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The Benefits of Hindsight: Lessons from the QPP for Other Pension Plans

From the start, political influence kept the Quebec Pension Plan's contribution rates lower than experts were recommending, undermining proper funding.

The authors examine the implications of political risk for public pension schemes' governance, funding and intergenerational equity.

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THE STUDY IN BRIEF

The Quebec Pension Plan was born of a compromise. The contribution rate set at inception was too low, which resulted in the plan's being undercapitalized in the early years. The demographic outlook came as no surprise: it was long known that there would be weak growth in the number of contributors and a sharp increase in beneficiaries in the years ahead, and these factors are particularly acute in Quebec.

Adjustments to the contribution rate were too late in coming, and the plan was therefore insufficiently capitalized. Our retrospective analysis shows the gains that would have been realized by listening to actuaries and other experts sooner. The plan's assets react strongly to a change in the contribution rate. Had the initial rate been 4 percent (as an interministerial committee proposed) instead of 3.6 percent from 1966 to 1987, the plan's assets at the end of 2011 would have been almost 80 percent higher.

The paper underscores basic policy questions for public pension schemes, such as whether these plans are needed, how to avoid inter-generational subsidies and how to minimize political risk. Based on the QPP experience, the authors draw lessons for other pension plans.

First, evaluate the relevancy of creating or enhancing a public pension plan. Specific needs might not be addressed efficiently by imposing compulsory contributions on all workers. Improving financial literacy among workers might provide better results at a lower cost.

Second, introduce full capitalization and gradually increase benefits. Benefits should be fully effective only once the plan has reached full maturity. Plans need to be fully funded in order to be equitable among cohorts.

Third, implement automatic adjustment mechanisms. Adjustments should be triggered once certain levels of funding ratios are attained. Certain parameters of the proposed Ontario Retirement Pension Plan, such as retirement benefits, earlier or later commencement of retirement benefits and indexation, should be flexible and prone to automatic mechanisms if underfunding or returns discrepancies are expected. Additionally, parameters of the mechanism should be set by experts independent of political influence.

Fourth, assess the performance of the plan. A performance evaluation of any public pension plan should be mandatory. Surprisingly, however, public plans do not seem to be subject to any such evaluation. A critical aspect of public pension plans is not measured – namely, the ability of the fund to deliver homogeneous real expected returns to various cohorts of retirees, and thus to provide equitable net asset values to all its members.

These measures would allow a public pension plan to be a true insurance system in which capitalized contributions equate to actuarial benefits. The QPP, in contrast, has come to be both a pension plan and an implicit wealth-transfer system among cohorts of retirees.

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Recently, several changes have been proposed regarding the retirement benefits of Canadians, including possible enhancement of the Canada Pension Plan (CPP), the introduction of a longevity pension in Quebec and the establishment of an Ontario Retirement Pension Plan.¹

Although these proposals have desirable intentions, previous experience – such as that of the Quebec Pension Plan (QPP), Quebec’s equivalent of the CPP – elicits red flags.

The QPP is a public, mandatory insurance system intended to provide basic financial protection upon retirement or in the event of disability or death. It is partially funded in equal proportion through workers’ and employers’ contributions. For a long time now, however, actuaries have sought to warn policymakers that the QPP’s contribution rate is insufficient to ensure long-term funding, in part due to an aging population. In this *Commentary*, we take a retrospective approach, based on warnings from actuarial reports, to examine the evolution of the plan if changes to its parameters proposed by QPP experts had been implemented. We also discuss policy implications for existing and proposed public pension plans.

One of the most serious problems with public pension plans is the difficulty of immunizing them against political risk (see Diamond 1994). The choice of their parameters is subject to electoral imperatives, particularly to the fear of unpopular increases in contribution levels, rather than to an objective examination of the data. Consequently, requisite adjustments to these plans are often watered down or postponed for political reasons. The fact that plans cannot operate proactively and independently has serious repercussions on the evolution of the assets and on equality between generations of depositors.² To alleviate this risk, we propose: i) evaluating the relevancy of creating or enhancing a public pension plan; ii) introducing full capitalization and the gradual introduction of new benefits; iii) implementing automatic adjustment mechanisms; and iv) assessing the performance of the plan.

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- 1 For the longevity pension, see Quebec (2013); for the ORPP, see *An Act to require the establishment of the Ontario Retirement Pension Plan*, Legislative Assembly of Ontario, 1st session, 41st legislature, 2014.
- 2 Intergenerational inequalities stemming from public decisions have been documented in many academic papers. In the case of social security in the United States, Diamond (2004), using an updated analysis of Leimer (1994), estimated that the net wealth transfer (in 2002 dollars) to beneficiaries born up to 1949 amounts to US\$11.5 trillion. Moreover, the internal rates of return estimated by Clingman et al. (2001) and Leimer (2007) show that benefits received by the first generation of recipients largely exceeded the contributions (taxes) it paid.

We begin by looking at the choices that guided the establishment of the QPP's parameters, how these parameters have changed over time and the warnings by actuaries regarding the projected assets. We then explain the methodology we used to simulate the effect of different contribution-rate scenarios. We also show the effect on assets and the rate of return for representative participants. We conclude the *Commentary* with a discussion of the policy implications of our findings and a brief summary.

PRESSURE ON QPP FUNDING

The QPP was born of a negotiated agreement between the federal government and the Quebec provincial government. At first, a contribution rate of 4 percent of employment earnings was recommended, a rate that was much higher than required to ensure funding purely through a pay-as-you-go method and higher than the 2 percent rate recommended to set up the CPP.³ Given the will of the two governments to ensure that the CPP and the QPP would be equivalent in terms of contributions and principal benefits, a compromise was reached that set the initial contribution rate at 3.6 percent. In the event, this initial rate proved too low. Although the parameters of the QPP and CPP were initially identical, over time a number of factors exerted pressure on the QPP's contribution rate and, in turn, on the state of the plan's assets and viability.

As a result of several key changes to the QPP's terms and conditions, pressure on the contribution rate increased significantly. First, in 1974, the full indexation of benefits was implemented. Then, beginning in 1977, individuals were able to exclude from their contributory period the months during

which they receive family benefits for a child under age seven if these months are included in a year where their employment earnings are less than the general tax exemption. Finally, in January 1984, early retirement was introduced.

Also exerting pressure on the contribution rate have been demographic factors, beginning with a decline in the number of births from 135,000 per year in the early 1960s to 95,000 at the end of the 1960s. As well, life expectancy at age 65 increased more than projected, from 14.3 years in the mid-1960s to 16.8 years in the mid-1980s to 20 years today. The contribution rate that derived from the choice of funding method adopted at the start – namely, partial funding – could have remained stable had the ratio of workers to retirees remained as expected, but the aging population has lowered this ratio, adding still more pressure on the contribution rate.

THE EVOLUTION OF THE QPP CONTRIBUTION RATE

Actuaries began signalling the need for additional funding for the QPP as far back as 1974. As Faille, Lévesque, and Rousseau (1978, p. 27) recommended, “partial funding should be maintained but the funding rate must be increased. This entails raising the QPP contribution rate over the coming years. The increase will need to be all the greater in that benefits will be indexed to the cost of living and that it is necessary today to amass the funds needed to cover future retirement benefit entitlements.” Despite the QPP's underfunding over the long term, however, the contribution rate was first raised only in 1986, by 0.2 percent per year over 10 years, and from 3.6 percent to 5.6 percent in 1996.

