



The Future Financing of the Canada and Quebec Pension Plans: Some Alternative Possibilities

Frank T. Denton
A. Leslie Robb
Byron G. Spencer



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Economic Council of Canada

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The Future Financing of the Canada and Quebec Pension Plans:
Some Alternative Possibilities

Preface

This study is concerned with the financing of the Canada and Quebec Pension Plans over a period extending to the middle of the next century. Interest in this topic has resulted from the realization that a continuation of the current CPP and QPP contribution rates and benefit provisions would lead, within a decade or so, to an excess of benefit payments over contributions. The interest has been heightened by recognition of the large increase in the proportion of the population that will be eligible to receive pension payments when the postwar baby boom reaches retirement age in the second and third decades of the next century.

In the course of this study we relied very heavily on a computer model of the CPP developed by the Canada Department of Insurance. Our use of results based on this model would not have been possible without the full co-operation of Pierre Treuil and Dick Humphries of that Department. We are greatly appreciative of their co-operation. We also appreciate the co-operation provided to us by the staff of the Economic Council of Canada, in particular Peter Cornell and Keith Patterson of the Council's retirement incomes project. We hasten to add, however, that we alone bear responsibility for interpretation of the results and the expression of opinion in this study. The study was completed in September of 1978.

1 Introduction

The Canada and Quebec Pension Plans were established in 1965. Under these plans, nearly all members of the labour force are required to contribute a percentage of their earnings to a fund, thereby accumulating credits toward retirement pensions. The first contributions were made in 1966, and the first benefits were paid in 1967.

As is the case with most pension funds, the funds of the CPP and QPP grew rapidly during their first decade or so of operation, when the flow of contributions far exceeded the flow of benefit payments. The accumulation of surpluses, however, is not expected to continue indefinitely; recent projections suggest that with the continuation of current benefit schemes and current contribution rates, the excess of contributions over benefits would cease in the latter part of the 1980s, and the funds themselves would be exhausted soon after the turn of the century. It therefore appears that some adjustments must be made, either to reduce future benefits or to increase future contributions.

The best way to handle the current surplus and the projected deficits in the funds is a matter of considerable importance. On the one hand are issues of intergenerational equity, which suggest, roughly speaking, that each generation should pay its own way, at least in the sense that subsequent generations should not be subject to markedly higher contribution rates in order to make available a specified level of benefits for those already retired. On the other hand are issues of efficiency and growth. The use of past and future surpluses can have a substantial impact on the current level of national savings and hence on capital formation and the future income-generating capacity of the economy.

In this study we neglect any possible impact of the plans on the national economy, and we focus instead on the impact of changes in the economy

and in the population on the plans and their funding in the future. In particular, we consider alternative ways of funding the plans, under various assumptions regarding the future growth of the population and the labour force, and regarding possible future changes in certain key provisions of the plans themselves.

The vehicle used in addressing questions concerning the future of the plans is a computer simulation model developed in the Department of Insurance, in Ottawa, by Mr. Pierre Treuil and his associates. The model itself is designed to accept assumptions concerning the future macro-economic and macro-demographic environment, and to translate these assumptions into the implications for the annual flows of benefits and contributions, for the stock of loans outstanding to the provinces, and for the flows of interest payments and new loans each year, under the provisions of the plans.

The remainder of this study is organized as follows. The major provisions of the plans are described briefly in Chapter 2, and the experience of the plans during their first decade or so of operation is reviewed. The formulation of assumptions for use in the projections is the topic of Chapter 3. The discussion of the projections starts in Chapter 4, with the "baseline." This case involves a combination of "medium" assumptions about the future growth of both the economy and the population, operating in conjunction with the current benefit provisions of the plans. The "medium" assumption concerning future population growth is modified in Chapter 5, and a variety of cases are considered involving possible alternative courses of population and labour force growth to the year 2050, as well as their implications for financing the plans. The financing implications of changes in certain key benefit provisions are investigated in Chapter 6, and the study concludes in Chapter 7.

2 Provisions of the Plans and the First Decade of Operation¹

The legislation under which the Canada Pension Plan was created provided for the possibility that a provincial government might wish to create a separate and comparable plan within its own jurisdiction and to substitute this for the Canada Pension Plan. Only the Government of Quebec chose this alternative by bringing into existence the Quebec Pension Plan, with provisions quite similar to those of the Canada Pension Plan. Since that time the two have operated simultaneously, with parallel provisions at almost all times, and with allowances for individuals to carry with them their accumulated benefit credits when moving from one jurisdiction to the other. For present purposes, the two plans may be considered effectively as one and will hereafter be referred to simply as "the Plan," where this can be done without confusion.

MAJOR PROVISIONS OF THE PLAN

With few exceptions, individuals whose annual earnings from employment and self-employment are above the basic exemption level (\$900 in 1977) are required to contribute to the Plan. The major exceptions are those who are not between the ages of 18 and 70 and those within this age interval who are beneficiaries under the Plan. All other individuals contribute a fraction of their earnings in excess of the basic exemption level, up to a maximum referred to as the year's maximum pensionable earnings, YMPE. (In 1977 the YMPE was \$9,300.) The difference between the maximum earnings subject to contribution and the basic exemption level is referred to as contributory earnings. On this amount of contributory earnings the Plan now makes a levy of 3.6 per cent. In the case of income from employment, the levy is paid in equal parts by the employer and the employee.

The primary purpose of the Plan is to provide retirement pensions for members of the labour force. For a typical individual who was in Canada from age 18 on or from 1966, whichever came later,

and remained here until retirement, the pension would be determined as the product of 25 per cent of the YMPE, — averaged over the three years ending with his year of retirement, \overline{YMPE} , and the individual's "average earnings ratio," AER . That is, for individual i , who retires in year t , the retirement pension, RP , would be determined as

$$RP_{it} = 0.25 \times \overline{YMPE}_t \times AER_{it}$$

The average earnings ratio, AER , is specific to the individual; it is the ratio of his annual pensionable earnings to the maximum pensionable earnings, averaged over his lifetime contributory period. In symbols,

$$AER_{it} = \frac{1}{T} \sum_{j=1}^T \left[\frac{PE_{i, t-j}}{YMPE_{t-j}} \right]$$

where T is the number of years in the contributory period, and PE is the amount of pensionable earnings — i.e., the individual's earnings, to a maximum of YMPE.

While the contributory period is defined as extending from age 18 or the year 1966, whichever came later, to age 65, not all *annual* earnings ratios need be counted in calculating the AER . First, the lowest 15 per cent of ratios are excluded from the calculation. Second, the individual who chooses to do so may contribute beyond age 65, to a maximum of age 70, and replace annual earnings ratios during the contributory period with later ones, on a one-for-one basis.

For an individual whose income was at average or above-average levels during his contributory period, the value of the AER would be 1.0; hence the pension would be equal to 25 per cent of the \overline{YMPE} . Furthermore, in accordance with recent legislation, the \overline{YMPE} is intended eventually to adjust automatically, although with a lag, to changes in the level of average industrial earnings.

Thus the individual in the example would receive a pension whose initial value would be roughly one-quarter of the average industrial wage. In subsequent years that pension would be adjusted for price inflation but would not otherwise reflect any further advances in average earnings. In other words, the pension is indexed to reflect inflation and thus to remain fixed in "real" terms, but the recipient does not share in any gains in productivity.

One who earned less than the maximum contributory earnings, on average, during the contributory period, would find his pension reduced accordingly. Thus an individual whose *AER* was 0.5 would receive a pension of one-eighth of the \overline{YMPE} .

This summary of the retirement provisions of the Plan neglects many of its complexities. In particular, there were a number of changes introduced during the first 10 years of operation — the phasing-in period — that affect the position of later beneficiaries relative to earlier ones. Our interest is in the future operation of the Plan, however, and we are concerned mostly with provisions that affect future retirements. Even so, there is one provision of transitional legislation with which we must be concerned. That provision concerns the eventual catch-up of maximum pensionable earnings to the average industrial wage.

Under the provisions of the current legislation the *YMPE* is to increase by 12.5 per cent each year, starting with 1976, until it reaches the level of the Statistics Canada industrial composite average weekly wages and salaries for the 12 months ending June 30 of the previous year, adjusted to the level expected to obtain in the current year. Thereafter the *YMPE* is to adjust in accordance with the formula used in constructing the average wage measure, as defined in the Plan.

The formula defining the average wage is of particular interest. Let *AHAT* be the formula average and *AIC_t* the industrial composite average weekly wages and salaries for the 12 months ending June 30 of year *t*. Then

$$AHAT_t = 52 AIC_{t-1} \cdot \left[\frac{AIC_{t-1} + AIC_{t-2} + AIC_{t-3}}{AIC_{t-2\frac{1}{2}} + AIC_{t-3\frac{1}{2}} + AIC_{t-4\frac{1}{2}}} \right]$$

The adjustment factor, in square brackets, is designed to project the known value *AIC_{t-1}*, to obtain an estimate of the unknown value for the current calendar year.

In 1978 the *YMPE* was \$10,400, and *AHAT* was approximately \$14,800. Looking ahead, it is clear that a number of developments are possible. At one

extreme, average wages could grow at a pace so rapid that the *YMPE* would never catch up. At the other extreme, the rate of growth of wages could fall considerably, in which case the *YMPE* would catch up within a relatively few years. At intermediate rates the catch-up will be more or less extended, depending on the actual circumstances: the catch-up period will be longer, the higher the rate at which average wages grow. Under plausible assumptions the catch-up could easily take a decade or more. The reason for emphasizing this particular transitional feature of the Plan's legislation is that it could have a major impact on both the costs of the Plan and the value of the benefits that it provides.

OTHER PLAN BENEFITS

In addition to the retirement pension benefits, the Plan provides for survivors' benefits (including a pension for a surviving spouse, benefits for dependent children, and a lump-sum death benefit) and for disability benefits (including both a pension for a disabled contributor and benefits for dependent children). Inasmuch as our primary interest is in connection with the retirement pension portions of the Plan, we make no attempt to summarize these other provisions here.² Below, however, we do consider the projected total cost of such Plan benefits.

THE FUND AS A WHOLE

Each year since 1966 3.6 per cent of the total amount subject to contribution — i.e., 3.6 per cent of contributory earnings — has been paid into the Plan's fund, and has constituted its major revenue source. Each year since 1967 an amount has been paid out in the form of benefits, and has constituted the major outflow from the fund. During the initial decade of operation the contributions accruing to the fund each year far exceeded the total payment of benefits; hence the fund grew quickly. The surplus accumulating in the CPP fund (after allowance for a reserve) is, under the terms of the legislation, available for borrowing by the provinces in proportion to contributions received. The provinces, in turn, pay interest on their borrowings, the rate on new loans being equal to the current yield on outstanding Government of Canada bonds having at least 20 years to maturity. The resulting interest charges add to any surplus of the fund and thus increase the annual volume of new loans flowing back to the provinces. The total of new loans to the provinces constitutes the "new investments" of the fund. In the case of the QPP, the surplus is invested with the Quebec Deposit and Investment Fund (Caisse de dépôt et placement), an agency of the

provincial government; investments are mostly in bonds issued or guaranteed by the province, or a municipality of the province or by a private corporation.

A statement of account of the operations of the Canada and Quebec Pension Plans during their first decade or so is provided in Table 2-1. The table documents the spectacular growth of the total combined fund, from 0 at its inception on January 1, 1966, to a figure in excess of \$15 billion 11 years later. The near trebling of contributions between its first full year of operation (1966-67 for the CPP and 1966 for the QPP) and the latest year reported reflects both the increase in the general level of earnings in the economy, and the fraction of those earnings subject to contribution. Not only has the maximum earnings subject to contribution been

adjusted to reflect, in a rough way, the general increases in earnings, as discussed earlier, but the amount subject to contribution has been increased by lowering the basic exemption level from 12 per cent of maximum pensionable earnings to 10 per cent, beginning in 1973. In the case of both the CPP and the QPP, the revenues arising from interest earnings have grown even more sharply and constitute close to one-third of the total revenue in the latest period. The enormous growth in interest earnings both reflects and adds to the rapid growth of the fund itself.

The expenditures of the fund consist of benefits paid plus the expenses of administration. In the first fiscal year of CPP operation, the only expenses were those of administration (\$5.5 million), since no benefits were paid. Subsequently the benefit payments

TABLE 2-1

STATEMENT OF ACCOUNT: CANADA PENSION PLAN, 1965-66 TO 1976-77, AND QUEBEC PENSION PLAN, 1966 TO 1976

	Current revenue			Net expenditure				Revenues less expenditures	Balance at end of period
	Contributions	Interest	Total*	Retirement pensions	Survivors' benefits	Disability benefits	Total*		
(Millions of dollars)									
Canada Pension Plan (year ending Mar. 31)									
1965-66	94.9	—	94.9	—	—	—	5.5	89.4	89.4
1966-67	587.2	11.0	599.9	0.1	—	—	8.4	591.5	680.9
1967-68	640.2	42.2	684.7	1.1	0.2	—	12.8	671.9	1,352.8
1968-69	697.6	84.4	785.0	5.4	10.1	—	30.0	755.0	2,107.8
1969-70	745.6	139.7	889.6	17.9	29.9	—	65.1	824.5	2,932.3
1970-71	812.9	202.7	1,020.1	41.0	46.3	4.0	108.7	911.3	3,843.6
1971-72	825.9	272.6	1,102.1	64.2	62.1	19.5	167.3	934.9	4,778.5
1972-73	897.4	341.4	1,243.4	88.7	81.6	35.7	228.9	1,014.5	5,793.0
1973-74	1,019.4	416.0	1,443.4	125.4	100.3	50.6	302.6	1,140.8	6,933.8
1974-75	1,238.8	504.4	1,757.4	188.5	132.7	69.1	428.8	1,328.6	8,262.4
1975-76	1,489.2	621.1	2,129.0	297.2	170.8	93.8	621.6	1,507.4	9,769.8
1976-77	1,684.2	750.2	2,461.6	453.3	214.1	125.1	874.5	1,587.1	11,356.9
Quebec Pension Plan (year ending Dec. 31)									
1966	187.5	4.9	192.4	—	—	—	5.9	186.6	186.6
1967	224.0	18.3	242.3	0.2	—	—	7.1	235.2	421.8
1968	236.2	34.6	270.9	1.1	2.6	—	11.6	259.3	681.1
1969	270.5	54.9	331.5	3.9	8.7	—	20.9	310.6	991.7
1970	283.4	79.7	365.1	10.3	15.4	0.4	36.2	328.9	1,320.6
1971	286.4	104.8	403.5	17.6	22.6	3.4	50.9	352.6	1,673.2
1972	321.3	132.4	466.5	23.7	28.7	6.1	71.1	395.5	2,068.7
1973	361.3	162.9	541.0	33.3	52.6	14.1	123.6	417.5	2,486.3
1974	403.8	207.1	611.1	48.8	67.0	20.9	159.3	451.8	2,891.5
1975	478.9	253.0	731.9	69.2	86.6	28.1	209.0	523.0	3,414.5
1976	574.2	317.5	891.7	115.2	111.3	39.8	290.5	601.2	4,015.7

*The "total" includes components other than those shown.

