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# Greener Pastures: Resetting the Age of Eligibility for Social Security Based on Actuarial Science

*With retirees living longer and the working-age population declining, the growing demand for financial support in retirement will potentially strain social security programs.*

Robert L. Brown and Shantel Aris

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## THE STUDY IN BRIEF

We know that because of low fertility rates, rising life expectancies and the aging of the baby boom, Canada's Old Age Dependency Ratio is rising. This will strain the sustainability of our Social Security systems and healthcare.

Other countries with aging populations are raising the Age of Eligibility (AOE) for social security benefits. These include Finland, Sweden, Norway, Poland and the United Kingdom.

In 2012, then Prime Minister, Steven Harper announced plans to increase the AOE for Old Age Security (OAS) and Guaranteed Income Supplement (GIS) from 65 to 67 between 2023 and 2029. Trudeau reversed this legislation (leaving the AOE at 65) in the 2016 budget.

This paper was inspired by work done in the UK for the Institute and Faculty of Actuaries State Pension Age Working Party. Our study applies their methodology onto the Canadian context. The results could be used in any country in the world, however.

The UK proposal is based on actuarial and demographic logic that would see a rise in the AOE to guarantee a constant proportion of one's adult life is spent in retirement. Thus, as life expectancy rises, there is an upward shift in the AOE for Social Security.

For Canadian demographics, that constant proportion is 34 percent. Any lower value would result in an immediate need for a shift in the AOE, which we rejected. Using 34 percent triggers the first change in the AOE in 2025, which provides enough notice. The new AOE of 66 (phased in beginning in 2023 and achieved by 2025) would then be constant until 2048 when the AOE should shift to age 67 over two years.

These shifts soften the rate of increase in the Old Age Dependency Ratio and bring lower OAS/GIS costs and lower required contribution rates for the CPP (both in tier 1 and the new tier 2). This, in turn, results in equity in financing retirement across generations and a higher probability of sustainability of these systems. There will also be an increase in the credibility of these systems in the public's eye and an easing of public anxiety.

One issue remains. Shifting the AOE upwards is regressive since wealthier Canadians live longer. We argue that this can be mitigated by changing the clawback formulae now used in the OAS and GIS.

The *Commentary* concludes by proposing that the formula should become an Automatic Balancing Mechanism beyond any political interference.

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## Pension reform continues to be a significant agenda item in government policies. Increasing life expectancy is leading to higher old-age dependency ratios.<sup>1</sup>

Pensioners are living longer, meaning the working-age population has to sustain retirement financing for an increasing number of retirement years while the number of working years has remained relatively constant. If we retain a constant age of eligibility for social security, old-age dependency ratios will continue to rise in the future with the improved life expectancies. The decline in fertility rates also plays a role in higher old-age dependency ratios because they lead to a decline in the working-age population (without huge levels of immigration) and ultimately to a softening of growth in the gross domestic product (GDP) and tax revenues. Without proper reform strategies, the growing demand for financial support in retirement will potentially strain social security programs. For all these reasons, we need to continue to study potential social security reforms.

Governments across the globe, including Canada, have been implementing unique strategies to protect their social security programs. A common but highly debated strategy in pension reform has been to raise the retirement age (the age of eligibility for unreduced pension benefits). The American Academy of Actuaries (2008) has advocated raising the retirement age for social security programs based on actuarial logic, noting that accounting for future increases in life expectancy is necessary to ensure the financial soundness of these systems. The fact is that social

security systems will put themselves at risk if they keep a constant retirement age for years to come. As the American Academy of Actuaries (2008) states: “This is primarily a demographic problem that demands a demographic solution.” In addition, as population life expectancy rises, each generation gets benefits for longer periods of time for the same amount of contributions, thereby creating a level of intergenerational inequity.

In Canada in February 2017, the Trudeau government’s Advisory Council on Economic Growth proposed that raising the age of eligibility for public pension benefits should be reconsidered in order to persuade more seniors to keep working. This *Commentary* will support that recommendation with in-depth analysis.

We define the age of eligibility (AOE) as the earliest age at which an individual is permitted to receive a full (unreduced) pension from the government. Generally speaking, the AOE is effectively the age that separates the working-age population from the retired population, even though leaving the workforce is not a requirement to attaining benefit payments. The AOE has a direct impact on both the amount of retirement benefit financing needed and the number of working years on which contributions will be derived, and it should be a primary consideration in the reform of any social security program.

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1 Old-age dependency ratio is defined as the ratio of the population aged over 65 to the working-age population – those aged 20 to 64.

In many countries, lowering pension benefits and, in particular, raising the AOE has been a popular political reform. Some other countries have integrated automatic adjustment mechanisms, with the objective of rebalancing pension systems in line with the evolution of demographic, economic, and financial parameters. Canada, the United Kingdom, Finland, Sweden, and Norway have all legislated changes to their pension landscape that assist us in our discussion below.

It is important for governments to be able to supply adequate retirement income while the social security programs remain financially sustainable (OECD 2015). Canada is one of many countries that has reformed its pension structure to ensure solvency and economic sustainability. Balancing sustainability and adequacy is critical because reform initiatives must be equitable for the entire population and across generations. Intergenerational equity must have been one of the motivations for making the new Canada Pension Plan (CPP) Tier 2 a fully funded system. Governments will confront several issues in legislating reforms, such as ensuring fairness to all income classes. This *Commentary* goes on to present a comprehensive overview of the welfare issues and sustainability factors to be considered.

Social security reforms are inherently political and inevitably represent compromises among various interests (OECD 2015). The AOE is an important component of this issue and should not be determined solely by political motivation. We highlight the importance of actuarial reasoning in the decision-making process. Actuaries are equipped with the expertise to assist policymakers with evaluating the impact of demographic factors and assessing sensitivities in modifying the AOE.

We will provide a method for setting the AOE for social security in Canada based on actuarial logic. We were inspired by the work of Hammond et al. (2016) in their consideration of the state pension age in the United Kingdom, and many of the foundational ideas and input parameters we use build on the work of the Institute and Faculty of

Actuaries (IFoA) State Pension Age Working Party. Furthermore, the issues we raise are not unique to Canada or the United Kingdom. Although our objective is to provide an analysis of the current issues surrounding AOE using a Canadian context, our analysis could assist any jurisdiction with current policymaking in this regard.

If successful, we hope to achieve five goals for Canada's social security system:

- increase its probability of being sustainable;
- increase the credibility of this sustainability with the Canadian public;
- enhance intergenerational equity;
- lower the overall costs of social security; and
- create a nudge for workers to stay in the labour force for a little longer period.

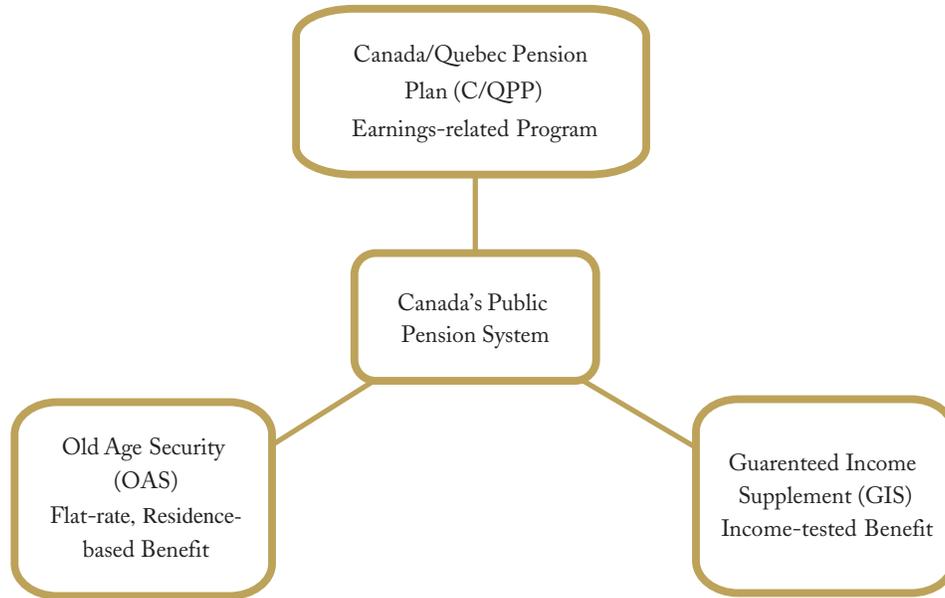
As Godbout, Trudel, and St-Cerny (2015) state: "All parameters, not just contributions, should enable variations to facilitate proper funding and equitable expected returns between cohorts of retirees."

