employment risk. As noted above, final average pay plans concentrate much of the benefit accrual in the later years of employment. Accordingly, employees who leave their jobs early give up larger benefit accruals. There is also the concern that their employer may freeze or terminate the plan, or change the plan structure. In either case, the participant loses out on future benefit accruals. Employees are also subject to employment risk in the event of job loss, or business risk in the event the business does poorly, impacting employment prospects, salary increases, and maybe the future of the pension plan.

When the benefits are provided through DC plans, there is much less business risk to the employee. DC plans usually vest quickly, and most often, accruals earned in early years of employment are high relative to what is earned later. However, if accounts are invested in company stock, this poses a potentially significant business risk for participants. There is also business risk for the employer in that employees may not have adequate funds to retire. This can be troublesome to the business for workforce management reasons.

Risk of poor choices. DC plans typically allow for more individual choices than do DB plans. Non-contributory private sector DB plans may not require any choices until benefits are paid. By

contrast, DC plans require choices about how much to save and how to invest those funds. At the point of retirement, these plans require choices about how benefits will be paid, and some of these choices may be irrevocable. Increasingly, many U.S. plans use default options such as auto-enrollment and auto-escalation to minimize the impact of poor choices, including using one's assets too early or taking them as a lump sum distribution and using a portion for immediate consumption. Interestingly, there is a recent challenge with regard to participant choice: some plan sponsors have offered pensioners a lump sum buyout as part of a corporate derisking strategy. This creates a challenging financial decision that some older participants may not be well equipped to make.

Fiduciary and litigation risk. Plan sponsors in the U.S. are subject to fiduciary requirements designed to protect participants against mismanagement, conflicts of interest, and fraud. Fiduciary risk refers to the risk that a sponsor fails to fulfill his requirements and can then be held responsible. For instance, the DC plan sponsor takes on fiduciary responsibility for choosing the investment options offered in private DC plans. The best defense is a demonstration that a prudent process was used to select and monitor the investment options in the fund. This responsibility helps explain plan sponsor reluctance to include annuity income payouts in their plans.

Solvency Risk. Solvency risk refers to the risk that an entity providing benefits will become insolvent or unable to pay benefits, resulting in a default on benefit payments. In DB plans, the employer or plan sponsor is responsible for plan funding. Private pensions in the United States have benefits insured by the PBGC up to specified limits in the event of bankruptcy, but participants bear risk when promised benefits exceed the PBGC limits. Participants also bear the risk of insolvency in situations where there are no back-up guarantee funds, as in the public sector. There is also some risk that a back-up guarantee fund could have solvency problems.

Public pension plans have traditionally been seen as not subject to solvency risk, since public entities usually do not go bankrupt. Moreover, public plan benefits are often protected by state constitutions. This view has recently been called into question by the bankruptcy of the city of Detroit, Michigan. A federal judge recently held that Detroit's obligations to pay pensions were not protected in a federal Chapter 9 bankruptcy, even though they were expressly protected by the Michigan Constitution (Davey 2013). The December 2013 Detroit ruling is expected to be further challenged in the courts, but it opens up the question of whether and in what circumstances pension benefit protection provided by state constitutions will prevail.

In DC plans, individual participants bear most of the solvency risk if the financial institution or particular investment funds become insolvent. Various kinds of financial institutions have some funds guaranteed by a back-up fund. For example, United States insurance companies and banks are part of guarantee arrangements, but these are subject to limits. Moreover, these guarantee funds do not protect against poor investment results, but rather the bankruptcy of the institution offering the financial product. As discussed above, U.S. employers or plan sponsors have fiduciary responsibility for determining the investment options in private plans.