SOURCE Statistics Canada, *Social Security, National Programs*, (Cat. No. 86-201), Chapter 1, Section D, Tables 7 and 11 of 1976 issues, and Chapter 1, Section D, Tables 2 and 6 of 1978 issue.

have grown sharply, though they amounted, in total, to only slightly over one-half of the contributions in 1976-77.

The benefits paid consist of retirement pensions, survivors' benefits (including pensions to surviving spouses, death benefits, and orphans' benefits), and disability benefits (including disability pensions and children's benefits). The growth of major benefit types is documented in Table 2-1. The first retirement pensions under the Plan were paid in 1967, and the first full retirement pensions were paid in 1976. The first survivors' benefits were paid in 1968, and the first disability benefits, in 1970.

In the case of the CPP, survivors' benefits were generally in excess of the retirement benefits until the fiscal year 1971-72. Since then, retirement benefits have been the larger component, and these have increased rapidly. In 1976-77, they constituted more than one-half of total expenditures by the CPP. In the case of the QPP, however, retirement pension payments have not grown quite so rapidly, relative to total expenditures. This appears to stem, in part, from the markedly higher level of the flat-rate portion of disability pensions and of pensions payable to widows and to disabled widowers under age

65, who have been covered under the QPP since 1973. In any event, retirement pensions accounted for considerably less than half of the total expenditures by the QPP in 1976.

The CPP fund — the balance at the end of each period — is, except for the estimated amount needed to pay benefits and administrative costs over a three-month period, the amount that has been made available to the provinces for borrowing. In total, the amount borrowed in this way is large relative to the level of the provincial debt. At the end of the 1976-77 fiscal year, for example, CPP funds invested in provincial government securities amounted to 18.1 per cent of the total provincial government debt in the Atlantic provinces, 33.7 per cent in Ontario, 30.5 per cent in the Prairie provinces, and 26.2 per cent in British Columbia. In addition, the QPP fund investments amounted to 32.6 per cent of Quebec's provincial debt. Under present arrangements, the provinces are required to repay these loans when the funds are needed to meet the obligations of the Plan. Such repayments could have a major impact on provincial finances if they had to be made within a short time, especially if the timing of the repayments were not fully anticipated.

3 The Formulation of Assumptions for Projections

In the preceding chapter we outlined some of the major provisions of the CPP and QPP and discussed the main items in the overall accounting of these plans in their first decade or so of operation. The purpose of this chapter is to lay the foundation for a subsequent analysis of the long-run prospects for these plans. As before, we shall refer to "the Plan," but this should be interpreted to mean both the CPP and the QPP, unless otherwise stated.

To undertake projections requires 1/ a model of the existing Plan, 2/ assumptions concerning the macro-economic and macro-demographic environment in which the Plan will operate, and 3/ a specification of the links between the macro-environment and the Plan. The Canada Department of Insurance has developed a computer-based model of the CPP which, with appropriate simplifying assumptions, can be used to make projections of the future course of both the CPP and QPP, taken together, as far into the future as the year 2050. We have made extensive use of this model here.

The Department of Insurance model requires from the user assumptions concerning future age-specific fertility rates, age/sex-specific mortality rates, and the annual numbers of immigrants and emigrants. Based on these assumptions, the model generates annual population projections by age and sex, using a recent actual population of Canada as a starting point. Use of the model also requires assumptions concerning the future rate of growth of average wages and salaries and of the consumer price index and concerning the rate of interest to be applied to new fund loans. These assumptions taken together determine the basic character of the macro-environment in which the Plan will operate. While the environment has an impact on the Plan, the Plan itself is assumed to have no impact whatsoever on the environment — that is, on the population or on the economy. Further assumptions relating more specifically to the coverage and provisions of the Plan are required as well.

ASSUMPTIONS CONCERNING PARTICIPATION RATES, AVERAGE CONTRIBUTIONS, AND BENEFICIARY RATES

To contribute to the Plan in any given year — that is, to "participate" in the Plan — an individual must have income from earnings or from self-employment that is above the basic exemption level; thus plan participation is closely linked to labour force participation. We make use of this relationship to project the Plan participation rates. Specifically, we project Plan participation rates as follows:

$$(1) \quad PR_{it} = \left[\frac{PR(CPP)_i, 1973}{LFPR_{i, 1973}} \right] \cdot LFPR_{it}$$

where

PR is the participation rate in the Plan (CPP and QPP, combined);

$PR(CPP)$ is the participation rate in the CPP;

$LFPR$ is the labour force participation rate;

i refers to a particular age-sex group;

t refers to a year in the projection period.

Thus the Plan participation rate for a particular age-sex group in year t is its projected labour force participation rate for that year, adjusted by the ratio of its (Canada Pension) Plan to labour force participation rate in 1973. (The year 1973 was the most recent year for which both series were available.) The projections of labour force participation rates are based on a study by Denton, Feaver, and Spencer.¹

The actual amount of the contributions from each age-sex group depends on the allocation of the overall growth of average wages among age-sex groups, as well as on future changes in the level of maximum pensionable earnings and the basic exemption level. As discussed in the previous chapter, there are legislative provisions relating to the

latter two figures, in accordance with which they are intended eventually to grow in line with average earnings. The model incorporates these provisions.

The future age-sex distribution of overall wage increases depends on the future supply of individuals of each age and sex and also on the demand for their labour services. However, a simplifying and not unreasonable assumption, and the one made by the Department of Insurance, is that the average wage of each age-sex group will grow at the overall average rate, allowing for an adjustment such that the wage level of women will eventually catch up to that of men.

On the benefits side, assumptions are required concerning the proportion of contributors in each age-sex group, as well as the proportion of their spouses and dependants who will receive benefits under the retirement provisions of the Plan and under each of the various survivors' benefits and disability benefits programs. Historical estimates of these proportions have been prepared by the Department of Insurance, and assumptions have been made about their future values. We have accepted the Department of Insurance projections of these rates.

POPULATION ASSUMPTIONS²

The Department of Insurance model projects the population by age and sex, starting from a given initial population, based on assumptions concerning future rates of fertility, mortality, immigration, and emigration.

Fertility — As is well known, the total fertility rate — the sum of age-specific rates — departed, in the 1940s, from a long term-downward trend. It increased during and after the Second World War, rising from about 2.7 children per woman of child-bearing age at the beginning of the War to almost 4 children at the end of the 1950s. Since that time the rate has declined precipitously; in 1975 (the latest year for which a figure was available at the time of writing) it was a little under 1.9. The rate was thus well below the long-run replacement level (which is somewhat over 2) and the lowest ever recorded in Canada.

Inasmuch as the reasons for fluctuations in fertility rates are not well understood, no one can be confident of what the rates will be in the future. In these circumstances it is therefore common practice to experiment with a range of assumptions. This we do in the next chapter, taking as a "medium" case a gradual return of the total fertility rate to approxi-

mately the replacement level. In addition, we consider cases involving "high" fertility and "low" fertility assumptions.

Mortality — One might expect that future changes in mortality rates would be of particular importance to the costs of operating the Plan: greater longevity implies a larger population of pensioners and benefits that are payable to an older age, on average.

Mortality rates for almost all age-sex groups in Canada have been declining for many decades, and further declines can be expected with some confidence. Of course, the extent of decline cannot be known in advance, but a reasonable assumption is that past trends will continue. In implementing this assumption we have made use of mortality rates drawn from the Statistics Canada life tables for periods centred on 1951 and 1971. In our "medium" case, we assume that the percentage change in the mortality rate for each age-sex group over the two-decade period ending in 1971 will continue for a further two decades to 1991; the rates are then assumed to change at half that speed for two more decades, to 2011, and to remain constant thereafter. In addition, we make "high" and "low" mortality assumptions, as discussed in the next chapter.

Immigration and Emigration — The movement of people into and out of Canada has played a major role in the growth of the Canadian population. Net immigration may, however, play a less important role in the years ahead, though obviously no one can be certain.

In the case of immigration, we have again made "medium," "high," and "low" assumptions. The "medium" assumption involves annual immigration at a level of 120,000, starting in 1977, while "high" immigration involves a smooth transition from the 1977 level of 120,000 to 180,000 annually by 1981; "low" immigration involves a transition to 60,000 by 1981. With respect to emigration, we make a single assumption — namely, a constant annual rate of 40,000.

ECONOMIC ASSUMPTIONS

As noted above, the use of the Department of Insurance model requires assumptions about the future rate of growth of average wages and of the consumer price index, as well as an assumption regarding the future rate of interest on new loans to the provinces.

One cannot expect the future growth of (money) wages to be unrelated to the future growth of prices. Nor will the interest rate be unrelated to other rates

of interest or to future price inflation. In an attempt to take into account the interconnections among these variables, we have estimated equations relating the rate of growth of money wages to the rate of growth of prices (as measured by the Statistics Canada consumer price index) and the rate of interest on new fund loans to the rate of growth of prices.

In the case of wages, the following equation was estimated, using data for the period 1954-55 to 1975-76:

$$(2) \quad \dot{W}_t = 2.9711 + 0.9187 \dot{CPI}_t$$

(6.19) (9.05)

$$\bar{R}^2 = 0.79$$

where

\dot{W}_t is the annual percentage rate of growth of the industrial composite average weekly earnings from year $t-1$ to year t ;

\dot{CPI}_t is the annual percentage rate of growth of the consumer price index from year $t-1$ to year t ;

R^2 is the coefficient of determination, adjusted for degrees of freedom; and the values in parentheses are t -ratios.

Some implications of the equation may be noted. It suggests that about 92 per cent of a percentage change in the CPI is reflected in wage change. In addition, there is an exogenous component in the growth of wages that is just short of 3 per cent; that is, even at zero inflation in the CPI, average wages would grow at an annual rate of 2.97 per cent — a rough measure of labour productivity growth.

In the estimation of the interest rate relationship, the historical series relating to the rate charged for new loans by the CPP is so short (dating only from 1966) that we deemed it advisable to employ the following two-stage procedure. At the first stage, we selected as the dependent variable not the rate on new fund loans, but instead a similar rate for which a longer historical series is available — namely, the McLeod, Young, and Weir average annual yield on ten provincial bonds. The estimated equation, which is based on annual data for the period 1954-55 to 1975-76, is then:

$$(3) \quad i_{m,t} = 1.15 + 0.18 \dot{CPI}_t + 0.77 i_{m,t-1}$$

(2.97) (3.53) (9.94)

$$\bar{R}^2 = 0.95$$

where i_m is the McLeod, Young and Weir rate.

Economic theory suggests that the interest rate will adjust to the *expected* (future) rate of inflation rather than to the actual (past) rate. The inclusion of the lagged value of the dependent variable on the right side of the equation makes allowance for changing expectations, based on a simple geometric distributed lag.

If the rate of inflation were to be constant, the rate of interest would approach constancy also. In this case, the current and lagged values of i_m would be the same, and a "long-run" or "equilibrium" version of the above equation would be

$$(4) \quad i_m = 4.94 + 0.76 \dot{CPI}$$

This latter equation suggests that a sustained zero rate of inflation would be consistent with a continued long-term interest rate of 4.94 per cent; every sustained percentage-point increase in the rate of inflation would add three-quarters of a percentage point to the interest rate.

Inasmuch as the projection model with which we are working requires assumptions specifically about the interest rate on new fund loans (rather than the McLeod, Young, and Weir rate), we have estimated a second equation, based on data for the period 1966-76, to translate i_m into the fund rate, i_f :

$$(5) \quad i_{f,t} = -0.06 + 0.88 i_{m,t}$$

(0.14) (16.5)

Armed with equation (2), which links the average annual rate of wage change to the consumer price index, equation (4), which links sustained (or long-run) CPI changes to the McLeod, Young, and Weir average interest rate, and equation (5), which links the McLeod, Young, and Weir rate to the fund rate on new investments, we can make a mutually consistent selection of assumptions. We proceed as follows: First, we assume a rate of inflation for the period 1984-85 and thereafter. That assumed rate is translated into an assumption about the 1985 McLeod, Young, and Weir interest rate, using equation (4), and then into a 1985 fund interest rate, using equation (5). Values of i_f for the period 1977 to 1984 are obtained by linear interpolation between the observed 1976 and assumed 1985 values. Similarly, the CPI percentage changes for the period 1977-78 to 1983-84 are obtained by linear interpolation between the observed 1976-77 and the assumed 1984-85 values. Finally, the 1984-85 value of \dot{W} is obtained from equation (2), and earlier values again are obtained by linear interpolation.

As the above description indicates, the key variable in making the set of assumptions about the

economic future is the rate of change of the consumer price index. Any assumption about that one variable determines the values of the remaining economic variables throughout the projection period. Because of the short time available in which to complete this study, we are able to report here on the results associated with only one set of assumptions concerning the economic future. The key

assumption is that the rate of increase of the consumer price index will fall between now and 1985 and that it will grow at a steady rate of 4 per cent per year from that time on. As a consequence, the rate of growth of average money wages will also fall, reaching 6.7 per cent in 1985, and the government long-term interest rate will decline to 7 per cent by the same year.