## CANADA'S PUBLIC PENSION SYSTEM

To begin, we present an overview of the structure of Canada's social security programs as a basis for our discussions. There are three primary sources of public retirement income: the Canada/Quebec Pension Plans (C/QPP), Old Age Security (OAS), and the Guaranteed Income Supplement (GIS) (Figure 1).

The C/QPP, introduced in 1965 to take effect in 1966, are earnings-based programs. Canadian employees who are 18 years of age and older are required to contribute a set percentage of their annual salary to the program up to the yearly maximum pensionable earnings (YMPE). At retirement, the flat-rate annual benefit is calculated as 25 percent of the retiree's average pre-retirement earnings (normally over the best 39 years) up to the YMPE. The 2017 YMPE is \$55,300. The YMPE adjusts in line with average wages. The AOE for the C/QPP is currently 65, but contributors can take an early reduced pension at the age of 60 and access a late increased pension as late as age 70.

Figure 1: Sources of Public Retirement Income in Canada



Source: Authors' compilation.

The OAS pension benefit is provided to all Canadians satisfying specific residency requirements with a minimum of 10 years of residency. For every year of Canadian residence, 2.5 percent of the maximum pension is earned commencing at 18 years of age, up to a maximum of 40 years. The benefit incorporates a recovery tax for high-income individuals who have an annual income exceeding a certain threshold (for 2017, \$74,789). This clawback specifies that 15 percent of the difference between annual net income and the threshold is repaid from the OAS pension. The OAS pension is currently payable from age 65. The maximum OAS benefit at age 65 in 2017 is \$578.53 monthly, or \$6,942 per annum. Since 2013, recipients have been able to defer payment of their OAS up to age 70, and in that case the benefit is increased by 0.6 percent for each month of deferment. Deferring payment until age 70 would therefore increase benefits by 36 percent and, if necessary, allow recipients to

make up for any deficiency in the 40-year residency requirement for maximum benefits.

The GIS pays an income-tested benefit. It is designed to provide financial assistance for seniors with little or no other income. There is a minimum residency requirement of 10 years. The annual GIS benefit is clawed back by 50 cents for every dollar of annual income a household possesses in retirement, including the C/QPP and income from Registered Retirement Savings Plans (RRSPs) and other savings. Income in excess of \$2,000 (single) and \$4,000 (couple) is clawed back at a 75 percent rate until a higher threshold, when the 50 percent rate applies. The first \$3,500 of employment earnings and all OAS/GIS and Tax-Free Savings Account (TFSA) benefits are exempt. The AOE for the GIS is age 65 – the same as for the C/QPP and the OAS. The maximum GIS benefit a person can receive in 2017 (single) is \$864.09 a month, or \$10,369 per annum.

## History of the Age of Eligibility

The first public pension system, Old Age Security, was legislated by Canada in 1927 under the *Old Age Pensions Act*. It created a federal-provincial shared-cost program with an AOE of 70. At the time, the AOE in the public pension systems in many other countries was 65. Some experts have argued that Canada's tactic of fixing the AOE at 70 implied a conservatism toward social security and a fear of budget deficits (Young 2012).

By the 1960s, however, Canada had a rapidly growing economy, and the government of Lester B. Pearson created the C/QPP in 1965 with an AOE of 65. At the same time, the AOE for the OAS pension was also lowered to 65. Coincidentally, the Pearson government established the GIS, effective January 1, 1967, with an AOE of 65. From 1966 to 1975, the age 65 C/QPP benefit was severely clawed back by other income. Recipients received a full CPP benefit only if they had no employment income. It wasn't until 1975 that age 65 became the unconditional AOE. Since 2009, the removal of the work cessation test has meant that CPP applicants do not need to stop work to qualify for retirement income.

In 1987, a more flexible retirement criterion was introduced whereby recipients could take benefits starting as early as age 60 or as late as age 70, with a commensurate adjustment in benefit levels. These adjustments were further amended and strengthened in 2010, and they are now very close to a complete actuarial value adjustment.

Decades passed with no further change to the AOE for any of these public pension programs. In 2012, however, the government of Stephen Harper enacted an increase in the AOE for the OAS/GIS pensions from age 65 to 67. This transition was expected to take place starting in April 2023, with full implementation completed by 2029. Arguments for and against the change followed: in support of the change, many argued that demographic challenges exist and threaten the sustainability of these programs; those opposed argued that the

benefits, payable at age 65, were sustainable and affordable in a growing economy. The debate was quickly ended when the government of Justin Trudeau announced a plan to reverse the previous proposal and leave the AOE at age 65 in the 2016 federal budget.

## Pension Announcements in the 2016 Federal Budget

Canada's federal budget for 2016 (Budget 2016) highlighted various proposals for reforming the pension landscape. These reforms have now been adopted (Bill C-15, which received royal assent on June 22, 2016) and are expected ultimately to strengthen Canada's social security programs and improve the quality of life of Canadian seniors. Some of the major initiatives are as follows:

- an enhanced CPP, as described in the next section;
- restoration to 65 of the AOE for the OAS and GIS benefits, which the previous Conservative government had intended to raise gradually from 65 to 67;
- an increase in the GIS top-up benefit to a maximum of \$947 annually for vulnerable single seniors, representing an investment of over \$670 million per year, commencing July 2016. This initiative is aimed at safeguarding seniors who rely almost exclusively on OAS and GIS benefits, making them most susceptible to living in poverty.

## The Enhanced Canadian Pension Plan

The most important recent pension reform in Canada is the expanded CPP, as agreed to in Bill C-26 passed on March 3, 2017.

- The reform brings higher CPP benefits by increasing the replacement percentage on average pre-retirement earnings from 25 percent to 33.33 percent. In addition, there will be a new upper earnings threshold of \$82,700 in 2025, representing an increase of 14 percent over the projected YMPE in 2025.

- The Working Income Tax Benefit, which is a refundable tax benefit to assist low-income earners, will be increased to mitigate the increase in CPP contributions for low-income workers.
- Employee contributions for the enhanced CPP will receive a full tax deduction rather than the current average tax credit.

CPP enhancement will be funded via a targeted increase in the CPP contribution rate for both employees and employers: this increase will be one percentage point along with the introduction of an additional 4 percent contribution on earnings between the YMPE and the new earnings limit. The new CPP contribution rates have now met the approval of an actuarial assessment by the Office of the Chief Actuary. This plan is expected to have a seven-year phase-in timeline of 2019–25. Full enhanced CPP benefits will be available only after 40 years of making contributions (in 2065), while partial benefits will be available sooner based on commensurate years of contributions.

A recent study showed that, at maturation, this system will provide lower earners and middle earners with a net benefit increase of about 33 percent, while higher earners will receive a significant increase of more than 50 percent above the existing CPP benefit package (Milligan and Schirle 2016).

To date, it appears there has been no direct integration of demographic factors into determining AOE reform strategies for public pension programs in Canada. Although demographic factors may have driven the public policy discussion, they were not explicitly part of the reform proposals. We believe a demographic adjustment should be a part of policy formulation.

## DEMOGRAPHIC PRESSURES ON SOCIAL SECURITY PROGRAMS

### Population Aging in Canada

Demographic studies illustrate that population aging in Canada is rapid and persistent. Life

expectancy continues to climb upward, and the country is recording lower fertility rates. These factors, combined with the aging of Canada's babyboom generation, have contributed to the steady increase in old-age dependency ratios. We turn now to some key findings regarding these demographic changes.

### *Lower Fertility Rates*

Total fertility rates in Canada have been fluctuating below the necessary replacement level of 2.1 children per woman for more than 40 years. This replacement level was last achieved in 1971. In 2011, the total fertility rate was 1.61 children per woman, up slightly from the record low of 1.51 about a decade earlier (Statistics Canada 2016).

### *Life Expectancy*

Steady improvement in life expectancy has occurred over the last century. When the C/QPP was introduced in 1966, life expectancy at age 65 was 13.6 years for males and 16.9 years for females (OSFI 2014). It has since increased, in 2010–12, to 18.7 years and 21.7 years, respectively. Table 1 shows historical life expectancies, with mortality improvements from 1992. These historical values were obtained from Statistics Canada and are calculated using a three-year reference period. (See Martel et al., 2016, for details.)