Case Study: Pension Reform in New Brunswick

In 2012, the Canadian province of New Brunswick adopted a new plan framework called the Shared Risk Pension Plan. The framework included: (1) a new design that split benefits between a base benefit and ancillary benefits; (2) protocols to keep the plan's operation on track, and (3) a new risk management regulatory framework to ensure compliance with the program (Munnell 2013). This new design is available to public and private pensions, and it may be used for conversion of existing pension plans or establishment of new plans (Financial and Consumer

Services Commission 2012). The program was developed by a government appointed Task Force who recommended that each public sector plan in New Brunswick be converted to the new plan (Government of New Brunswick 2013). At the time it was announced, it was supported by a number of public and private sector pension plans and by unions representing more than one-third of provincial government bargaining employees.[6] As of late 2012, the City of Saint John and Co-op Atlantic filed for approval of shared risk plans (Government of New Brunswick 2013), and in 2014, the Shared Risk Plan model was either adopted or announced for adoption by several Canadian DB pension plans.[7]

The principles for reforming New Brunswick pensions were set forth by the Task Force designing the reform (Government of New Brunswick 2013). As shown in Table 6.5, these seek to balance sustainability and risk pooling. They speak to plan design, transparency, financing, results measurement, and governance.[8]

Table 6.5 here.

The New Brunswick model weaves together plan design and plan financing. Funding levels can trigger benefit adjustments, either up or down. The traditional method used for DB pension funding uses best estimate assumptions, implying a 50 percent probability that contributions will not need to be increased. The risk sharing model provides for more stringent funding along with a specific method of adjusting benefits. If the funding level drops too low, benefits can be reduced or put on hold. If the funding increases beyond a certain point, benefits put on hold can be restored. 'Base' benefits are strongly supported, using a standard of success of at least 97.5 percent likelihood that adequate funding will be maintained without adjustment of benefits over a 20-year modeling horizon. 'Extra' benefits, such as cost-of-living increases or early retirement provisions are considered ancillary benefits, these and are also supported using a target contribution sufficient

to fund 75 percent of these benefits on average over a 20-year time horizon (Government of New Brunswick 2013:20). In rare and unforeseen circumstances, base benefits might need to be reduced; in such a case, the reduction will be borne by all plan beneficiaries including active employees, deferred vested employees, and retirees. This differs from the traditional DB approach where benefits were protected first for retirees and deferred vested participants, and where reductions generally applied first to future accruals, and then to those who had not reached retirement age.

In the Shared Risk model, the plan sponsor can offer a plan that pools risk for plan sponsors and taxpayers. In the conversions seen to date, this plan design used has replaced prior final average pay DB plan benefits with career average pay benefits, (although the legislation does not require use of a career average formula). Also, cost-of-living indexing has been replaced by contingent indexing, meaning indexing is contingent on funding levels. Final average pay accruals are frozen at the time of conversion. Contributions are shared and increased as needed based on financial results (Government of New Brunswick 2013:20-21). The legislation enabling these plans limits contribution changes to two percent of payroll and to 25 percent of the initial contribution level, intended to keep the plans affordable and sustainable. It is expected that the shared risk structure will encourage employees to work longer, leading to retirement at older ages. One report indicates that the targeted retirement year will rise three to four years for early career employees (Government of New Brunswick 2013: 13, 22).

It is worth noting that the legal structure governing these plans differs from U.S. pension requirements.[9] Specifically, the Canadian plan must be operated by independent trustees operating at arm's length from the employer. Trustees are required to have an annual actuarial valuation, a risk management structure, and an investment policy. The plan framework sets requirements for a

funding policy and measurement of plan liabilities, and actuarial liabilities are to be 'prudently valued.'[10] Funding policy must be established so that, in normal times, the plan's financial position is adequate to grant indexing and other ancillary benefits. For plans with contingent indexing, the funding policy must explain when contingent indexing starts and stops, and at what levels contingent payments are to be made. The funding policy also must include an explicit deficit recovery plan. Provincial legislation allows for the Superintendent of Pensions to establish guidance with regard to a minimum standard to address underfunding (Government of New Brunswick 2013:20-21). In conversions to date, it has been common to use a funding methodology that includes an open group funded ratio of 110 to 120 percent to be achieved over 15 years. However, a plan can start at a different point if it passes risk management tests in the statute.[11]