4 Baseline Projection Results

The combination of all the "medium" assumptions about the demographic, economic, and participation rate variables, as described in the previous chapter, yields our "baseline" set of projections. In the next chapter we consider deviations from the baseline case by varying the assumptions pertaining to the demographic variables and to the Plan participation rate. The baseline case, in addition to being of interest in itself, provides a standard against which to compare results based on the alternative assumptions.

Tables 4-1A, 4-1B, and 4-1C provide a summary of the baseline results. In Table 4-1A are recorded values for a selection of population and Plan variables for the period 1975-2050; values are provided at 10-year intervals after 1980. Appearing first in the table are the population figures. Under the medium assumptions about fertility rates, mortality rates, and immigration, the population grows from 23.3 million in 1975 to 31.2 million at the turn of the century and to 40.2 million by the middle of the next century; over the full 75-year period, the population increases by about 73 per cent. During the same period, the population aged 65 and over increases more than threefold, from less than 2 million in 1975 to 6.8 million in 2050. It is noteworthy that the most substantial increases are projected to occur in the second and third decades of the next century: an increase of about 1.3 million is projected for each of those two decades.

The projected number of retirement beneficiaries under the Plan is recorded next — for males, females, and the two combined — followed by the fraction of the population receiving benefits. The numbers suggest that both male and female recipients will grow rapidly in the near future. In another decade some 90 per cent of all males aged 65 and over will be recipients of pension benefits, and about half of all females.

The cost of these benefits is, of course, also expected to rise. An indicator of their cost in "real"

terms is provided by expressing benefits as a percentage of projected contributory earnings. This is a convenient measure, since it represents the tax rate that would have to be imposed on the contributory earnings base (as defined by statute) in order to meet the retirement pension costs if the Plan were financed on a pay-as-you go basis. Expressed in this way, pension costs under the Plan are projected to rise fairly steadily, from 1.5 per cent of contributory earnings in 1975 to 5.3 per cent at the turn of the century. Thereafter rather sharper increases are projected for a period of three decades, with the ratio reaching a peak of 9.3 per cent in about 2030 and then falling back somewhat.

The projected maximum pensionable earnings figure, YMPE, appears next in the table, followed by the average industrial composite earnings, both expressed in 1975 constant dollars. (Average earnings are calculated according to the formula for *AHAT* presented in Chapter 2.) As can be seen, the YMPE reaches the level of average earnings by about 1985 under the medium assumptions, which imply a 4 per cent annual increase in the CPI by 1984-85 and a 6.65 per cent annual increase in average wages. After 1985, the YMPE runs a little ahead of average earnings because of the manner in which the two are calculated; by 2050, the YMPE is ahead by about 3 per cent.

At the bottom of Table 4-1A we have the projected average retirement benefit for males, for females, and for both combined, expressed first in 1975 constant dollars and then relative to maximum pensionable earnings. The value of the average pension is projected to grow throughout most of the period, both in constant dollar terms and relative to maximum pensionable earnings. The exceptions come in the decades after 2030, when the changing age distribution results in a smaller number of new pensioners relative to old, and hence a reduction in the value of the average pension relative to average earnings. It is noteworthy that average pensions are

TABLE 4-1A

CANADA'S POPULATION, AND CANADA AND QUEBEC PENSION PLAN VALUES¹—PROJECTION 1

	1975	1980	1990	2000	2010	2020	2030	2040	2050
	(Thousands)								
Population									
Total	23,291	24,872	28,212	31,229	33,791	36,080	37,771	39,027	40,151
Aged 65 and over	1,990	2,309	2,886	3,533	4,156	5,488	6,772	6,655	6,804
Retirement beneficiaries									
Total									
Male	655	765	1,119.0	1,359.0	1,593.0	2,124.0	2,602.0	2,479.0	2,563.0
Female	349	416	854.4	1,355.9	1,901.9	2,814.5	3,628.3	3,667.3	3,721.7
Both	1,004	1,181	1,973.4	2,714.9	3,494.9	4,938.5	6,230.3	6,146.3	6,284.7
	(Per cent)								
As a proportion of population aged 65 and over									
Male	75.72	78.06	93.72	97.42	97.97	97.93	97.93	97.98	97.94
Female	31.02	31.33	50.50	63.42	75.17	84.80	88.17	88.90	88.89
Both	50.45	51.17	68.38	76.84	84.09	89.99	92.00	92.36	92.37
Cost of Plan relative to total contributory earnings									
Retirement pensions									
Male	.54	1.21	1.76	2.18	2.46	3.19	3.71	3.23	3.25
Female	.15	.47	.90	1.31	1.68	2.56	3.33	3.18	3.24
Both	.69	1.68	2.66	3.49	4.14	5.75	7.04	6.41	6.49
Total benefits	1.48	2.83	4.24	5.31	6.15	7.96	9.31	8.68	8.72
	(Dollars)								
Maximum pensionable earnings	7,400	9,346	15,595	20,090	25,840	33,239	42,754	54,985	70,718
Average individual composite earnings	9,939	11,577	15,140	19,472	25,043	32,207	41,421	53,272	68,513
Average retirement benefit									
Male	443	1,156	2,087	3,015	4,042	5,190	6,466	7,980	10,254
Female	231	820	1,393	1,813	2,320	3,139	4,155	5,294	7,022
Both	369	1,038	1,786	2,415	3,105	4,021	5,120	6,377	8,340
	(Per cent)								
Average retirement benefit relative to maximum pensionable earnings									
Male	5.98	12.37	13.38	15.01	15.64	15.61	15.12	14.51	14.50
Female	3.12	8.77	8.93	9.02	8.98	9.44	9.72	9.63	9.93
Both	4.99	11.10	11.45	12.02	12.02	12.10	11.98	11.60	11.79

¹ Money values expressed in 1975 dollars.

never more than 12.1 per cent of average earnings throughout the projection period. Even for males, the average pension benefit ranges only between 11.8 and 15.6 per cent of average earnings. In circumstances of continued economic growth, such as projected here, only newly retired persons could receive a pension as high as 25 per cent of the average wage, and only those who had earnings at or above the average earnings level throughout most

of their working lives would receive a pension that high. The low relative value of pension benefits should therefore come as no surprise.

In the following two tables the projected values of the combined operations of the Canada and Quebec Pension Plans are provided under a variety of alternative financing arrangements, and assuming a continuation of the benefit provisions now

available. Thus the series for "total benefits" is the same for each of the alternative financing arrangements considered. For each of these arrangements we present, in Table 4-1B, the contribution rate, the total contributions, the total benefits, the interest earnings on the loans outstanding to the provinces, the new loans to the provinces, and the accumulated value of the fund. All money values are expressed in 1975 constant dollars. In Table 4-1C the same series

are provided, except that the total benefits, interest earnings, new loans, and value of fund are expressed as a multiple of projected annual contributions.

Six alternative financing schemes are considered, and we discuss each in turn. Scheme A involves a continuation of the current contribution rate of 3.6 per cent. In this projection the benefits exceed contributions by the latter part of the 1980s.

TABLE 4-1B

PROJECTED CANADA AND QUEBEC PENSION PLAN VALUES¹ UNDER ALTERNATIVE ASSUMPTIONS ABOUT FINANCING ARRANGEMENTS—PROJECTION 1

	1975	1980	1990	2000	2010	2020	2030	2040	2050
	(Per cent)								
<i>A. Current plan</i>									
Contribution rate	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
	(\$ billion)								
Contributions	1.9	2.6	4.8	6.8	9.4	12.4	16.3	22.0	29.1
Total benefits	.8	2.1	5.6	10.0	16.1	27.5	42.2	53.1	70.4
Interest earnings	.9	1.8	3.9	2.7	0.0	0.0	0.0	0.0	0.0
New loans to provinces	2.0	1.8	1.0	-2.4	0.0	0.0	0.0	0.0	0.0
Value of fund	12.8	17.5	25.0	10.2	-41.5	-179.5	-480.1	-973.4	-1706.4
	(Per cent)								
<i>B. Net contributions not negative</i>									
Contribution rate	3.60	3.60	4.24	5.31	6.15	7.96	9.31	8.68	8.72
	(\$ billion)								
Contributions	1.9	2.6	5.6	10.0	16.1	27.5	42.2	53.1	70.4
Total benefits	.8	2.1	5.6	10.0	16.1	27.5	42.2	53.1	70.4
Interest earnings	.9	1.8	4.1	7.8	15.1	29.7	58.5	115.0	226.3
New loans to provinces	2.0	1.8	1.9	2.5	3.2	4.3	5.7	7.6	10.1
Value of fund	12.8	17.5	27.1	37.1	49.4	65.6	87.2	115.9	154.0
	(Per cent)								
<i>C. Net contributions plus interest earnings not negative</i>									
Contribution rate	3.60	3.60	3.60	4.64	5.83	7.79	9.22	8.63	8.69
	(\$ billion)								
Contributions	1.9	2.6	4.8	8.7	15.3	26.9	41.8	52.8	70.2
Total benefits	.8	2.1	5.6	10.0	16.1	27.5	42.2	53.1	70.4
Interest earnings	.9	1.8	3.9	4.0	4.0	4.0	4.0	4.0	4.0
New loans to provinces	2.0	1.8	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Value of fund	12.8	17.5	25.0	17.9	12.1	8.2	5.5	3.7	2.5
	(Per cent)								
<i>D. Flat contribution rate yielding nil fund in 2050</i>									
Contribution rate	3.60	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57
	(\$ billion)								
Contributions	1.9	4.8	8.7	12.4	17.2	22.7	29.8	40.2	53.1
Total benefits	.8	2.1	5.6	10.0	16.1	27.5	42.2	53.1	70.4
Interest earnings	.9	2.3	10.1	26.2	58.6	108.6	146.8	135.5	20.4
New loans to provinces	2.0	4.4	7.8	10.7	13.6	10.9	1.9	-4.0	-16.4
Value of fund	12.8	23.9	71.0	127.5	192.3	236.2	209.7	126.8	.9

TABLE 4-1B (Concl'd)

PROJECTED CANADA AND QUEBEC PENSION PLAN VALUES¹ UNDER ALTERNATIVE ASSUMPTIONS ABOUT FINANCING ARRANGEMENTS—PROJECTION I

	1975	1980	1990	2000	2010	2020	2030	2040	2050
	(Per cent)								
<i>E. Flat contribution rate yielding constantly growing fund</i>									
Contribution rate	3.60	6.94	6.94	6.94	6.94	6.94	6.94	6.94	6.94
	(\$ billion)								
Contributions	1.9	5.1	9.2	13.1	18.2	23.9	31.4	42.5	56.0
Total benefits	.8	2.1	5.6	10.0	16.1	27.5	42.2	53.1	70.4
Interest earnings	.9	2.4	10.9	29.1	67.3	131.7	203.6	269.8	329.7
New loans to provinces	2.0	4.7	8.7	12.3	16.4	15.5	9.1	7.2	.3
Value of fund	12.8	24.7	76.7	142.1	221.4	288.0	295.6	263.8	213.6
	(Per cent)								
<i>F. 1977 debts forgiven, flat rate for nil fund in 2050</i>									
Contribution rate	3.60	6.78	6.78	6.78	6.78	6.78	6.78	6.78	6.78
	(\$ billion)								
Contributions	1.9	5.0	9.0	12.7	17.8	23.4	30.7	41.5	54.7
Total benefits	.8	2.1	5.6	10.0	16.1	27.5	42.2	53.1	70.4
Interest earnings	.9	.7	7.3	21.7	51.5	98.1	132.7	120.5	16.4
New loans to provinces	2.0	3.4	6.8	9.6	12.7	10.1	1.5	-3.7	-14.9
Value of fund	12.8	8.9	52.6	106.3	169.6	213.5	189.2	112.7	-.5

¹ Money values expressed in 1975 dollars.

TABLE 4-1C

PROJECTED CANADA AND QUEBEC PENSION PLAN VALUES EXPRESSED RELATIVE TO CONTRIBUTIONS, UNDER ALTERNATIVE ASSUMPTIONS ABOUT FINANCING ARRANGEMENTS—PROJECTION I

	1975	1980	1990	2000	2010	2020	2030	2040	2050
	(Per cent)								
<i>A. Current plan</i>									
Contribution rate	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
	(Ratio)								
Total benefits	.41	.79	1.18	1.48	1.71	2.21	2.59	2.41	2.42
Interest earnings	.44	.48	.38	.13	0.00	0.00	0.00	0.00	0.00
New loans to provinces	1.03	.70	.20	-.35	0.00	0.00	0.00	0.00	0.00
Value of fund	6.60	6.67	5.22	1.50	-4.40	-14.45	-29.44	-44.20	-58.70
	(Per cent)								
<i>B. Net contributions not negative</i>									
Contribution rate	3.60	3.60	4.24	5.31	6.15	7.96	9.31	8.68	8.72
	(Ratio)								
Total benefits	.41	.79	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Interest earnings	.44	.48	.34	.25	.20	.16	.14	.14	.14
New loans to provinces	1.03	.70	.34	.25	.20	.16	.14	.14	.14
Value of fund	6.60	6.67	4.82	3.71	3.06	2.39	2.07	2.18	2.19

TABLE 4-1-C (Concl'd)

PROJECTED CANADA AND QUEBEC PENSION PLAN VALUES EXPRESSED RELATIVE TO CONTRIBUTIONS, UNDER ALTERNATIVE ASSUMPTIONS ABOUT FINANCING ARRANGEMENTS—PROJECTION 1