### *Projected Population Growth*

Historical and projected population levels under low-, medium-, and high-growth scenarios for 1972 to 2063 are set out in Figure 2. We see stable projected numbers for the population below age 20 in Figure 3. The working-age population is expected to grow steadily for decades to come, but at a much slower rate than the population over 65. Over the next 20 years, the working-age population and old-age population will increase by approximately 6 percent and 80 percent, respectively, above

**Table 1: Cohort Life Expectancies, Canada, 1992–2012**

Age	0			65			
	B	M	F	B	M	F	F
1992–1994	78.0	74.9	81.0	18.1	15.9	20.0	
1993–1995	78.0	75.0	81.0	18.1	15.9	19.9	
1994–1996	78.2	75.2	81.1	18.1	16.0	19.9	
1995–1997	78.4	75.4	81.2	18.2	16.1	20.0	
1996–1998	78.6	75.7	81.3	18.2	16.2	20.0	
1997–1999	78.8	76.0	81.5	18.3	16.3	20.1	
1998–2000	79.0	76.3	81.7	18.5	16.5	20.2	
1999–2001	79.3	76.6	81.9	18.7	16.8	20.4	
2000–2002	79.6	77.0	82.0	18.9	17.0	20.5	
2001–2003	79.8	77.2	82.2	19.1	17.2	20.6	
2002–2004	80.0	77.5	82.3	19.2	17.4	20.8	
2003–2005	80.2	77.7	82.5	19.4	17.6	20.9	
2005–2007	80.4	78.0	82.7	19.5	17.8	21.0	
2006–2008	80.6	78.3	82.9	19.7	18.0	21.1	
2007–2009	80.8	78.5	83.0	19.8	18.1	21.2	
2008–2010	81.1	78.8	83.2	20.0	18.3	21.4	
2009–2011	81.3	79.1	83.4	20.2	18.6	21.5	
2010–2012	81.5	79.4	83.6	20.3	18.7	21.7	

Notes: B – Both sexes; M – males; F – females.  
Source: Statistics Canada.

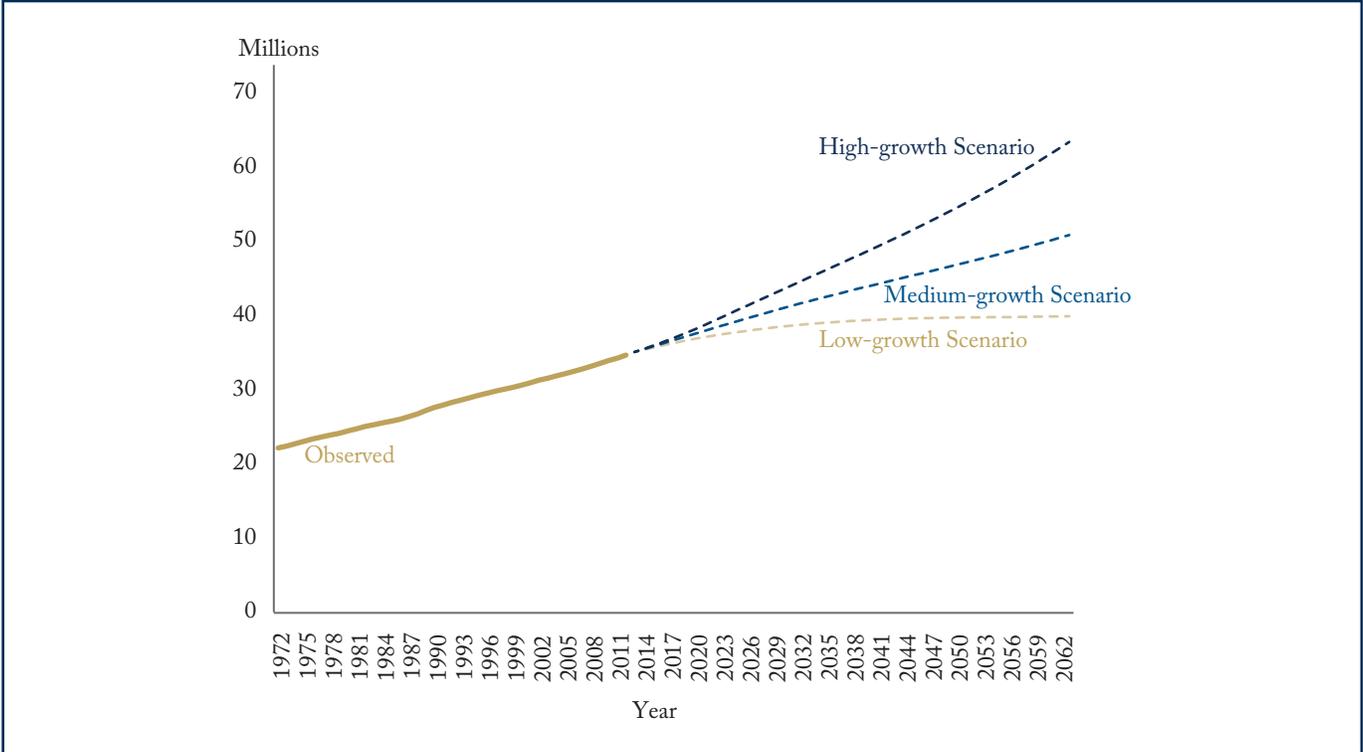
the 2016 level. Our calculations also show that the projected growth rate of the working-age population from 2016 to 2100 is approximately 142 percent, and it is 289 percent for the old-age population over the same years.

### *Migration*

In recent years, immigration has been a predominant factor in population growth for Canada. During the early 20th century, natural increase<sup>2</sup> was the main driver for population growth. Over the last decade, however, there has been a

2 Natural increase = births minus deaths.

Figure 2: Population Observed, 1972–2013, and Projected, 2014–2063, by Low-, Medium-, and High-Growth Scenarios, Canada



Source: Statistics Canada.

significant shift away from this trend. Migratory increases<sup>3</sup> are becoming a more notable component of population growth. It is expected that population growth from natural births will continue to decline (Figure 4).

*Babyboom Generation*

Brown (2011) and the Canadian Institute of Actuaries (2013) note that Canada, compared with other developed countries, had one of the more dramatic baby booms. As this babyboom generation ages, the number of persons aged over 65 increases, making an impact on the structure of the Canadian population. These factors signal

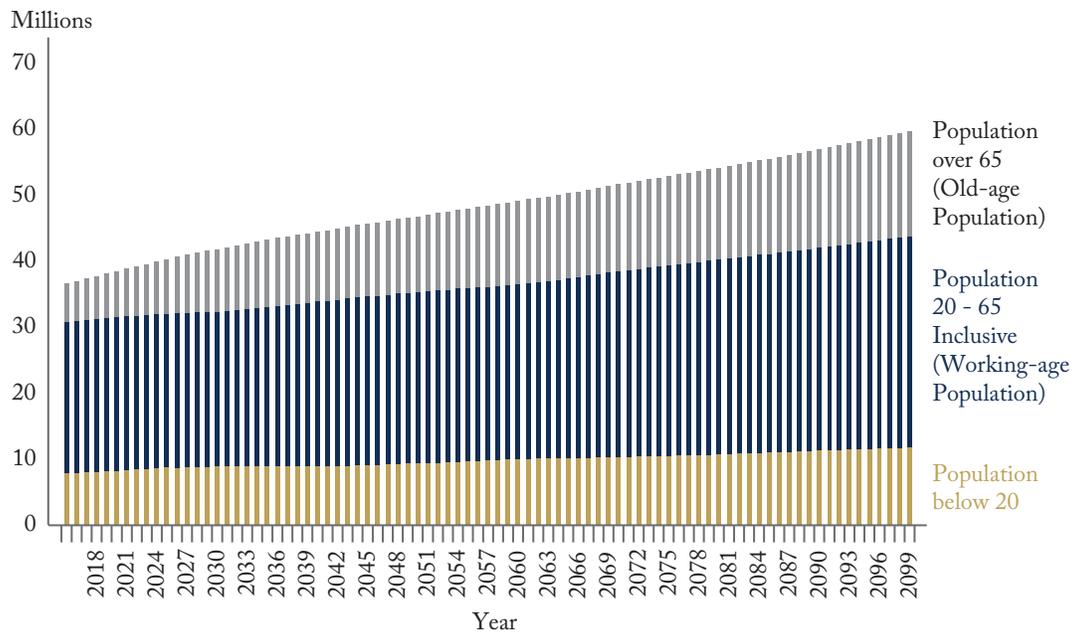
an expectation of a longer life for the average Canadian, and by extension more retirement years. Although this change is positive and welcomed, the implications on government spending should be assessed critically. Budgeting for public pension costs is directly tied to the projected growth in the old-age population. It is important to consider these demographic changes carefully when planning for the future.

*A Mitigating Force*

Not every element of Canada’s shifting demographic profile is negative. Since the turn of the century, Canadians have been staying in the labour force a

3 Migratory increase = immigration minus emigration.

Figure 3: Projected Population by Age Group, 2016–2100, Canada



Source: Authors' calculations using data from the Office of the Chief Actuary, Canada.

longer period (Figure 5). This decreases the impact of a rising aged-dependency ratio.

## PENSION REFORM IN EUROPEAN COUNTRIES: LESSONS TO BE LEARNED?

Four countries in Europe have introduced linkages between improved life expectancy and the AOE for social security benefits. We will review each one briefly.