The Canadian Shared Risk Pension Plan was possible because former Premier David Alward established an expert Task Force in 2010 (Government of New Brunswick 2013). Also, provincial demographics made pension reform quite urgent: its population is older than the rest of Canada, with nearly 20 percent of residents over age 65 (Leech 2013). In the last decade, private sector companies in New Brunswick, including the St. Anne-Nackawic Pulp Company and Fraser Paper, had gone bankrupt with inadequate funds in their DB pension plans, leading to benefit losses by both active workers and retirees (Leech 2013). At the time of the St. Anne-Nackawic Pulp Company bankruptcy, the law provided that assets must be used first to cover retirees, terminated employees, and employees age 55 and over. In 2005, the law was amended so that benefit losses were shared between retirees and active employees. Both participant groups lost benefits in multiple bankruptcies, driving the interest in reform (Leech 2013).

The government task force found major problems in the funding levels of both private and public sector plans. Of the existing DB plans registered in New Brunswick, only a few were fully funded (Leech 2013). The City of Saint John faced a pension deficit of C$130 million, an amount nearly equal to its 2011 revenue of C$138 million. These problems had arisen due to a history of inadequate funding, poor economic conditions, demographics, and extra benefits to induce early retirement (Leech 2013).

A climate for change resulted from the expert Task Force, as well as a great deal of communication and a high level of commitment from various stakeholders. Paul McCrossan, the actuary on the task force, stressed that solutions could be found provided that all parties made sacrifices. The Task Force negotiated with several key labor leaders, so that when the Premier introduced the proposed pension reforms and the Task Force report to the public, key labor leaders were at his side and part of the presentation (Leech 2013). Many of the ideas used in reform in New Brunswick had also been used in the Netherlands (Bovenberg et al. 2015).

Case study: A Different Type of Defined Contribution Plan

An alternative new model for corporate pensions is the Savings InSight™ plan offered by Buck Consultants and implemented in 2014 (Buck Consultants 2014). This plan is a DC plan designed to meet the needs of different groups of participants: those who prefer to have the plan sponsor do it for them, those who want guidance and shared responsibility, and those who wish to do it themselves. It includes auto-enrollment and auto-increases, and a modeling tool to enable participants to modify their decisions and customize them.

The plan design enables the employers to structure benefits so they fit into the firm's human resources needs. A plan sponsor participates in setting plan parameters for the target retirement

age, payout period, definition of 'living standards,' investments, and salary increases. These parameters influence participants' recommended contributions and increase the potential for an adequate retirement income payable at the selected target retirement age. They also communicate an expected retirement age to the individual participant. These plan features also offer an attractive workforce management tool, compared to traditional DC plans.

Recommended contributions vary by individual, but they are usually much higher than default contribution rates typically used for auto-enrollment in DC plans (Xerox 2013; Buck Consultants 2014).[12] Contributions are tailored to each individual based on his own data..[13] Unlike many retirement calculators, this plan uses actual participant records to produce an automated calculation customized to personal situations and account balances. It has been structured to produce an 'adequate' retirement benefit for those participants who do not take action. In this way, the plan is similar to a conventional target benefit approach.[14]

The recommended contribution is a 'nudge' or suggestion. In addition to this recommendation, the modeling tool also 'nudges' participants who use it by showing how different decisions can alter retirement income streams. This structure goes beyond DB plans, in that it gives those participants who seek choices the chance to make their own decisions. Contribution percentages are also recalculated annually, and if there is a recommended increase, an automatic contribution increase is implemented. A participant can always opt out or modify the amounts. The modeling tool can also be used to evaluate alternatives. If the initial contribution or the recommended increase is too large, the tool can offer a transition program. In this plan, the default auto-investment is a target date fund, the Qualified Default Investment Alternative (QDIA). The plan uses the assumed rate of return for the QDIA, but the participant may select whatever

investments he wishes. If a participant invests in funds that do not perform as well as the QDIA assumptions, his contribution rate is then recalculated to make up for the lost earnings.[15]