3 In 1964, an interministerial committee on the QPP recommended a mixed funding mode on the basis of the plan's public nature. Given the provincial government's power to impose taxes, the plan's sustainability could be ensured without having to resort to full funding.

Notwithstanding this increase, in 1996, the green book on QPP reform (Quebec 1996) demonstrated that the pace of contribution rate increases set in 1986 was inadequate, and a second series of contribution rate increases was introduced. After being increased by 0.4 percent on January 1, 1997, and again on January 1, 1998, the contribution rate was increased by 0.6 percent in 1999 and by 0.8 percent per year over the next three years, bringing it to 9.9 percent by 2003.⁴ One last series of increases was announced in the Quebec government's fiscal year 2011/12 budget, whereby the contribution rate is to increase gradually (by 0.15 percent per year) to 10.8 percent over six years. Without these contribution rate increases and other changes to the plan that began in 2012, the QPP's assets would have been depleted in 2039. As well, the "rule of prudence – decreed by the federal government in the mid-1980s to maintain year-end assets at a level equal to at least twice next-year outflows – would not have been respected.

A RETROSPECTIVE ANALYSIS OF ACTUARIAL REPORTS

Actuarial valuations of the QPP have been published periodically since its inception⁵ and, as

noted, actuaries long ago were emphasizing the need for additional funding: "Hence, it is evident that the plan will require additional funding in order to be able to pay out benefits.... In short, we have reason to believe that the problem of determining and studying the criteria for funding the plan over the long term must be addressed in the very near future" (Quebec 1975, p. 47; authors' translation).⁶ What is more, as early as in the actuarial report for 1970, the QPP's assets were projected to be depleted by 2001 if no changes were made to the plan's parameters, particularly the contribution rate. The actuarial reports for 1974, 1978, 1982 and 1986 expected the assets to be depleted in the early 2000s, and those for 1988, 1992 and 1994 projected the assets would be gone around the mid-2000s.

Table 1 compares the contribution rates applied and the steady-state rates recommended in the various actuarial reports. The steady-state rate is an estimate of the contribution rate required to ensure stable funding of the plan over the long term. As the table shows, the rates applied have practically always been lower than the recommended steady-state rates (the CPP did not encounter similar discrepancies due to demographic reasons). The last column of the table shows the year the assets would be depleted if no changes were made to parameters

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- 4 The QPP's current characteristics are as follows. All workers ages 18 and over contribute to the plan the moment their annual employment income exceeds \$3,500. In 2013, the contribution rate was 10.20 percent against maximum income of \$51,100 per year, for a maximum contribution of \$4,855 (employer and employee). To be entitled to a pension, a worker must contribute to the plan for at least one year. The pension amount equals 25 percent of the average employment income against which contributions were paid. It also varies as a function of retirement age, number of contributory years, and employment income on record with the plan.
- 5 At least once every three years, the Régie des rentes du Québec must prepare an actuarial review, over a projection period of at least 50 years, of the application of the act respecting the QPP and of the state of the plan's account. This report must also indicate the steady-state contribution rate. Moreover, if a bill tabled in the National Assembly aims to amend the existing act, the Régie des rentes du Québec must prepare a report indicating how the bill would affect the estimates of the most recent report.
- 6 In contrast, CPP actuarial reports project contributions, benefits and funding levels, but make no recommendations about how the plan should be funded. We thank a referee for pointing this out.

Table 1: Applied and Steady-State Contribution Rates, Quebec Pension Plan

Actuarial Report		Contribution Rate Applied (Percent)	Recommended Steady-State Rate (Percent)	Year Recommended Rate Would be Reached	Year Assets Would be Depleted
Year Covered by Valuation	Year of Publication				
1997	1998	6.0	9.9	2003	–
2000	2001	7.8	10.1	–	–
2003	2004	9.9	10.3	–	After 2055
2006	2007	9.9	10.54	–	2051
2006 update	2008	9.9	10.95	–	2049
2009	2010	9.9	11.02	–	2039
2009 1st update	May 2011	9.9	10.79	2017	–
2009 2nd update	Nov. 2011	9.9	10.81	2017	–

Note: Hyphens in the last two columns mean that no projected years were provided by the Régie des rentes du Québec.

Source: Quebec, Régie des rentes du Québec, *Analyses actuarielles du Régime des rentes du Québec*, various years.

other than those already announced.

EFFECTS ON THE QPP IF DIFFERENT PARAMETERS HAD BEEN APPLIED

What would have been the effect on the QPP's assets if different parameters had been applied? To determine this counterfactual, for each year from 1966 to 2056 we simulated changes in the parameters that cause the assets to vary. The assets were established with the following parameters:

$$\text{Assets}_t = \text{assets}_{t-1} + \text{contributions}_t + \text{IR}_t - \text{AC}_t - \text{benefits}_t + \Delta\text{MV}_t,$$

where Assets_t = assets as at December 31 of

year t ; contributions_t = contributions received in year t ; IR_t = investment revenues in year t ; AC_t = administrative costs in year t ; benefits_t = benefits paid out in year t ; and ΔMV_t = change in market value in year t .

Actual and projected data were derived from the *Régie des rentes du Québec* (RRQ), the Quebec pension board. For each year (from 1967 to 2056), we calculated the net contribution by adding contributions and investment revenues and subtracting administrative costs and benefits. The assets thus estimated are identical to the actual assets obtained from 1967 to 2009. Percentage differences between the assets estimated by the RRQ as of 2010 and the assets we examined

do not, on average, exceed -0.05 percent. It is therefore possible to change the contribution rate retrospectively to measure the effect on the level of assets. To that end, we made the following assumptions:

- administrative costs do not vary if the contribution rate is changed;
- benefits paid out do not vary as a function of the contribution rate;
- actual and projected rates of return remain the same;
- the variation in net contributions occurs at mid-year, according to the retrospective changes to the contribution rate, increased or reduced by the annual rate of return;
- the rates of return used are those posted by the *Caisse de Dépôt et Placement* (the plan's fund manager) for the years 1967 to 2009 and those projected by the RRQ for the years 2010 to 2056.

Scenario 1: An Initial Contribution Rate of 4 Percent

Impact on Assets

As noted earlier, the initial contribution rate of 3.6 percent was established as the result of a negotiated compromise between the Quebec and federal governments. Since that initial rate was inadequate, what would have been the impact on the QPP's assets of a higher contribution rate at the plan's inception? Suppose, for example, the initial rate had been set at 4 percent, the level recommended in 1964 by the QPP interministerial committee and, beginning in 1988, the contribution rate followed the same progression as the actual contribution rate. In our scenario, however, the rate

remains at 9.9 percent from 2012 to 2056, instead of integrating the announced increases from 2012 to 2017. We find that, under these assumptions, the assets would not be depleted at the end of the projection period and would be even higher than is anticipated under the actual rate.

Figure 1 shows the difference between the respective assets obtained under the actual rate and our first scenario. Our higher rate at the beginning of the period necessarily leads to higher contributions (the effect is too small to be clearly visible in the Figure), which, until 1988, lead to higher investment revenues. Then, beginning in 2012, as the contribution rate under our scenario is lower than the actual announced rate, the difference between the respective assets begins to decline. According to our scenario, assets would total \$60 billion, rather than the actual \$34 billion, a difference of 77 percent that is the result of higher contributions at the start and, therefore, a return on larger deposits across the entire period. In 2056, assets would be 20 percent greater. Cumulatively, this difference is due to significantly higher investment revenues. In fact, the surge in investment revenues is the result of increasing contributions sooner, which would make it possible in the following years to reduce the input of contributions to the assets.