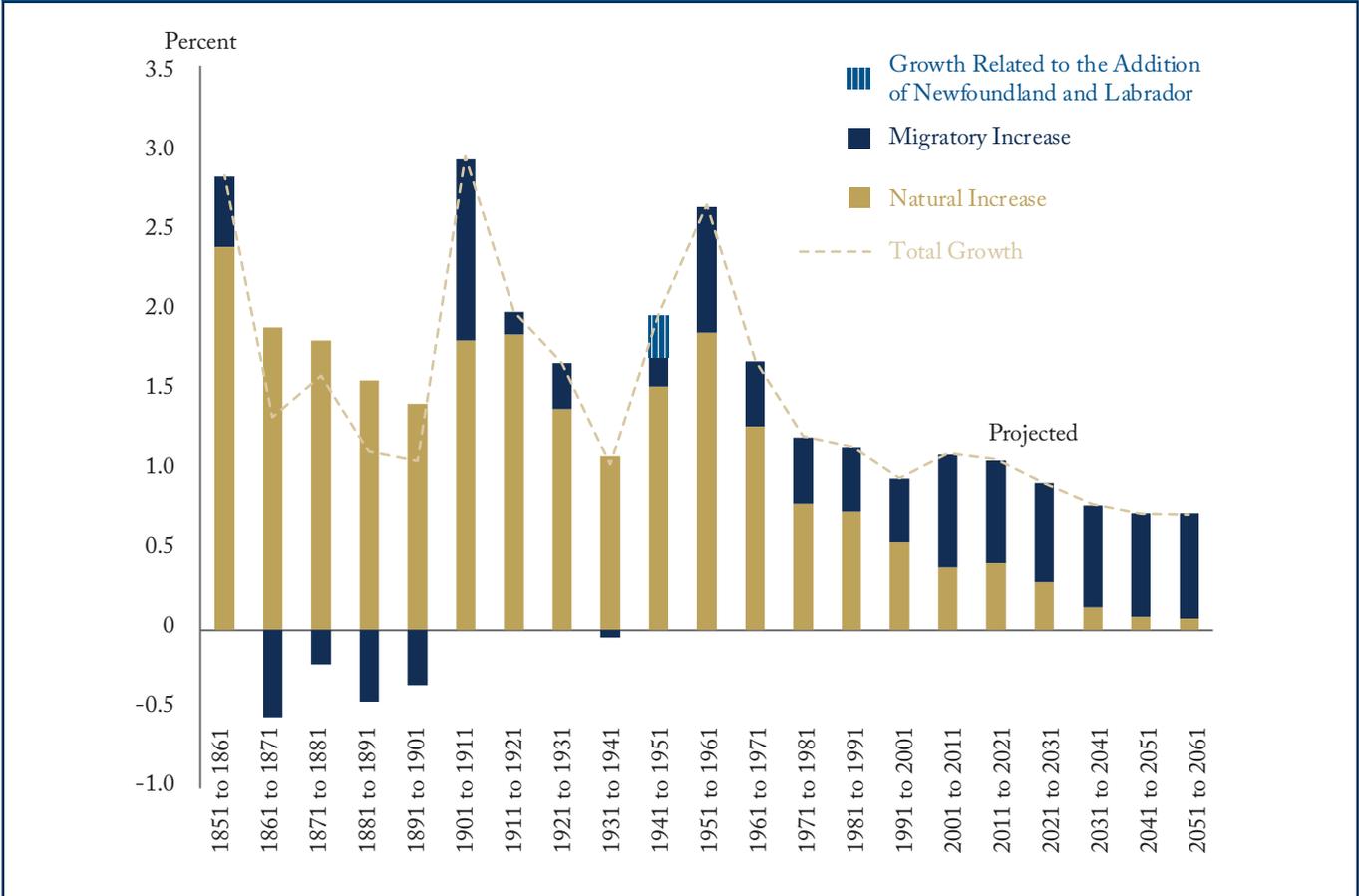
### Finland

For the past decade, Finland has effected noteworthy reforms to its pension system. In the 2005 reform, the country implemented a flexible retirement solution. Before 2005 the eligibility age for the retirement pension was fixed at 65, but the

reform that year made it feasible to retire between the ages of 63 and 68, with an AOE of 63.

The 2005 reform also introduced a life expectancy coefficient to regulate government pension expenditures as average life expectancy at retirement progresses. The life expectancy coefficient adjusts the accumulated capital value of starting pensions, and in turn determines the average pension level throughout retirement. An improvement in life expectancy would lower the accrued pension amount and also lower the monthly pension in retirement. The coefficient, which is the same for men and women, is calculated annually by the Finnish Centre of Pensions (ETK) for each age group at the age of 62 on the basis of the mortality rates for the preceding five years. While the coefficient ensures that the pension expenditure is curbed when average life expectancies improve, it does not affect the total

**Figure 4: Annual Average Growth Rate, Natural Increase and Migratory Increase per Intercensal Period, Canada, 1851–2061**



Source: Statistics Canada 2012.

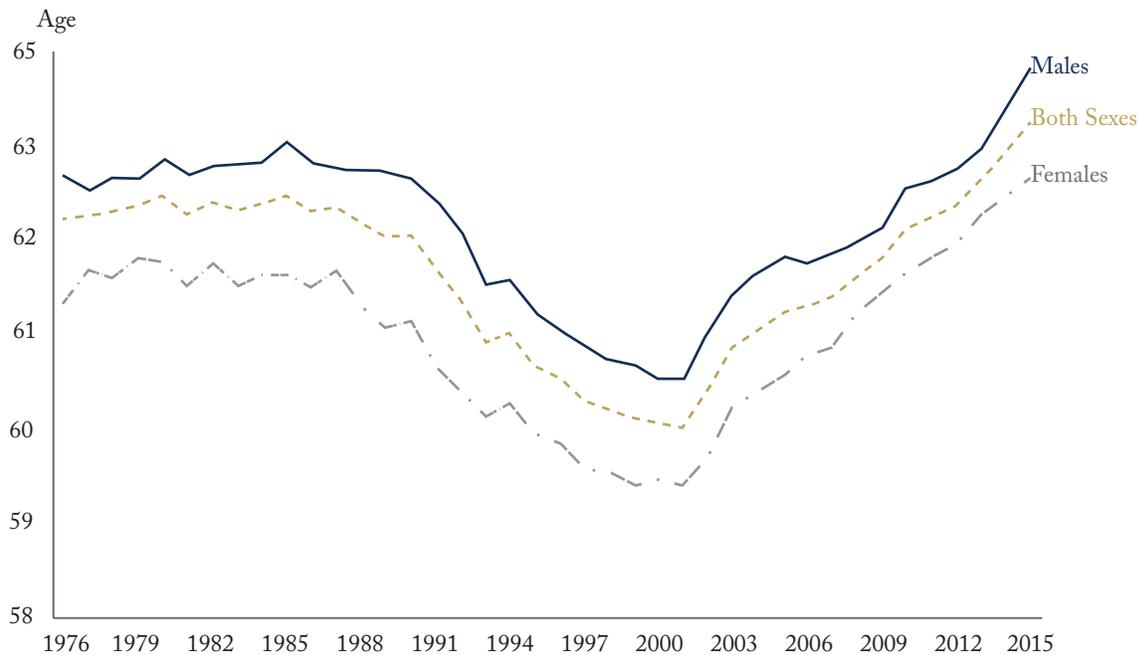
pension wealth accrued before retirement. Pension recipients can compensate for the reducing effect of the life expectancy coefficient by prolonging their working careers for a few years.

In September 2014, the Finnish government and the central labour market organizations agreed on revamping the 2005 reform. Commencing in 2017, Finland will introduce a new framework that links their increases in retirement ages to life expectancy. Their plan includes increasing their current AOE of 63, which was set in the 2005 reform, to 65. They will execute this change in three-month increments between 2017 and 2025 and, during the same period, increase the maximum retirement age from 68 to 70.

As of 2027, the AOE will be linked to life expectancy in such a way that the ratio of the number of working years to the number of retirement years remains at the 2025 benchmark. The plan dictates that the AOE is reviewed every five years, and any required increase in the AOE will develop gradually by three months per year.

This reform will encourage longer working careers and increase the average retirement age. Evaluations by the ETK project that the reform will reduce the sustainability gap of public finances by 1 percent of GDP. Additionally, it is expected to protect financing of earnings-related pensions, provide sufficient pensions, and assure intergenerational equity. Further details are

Figure 5: Average Exit Age from the Labour Force



Source: Office of the Chief Actuary of the CPP, using CPP data.

included in the Finnish Centre of Pensions (2013) and the Finnish Centre of Pensions (2016).