The benefit default is an installment payout for the number of years selected by the plan sponsor, with automatic adjustments as may be needed to maintain the targeted payout. The individual assumes his longevity and investment risk, but the payments are structured to reduce the chance that his fund will run out of money. The payment is calculated so that there is a notional side fund or buffer, to help cover market fluctuations. Good investment performance increases the side fund, and poor performance reduces it. The program sends monthly retiree benefit checks, and adjustments are made, as needed, to increase the probability that the payments will continue over the target payout period. Retirees retain full access to their funds, and they may withdraw more than the retiree check (but not less). This is reflected in the year-end gain/loss. Additional adjustments would likely be required to meet U.S. regulatory requirements.

Examples of Recent Developments

New Brunswick offers an example of a new DB structure integrating design, funding, and plan management, while the Savings InSight™ plan is a DC plan modified to produce many of the benefit delivery and human resources aspects of DB plans, (although it lacks an income guarantee). Numerous other plan sponsors have also made changes to modify risk sharing. In the U.S., for instance, some employers have frozen or terminated DB plans and moved into DC plans. This has primarily resulted in risk shifting rather than risk sharing. A smaller number of private sector employers has moved to cash balance plans.

The U.S. public sector has also made many changes to modify risk sharing and improve DB plan sustainability. For instance, the National Association of State Retirement Administrators

(NASRA 2014) documents recent changes to restore or improve sustainability in 56 statewide public plans. These changes have included increases in employee contributions and the method of determining them, changes in cost-of-living increases, increases in retirement ages, and changes primary benefit formulas. Some provisions explicitly link to the plan's funded status. For example, in 2010, the Minnesota Teachers suspended their cost-of-living increase for existing retirees for two years, and they then reduced the cost-of-living increase from 2.5 percent per year to 2.0 percent per year until the plan funding ratio rose to 90 percent. The Montana Public Employees Retirement Association (PERA) in 2013 reduced its cost-of-living adjustment to 1.5 percent for all current and future retirees, as long as the system was less than 90 percent funded. The cost-of-living adjustment will be reduced 0.1 percent for each two percent below a 90 percent funding level (NASRA 2014). NASRA (2013) also reports a new focus on hybrid plans in the public sector, since some employers have found that closing their traditional pension plans to future employees does not meet important retirement security, human resource, and fiscal objectives.

Conclusions

To make future retirement plans more effective for risk protection, it will be useful to develop new arrangements which pool some risk and provide for different risk sharing. The two case studies described here offer some insights. Other approaches include modifications of traditional plans, generally called hybrids, which assign various risks to either the plan sponsor or participants in the plan design. The new DC-based hybrid, described above, does include ongoing adjustments to both contributions and benefit payments as part of the default options built into the plan.

Conclusion

In sum, we show that it is feasible to offer a retirement plan that pools risk and is efficient, but which also limits the sponsor's downside in adverse conditions. A relatively easy way to do this is to use a plan design that shares risk and offers some self-adjusting features. The risk-sharing mechanisms discussed here could also, in theory, be added to most DB plan designs. For instance, the de-risking effort could move final average pay DB plans to a career average pay design with self-adjusting features and added benefits contingent on financial results. The de-risking could include recognition of increasing longevity through self-adjusting increases in retirement ages or self-adjusting reductions in benefit levels. DB plans could be structured to respond to future increases in longevity. It is likewise feasible to enhance DC plans so they include self-adjusting features and offer much better retirement security. Designs can be flexible to meet individual needs while also reflecting diverse organizational needs. A key item on the future retirement policy agendas is to pursue policy changes that will support desirable plan designs including optimal risk sharing.

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Endnotes

[1] This risk is reduced to the extent plans are insured by a guarantee fund. For example, benefits provided by private sector plans in the United States are insured up to specified limits by the Pension Benefit Guaranty Corporation. Such funds also exist in other locations such as Ontario, Great Britain, Japan, etc.