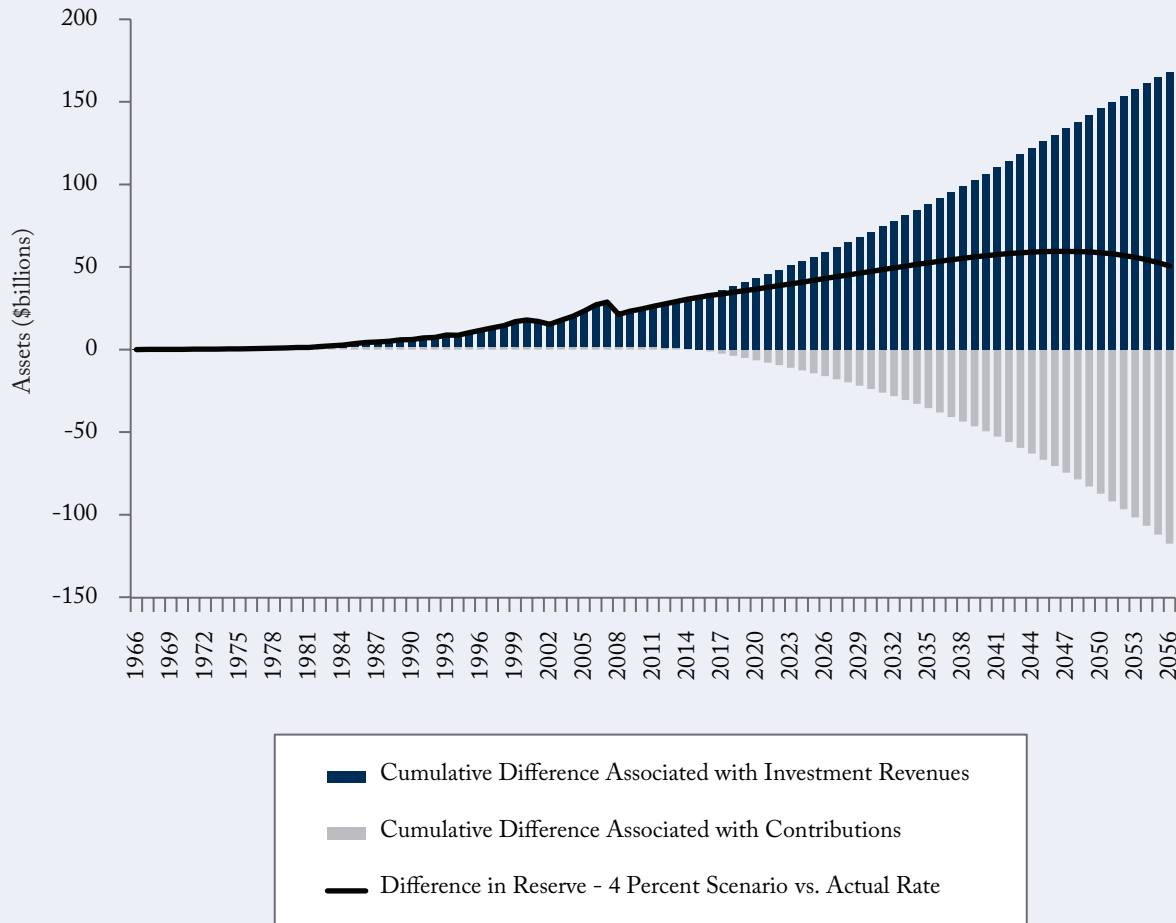
Impact on the Rates of Return for Representative Participants

In a previous study, we calculated the internal rates of return⁷ for representative participants in the QPP from 1968 through 2056,⁸ and determined there would be a steady decline in returns over the period. The rates of return of the first generation

7 The internal rate of return should not be confused with the rate of return actually earned on the pension plan's assets. The internal rate of return measures the return actually earned (or expected to be earned) by participants by taking into account the value and timing of the contributions (outflows) and benefits (inflows) of each representative participant.

8 See Godbout, Trudel, and St-Cerny (2013b) for a description of the methodology.

Figure 1: Evolution of the Difference in Quebec Pension Plan Assets, Initial Contribution Rate of 4 Percent versus Actual Rate



Source: Authors' calculations.

of contributors were markedly higher than those of subsequent generations primarily on account of a full pension paid out ahead of time. The higher contribution rate paid by subsequent generations plays a role in the lower rates of return, but to a lesser degree.

If the contribution rate had been different, would the observed rates of return have been significantly different as well? To answer this question, we calculated the rates of return that would have been

observed if the evolution of the contribution rate had followed the same course as in the scenario above. We find that, with an initial contribution rate of 4 percent, the rates of return would exceed those observed as of 2021. Before that date, the lower contribution rate beginning in 2012 does not compensate for the impact of the higher contribution rate early in the contributory period. In short, applying the initial recommendations of the RRQ actuaries would have translated not

only into a marked increase in assets, but also into greater intergenerational equality.⁹

Scenario 2: Increasing the Contribution Rate Earlier

Impact on Assets

Since actuarial reports documented the need to apply rate increases well ahead of their established effective dates, in a second scenario we simulate what would have happened if these increases had gone into effect five years earlier than they actually did – namely, rate increases begin in 1982 instead of 1987, the rate reaches 9.9 percent in 1998 instead of 2003 and remains at that level instead of beginning to rise again in 2012. We find that, if increases in the contribution rate of the same magnitude are effected five years earlier (and subsequent increases above 9.9 percent are excluded), a significantly higher level of assets is generated and amplified by the positive returns realized by the plan's fund manager. (The average annualized time-weighted rate of return is 19.7 percent from 1982 to 1986, thus contributing to the rapid growth of the simulated assets and therefore magnifying the advantages of better funding. The actual rate from 1982 to 1997 was 13.3 percent.) Figure 2 breaks down the difference between this simulated scenario and the actual situation. The rate is, of course, higher as of 1982, and then lower as of 2012, which explains the evolution of the input from contributions. Once again, the higher assets can be explained above all by substantially higher investment revenues.

Under the scenario where the contribution rate is increased earlier, assets as at the end of 2011 are 1.6 times greater than actual assets, and in 2056 they are 2.5 times greater. Based on the assumptions we made for the simulations, the large differences in assets in 2011 and 2056 are the result of different contributions and investment revenues. In 2011, one-third of the difference derives from additional contributions and two-thirds from higher investment revenues. In 2056, however, investment revenues explain all of the difference, attesting once again to the impact of compound returns on asset levels.