### Sweden

In 1998, Sweden replaced its defined-benefit pension system with a new system that had a total contribution rate of 18.5 percent of earnings: it comprised a pay-as-you-go (PAYG) notional defined contribution (NDC) program that was organized by individual accounts and managed privately; for low-income earners, there was a guaranteed supplement. Under this system, the state monopolized the annuity supply, meaning, essentially, that a single government authority collected taxes and contributions. It was all part of the overall plan for a mandatory social insurance system governed by the state (Palmer 2000). The

principal objectives of the Swedish reform are as follows:

- Eliminate the flat-rate benefit system and provide fair treatment of individuals with different contribution histories. Pension benefits are determined by lifetime money contributions rather than the number of years of contributions and the average best years of contributions.
- Protect the financial viability of the pension system against demographic and economic changes. The previous defined-benefit program assumed that future generations would absorb unplanned pension expenditure caused by changes in life expectancy. Under the new NDC system, the annuity takes into account future projected life expectancy. Pension benefits are commensurately lowered as life expectancy rises and the long-run aggregate contribution rate of future workers is maintained at its current level.

- Ensure there is a transparent redistribution policy. Financing from the NDC program may be granted to individuals with special rights, for reasons such as time spent in military conscription, care of younger children, higher education, unemployment, and disability.
- Provide flexible retirement opportunities, but with a minimum retirement age requirement of 61 years.

Under this system, annuities will adjust to changing life expectancy – a characteristic that addresses the inflexible payment structure of all pure defined-benefit programs. At retirement, the annuity payment is calculated by dividing the notional account balance (capital) by a factor that is determined by an estimate of life expectancy (unisex) for an individual and an assumed real rate of return of 1.6 percent. For a given amount of capital, the greater the life expectancy, the lower the annuity payment. Furthermore, the annuity payment is modified annually to incorporate changes in inflation and the variance between actual real earnings and the 1.6 percent used to compute the annuity. The system is therefore robust to changes in both demographic and economic conditions.

Palmer (2000) addressed some of the plausible design upgrades to the NDC system. They might include these changes:

- Revising the minimum retirement age upward to match increasing life expectancy. Since higher life expectancies result in lower annuity payments, that would ensure that an adequate pension benefit could be provided. It would encourage workers to remain in the workforce longer and thereby top up pension benefits.
- Periodically adjusting all benefit payments to account for new mortality information. An alternative would be to take into consideration future expected changes in life expectancy when calculating the initial benefit.

These suggestions have already made their way into practice. The Swedish government has proposed raising the minimum retirement age from 61 to 63 (from 61 to 62 in 2015, and to 63 in 2019), the

normal retirement age from 65 to 66 in 2019, the maximum retirement age from 67 to 69, and the age limit for occupational and private pensions from 55 to 62 in 2017.

Finally, under the Swedish NDC system, if potential retirees are disappointed in the amount of the monthly pension calculated for them, they are encouraged to defer retirement so they can achieve the level of pension they desire.

## Norway

Norway introduced a new pension system in 2011: it comprised a guaranteed pension for all residents who meet the prescribed residency requirements as well as a public earnings-related pension. The guaranteed pension is similar to Canada's OAS pension in structure, though the AOE is 67 years. Norway has a particularly flexible delayed retirement bracket for occupational pensions, with ages of retirement ranging from 62 to 75. This system, by encouraging workers to stay in the labour force longer, can help with the problem of aging societies.

Unlike the OAS pension, the Norwegian residence-based pension is adjusted for life expectancy. The pension annuity is calculated on the basis of the person's retirement age and the average life expectancy of the respective cohort. This payment is then indexed annually by a factor representing wage growth less a life expectancy adjustment (updated annually using new mortality information).

## Poland

Like Sweden, Poland replaced its defined-benefit program with a notional defined contribution (NDC) pension program in the 1990s. This system included a life expectancy element to lessen the impact of demographic fluctuations. Pension benefits are calculated by considering average projected life expectancy at the time of retirement –

reflecting that European strategy for deferring early retirement by gaining additional pension benefits through working longer.

In 2002, Poland also established a demographic reserve fund to cover future deficits. Should there be a need to finance unplanned pension expenditures, this reserve lessens the reliance on the state budget. In addition, it protects future generations from having to cover the deficiency.

The eligibility age in Poland has also been a part of recent reforms. In progress now are increases in the AOE of Poland's NDC system for both men and women: gender-specific retirement ages have been eliminated and will be replaced by a single AOE of 67, introduced at the rate of three months each year. The change for women is an increase from today's age 60, phased in over the years 2013–40; the change for men is an increase from today's age 65 to 67, phased in over the years 2013–20.

## THE AGE OF ELIGIBILITY IN THE UK: AN IFOA WORKING PARTY

As stated earlier, our work was motivated by a study done by a Working Party of the Institute and Faculty of Actuaries (IFOA) in the UK (Hammond et al. 2016) and by the Department of Work and Pensions (DWP) framework (DWP 2013).

The British government, through the *Pensions Act* of 2014, has legislated periodic revisions to the AOE. These revisions will reflect changes in the projected longevity (life expectancy) of the population. The principle underlying the revisions is based on the notion that individuals should receive a state pension for a set proportion of their adult life. The first review to be implemented will increase the AOE from 66 to 67, with the change phased in over a two-year period starting in April 2026.

The secretary of state is responsible for spearheading the review of the AOE and will publish a report on any relevant changes based on projected life expectancy data from the government actuary. It is important to note that a decision to review the AOE is not based simply on longevity

projections but, rather, is an intricate and holistic process. The secretary of state is permitted to consider other critical factors to the decision-making process, and these factors must be published in a separate report. In addition, the secretary of state may appoint professional consultants to comment on the potential impact of the decision. Parties such as the Institute and Faculty of Actuaries (UK) may take on a significant role in this process.

The framework uses a simple formula to connect the relationship between life expectancy and the proportion of adult life spent in receipt of government pension. It is expressed as follows:

$$\begin{aligned} & \textit{Proportion of adult life spent in retirement} \\ &= \frac{e_{AOE}}{e_{AOE} + AOE - \textit{adult life starting age}} \end{aligned}$$

where  $e_{AOE}$  represents life expectancy at the age of eligibility.

From the above formula, the following variables are important to the secretary of state:

- the age at which adult life begins;
- the measurement of life expectancy that will be assumed; and
- the method of measuring life expectancy.

For these variables, the British government has agreed on the following points (DWP 2013):

- The beginning of adult life will be assumed to be age 20. This selection is consistent with OECD custom in other pension-related matters.
- Life expectancy will be measured with future trends in longevity (cohort life expectancy), retrieved from the principal projections of UK cohort life expectancy published by the Office for National Statistics every two years.
- Life expectancy will be taken as the weighted average life expectancy of both genders, as follows:

$$\frac{(\textit{Male population at AOE} \times e_{AOE}^m) + (\textit{Female population at AOE} \times e_{AOE}^f)}{\textit{Total population at AOE}}$$

where  $e_{AOE}^m$  and  $e_{AOE}^f$  are the male and female cohort life expectancies at AOE.

The above principles will also be adopted in this *Commentary* and used for analyzing projected AOE shifts in Canada. For Canada, cohort life expectancy projections may be obtained from Statistics Canada or the Office of the Chief Actuary. We obtained historical life expectancies from Statistics Canada, and we determined projections with our own calculations using mortality rates and population statistics from the Office of the Chief Actuary as set out in the 27th Actuarial Review of the CPP. We adopted the method for constructing life tables for Canada from Martel et al. (2016).

Once the projected male and female life expectancies and projected population values are obtained, the DWP (2013) framework becomes quite straightforward:

**Step 1:** For each future year, calculate the projected “Proportion of adult life spent in retirement” using the prevailing AOE (rounded to the nearest 0.1 percent).

**Step 2:** Review the projected values and find the first year that is equal to or greater than 33.3 percent (the criterion used in the UK). As will be seen, the Canadian criterion will be 34.0 percent.

**Step 3:** For that year, the AOE is revised to be one year higher.

**Step 4:** Phase in the revision over a period – in the UK it is currently two years.

Step 5: Repeat steps 1–4 using the revised AOE to identify any further progressions.

Hammond et al. (2016) made two key observations about this process. First, they note that on average, the proportion of adult life spent in retirement will not remain constant at 33.3 percent; rather, it is capped at this percentage. In particular, the average retiree would spend less than 33.3 percent of adult life in retirement as the AOE rises.

Second, the formulaic process given is built on the assumption that life expectancy will continue to rise and does not address the treatment of a fall in life expectancy. Given the unpredictability of future longevity, this limitation may create problems for the future. What happens if life expectancy falls? Will the AOE fall as well?