	1975	1980	1990	2000	2010	2020	2030	2040	2050
	(Per cent)								
<i>C. Net contributions plus interest earnings not negative</i>									
Contribution rate	3.60	3.60	3.60	4.64	5.83	7.79	9.22	8.63	8.69
	(Ratio)								
Total benefits	.41	.79	1.18	1.15	1.06	1.02	1.01	1.00	1.00
Interest earnings	.44	.48	.38	.15	.06	.02	.01	.00	.00
New loans to provinces	1.03	.70	.20	0.00	0.00	0.00	0.00	0.00	0.00
Value of fund	6.60	6.67	5.22	2.05	.79	.30	.13	.07	.04
	(Per cent)								
<i>D. Flat contribution rate yielding nil fund in 2050</i>									
Contribution rate	3.60	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57
	(Ratio)								
Total benefits	.41	.43	.65	.81	.94	1.21	1.42	1.32	1.33
Interest earnings	.44	.34	.54	.67	.73	.69	.48	.22	.02
New loans to provinces	1.03	.91	.90	.86	.79	.48	.06	-.10	-.31
Value of fund	6.60	4.98	8.14	10.32	11.17	10.42	7.04	3.15	.02
	(Per cent)								
<i>E. Flat contribution rate yielding constantly growing fund</i>									
Contribution rate	3.60	6.94	6.94	6.94	6.94	6.94	6.94	6.94	6.94
	(Ratio)								
Total benefits	.41	.41	.61	.77	.89	1.15	1.34	1.25	1.26
Interest earnings	.44	.33	.55	.71	.79	.79	.63	.42	.26
New loans to provinces	1.03	.92	.94	.94	.90	.65	.29	.17	.01
Value of fund	6.60	4.87	8.32	10.89	12.18	12.02	9.40	6.22	3.81
	(Per cent)								
<i>F. 1977 Debts forgiven, flat rate for nil fund in 2050</i>									
Contribution rate	3.60	6.78	6.78	6.78	6.78	6.78	6.78	6.78	6.78
	(Ratio)								
Total benefits	.41	.42	.63	.78	.91	1.17	1.37	1.28	1.29
Interest earnings	.44	.11	.38	.54	.62	.61	.42	.19	.01
New loans to provinces	1.03	.69	.75	.76	.71	.43	.05	-.09	-.27
Value of fund	6.60	1.80	5.85	8.34	9.55	9.13	6.16	2.72	-.01

The projected high level of interest earnings (2.9 billion in 1985) accruing to the fund as a result of its earlier loans to the provinces permits still more new loans, but by 1985 their projected value is less than the amount of interest payable. The amount of new loans declines further by 1990 and becomes negative by 1995, by which time the value of the fund itself starts to decline. For a further decade or so the provinces continue to repay the loans outstanding in the amounts necessary to meet each

year's shortfall of benefits over revenues. By 2010 the value of the fund is negative and, under the assumptions of the projection, its deficit increases rapidly, reaching more than \$1,700 billion by 2050! (The calculation assumes that in order to meet its annual operating deficit the fund, or the government on its behalf, borrows, on the open market, as required, at the government long-term rate.) Much the same information is obtained when the Plan values are expressed as a multiple of contributions,

as in Table 4-1C. Thus we find that benefits are projected to amount to 94 per cent of contributions by 1985 and to 118 per cent by 1990, and to continue to grow rapidly thereafter. Interest earnings decline, relative to contributions, from a projected peak of 48 per cent in 1980 to 0 per cent by 2010. It is projected that the provinces in 1990 will be granted loans amounting to about 20 per cent of total contributions. By 1995, though, their repayment of loans outstanding will equal 7 per cent of contributions; by 2000, they will equal 35 per cent. By 2010 all loans will have been repaid, and the deficit of the fund will increase annually by the excess of benefits over contributions plus the interest costs associated with the deficit financing and the administrative costs of operating the Plan. Whereas the projected value of the fund in 1980 peaks at 6.67 times the annual contributions, it falls continuously thereafter, to zero in the first decade of the next century and to a projected deficit the equivalent of more than 58 years of contributions by the year 2050!

There are, of course, many ways to avoid deficits in the fund and, at the same time, continue to make benefit payments in accordance with the current legislation. The most obvious possibilities involve raising the contribution rate, expanding the earnings base subject to contributions, or both. In the alternatives considered here the earnings base, as described in Chapter 2, is assumed not to change; instead, the implications of a variety of rules concerning contribution rates are considered.

In scheme B, the rule adopted is that net contributions — that is, contributions less expenditures — would not be allowed to go negative. Under this scheme, the interest payments from the provinces would not be used to meet current obligations; instead, the contribution rate would be raised, as required, to meet current expenditures, and the interest payments from the provinces would automatically be returned to them in the form of new loans.

If scheme B were adopted, the projected contribution rate would remain at 3.6 per cent for another decade or so, after which it would increase to bring contributions into line with expenses. In Table 4-1B, the first increase under this scheme is recorded in 1990, when the rate is projected to be 4.2 per cent. It is projected to increase to 5.3 per cent by 2000 and to continue increasing to a peak of 9.3 per cent by about 2030, after which it declines slightly. One consequence would be the continued accumulation of assets in the fund, as the provinces add annually to their liabilities the amount of interest owing to the fund. By the year 2050, for example, the pro-

jected value of the fund under this scheme would be \$154 billion, or 2.2 times the projected contributions in that year. Under this scheme the loans outstanding in the late 1980s are, in effect, forgiven, though a record is maintained of their value over time, as augmented by interest owing but never paid.

Scheme C differs from scheme B in that the sum of net contributions plus the interest earnings of the fund are not permitted to go negative: when the sum would otherwise go negative, the contribution rate is increased, as necessary. By using interest earnings to help meet expenses, the need to increase the contribution rate is postponed for about half a decade, as compared with scheme B, and then the increase is rather less, as one might expect. In general, the projected result of this scheme would be to permit a lower contribution rate than under scheme A, but one with a similar time path. The current-dollar value of the fund, which is equal to the loans outstanding, does not change after about 1990, when new loans to the provinces cease. Under the assumption of continued inflation of 4 per cent, the constant-dollar value of the fund decreases continuously; in this projection it reaches \$2.5 billion in 2050, or 0.04 times the annual contributions, having fallen from a high of \$25.0 billion in 1990, or 5.2 times the annual contributions.

The remaining schemes, D, E, and F, all involve flat contribution rates starting in the year 1978. In D, the flat rate chosen is the one that would yield approximately a nil fund — that is, one having no assets — by the year 2050. In E, the rate is chosen so as to yield a constantly growing fund. Finally, in F, it is assumed that all of the fund loans to the provinces to the end of 1977 are forgiven, and a flat contribution rate is selected that would yield a nil fund in 2050.

One interesting characteristic of these schemes is the similarity of the contribution rates in each of the three cases: the lowest (under scheme D) is 6.57 per cent and the highest (under scheme E) is 6.94 per cent. Not surprisingly, the annual contributions are also quite similar and, of course, the total benefits are identical — under the assumptions made.

In all cases, the immediate move to higher contribution rates, as compared with scheme A, serves to extend to the second decade of the next century the period during which contributions received exceed benefits paid. Up to that time, the projected fund values associated with each of the schemes would increase very rapidly, reaching \$237 billion in the case of scheme D, \$288 billion in the case of

scheme E, and \$214 billion in the case of scheme F. Thereafter the values of the fund under schemes D and F rapidly approach zero, whereas the fund in scheme E continues to rise, in nominal terms, but to fall, in real terms, to \$214 billion by 2050.

While the alternative financing cases considered are, of course, not exhaustive, they do cover a wide range of possibilities. In summary, it seems reasonable to conclude that if the macro-economic-demographic environment is even roughly of the sort projected in this baseline case, there is no approaching "crisis" in connection with the operations of the Canada and Quebec Pension Plans. Even though the

benefit payments would likely exceed contributions within a decade if the current contribution rate of 3.6 per cent were retained, and the fund itself would go negative shortly after the turn of the century, the legislative modifications required to avoid such problems appear to be modest. Thus, for example, scheme C suggests that a switch to pay-as-you-go financing in another 10 to 15 years would avoid having the fund go negative, without the provinces even repaying the borrowings from the fund. Alternatively a flat contribution rate of about 6.6 per cent enacted now would enable the fund to meet all of its projected liabilities to the year 2050, under the assumptions of scheme D.

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5 The Financing Implications of Alternative Demographic and Participation Rate Assumptions

In Chapter 4 we considered a baseline projection of the operations of the Canada and Quebec Pension Plans over a period extending many decades into the future. Incorporated into the baseline case were our "medium" assumptions about the environment in which the Plan would function. It is the purpose of this chapter to modify the assumptions relating to the demographic and participation rate aspects of the future, in order to determine how sensitive the conclusions of the baseline case are to the particular assumptions on which they were based.

The approach adopted here is to change, one at a time, the assumptions relating to projected fertility rates, mortality rates, net immigration rates, and Plan participation rates. In each case we have selected, as alternatives to the medium assumptions of the baseline case, both a "high" level and a "low" level. All other assumptions are the same as in the baseline case.

ALTERNATIVE FERTILITY RATE ASSUMPTIONS

The medium assumption concerning the total fertility rate, as described in Chapter 3, was that it would rise from its 1975 level of about 1.9 births per woman to about 2.1, which is approximately the replacement level, by 1984. To assess the probable impact of different fertility rates on the operations of the Plan, we have considered a possible transition to a high fertility rate by 1984 (with "high" defined as a total fertility rate of 3.0) and to a low fertility rate (with "low" defined as 1.5). Even though the high rate falls well within the range of recent experience, many observers do not expect a return to a rate much above the replacement level, at least in the foreseeable future. No one can be certain, however. The low assumption involves a continuation of the declining trend of the past decade and a half, with a new record low rate occurring each year until 1984, after which the 1984 rate is maintained.

A summary of results is provided in Tables 5-1 and 5-2¹. (The results of these projections, and subsequent ones, are summarized in considerably less detail than the results of the baseline projection, in Chapter 4.)

The movement to high fertility results in a return to rapid population growth: whereas the baseline case involves a projected population in 2050 that is considerably less than double that of 1975, the high fertility projection leads to a population of more than three times that of 1975. The proportionate increase in the population over age 65 is much less affected, however, with the consequence that those over 65 constitute about 11 per cent of the projected population of 2050 in the high fertility case, compared with 17 per cent in the baseline case. In absolute numbers, projected retirement beneficiaries are more numerous in the high fertility case. The cost of their benefits relative to total contributory earnings, however, is projected to increase less in the high fertility case than in the baseline case, reflecting the increased long-run production and contribution potential associated with high fertility. The difference between the two cases is quite substantial: interpreted as a pay-as-you-go tax rate on contributory earnings, the tax needed to sustain benefits in the last three decades of the projection period would be 2-1/2 to 3 percentage points lower in the high fertility case than in the baseline case.

Let us consider the Plan values under alternative financing arrangements. Even with sustained high fertility levels, a continuation of the current 3.6 per cent contribution rate would result in a fund that would turn negative during the first decade of the twenty-first century, with its debt position rapidly worsening and reaching almost 26 times the projected annual contributions by 2050, as indicated in Table 5-1, scheme A. The continuation of the 3.6 per cent contribution rate thus appears very unlikely.

TABLE 5-1

PROJECTED POPULATION, AND CANADA AND QUEBEC PENSION PLAN VALUES—PROJECTION 9
High Fertility Projection: The Total Fertility Rate is Assumed to Increase to 3.0 by 1984

	1975	1980	1990	2000	2010	2020	2030	2040	2050
	(Thousands)								
Population									
Total	23,291	25,254	30,470	35,521	41,290	48,159	55,277	63,633	73,323
Aged 65 and over	1,990	2,309	2,886	3,533	4,156	5,488	6,772	6,668	7,737
Retirement Beneficiaries									
Male	655	765	1,119.0	1,359.0	1,593.0	2,124.0	2,602.0	2,486.0	2,972.0
Female	349	416	854.4	1,355.9	1,901.9	2,814.5	3,628.3	3,674.2	4,180.3
	(Per cent)								
Cost of plan relative to total contributory earnings									
Retirement pensions	.69	1.67	2.61	3.35	3.66	4.64	5.07	4.11	4.33
Total benefits	1.48	2.83	4.19	5.15	5.48	6.49	6.82	5.79	5.96
Average retirement benefit relative to maximum pensionable earnings									
Male	5.94	12.37	13.39	15.05	15.71	15.71	15.26	14.67	14.85
Female	3.17	8.77	8.96	9.08	9.07	9.57	9.88	9.81	10.33
Contribution rate									
Plan A	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
Plan B	3.60	3.60	4.19	5.15	5.48	6.49	6.82	5.79	5.96
Plan C	3.60	3.60	3.60	4.49	5.19	6.35	6.76	5.76	5.94
Plan D	3.60	5.42	5.42	5.42	5.42	5.42	5.42	5.42	5.42
Plan E	3.60	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54
Plan F	3.60	5.58	5.58	5.58	5.58	5.58	5.58	5.58	5.58
	(Ratio)								
Value of fund expressed relative to contributions									
Plan A	6.60	6.65	5.21	1.64	-3.06	-9.47	-17.12	-21.99	-25.75
Plan B	6.60	6.65	4.82	3.70	3.04	2.36	2.02	2.08	1.83
Plan C	6.60	6.65	5.21	2.08	.80	.31	.13	.07	.03
Plan D	6.60	5.40	7.35	7.98	7.21	5.50	2.50	.71	.04
Plan E	6.60	5.34	7.44	8.25	7.65	6.14	3.34	1.68	1.14
Plan F	6.60	1.55	4.62	5.65	5.44	4.19	1.66	.30	-.04

Some alternative financing possibilities are considered in schemes B through F. These alternatives are the same as those considered in the baseline case, and the results should be compared with the previous results. Schemes B and C involve a transition to pay-as-you-go financing once the accumulated surplus has been depleted. Compared with the baseline case, while the contribution rate would increase from the current 3.6 per cent at about the same time, the amount of increase would be considerably less in the high fertility case, especially towards the end of the projection period.

Financing schemes D, E, and F all involve an immediate movement to a contribution rate that would satisfy certain conditions (as discussed in Chapter 4) and that would be held constant throughout the projection period. The high fertility

case involves a contribution rate lower than that of the baseline case by between 1.15 and 1.40 percentage points, depending on the scheme.

The low fertility projection results are displayed in Table 5-2. As can be seen there, the fraction of the population aged 65 and over increases sharply, rising above 24 per cent by the end of the projection period (compared with about 17 per cent in the baseline case). As a consequence, the cost of benefits relative to total contributory earnings is projected in this case to increase to a much higher level in the first half of the next century than under the baseline assumptions.