Impact on the Rates of Return for Representative Participants

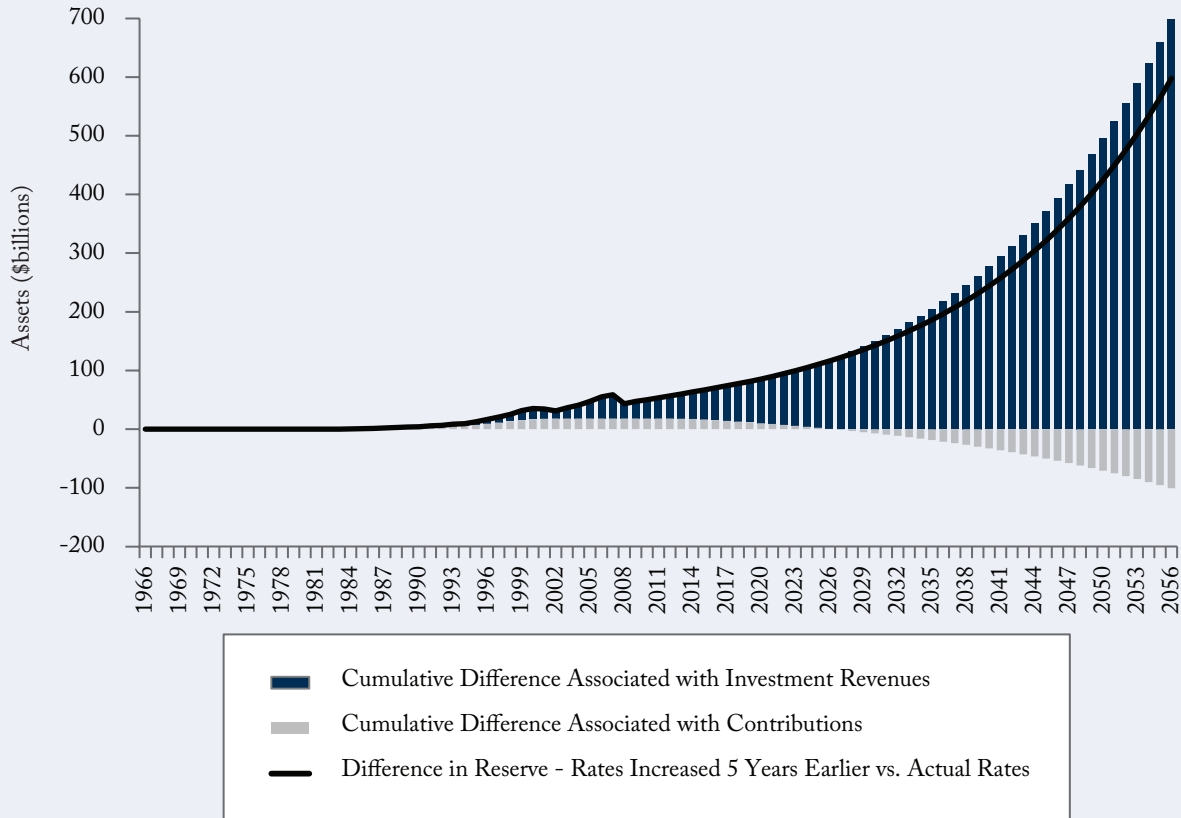
Under the scenario where the contribution rate is increased five years earlier, the internal rate of return for a representative participant exceeds the observed rate of return by 2036. Prior to that year, the contributory years at a higher rate are a bigger factor in the flow that serves to calculate the internal rate of return. After 2036, however, the internal rate of return is significantly higher. Hence, by merely putting measures into effect a few years earlier, the QPP's assets are markedly higher and inequalities are sensibly reduced.

An initial contribution rate of 4 percent and increasing the rate earlier would have reduced the variance in the rate of return for representative participants by 41 percent and 72 percent, respectively, relative to the baseline situation.¹⁰ We then repeated the exercise, but increased the contribution rate four years, three years, two years

⁹ For more details on these results, see Godbout, Trudel, and St-Cerny (2013a).

¹⁰ The variances are 0.0029 percent, 0.0017 percent and 0.0008 percent, respectively, for the baseline situation, the scenario where the initial contribution rate is 4 percent, and the scenario where rates are increased five years earlier. These percentages reflect the variability of average returns for depositors but are not necessarily indicative of the variability of returns for the plan. In order to measure this variability more precisely, it is essential to take account, in particular, of the relative weight of each representative participant in the plan. For example, the average realized return for the representative participant in the period from 2012 to 2056 is 1.9 percent under the actual contribution rate, 2.0 percent under the scenario where the initial contribution rate is 4 percent and at 1.8 percent under the scenario where the rate is increased five years earlier.

Figure 2: Evolution of Difference in Quebec Pension Plan Assets, Increasing Contribution Rate Five Years Earlier versus Actual Rate



Source: Authors' calculations.

and one year earlier. The impact on assets of these different rate-increase scenarios is illustrated in Figure 3. Except for two cases – namely, when the rate is increased two years and one year earlier – the level of assets attained in 2056 exceeds that generated by the actual rate.

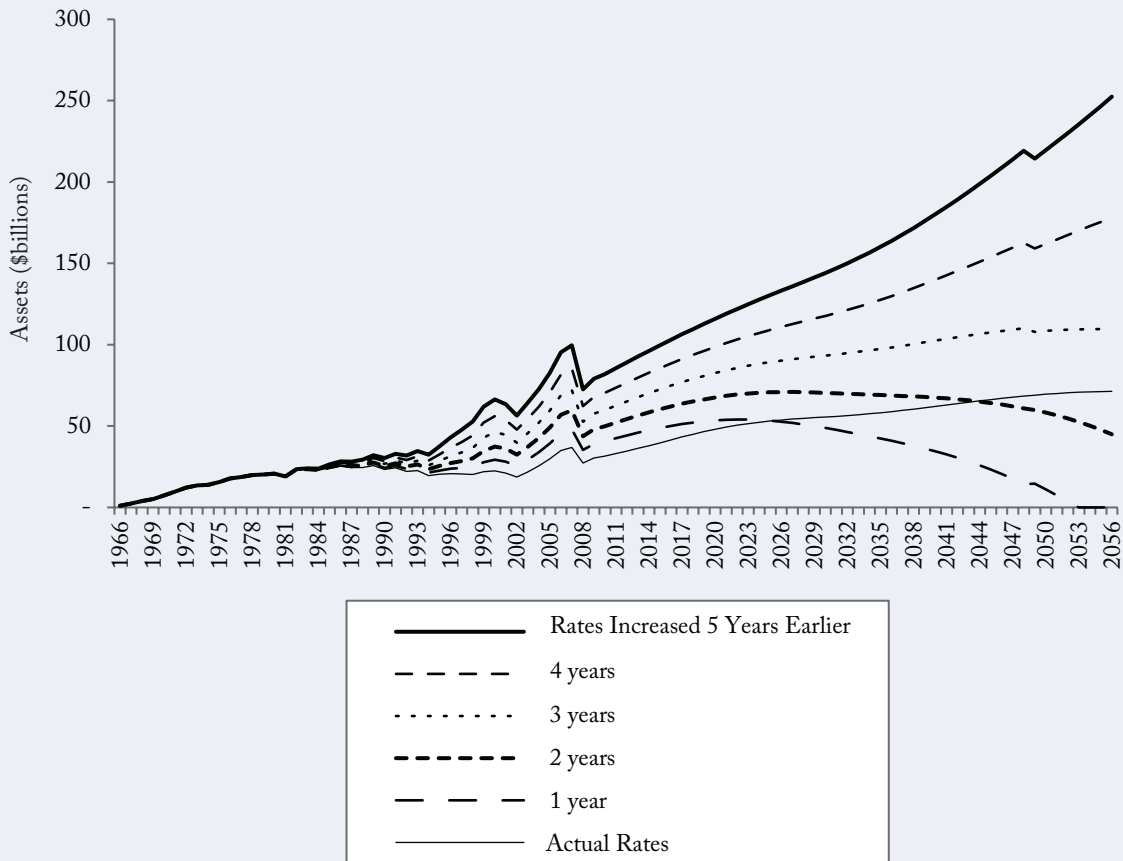
Impact on the Contribution Rate for a Given Asset Target

The previous scenario showed that, if the contribution rate had been increased five years earlier, assets in 2056 would be much larger even

if the rate increases had stopped at 9.9 percent instead rising to 10.8 percent as is actually planned. Here, we establish the contribution rate required for the assets in 2056 to equal the level expected under the actual and planned rates if the increases in the contribution rate had been put into effect from one to five years earlier than the actual and planned increases. This approach is predicated on the actuaries' numerous warnings regarding the contribution rate required to ensure adequate asset levels. Accordingly, we examine five cases.