## THE UK FRAMEWORK IN THE CANADIAN CONTEXT

In this section we present our proposal for the implementation of the UK (DWP) framework in Canada. In generating this proposal, various modifications to the process were required such that the framework was compatible with the Canadian demographic context. We begin our analysis by briefly discussing these modifications and any other necessary factors.

### Proportion of Adult Life Spent in Retirement

To avoid having a criterion that needed decimal place determination, we selected 34 percent as the cap on the proportion of life spent in retirement. We initially tested a 33.3 percent ratio, but it would have required an immediate increase in the AOE. We therefore disregarded it as the critical criterion, though it was useful for robustness tests, and moved to the next logical expression of a “constant proportion” statistic. Our selection was based on the “actual” projected replacement ratio of 0.34 (rounded) in 2025.

### Notice and Phase-in Period

Before increasing the AOE, it is necessary to make careful and informed transitional arrangements to facilitate a smooth transition for the public. Untenable impacts should be avoided for individuals close to retirement, and sufficient time should be provided for others to plan for the change. For an increase in the AOE to come fully into effect, the UK government opted for a 10-year

notice period and two-year phase-in period – 12 years in all. Although “sufficiency” is debatable in this context, our proposal needs to take effect in 2025 if it is to have an “uncomplicated” proportion criterion (i.e., 34 percent). We propose a five-year notice period and two-year phase-in period. The end point of the phase-in period being the year for the projected AOE increase; this is necessary for the constant proportion to remain below 34 percent. We believe this date provides a reasonable time line for Canadians to adjust. It is also true that, with the unpredictability and inevitable time lags of the required mortality studies, a very long notice period could result in outdated and inappropriate changes.

### Mortality Information

For this *Commentary*, we developed our analysis using the most recent mortality rates and population statistics from the Office of the Chief Actuary (OSFI 2016).

### AOE PROGRESSION USING THE CONSTANT PROPORTION FRAMEWORK

We then proceeded with an analysis using the UK (DWP) actuarial formulation and the OSFI (2016) data. Our intent is that there will be a shift in the AOE for all the public pension programs: OAS/GIS and C/QPP. For Canada the model produced the following expected increases in the AOE over the next 40 years (Figure 6):

- The first increase in the AOE would take place in 2025. According to our recommendations, this increase would have to be announced to the public in 2018 in order to be fully implemented in 2025.
- Projections show that an AOE of 66 will remain in effect for 18 years.
- The next increase, to age 67, would take place between 2048 and 2050.

The UK framework was envisaged so that the proportion of adult life spent receiving a

government pension might be contained to a certain threshold (see Figure 6 for Canada). The proportion criterion never exceeded the 34 percent threshold, and in most years it lay below the threshold. In particular, it averaged approximately 33.43 percent for the years 2016–55.

We can compare this threshold to the period of adult life spent in retirement if the eligibility age remains at 65 (Figure 7). Clearly, the proportion of adult life spent receiving a government pension would continue to increase steadily if there were no shift in the AOE.

With the AOE changing in line with life expectancy, there will also be an impact on old-age dependency ratios (Figure 8). It is evident that once the first increase is effected, the expected growth over the next 40 years will be curbed drastically. The values eventually stabilize and average about 32 percent. That means there will be slightly more than three potential workers to provide for every Canadian over the AOE.

Our proposal to live a constant percentage of one’s life in retirement has the positive impact of ensuring equity across generations for financing retirement (Figure 9).

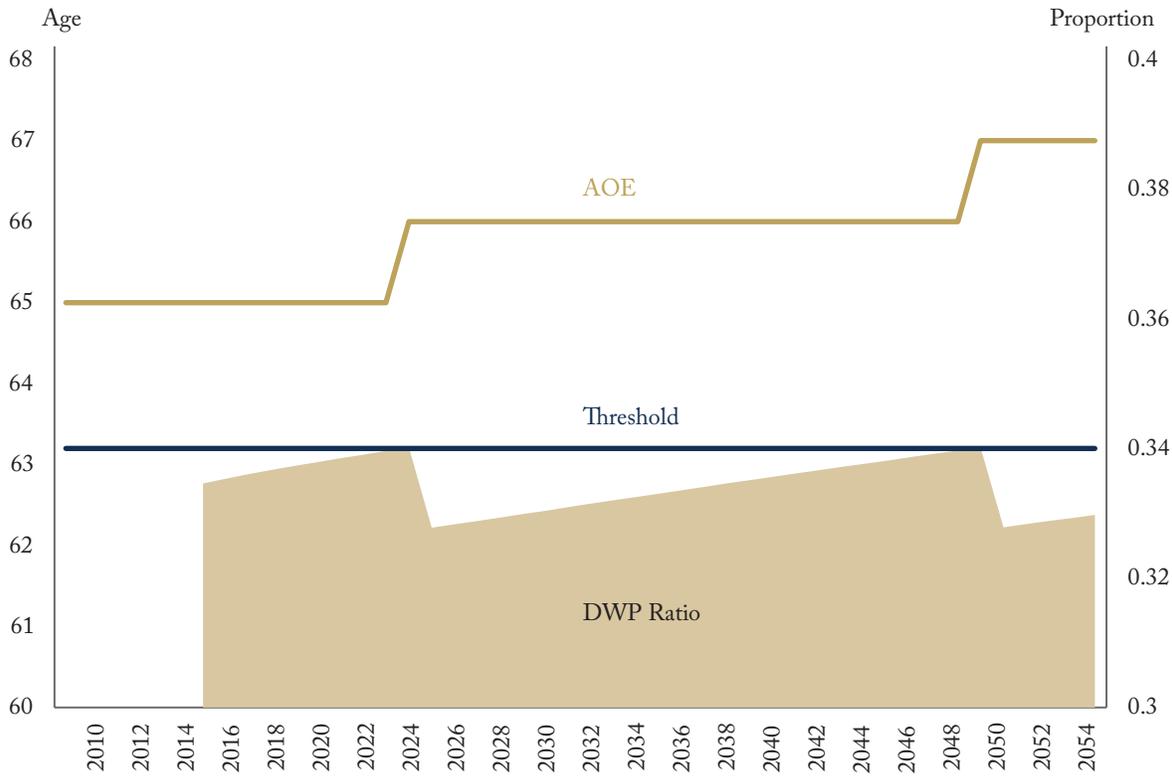
Table 2 summarizes the average projected life expectancy commensurate with the shifts in AOE. Elderly Canadians will not lose all their increased longevity benefit coverage because, as shown, life expectancies rise faster than the shift in the AOE. Thus, retirees get a “dividend” from the increase in the life expectancy “asset.”

### CONSTANT PERCENTAGE CRITERION: SENSITIVITY ANALYSIS

We reviewed the impact of small changes in the 34 percent criterion (Figure 10).

- A threshold of 33 percent would result in an immediate increase in the AOE (actually in 2016). Also, increases in the AOE would happen at a much faster rate while the highest AOE experienced within our proposal is age 67.

**Figure 6: AOE Progression and the Proportion of Adult Life Spent in Retirement, Canada, 2010–2055**



Source: Authors’ calculations using data from the Office of the Chief Actuary, Canada.

- A selection of 35 percent would result in slower increases. In this scenario, an increase in AOE to 66 would not come into effect until 2044. Using our proposed 34 percent, an AOE of 67 would be in effect in 2044.

A small change in the threshold would have material impact and, for that reason, the selection should be chosen with care. That choice, in turn, will affect the mitigation of the projected rise in the old-age dependency ratio.