[2] This statement about future accruals applies to private sector plans in the United States. The situation is much more mixed with respect to public sector plans. Some have future accruals protected and others do not.

[3] Public pension plans are normally set up by local or state legislation. The choices open to the plans depend on the legislation. The regulation is very different from private sector plans in the United States.

[4] In the United States, a 'multi-employer' plan is a specific type of plan authorized under Federal law. These plans have joint union-management governance, and are subject to different requirements with regard to plan termination and Pension Benefit Guaranty Corporation premiums. They are a subset of the broader class of multiple entity arrangements.

[5] Liability-driven investments are investments structured so that the term of the investments matches or is closely linked to the duration of the expected payments from the plan. Liability-driven investments reduce investment risk considerably.

[6] Unions supporting the plan when it was announced included the New Brunswick Nurses Union, the New Brunswick Union, the Canadian Union of Public Employees (CUPE) Local 1212 (New Brunswick Council of Hospital Unions) and New Brunswick Pipe Trades, and it had been announced that these unions would be adopting the new model for specific plans (Government of New Brunswick 2013).

[7] Information supplied by Paul Lai Fatt from Morneau Sobeco. Information on the New Brunswick plan is taken from government reports as indicated in the references and supplemented by an interview with Paul Lai Fatt, an actuary who is actively involved in working with plans in New Brunswick.

[8] The principles as shown in Table 10.5 are from the reference cited. The authors have learned from discussion with an actuary working in New Brunswick that Principle 10 was not included in the legislation as finally passed, and that Principle 7 has proved to be difficult in operation. Plan members have found it difficult to understand what is guaranteed and what is not. It was also pointed out that while accrued benefits are preserved on conversion, there are some improbable circumstances where they would be reduced.

[9] Private pension plans in the United States are subject to the Employee Retirement Income Security Act (ERISA) which sets forth detailed requirements for funding and plan governance. There is no similar requirement applicable to public plans in the United States, and there is wide variation in practice and requirements by state. The New Brunswick model authorized by legislation effective July 1, 2012 uses very different requirements. Regulations were issued in August, 2012 effective July 1, 2012 (Financial Services Commission 2012). The prompt issuance of regulations is also very different from the United States.

[10] The Task Force report on the design indicated a discount rate close to 4.5 percent based on market conditions in mid-2013 when the report was issued as well as mortality tables that include current best estimates of mortality improvement (Government of New Brunswick 2013).

[11] Actuarial valuations can use either a closed group or an open group. Funding valuations for most plans are closed group, whereas open group valuations are commonly used to plan benefit and other changes. The closed group approach focuses on the currently covered population group for

a pension plan, including active participants and participants currently receiving a benefit or due to receive a benefit in the future. A *closed group* projection requires *demographic assumptions* about how current participant are expected to withdraw, retire, become disabled and die. The open group approach includes not only the currently covered population group for a pension plan (as defined in *closed group*), but also including future anticipated new entrants (i.e., new employees) to a system. In addition to the *demographic assumptions* required for a *closed group* projection, an *open group* projection requires assumptions about the age, service, and salary profile of new entrants and whether an employee population is expected to grow, stay in a steady state, or decline. The open group funded ratio is the assets plus the present value of the next 15 years of excess contributions (employee contributions plus employer contributions less normal cost), all divided by the liability of the base benefit.

[12] The information on the Savings Insight™ program was provided partly from literature from the firm as indicated in the references and supplemented by an interview with Ted Goldman, National Retirement Leader at Buck Consultants.

[13] Adequate is defined by each company adopting the plan, and the plan sponsor has choices in that regard.

[14] A target benefit plan is a DC plan that uses an underlying formula to define a specified retirement benefit. It then calculates a recommended contribution to the plan that is expected to accumulate sufficient funds, using an assumed rate of investment earnings, to provide the targeted benefit at retirement. In such a plan a different contribution rate is calculated for each employee reflecting that employee's demographics, salary, and current account balance.