For the Plan as a whole, it is clear again that a continuation of the 3.6 per cent contribution rate would lead to benefits in excess of contributions before 1990 and to exhaustion of the fund surplus

TABLE 5-2

PROJECTED POPULATION, AND CANADA AND QUEBEC PENSION PLAN VALUES—PROJECTION 10
 Low Fertility Projection: the Total Fertility Rate is Assumed to Decline to 1.5 by 1984

	1975	1980	1990	2000	2010	2020	2030	2040	2050
	(Thousands)								
Population									
Total	23,291	24,615	26,707	28,414	29,267	29,355	28,688	27,299	25,625
Aged 65 and over	1,990	2,309	2,886	3,533	4,156	5,488	6,772	6,647	6,180
Retirement beneficiaries									
Male	655	765	1,119.0	1,359.0	1,593.0	2,124.0	2,602.0	2,475.0	2,292.0
Female	349	416	854.4	1,355.9	1,901.9	2,814.5	3,628.3	3,663.2	3,414.7
	(Per cent)								
Cost of plan relative to total contributory earnings									
Retirement pensions	.69	1.68	2.70	3.59	4.54	6.81	9.18	9.24	9.12
Total benefits	1.48	2.84	4.28	5.44	6.70	9.35	12.00	12.21	12.08
Average retirement benefit relative to maximum pensionable earnings									
Male	5.94	12.37	13.37	14.97	15.59	15.53	15.01	14.38	14.19
Female	3.17	8.77	8.92	8.98	8.90	9.34	9.59	9.48	9.62
Contribution rate									
Plan A	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
Plan B	3.60	3.60	4.28	5.44	6.70	9.35	12.00	12.21	12.08
Plan C	3.60	3.60	3.60	4.76	6.36	9.16	11.89	12.15	12.04
Plan D	3.60	7.52	7.52	7.52	7.52	7.52	7.52	7.52	7.52
Plan E	3.60	8.12	8.12	8.12	8.12	8.12	8.12	8.12	8.12
Plan F	3.60	7.77	7.77	7.77	7.77	7.77	7.77	7.77	7.77
	(Ratio)								
Value of fund expressed relative to contributions									
Plan A	6.60	6.69	5.23	1.36	-5.56	-19.29	-43.21	-72.66	-104.90
Plan B	6.60	6.69	4.81	3.72	3.08	2.41	2.10	2.25	2.50
Plan C	6.60	6.69	5.23	2.02	.78	.30	.13	.07	.04
Plan D	6.60	4.72	8.62	11.80	14.05	14.56	11.49	5.91	-.03
Plan E	6.60	4.59	8.86	12.50	15.39	16.86	15.20	11.24	7.09
Plan F	6.60	1.94	6.60	10.02	12.51	13.25	10.52	5.40	-.04

by early in the next century. The several alternative financing possibilities considered before lead to a similar pattern of results, but the requisite contribution rates are much higher in this case. Under a modified pay-as-you-go scheme (B or C), the contribution rate exceeds 12 per cent in the final decades of the projection period, some 3 to 3-1/2 percentage points higher than in the baseline case.

ALTERNATIVE MORTALITY RATE ASSUMPTIONS

Our medium assumption concerning future mortality rates, as discussed in Chapter 3, is that the percentage reduction in age/sex-specific rates that occurred over the two decades ending in 1971 will continue for two more decades, to 1991, and will then be followed by reductions at half that pace for the period ending in 2011; thereafter no further

reductions are assumed. In the high mortality case we assume that the percentage reductions in the periods 1971 to 1991 and 1991 to 2011 occur at half the rate of the medium case, while in the low mortality case we assume that the percentage reductions in the same two periods are half as high again as in the medium case.

The results of the high mortality case are displayed in Table 5-3. Compared with the baseline case, the population grows less quickly. If the reductions in mortality in the future have the same differential age-sex pattern as in the past, as we assume here, then a lesser reduction in mortality rates (the high mortality case) can be expected to result in a smaller fraction of the population being aged 65 and over. As a consequence, the cost of the Plan relative to total contributory earnings is somewhat lower. This general comment is reinforced in

studying the alternative financing arrangements: the high mortality rate assumption leads to a pattern of results very similar to that of the baseline case, with the contribution rates under the various schemes differing from their counterparts in the baseline case by only one- or two-tenths of a percentage point.

The results of the low mortality assumption are displayed in Table 5-4 and largely mirror the high mortality case. Thus we see that the fraction of population aged 65 and over increases in this case, as does the cost of maintaining the Plan, expressed in relation to total contributory earnings. Similarly, the required contribution rates under the various

alternative financing schemes also increase, compared with the baseline case, but only to a minor extent.

In summary, it appears that the future course of mortality rates will have little impact on the funding of the Plan.

ALTERNATIVE IMMIGRATION ASSUMPTIONS

Our medium immigration assumption involves an annual immigration flow of 120,000, together with emigration of 40,000 throughout the projection period. The high assumption involves annual immigration at a rate of 180,000 from 1981 on, following

TABLE 5-3

PROJECTED POPULATION, AND CANADA AND QUEBEC PENSION PLAN VALUES—PROJECTION 11
High Mortality Projection: Half the Percentage Decline in Age-Sex-Specific Mortality Rates Observed Between 1951 and 1971 is Assumed to Occur Between 1971 and 1991, One Quarter the Decline Between 1991 and 2011, and no Further Decline Thereafter

	1975	1980	1990	2000	2010	2020	2030	2040	2050
	(Thousands)								
Population									
Total	23,291	24,785	28,115	30,936	33,330	35,493	37,028	38,138	39,152
Aged 65 and over	1,964	2,265	2,842	3,376	3,918	5,193	6,391	6,217	6,345
Retirement Beneficiaries									
Male	655	761	1,112.0	1,333.0	1,553.0	2,074.0	2,538.0	2,404.0	2,484.0
Female	349	409	838.8	1,282.3	1,769.1	2,623.0	3,359.7	3,345.8	3,389.3
	(Per cent)								
Cost of plan relative to total contributory earnings									
Retirement pensions	.69	1.67	2.64	3.40	4.01	5.58	6.81	6.15	6.24
Total benefits	1.48	2.83	4.23	5.27	6.08	7.85	9.14	8.48	8.53
Average retirement benefit relative to maximum pensionable earnings									
Male	5.93	12.38	13.39	15.06	15.69	15.64	15.14	14.55	14.53
Female	3.14	8.79	8.97	9.09	9.04	9.53	9.82	9.74	10.06
Contribution rate									
Plan A	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
Plan B	3.60	3.60	4.23	5.27	6.08	7.85	9.14	8.48	8.53
Plan C	3.60	3.60	3.60	4.59	5.75	7.68	9.06	8.44	8.51
Plan D	3.60	6.46	6.46	6.46	6.46	6.46	6.46	6.46	6.46
Plan E	3.60	6.81	6.81	6.81	6.81	6.81	6.81	6.81	6.81
Plan F	3.60	6.67	6.67	6.67	6.67	6.67	6.67	6.67	6.67
	(Ratio)								
Value of fund expressed relative to contributions									
Plan A	6.60	6.68	5.24	1.61	-4.14	-13.94	-28.57	-42.91	-56.98
Plan B	6.60	6.68	4.84	3.76	3.12	2.44	2.13	2.26	2.27
Plan C	6.60	6.68	5.24	2.10	.81	.31	.14	.07	.04
Plan D	6.60	5.01	8.08	10.21	11.04	10.26	6.89	3.06	.01
Plan E	6.60	4.91	8.27	10.77	12.02	11.83	9.19	6.04	3.69
Plan F	6.60	1.77	5.76	8.20	9.38	8.94	5.99	2.61	-.04

TABLE 5-4

PROJECTED POPULATION, AND CANADA AND QUEBEC PENSION PLAN VALUES—PROJECTION 12
 Low Mortality Projection: 1.5 Times the Percentage Decline in Age-Sex-Specific Mortality Rates Observed Between 1951
 and 1971 is Assumed to Occur Between 1971 and 1991, 0.75 Times the Decline Between 1991 and 2011, and no Further
 Decline Thereafter

	1975	1980	1990	2000	2010	2020	2030	2040	2050
	(Thousands)								
Population									
Total	23,291	24,962	28,309	31,521	34,254	36,679	38,540	39,962	41,201
Aged 65 and over	2,017	2,357	2,934	3,694	4,408	5,806	7,189	7,152	7,325
Retirement beneficiaries									
Male	655	768	1,126.0	1,385.0	1,635.0	2,176.0	2,671.0	2,557.0	2,649.0
Female	349	424	870.0	1,430.6	2,046.7	3,028.3	3,930.4	4,037.0	4,108.8
	(Per cent)								
Cost of plan relative to total contributory earnings									
Retirement pensions	.69	1.69	2.68	3.57	4.28	5.95	7.30	6.70	6.78
Total benefits	1.48	2.83	4.25	5.36	6.23	8.08	9.49	8.90	8.94
Average retirement benefit relative to maximum pensionable earnings									
Male	5.95	12.38	13.37	14.96	15.58	15.58	15.09	14.48	14.45
Female	3.20	8.76	8.90	8.95	8.89	9.34	9.61	9.51	9.79
Contribution rate									
Plan A	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
Plan B	3.60	3.60	4.25	5.36	6.23	8.08	9.49	8.90	8.94
Plan C	3.60	3.60	3.60	4.69	5.91	7.92	9.41	8.86	8.92
Plan D	3.60	6.69	6.69	6.69	6.69	6.69	6.69	6.69	6.69
Plan E	3.60	7.08	7.08	7.08	7.08	7.08	7.08	7.08	7.08
Plan F	3.60	6.90	6.90	6.90	6.90	6.90	6.90	6.90	6.90
	(Ratio)								
Value of fund expressed relative to contributions									
Plan A	6.60	6.66	5.21	1.39	-4.68	-15.01	-30.40	-45.65	-60.67
Plan B	6.60	6.66	4.80	3.67	3.00	2.33	2.01	2.10	2.10
Plan C	6.60	6.66	5.21	2.01	.77	.29	.13	.07	.03
Plan D	6.60	4.94	8.19	10.43	11.32	10.59	7.20	3.24	-.01
Plan E	6.60	4.82	8.38	11.01	12.35	12.23	9.62	6.37	3.88
Plan F	6.60	1.82	5.94	8.49	9.74	9.33	6.35	2.82	-.02

a smooth transition from 120,000 in 1977. The low assumption involves annual immigration of 60,000 from 1981 on. In both cases, emigration is assumed to continue at an annual rate of 40,000. The results of the projections are summarized in Tables 5-5 and 5-6.

In comparison with the baseline case, the high immigration assumption leads to a larger population throughout the projection period, with a somewhat smaller proportion of older people as a result of the age distribution of immigrants. As a consequence, the cost of maintaining the Plan relative to total contributory earnings falls somewhat. The alternative financing arrangements considered all suggest that a somewhat lower contribution rate would be associated with continued high immigration, but the differences are not great, amounting typically to two- or three-tenths of a percentage point.

Opposite results are obtained in the low immigration case: the population grows more slowly than in the baseline projection, and the fraction aged 65 and over is somewhat larger. The required contribution rates under the various financing schemes are accordingly somewhat higher, but again the differences are not striking.

In summary, one can conclude that substantial differences in immigration levels can be expected to have rather little impact on the choice of funding arrangements for the Plan or on the ability of the economy to support the Plan.

ALTERNATIVE RATES OF PARTICIPATION IN THE PLAN

Participation in the Plan requires that contributions be made; with them, rights to specified benefits are accumulated. In practice, participation in

TABLE 5-5

PROJECTED POPULATION, AND CANADA AND QUEBEC PENSION PLAN VALUES—PROJECTION 13
High Immigration Projection: Annual Immigration of 180,000 is Assumed, Beginning in 1981

	1975	1980	1990	2000	2010	2020	2030	2040	2050
	(Thousands)								
Population									
Total	23,291	24,961	28,976	32,776	36,199	39,410	42,059	44,260	46,319
Aged 65 and over	1,990	2,309	2,899	3,575	4,253	5,705	7,205	7,273	7,579
Retirement beneficiaries									
Male	655	765	1,123.0	1,372.0	1,629.0	2,214.0	2,776.0	2,717.0	2,859.0
Female	349	417	858.7	1,374.7	1,951.9	2,927.1	3,854.9	4,000.5	4,144.8
	(Per cent)								
Cost of plan relative to total contributory earnings									
Retirement pensions	.69	1.67	2.59	3.34	3.93	5.44	6.68	6.15	6.23
Total benefits	1.48	2.82	4.15	5.12	5.87	7.56	8.86	8.33	8.38
Average retirement benefit relative to maximum pensionable earnings									
Male	5.94	12.37	13.39	15.02	15.65	15.63	15.14	14.54	14.51
Female	3.17	8.77	8.95	9.03	8.98	9.46	9.75	9.67	9.96
Contribution rate									
Plan A	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
Plan B	3.60	3.60	4.15	5.12	5.87	7.56	8.86	8.33	8.38
Plan C	3.60	3.60	3.60	4.44	5.56	7.40	8.78	8.29	8.36
Plan D	3.60	6.39	6.39	6.39	6.39	6.39	6.39	6.39	6.39
Plan E	3.60	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75
Plan F	3.60	6.59	6.59	6.59	6.59	6.59	6.59	6.59	6.59
	(Ratio)								
Value of fund expressed relative to contributions									
Plan A	6.60	6.64	5.20	1.80	-3.44	-12.33	-25.70	-38.92	-51.69
Plan B	6.60	6.64	4.83	3.69	3.01	2.31	1.95	2.01	1.98
Plan C	6.60	6.64	5.20	2.13	.81	.31	.13	.07	.03
Plan D	6.60	5.02	7.95	9.96	10.74	9.99	6.75	3.02	-.00
Plan E	6.60	4.91	8.14	10.52	11.71	11.53	8.98	5.91	3.55
Plan F	6.60	1.76	5.67	8.03	9.19	8.79	5.96	2.67	.05

the Plan is closely linked to labour force participation, and, as explained in Chapter 3, we have made use of projections of labour force participation rates in projecting the Plan rates. The medium labour force participation rate projections are used in obtaining the baseline projections of Chapter 4. Alternative projections are based on high and low labour force participation rate assumptions, as described in detail in Denton, Feaver, and Spencer.²

Looking first at the results of the high participation case in Table 5-7, we note that the number of retirement beneficiaries does not differ from the baseline projection, even though it would be expected to. The reason is that under the simplifying assumptions incorporated into the Department of Insurance model, the number of beneficiaries is

determined solely with reference to the population and not with reference to their rate of participation in the Plan. The amount of the projected benefits, however, does reflect changes in participation rates. We can see from Table 5-7 that benefits are projected to increase somewhat less relative to contributory earnings, as compared with the baseline case. The differences are slight, however. Of greater interest is the fact that the assumption of high participation rates produces a noticeable increase in the average retirement benefit of females.