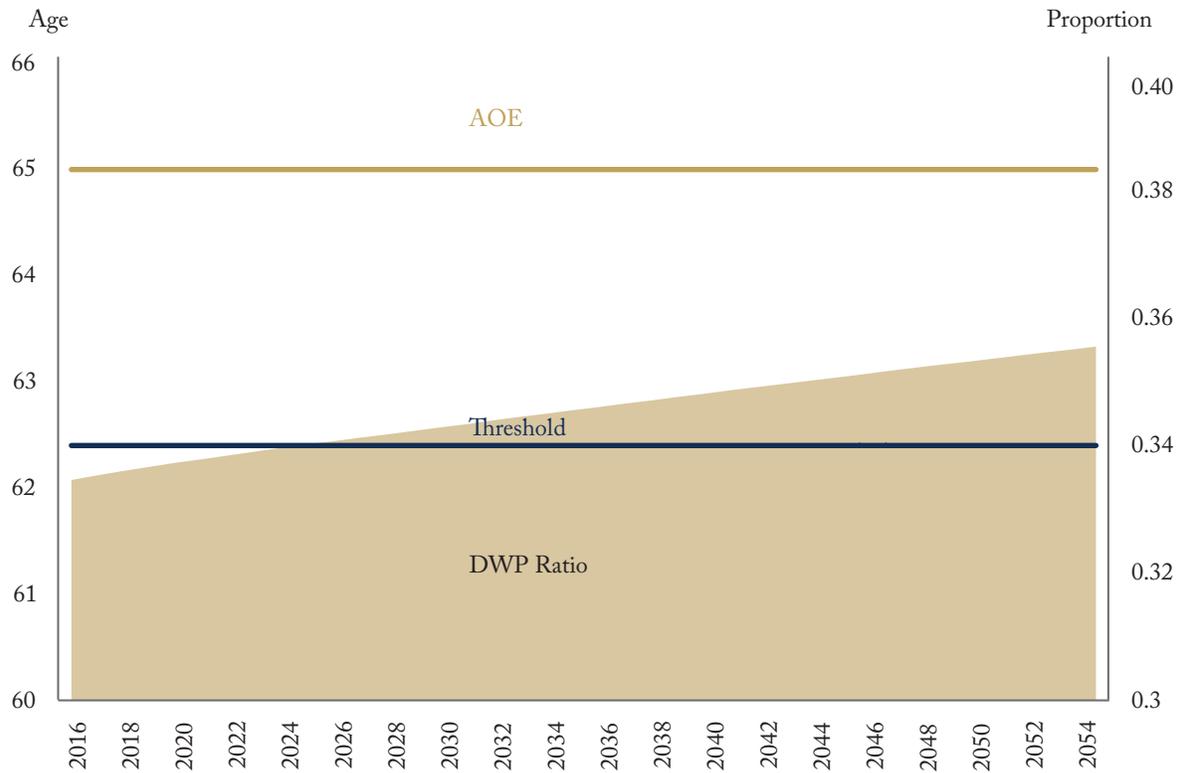
Our recommendation is to retain the flexible retirement window now available in the C/QPP, but to make a shift in the CPP “early and late take-up ages of 60 and 70” upward with the age of eligibility.

## DISCUSSION

Our goal in this *Commentary* is to introduce an “evidence-based” analysis that can be used impartially to adjust the age of eligibility (AOE) for Canada’s social security system based on actuarial logic, not political whims.

We have noted the concerns about ever rising dependency ratios and the commensurate cost of Canadian social security systems and healthcare. We have not argued that current systems and reform plans are unsustainable. In fact, increasing life expectancy and increasing aged-dependency ratios are consistent with the assumptions behind the C/QPP actuarial valuations. We would argue,

**Figure 7: Constant AOE at 65 and the Proportion of Adult Life Spent in Retirement, Canada, 2016–2055**



Source: Authors' calculations using data from the Office of the Chief Actuary, Canada.

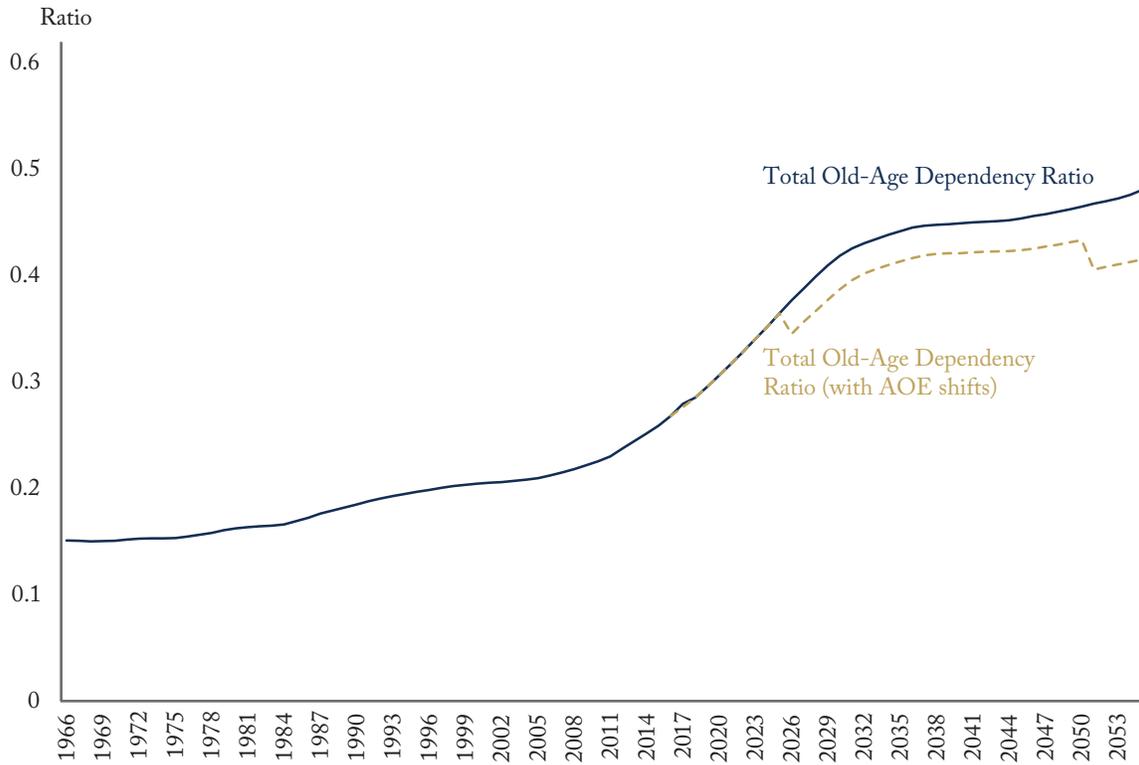
however, that if a relatively palatable “mitigation” action is available which is based in logic, then such mitigation is worthy of public debate.

Had the shift in AOE to age 67 remained in the OAS, the cost of the total OAS system (including GIS) would have been \$96 billion in 2030 and \$181 billion in 2050. As a percentage of GDP, OAS costs would have peaked at 2.8 percent in 2033 and then fallen to 2.4 percent of GDP by 2050. We argue that these ratios are sustainable and that, if our AOE framework were adopted, the costs of OAS would be very similar. With the current AOE of age 65, OAS costs will peak at 3.1 percent of GDP in 2030 before falling to 2.6 percent of GDP by 2050.

As for the CPP, the 27th Actuarial Report (AR

27) for the CPP (as at December 31, 2015) shows that the 9.9 percent contribution rate sustains the system over the next 75 years. Actually, the minimum contribution rate required over the next 75 years is 9.79 percent. However, in the sensitivity analysis contained in the 27th AR, where the chief actuary tests the minimum contribution rate in a number of alternative scenarios, in five of eight such scenarios the minimum contribution rate exceeds 9.9 percent. In the real world, that would require some adjustment to the CPP (e.g., a reduction in benefits or a rise in the contribution rate, or both). The minimum contribution rate also exceeds 9.9 percent in a low economic growth test and in an “older” population test.

Figure 8: Old-age Dependency Ratio with Shifts in the AOE, Canada, 1966–2053



Source: Authors’ calculations using data from the Office of the Chief Actuary, Canada.

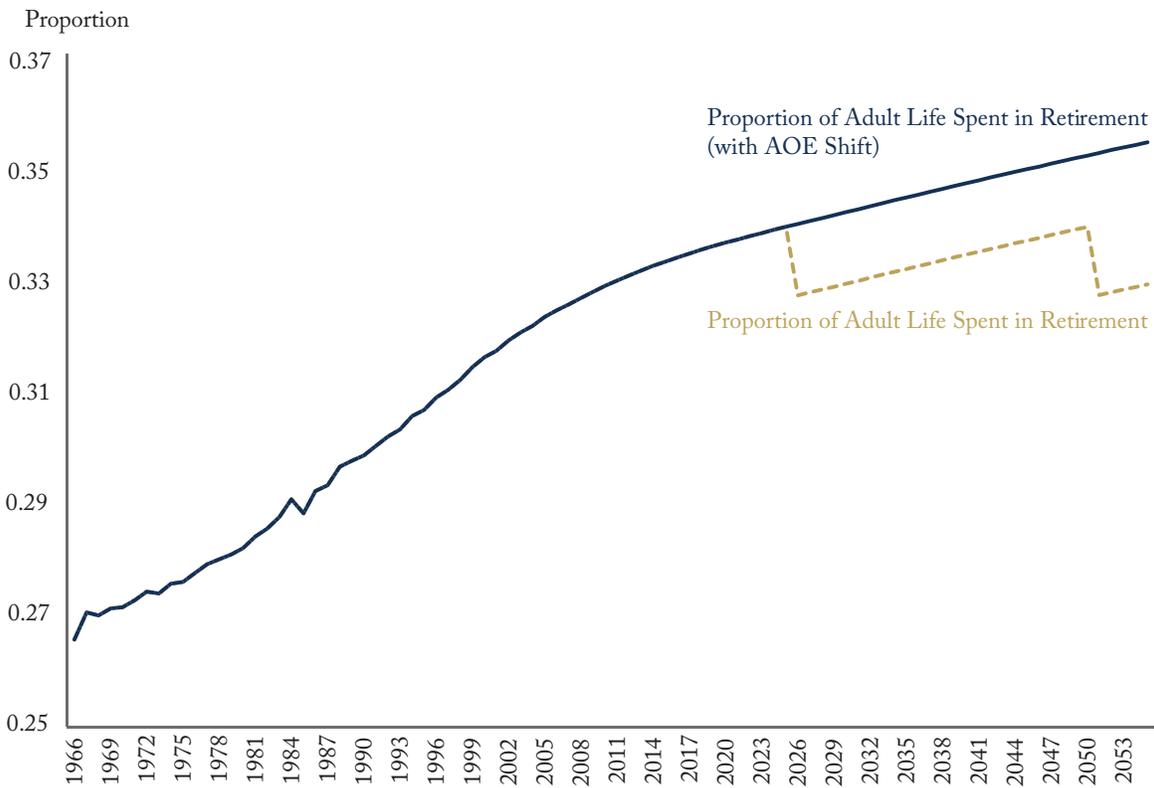
Were the AOE framework to be in place, the probability of having to adjust the CPP benefits or contributions would be much lower. In fact, the 27th AR provides an indication to this effect. In testing the mortality assumption, the low-cost scenario has no increase in life expectancy whatsoever. The minimum contribution rate required in this case is 9.46 percent. Although our AOE framework does not fully adjust for the total improvement in life expectancy, it would take the minimum contribution rate for the CPP very close to the 9.46 percent rate presented. It would be possible, then, to consider lowering either the CPP contribution rate or the new contributions for the additional CPP benefits being introduced