[15] QDIA is Qualified Default Investment Alternative. Under United States Federal regulations, these investment alternatives are permitted for default options in defined contribution plans governed by ERISA.

Table 6.1. Major risks facing plan sponsors and participants in retirement plans

Risk	Definition	Pre- or post-retirement risk
Investment	Risk that returns on invested assets are different from what is expected	Both
Interest rate risk	Risk of unexpected changes in interest rates leading to changes in value of defined plan liabilities, changes in annuity prices, and to changes in the interest earnings on fixed dollar investments and bank accounts	Both and also at time of retirement
Inflation risk	Risk resulting from loss of purchasing power due to unexpected increases in price levels.	Both
Longevity risk	Risk resulting from differences in the level of population mortality and/or the risk that any particular individual will live longer (or shorter) than expected	Primarily post-retirement
Employment risk	Risk that individual will lose job prior to retirement or leave and lose future benefit accruals; also includes risk of being pushed into retirement earlier than planned	Pre-retirement
Business risk	Risk that business sponsoring plan will do poorly, impacting jobs, that employer will decide to change plans, or be acquired leading to plan change	Primarily pre-retirement, but also post-retirement if benefits being paid from plan are not fully funded
Risk of poor choices	Risk that participant will not make good choices leading to insufficient savings and/or a poor plan for using funds post-retirement	Both and at time of retirement
Fiduciary risk	Risk that plan sponsors and service providers don't meet fiduciary requirements; sponsor may be subject to penalties if they fail to meet them	As long as funds remain in the plan
Solvency risk	Risk that any entity providing benefits will become insolvent, or unable to pay benefits and that there will be a default on all or part of benefit payments	Both
Public policy risk	Risk that policy will change or be enforced in a way that creates adverse impact	Both

Source: Authors' analysis

Table 6.2. Strategies for managing and sharing risk

Strategy	Description	Type of sharing	Comments
Plan design	Defines benefit and obligations of parties	Between plan sponsor and participant	Different types of plan structures share risk differently; variations can moderate risk sharing
Financial structure	Defines who pays for benefits and how cost shared, and allocated over time	In contributory plans, risk shared between plan sponsor and participant, risk may also be shared with third party	In noncontributory plans, no sharing of financial risk
Self-adjusting systems	Provisions in plans that adjust arrangements based on circumstances	Used to moderate risk sharing	Can apply to plan design or financial structure
Risk pooling	Spreads risk over a group of participants and defines pool	Spreads between individual participants, or entities within same risk pool	Some risks pool well, for some anti-selection is a potential problem, and some do not pool at all
Multi-entity arrangements	Uses a single plan to provide benefits to participants from multiple entities	May share risks between entities depending on type of arrangement	
Third party guarantees	If benefits are insured, then a third party, usually an insurance company, offers a guarantee	Involves sharing risk with third party in exchange for a market price	
Backup guarantee funds	Governmentally or industry sponsored arrangements to provide backup guarantees; provide protection for solvency risk	Shares risk across pension plans, banks or insurance companies; provides protection to individuals	U.S. examples are the Pension Benefit Guaranty Corporation, the FDIC, and state insurance guarantee funds. Other countries have generally similar programs.

Source: Authors' analysis.