The low participation rate assumptions produce results in the opposite direction: compared with the baseline case, the average retirement benefit increases less, but the total projected payments constitute a larger fraction of contributory earnings. The differences are not great, however.

TABLE 5-6

PROJECTED POPULATION, AND CANADA AND QUEBEC PENSION PLAN VALUES—PROJECTION 14
 Low Immigration Projection: Annual Immigration of 60,000 is Assumed, Beginning in 1981

	1975	1980	1990	2000	2010	2020	2030	2040	2050
	(Thousands)								
Population									
Total	23,291	24,782	27,450	29,685	31,384	32,748	33,487	33,795	33,982
Aged 65 and over	1,990	2,308	2,873	3,494	4,059	5,265	6,337	6,039	6,027
Retirement beneficiaries									
Male	655	765	1,115.0	1,345.0	1,558.0	2,035.0	2,429.0	2,242.0	2,270.0
Female	349	416	849.2	1,337.2	1,856.3	2,702.0	3,400.8	3,334.7	3,299.4
	(Per cent)								
Cost of plan relative to total contributory earnings									
Retirement pensions	.69	1.68	2.73	3.65	4.39	6.14	7.51	6.75	6.85
Total benefits	1.48	2.84	4.34	5.53	6.48	8.45	9.88	9.13	9.18
Average retirement benefit relative to maximum pensionable earnings									
Male	5.94	12.37	13.37	15.00	15.62	15.59	15.10	14.47	14.47
Female	3.17	8.77	8.93	9.01	8.96	9.43	9.68	9.58	9.90
Contribution rate									
Plan A	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
Plan B	3.60	3.60	4.34	5.53	6.48	8.45	9.88	9.13	9.18
Plan C	3.60	3.60	3.60	4.85	6.15	8.27	9.79	9.08	9.15
Plan D	3.60	6.78	6.78	6.78	6.78	6.78	6.78	6.78	6.78
Plan E	3.60	7.17	7.17	7.17	7.17	7.17	7.17	7.17	7.17
Plan F	3.60	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01
	(Ratio)								
Value of fund expressed relative to contributions									
Plan A	6.60	6.67	5.25	1.16	-5.54	-17.06	-34.24	-51.25	-68.42
Plan B	6.60	6.67	4.81	3.74	3.13	2.48	2.20	2.40	2.46
Plan C	6.60	6.67	5.25	1.98	.78	.30	.14	.07	.04
Plan D	6.60	4.93	8.34	10.74	11.72	10.98	7.45	3.33	-.02
Plan E	6.60	4.81	8.53	11.33	12.78	12.71	10.02	6.69	4.20
Plan F	6.60	1.83	6.06	8.73	10.04	9.63	6.51	2.86	-.05

We conclude that the choice of the means of financing the Plan in the future will not be much affected by one's expectations concerning participation rates.

CONCLUDING REMARKS

In this chapter we have investigated the probable impact of a range of assumptions concerning future fertility rates, mortality rates, immigration rates, and Plan participation rates on the projected costs of operating the Plan and on its projected (contributory earnings) tax base.

We have concluded, in each case, that even though future changes in demographic and participation rate variables will affect the contribution rate required to keep the fund operating, widely differing assumptions concerning these variables produce only rather modest changes in the implied contribution rates under the various financing schemes. All of the projections, however, have in common the characteristic that the fund would go into a deficit position in the first decade of the next century if the current benefit system and contribution rate were both retained.

TABLE 5-7

PROJECTED POPULATION, AND CANADA AND QUEBEC PENSION PLAN VALUES—PROJECTION 2
 High Participation Projection: "High" Assumptions Concerning Future Labour Force Participation Rates for Each
 Age-Sex Group are Translated Into "High" Plan Participation Rates

	1975	1980	1990	2000	2010	2020	2030	2040	2050
	(Thousands)								
Population									
Total	23,291	24,872	28,212	31,229	33,791	36,080	37,771	39,027	40,151
Aged 65 and over	1,990	2,309	2,886	3,533	4,156	5,488	6,772	6,655	6,804
Retirement beneficiaries									
Male	655	765	1,119.0	1,359.0	1,593.0	2,124.0	2,602.0	2,479.0	2,563.0
Female	349	416	854.4	1,355.9	1,901.9	2,814.5	3,628.3	3,667.3	3,721.7
	(Per cent)								
Cost of plan relative to total contributory earnings									
Retirement pensions	.69	1.65	2.56	3.40	4.07	5.69	7.03	6.43	6.53
Total benefits	1.48	2.78	4.10	5.17	6.02	7.83	9.23	8.63	8.69
Average retirement benefit relative to maximum pensionable earnings									
Male	5.98	12.38	13.46	15.21	15.90	15.88	15.43	14.84	14.84
Female	3.12	8.78	9.02	9.23	9.32	9.97	10.38	10.35	10.71
Contribution rate									
Plan A	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
Plan B	3.60	3.60	4.10	5.17	6.02	7.83	9.23	8.63	8.69
Plan C	3.60	3.60	3.60	4.46	5.68	7.66	9.14	8.59	8.66
Plan D	3.60	6.49	6.49	6.49	6.49	6.49	6.49	6.49	6.49
Plan E	3.60	6.87	6.87	6.87	6.87	6.87	6.87	6.87	6.87
Plan F	3.60	6.69	6.69	6.69	6.69	6.69	6.69	6.69	6.69
	(Ratio)								
Value of fund expressed relative to contributions									
Plan A	6.60	6.57	5.30	1.96	-3.58	-13.25	-27.94	-42.57	-56.94
Plan B	6.60	6.57	4.92	3.77	3.09	2.39	2.06	2.16	2.16
Plan C	6.60	6.57	5.30	2.25	.85	.32	.14	.07	.04
Plan D	6.60	4.94	8.06	10.37	11.33	10.63	7.26	3.28	.03
Plan E	6.60	4.84	8.26	10.95	12.36	12.27	9.68	6.44	3.96
Plan F	6.60	1.79	5.85	8.45	9.74	9.36	6.38	2.84	-.01

TABLE 5-8

PROJECTED POPULATION, AND CANADA AND QUEBEC PENSION PLAN VALUES—PROJECTION 3
 Low Participation Projection: "Low" Assumptions Concerning Future Labour Force Participation Rates for Each Age-Sex Group are Translated into "Low" Plan Participation Rates

	1975	1980	1990	2000	2010	2020	2030	2040	2050
	(Thousands)								
Population									
Total	23,291	24,872	28,212	31,229	33,791	36,080	37,771	39,027	40,151
Aged 65 and over	1,990	2,309	2,886	3,533	4,156	5,488	6,772	6,655	6,804
Retirement beneficiaries									
Male	655	765	1,119.0	1,359.0	1,593.0	2,124.0	2,602.0	2,479.0	2,563.0
Female	349	416	854.4	1,355.9	1,901.9	2,814.5	3,628.3	3,667.3	3,721.7
	(Per cent)								
Cost of plan relative to total contributory earnings									
Retirement pensions	.69	1.71	2.76	3.59	4.23	5.82	7.06	6.38	6.45
Total benefits	1.48	2.88	4.40	5.47	6.30	8.09	9.39	8.72	8.74
Average retirement benefit relative to maximum pensionable earnings									
Male	5.98	12.36	13.30	14.80	15.38	15.35	14.82	14.18	14.16
Female	3.12	8.76	8.85	8.82	8.64	8.93	9.06	8.91	9.16
Contribution rate									
Plan A	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
Plan B	3.60	3.60	4.40	5.47	6.30	8.09	9.39	8.72	8.74
Plan C	3.60	3.60	3.60	4.82	5.99	7.93	9.31	8.68	8.72
Plan D	3.60	6.66	6.66	6.66	6.66	6.66	6.66	6.66	6.66
Plan E	3.60	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01
Plan F	3.60	6.88	6.88	6.88	6.88	6.88	6.88	6.88	6.88
	(Ratio)								
Value of fund expressed relative to contributions									
Plan A	6.60	6.74	5.15	.99	-5.31	-15.77	-31.07	-45.97	-60.61
Plan B	6.60	6.74	4.73	3.68	3.05	2.40	2.09	2.22	2.23
Plan C	6.60	6.74	5.15	1.89	.74	.29	.13	.07	.03
Plan D	6.60	4.99	8.22	10.27	11.02	10.21	6.84	3.06	.05
Plan E	6.60	4.90	8.40	10.81	11.98	11.74	9.07	5.94	3.61
Plan F	6.60	1.81	5.87	8.24	9.36	8.89	5.95	2.61	.03

6 The Financing Implications of Alternative Retirement Benefit Provisions

In Chapters 4 and 5 we considered the results of projections in which the current provisions of the Canada and Quebec Pension Plans ("the Plan") were assumed to be maintained throughout the projection period, and we investigated the implications for the future financing of the Plan of various possible demographic and participation changes. The purpose of this chapter is to assess the financing implications of a number of possible modifications in the provisions of the Plan, while retaining the baseline demographic and participation rate assumptions of Chapter 4.

The provisions on which we focus are those relating to the retirement benefit proportion and the age at retirement. Again, the results of each projection are summarized in a table, and we consider each in turn. The assumptions underlying the relevant projections are summarized in Table 6-1.

PROJECTIONS INVOLVING INCREASES IN THE PENSION

There are four projections involving solely changes in the retirement benefit proportion — that is, the fraction of an individual's average annual earnings, as defined under the Plan (and as described in Chapter 2), that will constitute his pension. The benefit proportion is currently 25 per cent. In the projections discussed here we have increased it to 50 per cent, raising it by a 5 per cent increment in each year of a 5-year period.

In projection 15 (Table 6-2) the increase is assumed to apply to those who were receiving the pension before the change, as well as to those who would start to receive it subsequently, and the increase in the benefit proportion is assumed to commence in 1981. The results of this projection are summarized in Table 6-2 and should be compared to those of the baseline case in Table 4-1.

The population size and age distribution are, of course, unaffected by the change in the benefit

proportion. Also, under the assumptions of the projection, the number of beneficiaries is unchanged. The only difference is that each one of them receives twice as large a pension, once the change has been fully implemented. The change is to be

TABLE 6-1

SUMMARY DESCRIPTION OF PROJECTIONS

Table	Projection number	Description
4-1	1	"Baseline" case
6-2	15	Retirement benefit proportion increased evenly over a 5-year period, to 0.50 from the current 0.25, starting in 1981; change applies to all beneficiaries.
6-3	16	Retirement benefit proportion increased evenly over a 5-year period, to 0.5 from the current 0.25, starting in 1981; change applies only to new beneficiaries.
6-4	17	Retirement benefit proportion increased evenly over a 5-year period, to 0.50 from the current 0.25, starting in 1991; change applies to all beneficiaries.
6-5	18	Retirement benefit proportion increased evenly over a 5-year period, to 0.50 from the current 0.25, starting in 1991; change applies only to new beneficiaries.
6-6	19	Age of eligibility for receipt of the pension reduced to 60 from the current age of 65, starting in 1981.
6-7	20	Age of eligibility for receipt of the pension reduced to 60 from the current age of 65, starting in 1991.
6-8	23	"High-cost" case: age of eligibility for recipients of the pension reduced to 60 from the current age of 65, starting in 1981, and the benefit proportion for all beneficiaries increased evenly over a 5-year period, to 0.50 from the current 0.25, starting in 1981.

TABLE 6-2

PROJECTED POPULATION, AND CANADA AND QUEBEC PENSION PLAN VALUES—PROJECTION 15
Retirement Benefit Proportion Increased Evenly Over a Five-year Period From 0.25 to 0.50,
Beginning in 1981, With All Beneficiaries Receiving the Increase

	1975	1980	1990	2000	2010	2020	2030	2040	2050
	(Thousands)								
Population									
Total	23,291	24,872	28,212	31,229	33,791	36,080	37,771	39,027	40,151
Aged 65 and over	1,990	2,309	2,886	3,533	4,156	5,488	6,772	6,655	6,804
Retirement beneficiaries									
Male	655	765	1,119.0	1,359.0	1,593.0	2,124.0	2,602.0	2,479.0	2,563.0
Female	349	416	854.4	1,355.9	1,901.9	2,814.5	3,628.3	3,667.3	3,721.7
	(Per cent)								
Cost of plan relative to total contributory earnings									
Retirement pensions	.69	1.68	5.31	6.97	8.29	11.51	14.08	12.82	12.98
Total benefits	1.48	2.83	8.01	10.21	11.95	15.60	18.35	17.13	17.23
Average retirement benefit relative to maximum pensionable earnings									
Male	5.98	12.37	26.76	30.01	31.29	31.23	30.25	29.03	29.00
Female	3.12	8.77	17.87	18.05	17.95	18.89	19.44	19.26	19.86
Contribution rate									
Plan A	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
Plan B	3.60	3.60	8.01	10.21	11.95	15.60	18.35	17.13	17.23
Plan C	3.60	3.60	7.19	9.87	11.79	15.52	18.31	17.10	17.22
Plan D	3.60	12.89	12.89	12.89	12.89	12.89	12.89	12.89	12.89
Plan E	3.60	13.63	13.63	13.63	13.63	13.63	13.63	13.63	13.63
Plan F	3.60	13.10	13.10	13.10	13.10	13.10	13.10	13.10	13.10
	(Ratio)								
Value of fund expressed relative to contributions									
Plan A	6.60	6.67	-1.67	-17.37	-37.20	-66.84	-106.67	-144.88	-183.87
Plan B	6.60	6.67	2.33	1.76	1.44	1.11	.96	1.01	1.01
Plan C	6.60	6.67	1.41	.49	.20	.08	.03	.02	.01
Plan D	6.60	3.97	7.97	10.35	11.33	10.63	7.22	3.25	.01
Plan E	6.60	3.91	8.17	10.93	12.35	12.25	9.61	6.36	3.88
Plan F	6.60	2.34	6.79	9.33	10.49	9.96	6.76	3.02	.00

complete by 1985, and we observe in Table 6-2 that, indeed, in 1985 and thereafter the projected costs of the retirement pensions relative to the (unchanged) total contributory earnings base double, as do average retirement benefits expressed relative to maximum pensionable earnings.