- Rate increases begin in 1982 (instead of 1987) meaning rates are increased five years earlier,

Figure 3: Evolution of Quebec Pension Plan Assets, 1966–2056



Sources: Quebec, Régie des rentes du Québec, *Analyses actuarielles du Régime des rentes du Québec*, various years; and authors' calculations.

- in 1983 meaning rates are increased four years earlier, in 1984 meaning rates are increased three years earlier, in 1985 meaning rates are increased two years earlier, and in 1986 meaning rates are increased one year earlier.
- Subsequent increases in the actual contribution rate occur in 2003 and the rate of 9.9 percent then remains stable until 2011. In each of our five scenarios, 2003 is the baseline year for establishing the last rate change.
- The contribution rate is thus held constant from 1998 to 2056 for the five-year scenario, from 1999 to 2056 for the four-year scenario, from 2000 to 2056 for the three-year scenario, from 2001 to 2056 for the two-year scenario and from 2002 to 2056 for the one-year scenario. Each contribution rate thus established allows the same asset level to be attained in 2056 (\$218.9 billion) as expected under the actual and planned rates.

The impact on assets of these earlier rate increases is illustrated in Figure 4. The difference between the assets obtained under the different earlier-increase scenarios and the actual assets stems, needless to say, from the greater amount of contributions collected sooner, but also from the return realized on this amount. Whereas actual assets stagnated over the period from 1982 to 1997 and even declined through to 2002, they grow sharply in all the earlier-increase scenarios, but most markedly in the five-year scenario, which benefits in full not only from the contribution increase, but also from the strong rates of return realized in the 1982–97 period.

Table 2 shows the contribution rates established under the different scenarios. Owing to the higher contributions and strong realized rates of return from 1982 to 1997, the contribution rate required to attain the 2056 assets target is revised downward in essentially all the earlier-increase scenarios. The steady-state rate that allows the 2056 asset level to be achieved also declines steadily in every scenario. Owing to the amounts generated by the earlier contribution rate increases and the realized rates of return, this rate stabilizes (through to 2056) at a relatively higher level the fewer years the contribution rate increases are pulled back in time. Indeed, the steady-state rate goes from 9.24 percent when the rate is increased five years earlier, to 9.50 percent when the rate is increased four years earlier, to 9.75 percent when increased three years earlier, to 10 percent when increased two years earlier, and to 10.27 percent when increased one year earlier. Our simulations also indicate that increasing the contribution rate sooner would have led to a levelling of the rate from 1982 to 2056 and greater intergenerational equality (Figure 5).

Under these scenarios, the real internal rate of return, too, would be higher at the end of the projection period and its variance would be smaller. In fact, the variance in returns would have been reduced by more than 75 percent had the contribution rate been increased five years earlier than it actually was.

Automatic Mechanisms

The previous sections demonstrated the impact of not putting into effect the recommendations of actuarial experts or of delaying their application. In attempting to avoid the political risk of implementing these recommendations, the omissions or postponements have had significant effects on the state of the QPP's assets, on the future contribution rate and on equality between cohorts of depositors.

The sources of political risk are multiple in the case of public pension plans (Diamond, 1994, 2004). The consequences of such risk include, in particular, granting excessive benefits to newly retired participants when the public plan is not yet mature. This problem is necessarily amplified if promises made to future retirees cannot be honoured. From an operational point of view, however, the introduction of automatic mechanisms insensitive to political pressure and the delegation of oversight to an independent body immune from such pressure – such as is the case, for example, with monetary policy and central bank operating modes – would have minimized the political risk of implementing the experts' recommendations.

For the QPP, it was suggested as far back as 1977 that, after each actuarial valuation, the contribution rate be adjusted automatically by law (Cofirentes 1977). This recommendation was finally taken into account in 2011, as a budget paper presented with the fiscal year 2011/12 provincial budget indicated:

The 2011-2012 Budget stipulates, like the Canada Pension Plan, that an automatic adjustment mechanism will be put in place as of January 1, 2018, to secure such stability in the long run.... the mechanism will engage automatically following publication of the QPP actuarial report every three years. Where the steady-state contribution rate exceeds the contribution rate in effect by 0.1 percentage point, the contribution rate will automatically be increased by 0.1 percentage point per year as of the following January 1, until the

Table 2: Contribution Rates Required to Achieve the Same Asset Target for 2056, Quebec Pension Plan

Year Rate Increased	5 Years Earlier	4 Years Earlier	3 Years Earlier	2 Years Earlier	1 Year Earlier	Actual
	<i>Contribution Rate Required (Percent)</i>					
1980	3.60	3.60	3.60	3.60	3.60	3.60
1981	3.60	3.60	3.60	3.60	3.60	3.60
1982	3.80	3.60	3.60	3.60	3.60	3.60
1983	4.00	3.80	3.60	3.60	3.60	3.60
1984	4.20	4.00	3.80	3.60	3.60	3.60
1985	4.40	4.20	4.00	3.80	3.60	3.60
1986	4.60	4.40	4.20	4.00	3.80	3.60
1987	4.80	4.60	4.40	4.20	4.00	3.80
1988	5.00	4.80	4.60	4.40	4.20	4.00
1989	5.20	5.00	4.80	4.60	4.40	4.20
1990	5.40	5.20	5.00	4.80	4.60	4.40
1991	5.60	5.40	5.20	5.00	4.80	4.60
1992	6.00	5.60	5.40	5.20	5.00	4.80
1993	6.40	6.00	5.60	5.40	5.20	5.00
1994	7.00	6.40	6.00	5.60	5.40	5.20
1995	7.80	7.00	6.40	6.00	5.60	5.40
1996	8.60	7.80	7.00	6.40	6.00	5.60
1997	9.24	8.60	7.80	7.00	6.40	6.00
1998	9.24	9.40	8.60	7.80	7.00	6.40
1999	9.24	9.50	9.40	8.60	7.80	7.00
2000	9.24	9.50	9.75	9.40	8.60	7.80
2001	9.24	9.50	9.75	10.08	9.40	8.60
2002	9.24	9.50	9.75	10.08	10.27	9.40
2003	9.24	9.50	9.75	10.08	10.27	9.90
2004	9.24	9.50	9.75	10.08	10.27	9.90
2005	9.24	9.50	9.75	10.08	10.27	9.90
2006	9.24	9.50	9.75	10.08	10.27	9.90
2007	9.24	9.50	9.75	10.08	10.27	9.90
2008	9.24	9.50	9.75	10.08	10.27	9.90
2009	9.24	9.50	9.75	10.08	10.27	9.90

Table 2: Continued

Year Rate Increased	5 Years Earlier	4 Years Earlier	3 Years Earlier	2 Years Earlier	1 Year Earlier	Actual
	<i>Contribution Rate Required (Percent)</i>					
2010	9.24	9.50	9.75	10.08	10.27	9.90
2011	9.24	9.50	9.75	10.08	10.27	9.90
2012	9.24	9.50	9.75	10.08	10.27	10.05
2013	9.24	9.50	9.75	10.08	10.27	10.20
2014	9.24	9.50	9.75	10.08	10.27	10.35
2015	9.24	9.50	9.75	10.08	10.27	10.50
2016	9.24	9.50	9.75	10.08	10.27	10.65
2017	9.24	9.50	9.75	10.08	10.27	10.80
2018	9.24	9.50	9.75	10.08	10.27	10.80
2019	9.24	9.50	9.75	10.08	10.27	10.80
2020	9.24	9.50	9.75	10.08	10.27	10.80

Note: The simulated rates are rounded off to two decimal places. The exact rates by the number of years the rate increases are applied earlier are 9.24027524% for five years, 9.4978999% for four years, 9.75289% for three years, 10.077515% for two years and 10.2666011% for one year.