Table 6.3. Risks assumed by various stakeholders under selected plan designs

Plan type	Plan sponsor risks	Participant risks	Comments
Final average pay defined benefit	In non-contributory plans, full risk that costs exceed expected. Risks include longevity, investment, interest rate risk, and pre-retirement inflation risk.	In most plans, post-retirement inflation risk. Risk that plan will be modified or terminated, or early employment termination. In contributory plans, participants may share risks usually borne by plan sponsor.	Costs reflect benefits already earned and expected future benefits. Benefits already earned are protected on plan termination. Risks can be moderated by adding provisions to adjust benefits based on funding levels.
Career average pay defined benefit	In non-contributory plans, full risk that costs exceed expected. Risks include longevity, investment, and interest rate risk.	Inflation risk. Risk that plan will be modified or terminated. In contributory plans, participants may share risks usually borne by plan sponsor.	It is customary in some plans to provide ad-hoc updates, covering some part of the impact of inflation. Risks can be moderated as mentioned above.
Cash balance	In non-contributory plan, full risk that costs exceed expected. Risks include investment, interest rate risk and some longevity risk (depending on participant choices).	Inflation and most longevity risk. Risk that plan will be modified or terminated. In contributory plans, participants may share risks usually borne by plan sponsor.	Cash balance plans use different return indices subjecting sponsor and participants to varying levels of investment risk. Prevalence of lump sum decisions impacts longevity risk.
Defined contribution	Fiduciary risk if plan not managed properly. Risk that employees will be unable to afford to retire and create workforce management challenges.	Longevity, investment, and inflation risk.	Investments generally not pooled. Risks can be reduced by guaranteeing a floor investment return, but this comes with a price. Such provisions offered in variable annuity contracts.
Collective defined contribution	Fiduciary risk if plan not managed properly. Risk that employees will be unable to afford to retire and there will be difficult human resource issues.	Longevity, investment and inflation risk. Longevity risk may be pooled depending on how benefits are paid. Investment risk may be shared depending on plan structure.	This is a defined contribution plan with pooled investments. Some such plans require annuity payouts.

Note: Some risks discussed in text such as solvency and business risk, and the risk of poor decisions not included in this analysis. *Source*: Authors' analysis.

Table 6.4. Summary of methods for managing key selected risks

Risk	**Plan sponsor risk management**	**Participant risk management**
Investment	Move from defined benefit to defined contribution plan Use liability-driven investments Manage investment mix, diversification, use of investment managers, choice of investment vehicles Transfer to insurance company	Transfer to financial institution Manage investment mix and investments Use advice Note: When lump sum paid at retirement, totally up to participant after that
Interest rate risk	Use liability-driven investment strategy Offer gradual purchase of annuity income over time Move to defined contribution plans Pay out lump sums Use account based defined benefit plan that credits interest to accounts based on an index	If purchasing annuity, do so gradually over time Consider risk in choice of investments
Inflation risk	Use plan design to allocate risk between plan sponsor and employee Invest in assets that help manage this risk Note: Benefits can be indexed or partly indexed: indexation changes the amount of risk management needed	Save more Use inflation indexed bonds Purchase annuity including inflation indexing
Longevity risk	Move to defined contribution plans Pay out lump sums Index retirement ages Adjust benefits for longer life spans Choose assumptions for defined benefit plan valuation that build in enough mortality improvement Use financial instruments to manage this risk	Use of lifetime income payout Spend only investment income Select withdrawal rate that is hoped to be safe – only partially manages risk Retire later Set long planning horizon

Source: Authors' analysis

Table 6.5. Principles for reformed New Brunswick pensions

	Principle
1.	Pension plans must be subject to robust risk management, including annual review and stress tests to ensure compliance.
2.	Pension plan must provide benefit security, which includes (a) risk management targets focused on a high level of benefit security and (b) governance by an independent trustee.
3.	Plan must be able to demonstrate sustainability.
4.	Plan must be affordable, which means that contributions must be stable and affordable for both employer and employees.
5.	Plan must be equitability designed – no single age cohort should unduly subsidize another, and no one should be able to 'game' the system.
6.	The plan must be transparent. Who shares in the risks and rewards and by how much must be clear and pre-established.
7.	Benefit changes as a result of conversion will apply only in the future; everyone keeps the pension amount that has already been credited.
8.	There should be no sudden shocks to members and retirees' retirement plans.
9.	All groups of employees should be treated consistently including part-time employees.
10.	At inception, the actuarial assumptions must be closely related to market benchmarks such as International Accounting Standard #19.

Notes: Language simplified and adapted. Item 10 was not included in legislation as ultimately adopted. It has been observed that Item 7 led to some participant confusion, and that there may also be some confusion about what benefit has already been earned and what benefit will be earned in the future.

Source: Government of New Brunswick (2013): 8, 9.