Some implications of financing this increase in benefits are evident. If the 3.6 per cent contribution rate were retained, the Plan would be in a debtor position by 1990, or about two decades earlier than if current benefit provisions were maintained. And if deficits were financed by continued borrowing at the projected government long-term rate, by the middle of the next century the debt would be more than three times the debt involved in maintaining

the current benefit provision — a figure in excess of \$5 trillion. Clearly neither option would be financed in this way.

The alternative financing possibilities considered in earlier chapters are considered again here. Not surprisingly, we observe in Table 6-2 that the increase in the contribution rate necessary to finance this doubling of the retirement benefit is substantial. Indeed, the contribution rate itself nearly doubles under each of the alternatives considered, compared with the baseline case. Consider, for example, scheme C, in which there is a switch from the current contribution rate to a pay-as-you-go rate as soon as necessary to keep net contributions plus interest earnings above zero. We observe

that the increases in the contribution rate start in 1985, a decade earlier than in the baseline case, and that the rate reaches a peak of 18.3 per cent in 2030. An immediate switch to a flat contribution rate throughout the projection period suggests that a rate of about 13 per cent would result in an approximately zero fund by 2050 (scheme F).

There are, of course, many ways in which to avoid such a large increase in the contribution rate while still increasing the benefit proportion. One possibility is to give the increase only to those who first receive the pension after the change comes into effect. This possibility is considered in projection 16, the results of which are summarized in Table 6-3. Another possibility is to delay implementation of the change, and this we consider in projection 17,

and the results are summarized in Table 6-4. The final possibility involves both delaying the implementation of the change and having it apply only to new beneficiaries; this combination characterizes projection 18, the results of which are summarized in Table 6-5.

Restricting the increased benefit proportion to new recipients as of 1981 has only a relatively minor impact on the costs of the Plan, as seen over the longer run. At the same time, the restriction does delay for about half a decade the date on which the fund would go into deficit under the current plan (scheme A, comparing projection 16 with projection 15), and it also makes much less sharp the increase in contribution rates over the next two decades or so that would be required for a shift to pay-as-you-go

TABLE 6-3

PROJECTED POPULATION, AND CANADA AND QUEBEC PENSION PLAN VALUES—PROJECTION 16
Retirement Benefit Proportion Increased Evenly Over a Five-Year Period From 0.25 to 0.50,
Beginning in 1981, With Only New Beneficiaries Receiving the Increase

	1975	1980	1990	2000	2010	2020	2030	2040	2050
	(Thousands)								
Population									
Total	23,291	24,872	28,212	31,229	33,791	36,080	37,771	39,027	40,151
Aged 65 and over	1,990	2,309	2,886	3,533	4,156	5,488	6,772	6,655	6,804
Retirement beneficiaries									
Male	655	765	1,119.0	1,359.0	1,593.0	2,124.0	2,602.0	2,479.0	2,563.0
Female	349	416	854.4	1,355.9	1,901.9	2,814.5	3,628.3	3,667.3	3,721.7
	(Per cent)								
Cost of plan relative to total contributory earnings									
Retirement pensions	.69	1.68	4.44	6.71	8.26	11.51	14.08	12.82	12.98
Total benefits	1.48	2.83	6.66	9.70	11.84	15.59	18.35	17.13	17.23
Average retirement benefit relative to maximum pensionable earnings									
Male	5.98	12.37	22.33	29.02	31.21	31.23	30.25	29.03	29.00
Female	3.12	8.77	14.94	17.23	17.86	18.89	19.44	19.26	19.86
Contribution rate									
Plan A	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
Plan B	3.60	3.60	6.66	9.70	11.84	15.59	18.35	17.13	17.23
Plan C	3.60	3.60	5.64	9.26	11.64	15.48	18.29	17.10	17.22
Plan D	3.60	12.59	12.59	12.59	12.59	12.59	12.59	12.59	12.59
Plan E	3.60	13.38	13.38	13.38	13.38	13.38	13.38	13.38	13.38
Plan F	3.60	12.80	12.80	12.80	12.80	12.80	12.80	12.80	12.80
	(Ratio)								
Value of fund expressed relative to contributions									
Plan A	6.60	6.67	2.19	-11.41	-30.91	-60.53	-100.33	-138.68	-177.80
Plan B	6.60	6.67	2.91	1.93	1.51	1.15	.99	1.05	1.05
Plan C	6.60	6.67	2.28	.66	.26	.10	.04	.02	.01
Plan D	6.60	3.99	8.95	11.77	12.65	11.69	7.95	3.62	.02
Plan E	6.60	3.93	9.11	12.32	13.68	13.39	10.51	6.98	4.23
Plan F	6.60	2.33	7.73	10.70	11.77	10.98	7.47	3.38	.01

TABLE 6-4

PROJECTED POPULATION, AND CANADA AND QUEBEC PENSION PLAN VALUES—PROJECTION 17
Retirement Benefit Proportion Increased Evenly Over a Five-Year Period From 0.25 to 0.50, Beginning in 1991, With All
Beneficiaries Receiving the Increase

	1975	1980	1990	2000	2010	2020	2030	2040	2050
	(Thousands)								
Population									
Total	23,291	24,872	28,212	31,229	33,791	36,080	37,771	39,027	40,151
Aged 65 and over	1,990	2,309	2,886	3,533	4,156	5,488	6,772	6,655	6,804
Retirement beneficiaries									
Male	655	765	1,119.0	1,359.0	1,593.0	2,124.0	2,602.0	2,479.0	2,563.0
Female	349	416	854.4	1,355.9	1,901.9	2,814.5	3,628.3	3,667.3	3,721.7
	(Per cent)								
Cost of plan relative to total contributory earnings									
Retirement pensions	.69	1.68	2.66	6.97	8.29	11.51	14.08	12.82	12.98
Total benefits	1.48	2.83	4.24	10.21	11.95	15.60	18.35	17.13	17.23
Average retirement benefit relative to maximum pensionable earnings									
Male	5.98	12.37	13.38	30.01	31.29	31.23	30.25	29.03	29.00
Female	3.12	8.77	8.93	18.05	17.95	18.89	19.44	19.26	19.86
Contribution rate									
Plan A	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
Plan B	3.60	3.60	4.24	10.21	11.95	15.60	18.35	17.13	17.23
Plan C	3.60	3.60	3.60	9.57	11.65	15.45	18.27	17.09	17.21
Plan D	3.60	12.47	12.47	12.47	12.47	12.47	12.47	12.47	12.47
Plan E	3.60	13.28	13.28	13.28	13.28	13.28	13.28	13.28	13.28
Plan F	3.60	12.68	12.68	12.68	12.68	12.68	12.68	12.68	12.68
	(Ratio)								
Value of fund expressed relative to contributions									
Plan A	6.60	6.67	5.22	-8.61	-28.85	-58.42	-98.15	-136.49	-175.42
Plan B	6.60	6.67	4.82	1.93	1.58	1.22	1.05	1.11	1.11
Plan C	6.60	6.67	5.22	.94	.37	.14	.06	.03	.02
Plan D	6.60	4.01	9.80	12.47	13.06	12.00	8.14	3.69	.00
Plan E	6.60	3.94	9.92	12.99	14.10	13.74	10.77	7.16	4.35
Plan F	6.60	2.33	8.56	11.38	12.16	11.28	7.65	3.44	-.01

financing (schemes B and C). If a shift to a flat rate yielding a nil fund by the year 2050 were preferred, however, the contribution rate would differ by only about 0.3 of a percentage point.

Delaying the date of implementing the increase in the benefit proportion would, perhaps, be expected to have a much more substantial effect. Indeed, this expectation is borne out if one focuses on the projected developments over the next 25 years or so. Thus the delay in implementation postpones for about one decade the date on which the fund would go into deficit under scheme A, implies a markedly lower pay-as-you-go contribution rate over the next decade (before the changes are implemented) under schemes B and C, and implies a much greater accumulation of assets in the fund between now and

the turn of the century under schemes D, E, and F. It should also be noted that the timing of the change now has a relatively small impact on the required contribution rates during the first five decades of the next century, under schemes B through F. For example, the one-decade postponement in introducing the higher benefit proportion would reduce the flat contribution rate under schemes D, E, and F by less than half a percentage point.

Broadly similar comments can be made about projection number 18, in which the increased benefit proportion applies only to those who start to receive the pension in 1991 or later. The savings can perhaps be summarized by noting that the required flat contribution rate under schemes D, E, and F would be about 0.5 to 0.6 of a percentage point

lower than under projection 15. It is also of interest to note that the projected flat contribution rate under the least expensive alternative considered here (projection 18) differs from the most expensive (projection 15) by about 1 percentage point.

PROJECTIONS INVOLVING REDUCTIONS IN THE AGE OF PENSION ELIGIBILITY

Another provision of the Plan legislation that one would expect to have a major impact on costs is the age at which an individual who has contributed to the Plan may start to receive a retirement pension. Our intention in this regard was to consider, in turn, projections involving both a reduction and an increase in the age of eligibility. It turned out to be feasible within the time available, however, to make

projections for only the case involving a reduction in the age of eligibility.

Two projections have been made involving a reduction in the age of eligibility. Both assume that the age is reduced in one year to age 60 from its current level of 65. In projection 19, the reduction is assumed to commence in 1981; in projection 20, it starts in 1991.

The results of projection 19 are summarized in Table 6-6; again, they may be compared with those of the baseline case. As can be seen from the table, the projected number receiving benefits is increased substantially when the age of eligibility is reduced. And clearly the total cost of the Plan, relative to contributory earnings, increases quite substantially. Without an increase in the contribution rate, the fund would go into deficit by 1995, or a decade and a half earlier than in the baseline case.

TABLE 6-5

PROJECTED POPULATION, AND CANADA AND QUEBEC PENSION PLAN VALUES—PROJECTION 18
Retirement Benefit Proportion Increased Evenly Over a Five-Year Period From 0.25 to 0.50, Beginning in 1991, With Only New Beneficiaries Receiving the Increase

	1975	1980	1990	2000	2010	2020	2030	2040	2050
	(Thousands)								
Population									
Total	23,291	24,872	28,212	31,229	33,791	36,080	37,771	39,027	40,151
Aged 65 and over	1,990	2,309	2,886	3,533	4,156	5,488	6,772	6,655	6,804
Retirement beneficiaries									
Male	655	765	1,119.0	1,359.0	1,593.0	2,124.0	2,602.0	2,479.0	2,563.0
Female	349	416	854.4	1,355.9	1,901.9	2,814.5	3,628.3	3,667.3	3,721.7
	(Per cent)								
Cost of plan relative to total contributory earnings									
Retirement pensions	.69	1.68	2.66	5.43	7.84	11.47	14.08	12.82	12.98
Total benefits	1.48	2.83	4.24	7.92	11.11	15.43	18.32	17.12	17.23
Average retirement benefit relative to maximum pensionable earnings									
Male	5.98	12.37	13.38	23.68	29.90	31.15	30.25	29.03	29.00
Female	3.12	8.77	8.93	13.78	16.75	18.79	19.44	19.26	19.86
Contribution rate									
Plan A	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
Plan B	3.60	3.60	4.24	7.92	11.11	15.43	18.32	17.12	17.23
Plan C	3.60	3.60	3.60	7.26	10.80	15.27	18.24	17.08	17.21
Plan D	3.60	11.90	11.90	11.90	11.90	11.90	11.90	11.90	11.90
Plan E	3.60	12.81	12.81	12.81	12.81	12.81	12.81	12.81	12.81
Plan F	3.60	12.11	12.11	12.11	12.11	12.11	12.11	12.11	12.11
	(Ratio)								
Value of fund expressed relative to contributions									
Plan A	6.60	6.67	5.22	-2.03	-18.73	-47.11	-86.55	-125.08	-164.10
Plan B	6.60	6.67	4.82	2.49	1.70	1.23	1.05	1.11	1.11
Plan C	6.60	6.67	5.22	1.27	.42	.15	.06	.03	.02
Plan D	6.60	4.06	9.72	14.04	15.30	14.04	9.58	4.40	.01
Plan E	6.60	3.98	9.85	14.53	16.35	15.92	12.54	8.39	5.07
Plan F	6.60	2.30	8.41	12.87	14.32	13.26	9.04	4.13	-.01

TABLE 6-6

PROJECTED POPULATION, AND CANADA AND QUEBEC PENSION PLAN VALUES—PROJECTION 19
Age of Eligibility for Receipt of the Pension Reduced From 65 to 60, Beginning in 1981

	1975	1980	1990	2000	2010	2020	2030	2040	2050
	(Thousands)								
Population									
Total	23,291	24,872	28,212	31,229	33,791	36,080	37,771	39,027	40,151
Aged 65 and over	1,990	2,309	2,886	3,533	4,156	5,488	6,772	6,655	6,804
Retirement beneficiaries									
Male	655	765	1,119.0	1,359.0	1,593.0	2,124.0	2,602.0	2,479.0	2,563.0
Female	349	564	1,272.0	1,931.0	2,423.0	3,215.0	3,991.0	4,003.0	4,061.0
	(Per cent)								
Cost of plan relative to total contributory earnings									
Retirement pensions	.69	1.69	4.19	5.02	6.48	8.61	9.36	8.66	9.11
Total benefits	1.48	2.85	5.80	6.86	8.51	10.85	11.63	10.94	11.36
Average retirement benefit relative to maximum pensionable earnings									
Male	5.98	12.41	20.40	21.15	23.51	22.48	19.55	19.33	19.99
Female	3.12	6.64	9.24	8.73	10.51	11.60	11.05	11.10	11.82
Contribution rate									
Plan A	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
Plan B	3.60	3.60	5.80	6.86	8.51	10.85	11.63	10.94	11.36
Plan C	3.60	3.60	4.79	6.42	8.30	10.75	11.58	10.91	11.35
Plan D	3.60	8.59	8.59	8.59	8.59	8.59	8.59	8.59	8.59
Plan E	3.60	9.06	9.06	9.06	9.06	9.06	9.06	9.06	9.06
Plan F	3.60	8.81	8.81	8.81	8.81	8.81	8.81	8.81	8.81
	(Ratio)								
Value of fund expressed relative to contributions									
Plan A	6.60	6.64	2.63	-5.25	-16.41	-34.39	-56.98	-77.30	-99.71
Plan B	6.60	6.64	3.43	2.81	2.19	1.74	1.63	1.71	1.66
Plan C	6.60	6.64	2.67	.95	.36	.14	.07	.04	.02
Plan D	6.60	4.49	7.96	10.12	10.88	9.62	6.15	3.03	.01
Plan E	6.60	4.41	8.16	10.70	11.90	11.27	8.51	6.03	3.74
Plan F	6.60	2.05	6.16	8.57	9.60	8.61	5.48	2.70	.00

The cost of paying the pension at an earlier age is fairly substantial, as indicated by the required contribution rates under the various financing schemes. Under scheme C, a modified pay-as-you-go plan, the contribution rate in 1990 would be about 1 percentage point higher than in the baseline case, 2 points higher by the year 2000, and about 2-1/2 points by the last decades of the projection period. The flat-rate contribution schemes D, E, and F all have rates 2 percentage points or more higher than the baseline case.