Source: Authors' calculations.

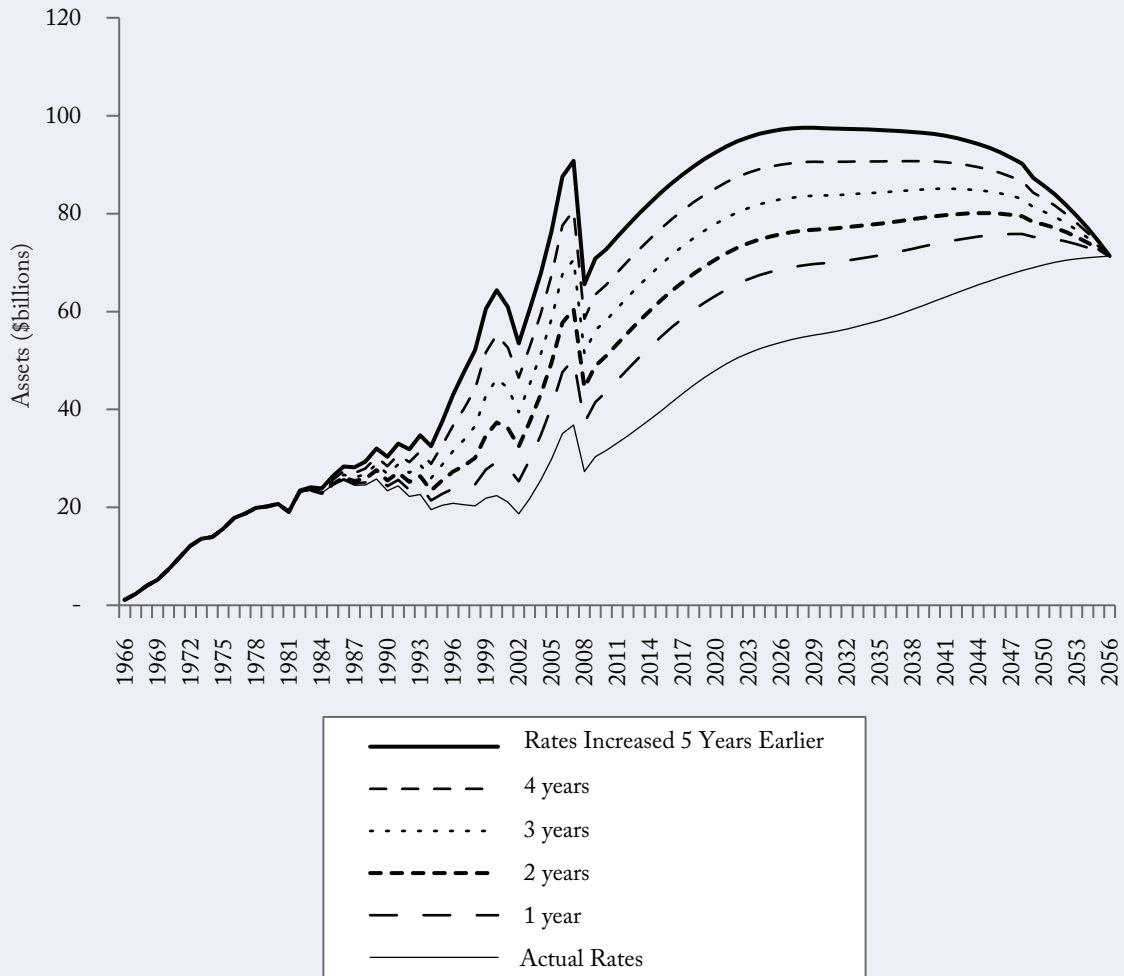
steady-state contribution rate is reached or the publication of the next actuarial report....Also, the government may suspend the automatic application of the increase in the contribution rate by otherwise stipulating alternative measures to maintain the Plan's equilibrium. (Quebec 2011, p. 29.)

An automatic adjustment mechanism has existed for the CPP since 1998 (see Canada 2012). Section 113.1 of the *Canada Pension Plan Act* stipulates that, when the plan's steady-state contribution rate exceeds the legal contribution rate and if the provinces cannot agree on the action to take, the contribution rate is to be increased. This increase is spread over a period of three years, in a measure equal to half the difference between the current rate and the steady-state rate (a maximum of 0.2 percent

per year). Benefits paid out are frozen for three years as well, or until the next actuarial review.

In Sweden, the public pension plan is endowed with two automatic stabilization mechanisms. At retirement, the virtual amount in the contributor's account is converted into a monthly pension based on a conversion factor that is updated annually. This mechanism takes account of life expectancy estimates. Since 2001, the Swedish government has also presented each year a report evaluating the plan's assets and liabilities in order to verify the system's steady state. If a funding problem is detected, the planned indexation of the notional account and the updating of the conversion factor are modified to address the imbalance (Barr and Diamond 2011). Automatic mechanisms exist in

Figure 4: Evolution of Quebec Pension Plan Assets, 1966–2056, Maintaining Reserve Target for 2056 (2010 \$ Billions)



Sources: Quebec, Régie des rentes du Québec, *Analyses actuarielles du Régime des rentes du Québec*, various years; and authors' calculations.

other countries as well, including Germany, Finland and Japan (see Vidal-Meliá, Boado-Penas, and Settergren 2009).