or enhancing benefits slightly (e.g., adding a Child Rearing Drop Out to the new Tier 2 CPP).

The AOE framework might be even more beneficial for the QPP. The 2016 contribution rate for the QPP is 10.65 percent, rising to 10.80 percent in 2018; thereafter, an automatic balancing mechanism will be implemented. If we go back to the CPP analysis, our AOE framework is expected to lower the required contribution rate by close to 0.50 percent, thereby potentially lowering the QPP rate from 10.80 percent to approximately 10.30 percent.

We also believe that having the AOE adjustment “buffer” would greatly decrease the public anxiety about the sustainability of both the CPP and the

Figure 9: Proportion of Adult Life Spent in Retirement, Canada, 1966-2055



Source: Authors' calculations using data from the Office of the Chief Actuary, Canada.

Table 2: Life Expectancy and Proportion of Adult Life Spent in Retirement Associated with AOE Shifts, Canada

Year	AOE	Life Expectancy	Proportion of Adult life Spent in Retirement
2016	65	22.63	0.334597223
2025	66	23.20	0.340169867
2050	67	23.71	0.340147716

Source: Authors' calculations using data from the Office of the Chief Actuary, Canada.

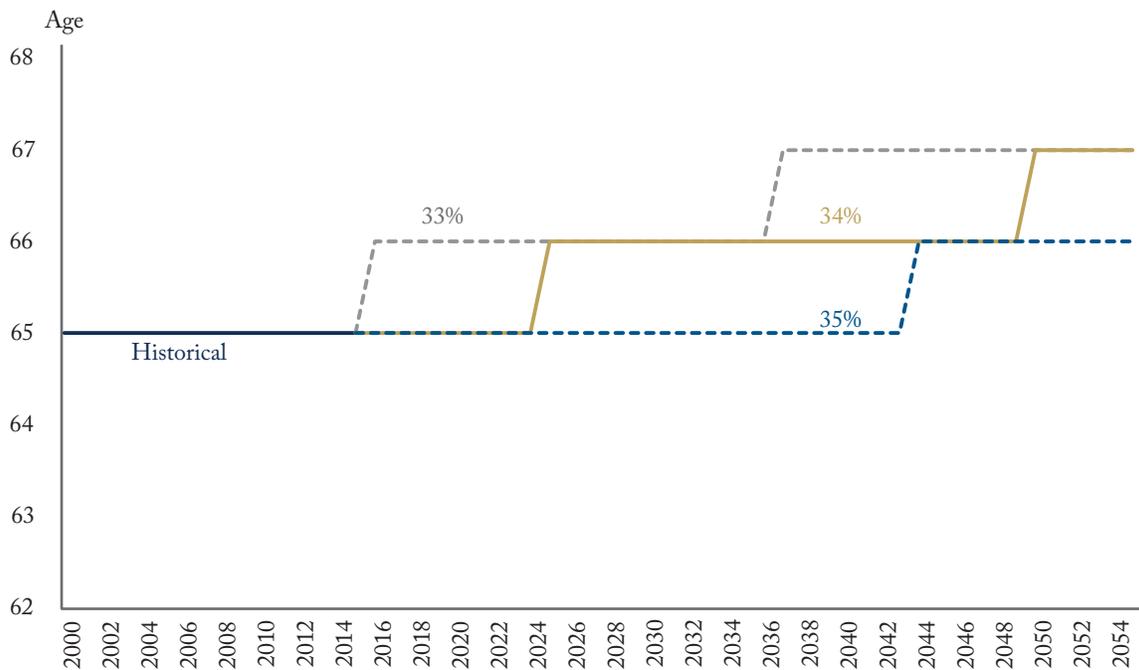
OAS. Finally, policymakers must take the time to analyze the impact of a shift in the AOE on other government benefit programs, such as Workers' Compensation and the provincial social assistance programs.

### REMAINING ISSUES

The proposed AOE adjustment framework is not all good news. It does come with some important issues attached.

One of these issues is the fact that raising the AOE is regressive. If your life expectancy at retirement is five years, and the AOE is raised by one

Figure 10: Sensitivity Analysis of AOE Progression, Canada, 2000–2054



Source: Authors' calculations using data from the Office of the Chief Actuary, Canada.

year, then that is a 20 percent loss in benefits. If your life expectancy at retirement is 20 years, then the one year shift in the AOE is only a 5 percent loss in benefits. People with higher income and wealth tend to live longer, so the impact of raising the AOE will be greater on lower-income workers than on higher-income workers. Access to social assistance benefits would be needed to mitigate this loss.

Actuarial Study no. 17 (OSFI 2016) shows that in 2013, beneficiaries with low income live on average about 2.5 years less than those with higher income. The differential in life expectancies at age 65 by level of income has shown little variability over the last 15 years. As an interesting comparative, at age 65, married males live on average 3.5 years longer than single males, while married females live on average 2.2 years longer than single females.

However, there is a greater regressive impact in

our OAS/GIS system than the AOE framework proposed: the OAS and GIS clawbacks. It is very easy for a low-income worker, who has some other income source (e.g., workplace pension or even the CPP) to lose 100 percent of this non-OAS income to the OAS/GIS clawbacks combined with similar provincial systems (e.g., the Ontario GAINS). Thus, it would be easy to mitigate the small regressive element of the shift in AOE by reforming the OAS/GIS clawbacks as the AOE starts to rise (see Chisholm and Brown 2007 or Milligan and Schirle 2016).

Further, if benefits were provided that were actuarially equivalent to contributions for every subset of workers, we would need a separate system for females versus males, blue collar versus white collar, married versus single, smokers versus non-smokers, and on and on. Canada's social security

programs are not, however, private-sector pensions where costs and benefits are actuarially equivalent. Rather, like education and healthcare, they are a social contract where individual actuarial equity is not a goal.

## CONCLUSION

This *Commentary*, which outlines a logical process to follow in raising the age of eligibility for social security benefits in Canada, is written at a time when healthy life expectancy is rising as quickly as life expectancy overall (see, for example, Crimmins et al. 2009).

Changing the age of eligibility does not mean that a person's actual age of retirement has to change. However, it is our position that workers who previously retired at age  $x$  should be able to continue to be employed gainfully to age  $x + 1$  or  $x + 2$ . In fact, that is happening, as Figure 5 shows, especially where a progressive employer will allow reallocation of work assignments to more appropriate activities. Police officers, for example,

can move from patrol to dispatch, and firefighters can shift from fighting fires to building inspection. This trend is further abetted by artificial assistance.

We believe that having partial immunization of the OAS/GIS and C/QPP from increases in life expectancy is wise and logical. It would help Canada to achieve five attractive goals with respect to our social security system:

- increase the probability of its being sustainable;
- increase the credibility of this sustainability with the Canadian public;
- enhance intergenerational equity;
- lower the overall costs of social security; and
- create a nudge for workers to stay in the labour force for a little longer period.

Finally, we recommend that this methodology be embedded into the Canadian social security system (C/QPP and OAS) as an automatic balancing mechanism so as to put it beyond the vagaries of political winds.

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