One way to reduce the cost of lowering the retirement age is to introduce the change at a later date. To assess the costs in this case, we consider lowering the eligibility age to 60 in 1991 rather than 1981. The outcome is summarized in Table 6-7. The result for the 3.6 per cent contribution case, scheme A, is to postpone for half a decade the date on which

the fund would go into deficit. Under the modified pay-as-you-go alternatives, schemes B and C, postponement means lower contribution rates until the last decade of this century, after which the rates are quite similar. The flat contribution rate alternatives, schemes D, E, and F, all have rates that are lower by about 0.1 of a percentage point when the change is postponed.

It would thus appear that the cost of lowering the retirement age by five years is quite considerable, even though it falls far short of the cost of doubling the benefit proportion.

AGE AND BENEFIT PROPORTION CHANGES

Our final projection involves both lowering the age of pension eligibility from 65 to 60 in the year

1981, as in projection 19, and increasing the benefit proportion from 0.25 to 0.50, starting in 1981, as in projection 15. Thus the case combines two high-cost options. The projected results of providing both together are summarized in Table 6-8 (projection 23).

The increase in costs in this case is quite dramatic. Expressed relative to the total contributory earnings base, the projected cost rises to 13.3 per cent by the end of this century, compared with 5.3 per cent in the baseline case and 10.2 per cent in the case where the benefit proportion alone is increased. Projected costs continue to rise in all cases, reaching a peak in 2030 when the high-cost combination would require a rate of 23 per cent of total contributory earnings.

The contribution rate would depend to some extent on the financing scheme adopted. It is clear,

however, that the contribution rate under any financing scheme must be markedly higher in this high-cost case than in those considered previously if the Plan is to be self-financing in any sense. Under the modified pay-as-you-go alternatives, schemes B and C, the projected required contribution rate would more than double between 1980 and 1985 and would approximately double again by 2010, after which there would be a further sharp increase, with the rate climbing to about 23 per cent at its peak in 2030. This 23 per cent peak can be compared with the peak of 18 per cent when the benefit proportion alone is doubled (projection 15) and with 9 per cent in the baseline case, in which the existing benefit provisions are unchanged.

The flat-rate contribution financing alternatives — schemes D, E, and F — all yield similar results. It would require a contribution rate of about 17 per

TABLE 6-7

PROJECTED POPULATION, AND CANADA AND QUEBEC PENSION PLAN VALUES—PROJECTION 20
Age of Eligibility for Receipt of the Pension Reduced From 65 to 60, Beginning in 1991

	1975	1980	1990	2000	2010	2020	2030	2040	2050
	(Thousands)								
Population									
Total	23,291	24,872	28,212	31,229	33,791	36,080	37,771	39,027	40,151
Aged 65 and over	1,990	2,309	2,886	3,533	4,156	5,488	6,772	6,655	6,804
Retirement beneficiaries									
Male	655	765	1,119.0	1,359.0	1,593.0	2,124.0	2,602.0	2,479.0	2,563.0
Female	349	564	1,272.0	1,931.0	2,423.0	3,215.0	3,991.0	4,003.0	4,061.0
	(Per cent)								
Cost of plan relative to total contributory earnings									
Retirement pensions	.69	1.69	2.81	5.33	6.59	8.63	9.35	8.66	9.11
Total benefits	1.48	2.85	4.40	7.20	8.66	10.88	11.64	10.94	11.36
Average retirement benefit relative to maximum pensionable earnings									
Male	5.98	12.41	13.76	22.20	23.78	22.49	19.55	19.32	19.99
Female	3.12	6.64	6.71	9.44	10.78	11.63	11.05	11.09	11.82
Contribution rate									
Plan A	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
Plan B	3.60	3.60	4.40	7.20	8.66	10.88	11.64	10.94	11.36
Plan C	3.60	3.60	3.60	6.56	8.35	10.72	11.55	10.90	11.34
Plan D	3.60	8.47	8.47	8.47	8.47	8.47	8.47	8.47	8.47
Plan E	3.60	8.96	8.96	8.96	8.96	8.96	8.96	8.96	8.96
Plan F	3.60	8.69	8.69	8.69	8.69	8.69	8.69	8.69	8.69
	(Ratio)								
Value of fund expressed relative to contributions									
Plan A	6.60	6.64	4.97	-2.26	-14.16	-32.31	-54.93	-75.28	-97.67
Plan B	6.60	6.64	4.58	2.79	2.24	1.81	1.70	1.78	1.74
Plan C	6.60	6.64	4.97	1.36	.53	.21	.10	.05	.03
Plan D	6.60	4.51	8.82	11.37	11.69	10.19	6.52	3.20	-.00
Plan E	6.60	4.42	8.97	11.92	12.74	11.91	9.00	6.38	3.95
Plan F	6.60	2.04	7.02	9.77	10.38	9.16	5.83	2.87	-.00

TABLE 6-8

PROJECTED POPULATION, AND CANADA AND QUEBEC PENSION PLAN VALUES—PROJECTION 23
Age of Eligibility for Receipt of the Pension Reduced From 65 to 60, Beginning in 1981, and the Retirement Benefit Proportion for All Beneficiaries Increased Evenly Over a Five-Year Period From 0.25 to 0.50, Beginning in 1981

	1975	1980	1990	2000	2010	2020	2030	2040	2050
	(Thousands)								
Population									
Total	23,291	24,872	28,212	31,229	33,791	36,080	37,771	39,027	40,151
Aged 65 and over	1,990	2,309	2,886	3,533	4,156	5,488	6,772	6,655	6,804
Retirement beneficiaries									
Male	655	765	1,119.0	1,359.0	1,593.0	2,124.0	2,602.0	2,479.0	2,563.0
Female	349	416	854.4	1,355.9	1,901.9	2,814.5	3,628.3	3,667.3	3,721.7
	(Per cent)								
Cost of plan relative to total contributory earnings									
Retirement pensions	.69	1.69	8.38	10.04	12.96	17.23	18.71	17.32	18.23
Total benefits	1.48	2.85	11.13	13.29	16.66	21.38	23.00	21.64	22.52
Average retirement benefit relative to maximum pensionable earnings									
Male	5.98	12.41	40.80	42.30	47.02	44.95	39.10	38.65	39.98
Female	3.12	8.99	27.51	24.87	26.79	26.49	24.31	24.22	25.79
Contribution rate									
Plan A	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
Plan B	3.60	3.60	11.13	13.29	16.66	21.38	23.00	21.64	22.52
Plan C	3.60	3.60	10.32	12.95	16.49	21.30	22.95	21.62	22.51
Plan D	3.60	16.92	16.92	16.92	16.92	16.92	16.92	16.92	16.92
Plan E	3.60	17.86	17.86	17.86	17.86	17.86	17.86	17.86	17.86
Plan F	3.60	17.14	17.14	17.14	17.14	17.14	17.14	17.14	17.14
	(Ratio)								
Value of fund expressed relative to contributions									
Plan A	6.60	6.64	-6.97	-30.74	-61.37	-107.10	-161.77	-211.06	-237.00*
Plan B	6.60	6.64	1.72	1.39	1.07	.85	.79	.83	.81
Plan C	6.60	6.64	.98	.37	.14	.06	.03	.01	.01
Plan D	6.60	3.72	7.86	10.17	11.02	9.79	6.28	3.11	.01
Plan E	6.60	3.68	8.06	10.74	12.04	11.45	8.67	6.15	3.80
Plan F	6.60	2.48	6.93	9.37	10.36	9.27	5.94	2.93	.01

*As a result of some minor computer programming difficulties, the ratio for Plan A for 2050 is estimated by the authors, and is not based entirely on data provided by the Department of Insurance.

cent between now and the middle of the next century to finance the benefits of the Plan over that entire period and leave approximately a zero bal-

ance in the Plan fund at the end of the period. That rate is somewhat more than 10 percentage points higher than in the baseline projection.

7 Summary and Concluding Remarks

The purpose of this study has been to consider the future financing of the Canada and Quebec Pension Plans. This topic is of special interest because changes in the age structure of the population over the next few decades and beyond will result in a substantial increase in the older proportion of the population. These changes, in turn, will mean that benefit payments under the Canada and Quebec Pension Plans will soon exceed the contributions, with the result that the combined CPP and QPP fund will eventually go into deficit if financing arrangements are not modified.

To project the deficits that would occur in the absence of corrective action and also to consider some possible ways of avoiding these deficits, we have made use of a computer simulation model developed by the Canada Department of Insurance. This model accepts assumptions concerning future demographic and economic change and produces projections of the population, the total amount of earnings subject to contribution, and the costs of operating the CPP and QPP Plan. In addition, the model projects or simulates the revenue, expenditure, and fund values associated with the operation of the Plan, under a variety of assumptions concerning the financing method chosen.

As a convenient focus, we have emphasized in our discussion a "baseline" case in which the current benefit provisions of the Plan are assumed to be maintained, in conjunction with a "medium" projection of the future growth of the population and of the economy. The effects of alternative assumptions concerning demographic changes, changes in participation rates, and changes in key benefit provisions of the Plan have then been assessed by comparison with the baseline results.

In the baseline case, the continuation of the current 3.6 per cent contribution rate, in conjunction with the current benefit provisions, results in benefits exceeding contributions by 1990, with the

fund going into a debtor position before 2010 and accumulating increasingly large deficits thereafter.

Five financing possibilities have been considered in addition to the current arrangements. Two involved transition to a pay-as-you-go scheme once the payment outflows exceeded the revenue inflows, and three involved an early switch from the 3.6 per cent contribution rate to a higher flat rate. Depending on the details of the scheme, the flat rate chosen would either result in a zero fund at the end of the projection period or keep the fund growing throughout that period. Under both of the pay-as-you-go schemes, the projected contribution rates increase from 3.6 per cent between 1985 and 1990, reaching peaks in excess of 9 per cent by 2030. In the case of the three flat-rate schemes, the lowest rate is about 6.6 per cent and the highest, about 6.9 per cent — not a big difference.

It was found in a variety of projections, based on alternative assumptions about possible future demographic change, that the major conclusions of the baseline projection are largely unaffected; that is, a continuation of the current benefit provisions in conjunction with current financing arrangements would lead to benefit payments in excess of contributions within another decade or so and to an accumulated deficit in the fund within four decades. Thus, whatever the course of future demographic change, some combination of changes in the benefit provisions and the financing arrangements appear to be inevitable. If the benefit provisions were to be retained, the level of the projected contribution rates in the case of a transition to a pay-as-you-go scheme would not appear particularly onerous, especially over the next three to four decades. If a flat contribution rate were chosen instead, the rate that is projected to be appropriate would be somewhat above the pay-as-you-go rate over the next four decades or so and somewhat below it thereafter. Depending on the particular projection and the flat-rate financing scheme chosen, the appropriate

rate would appear to be somewhere between 5.4 and 8.1 per cent, with 7 per cent being a rough average. We conclude that a switch to a somewhat higher contribution rate will be required within a decade or so if the current benefit provisions of the Plan are to be retained and an accumulated deficit avoided. The required increase is not very sensitive to alternative population projections.

We have also made a variety of projections involving changes in those provisions of the Plan relating to the retirement benefit proportion and to the age of retirement pension eligibility. We have found, not surprisingly, that, taken separately, both a reduction in pensionable age from 65 to 60 and an

increase in benefit proportion from 25 to 50 per cent would result in very substantial increases in costs and thus hasten the date by which the present contribution rate would have to be increased if the fund were not to go into debt. It should be noted, however, that we have assumed rather major changes in order to emphasize the consequences and that, even for these, the required contribution rates that are projected would appear not to be so great as to lie outside the bounds of possible future acceptability. Of course, lesser increases in the benefit proportion or less reduction in the age of pension eligibility would produce correspondingly smaller increases in costs.

Notes

CHAPTER 2

- 1 This chapter draws heavily on Statistics Canada, *Social Security, National Programs* (Cat. No. 86-201) and on the Department of Insurance, *Canada Pension Plan, Statutory Actuarial Report No. 3, as at December 31, 1973* (Ottawa, April 1974).
- 2 For a full account of the nonretirement pension benefits available under the plan, see Statistics Canada, *Social Security, National Programs*.

CHAPTER 3

- 1 Frank T. Denton, Christine H. Feaver, and Byron G. Spencer, *The Future Population and Labour Force of Canada: Projections to the Year 2051*, Economic Council of Canada (Ottawa: Supply and Services Canada, 1980).
- 2 The population assumptions made here parallel as closely as possible to those made in Denton, Feaver, and Spencer, *The Future Population and Labour Force of Canada*.

CHAPTER 5

- 1 The projection numbers reported in Tables 5-1 and 5-2, and subsequently are not in strictly ascending order, nor are all projections reported. The numbers indicate the sequence in which projections were requested of the Department of Insurance.
- 2 Frank T. Denton, Christine H. Feaver, and Byron G. Spencer, *The Future Population and Labour Force of Canada*.

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