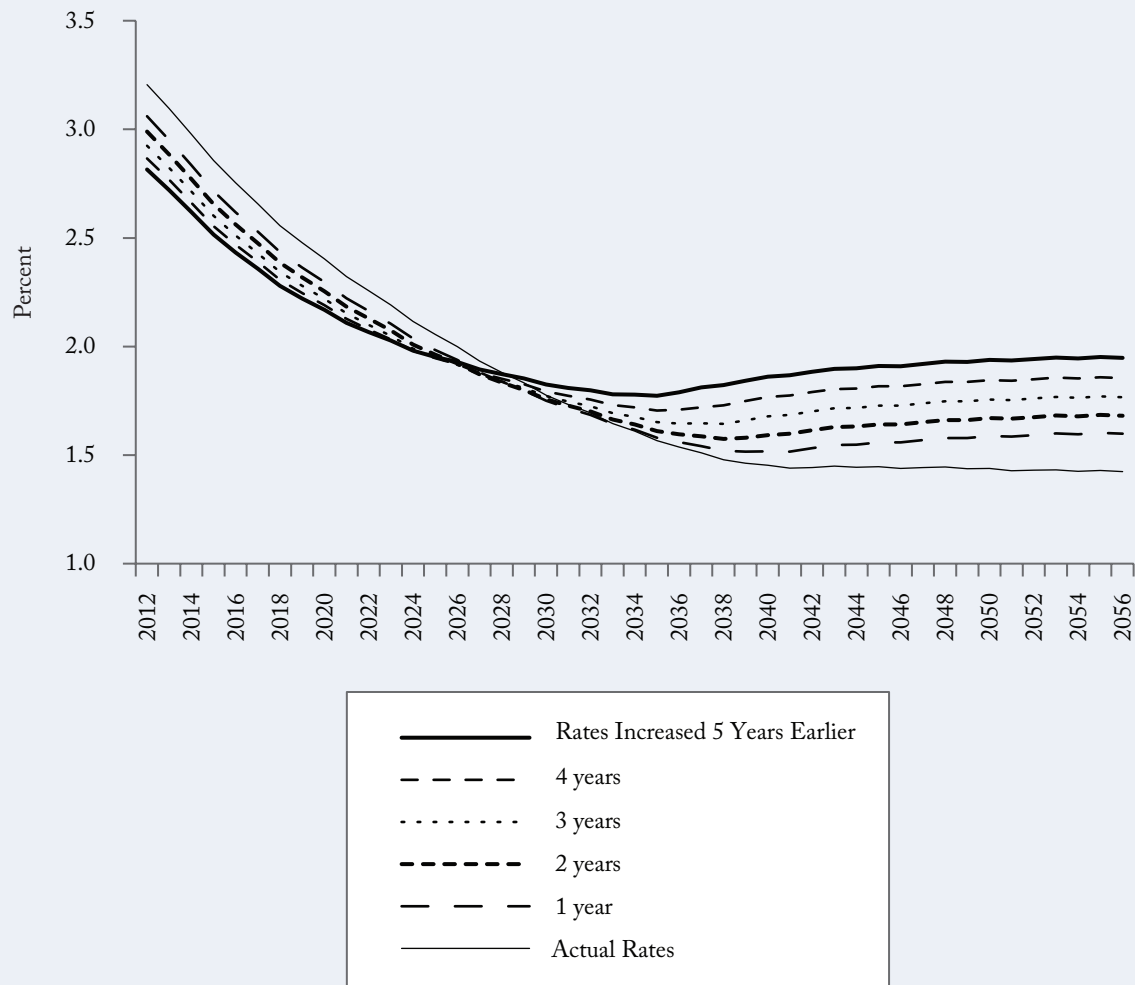
Ultimately, the aim of such mechanisms is to ensure adequate funding for a plan while maintaining equality between the different cohorts of contributors. Below, we compute an example of an automatic adjustment mechanism to illustrate,

retrospectively, the effect it would have had on the QPP's contribution rate and intergenerational equality.

Example of an Automatic Mechanism

The proposed mechanism binds the contribution rate and life expectancy through a constant factor in

Figure 5: Real Internal Rate of Return, Quebec Pension Plan, 2012–56, if the Contribution Rate Had Been Increased Earlier



Source: Authors' calculations.

order to achieve the level of assets expected in 2056. To this end, we used a constant factor of 2.8975 – that is, the contribution rate is equal to the life expectancy of men and women together divided by 2.8975. The mechanism goes into effect in the plan's second year, 1967. Accordingly, the contribution rate varies proportionally to life expectancy. Figure 6 shows the evolution of the resulting contribution

rate. Figure 7 tracks the evolution of the internal rate of return based on this rate and on the actual rate as of 2012 – that is, from the moment the plan reached maturity. The evolution of the internal rate of return is also compared with that obtained with the actual contribution rate and with the evolution of the rate under the scenario in which rate increases are applied five years earlier. We find that,

with the adjustment mechanism, the internal rate of return would have proved higher and more stable over time.

POLICY IMPLICATIONS

This retrospective analysis clearly demonstrates the gains that the QPP would have realized had the recommendations of actuaries and other experts been implemented sooner. Delaying the application of their recommendations generated a considerable shortfall in the plan's assets and significant differences in contributors' returns across generations. The apprehension of the political authorities to change the initial parameters of the plan contributed to inequalities across generations of depositors and, in all likelihood, restricted the growth of the plan's assets.

Therefore, whether there is a possible expansion of the CPP, the introduction of a longevity pension as has been proposed in Quebec, or the establishment of an Ontario Retirement Pension Plan, the past experiences of the QPP and other such plans should be taken into consideration.¹¹ Accordingly, we make the following recommendations.

First, evaluate the relevancy of creating or enhancing a public pension plan. Specific needs might not be addressed efficiently by imposing compulsory contributions on all workers. For instance, both the QPP and the CPP are implicit wage taxes that reduce overall employability. Studies should thus assess whether or not mandatory pension plan contributions are the best way to address problems that might be specific to some workers. For example, improving financial literacy among workers might provide better results at a lower cost.

Second, introduce full capitalization and a gradual increase in benefits. Benefits should be implemented gradually, and be fully effective only once the

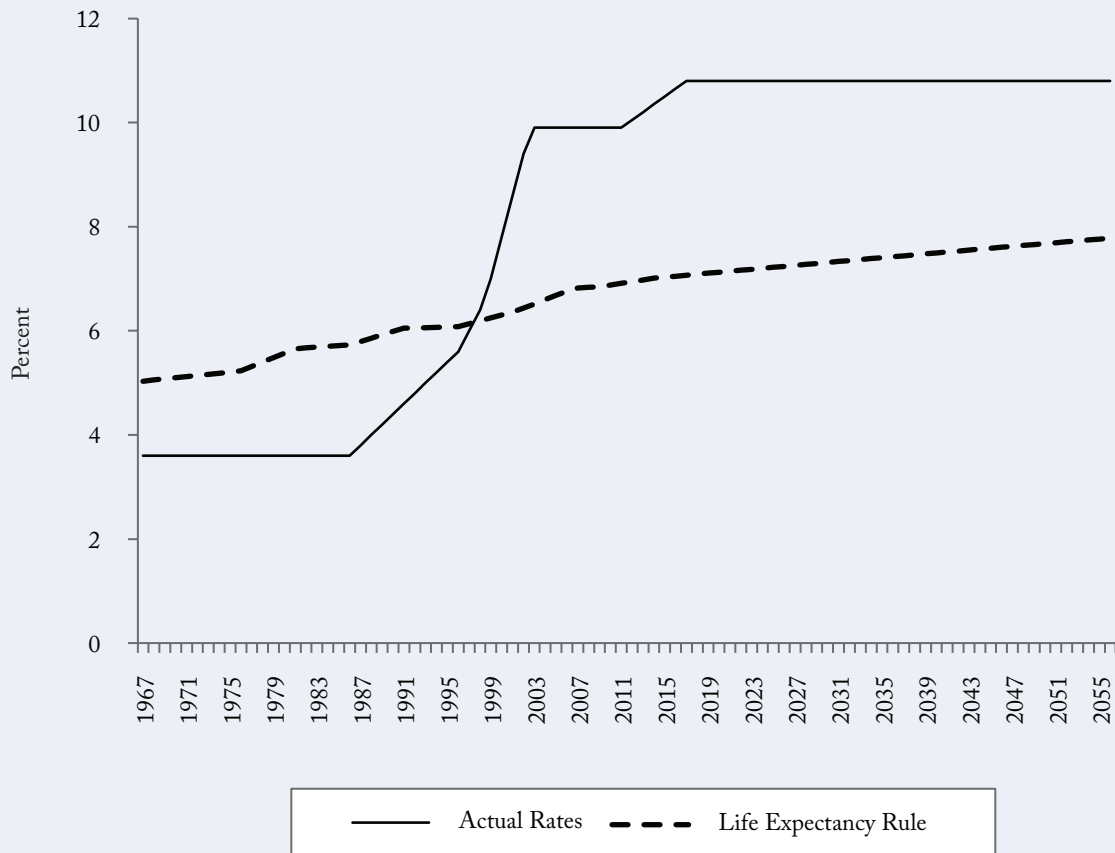
plan has reached full maturity – that is, when the plan has reached 65 minus 18 years of existence and is therefore equal to the full working life of a participant who has then fully contributed to the plan. Any existing or new plans should take into account when beneficiaries are expected to take full advantage of the plan. As well, plans need to be fully funded in order to be equitable among cohorts. Consequently, new benefits should be based on the number of contributed years to the plan.

Third, implement automatic adjustment mechanisms. Adjustments should be triggered once certain levels of funding ratios are attained. All parameters, not just contributions, should enable variations to facilitate proper funding and equitable expected returns between cohorts of retirees. For instance, certain parameters of the proposed Ontario Retirement Pension Plan, such as retirement benefits, earlier or later commencement of retirement benefits and indexation, should be flexible and prone to automatic mechanisms if underfunding or returns discrepancies are expected. Additionally, parameters of the mechanism should be set ex ante by experts independent of political influence.

Fourth, assess the performance of the plan. A performance evaluation of any public pension plan should be mandatory. Surprisingly, however, public plans do not seem to be subject to any such evaluation. They are usually monitored in terms of their fund performance and on their ability to deliver services to their members at a reasonable cost, as measured by the ratio of administrative expenses to the funds under management. However, a critical aspect of public pension plans is not measured – namely, the ability of the fund to deliver homogeneous real expected returns to various cohorts of retirees, and thus to provide equitable net asset values to all its members.

¹¹ Inequity, for instance, is quite present in the CPP; see Godbout, Trudel, and St-Cerny (2014).

Figure 6: Contribution Rate, Quebec Pension Plan, 1967–2056, Assuming an Automatic Adjustment Mechanism



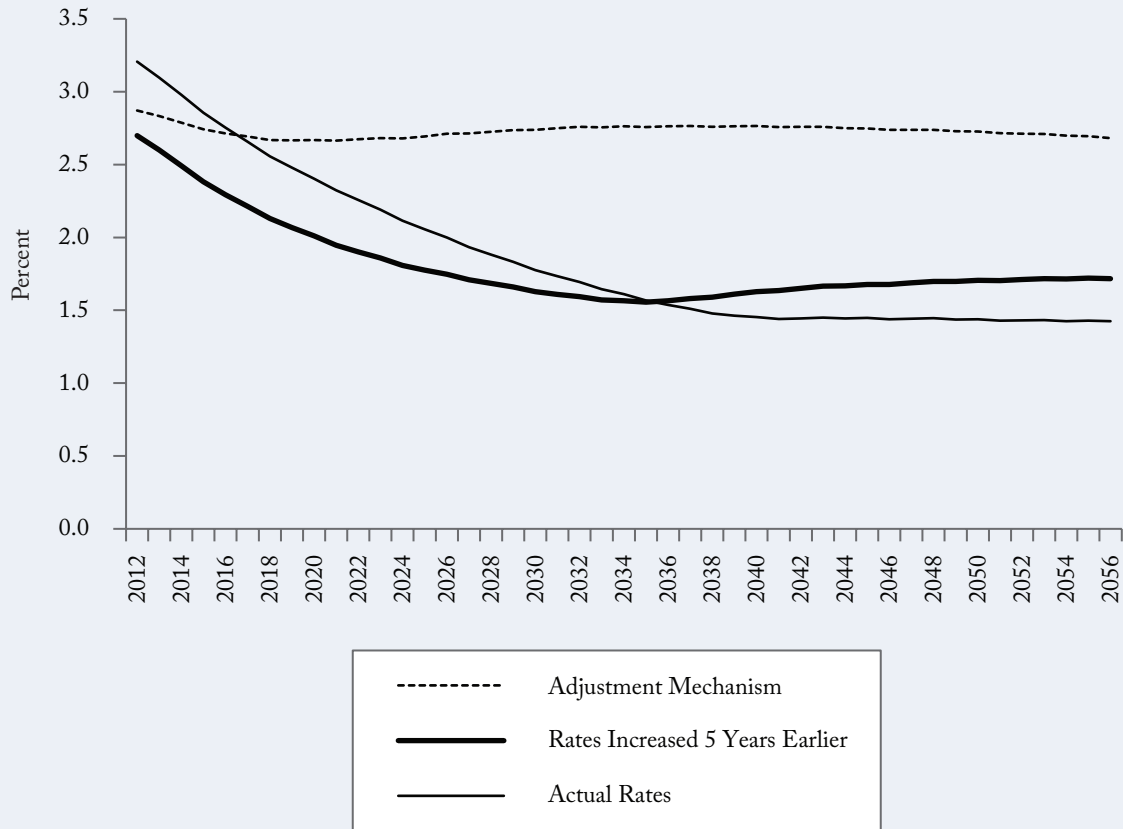
Sources: Quebec, Régie des rentes du Québec, *Analyses actuarielles du Régime des rentes du Québec*, various years; and authors' calculations.

These measures would allow a public pension plan to be a true insurance system in which capitalized contributions equate to actuarial benefits. The QPP, in contrast, has come to be both a pension plan and an implicit wealth-transfer system among cohorts of retirees.

CONCLUSION

The Quebec Pension Plan was born of a compromise. The contribution rate set at inception was too low, which resulted in the plan being undercapitalized in the early years. The demographic outlook came as no surprise: it was

Figure 7: Internal Rate of Return, Quebec Pension Plan, 2012–2056, Assuming an Automatic Adjustment Mechanism



Sources: Quebec, Régie des rentes du Québec, *Analyses actuarielles du Régime des rentes du Québec*, various years; and authors' calculations.

long known that there would be weak growth in the number of contributors and a sharp increase in beneficiaries in the years ahead, and these factors are particularly acute in Quebec.

Adjustments to the contribution rate were too late in coming, and the plan was therefore insufficiently capitalized. Our retrospective analysis shows the gains that would have been realized by listening to actuaries and other experts sooner. The plan's assets react strongly to a change in

the contribution rate. Had the initial rate been 4 percent (as the interministerial committee proposed) instead of 3.6 percent from 1966 to 1987, the plan's assets at the end of 2011 would have been almost 80 percent higher.

As our counterfactual scenarios revealed, the effect of increasing the contribution rate earlier is also evident in the evolution of the assets, in the contribution rate required to maintain the target assets, and in the increased equality between

cohorts and depositors, as measured by the internal rate of return. The application of a simple automatic adjustment rule bound to life expectancy could have substantially levelled out intergenerational inequalities.

This analysis underscores the difficulty of insulating public pension plans against the risk of burdening future generations for the benefit of current political gains. The need for, and potential social benefits of, creating new or enhancing existing public pension plans should be carefully evaluated. New plans or the expansion of existing

plans should be fully capitalized so that full pension benefits can be paid only once the plans reach full maturity (which could take up to 47 years). As well, plans should be subjected to regular independent and professional review of their ability to deliver homogeneous real expected returns across various cohorts of retirees, with predetermined adjustments triggered automatically when conditions change. These measures would greatly help to prevent the creation of greater inequality across generations of depositors.

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