AN ACTUARIAL MONOGRAPH

ON THE

CANADA PENSION PLAN

By

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Both reviewed the many drafts of the text, and made invaluable suggestions. The monograph, however, reflects my views and opinions, and should not be construed in any way as necessarily representing their opinions, those of their Departments, or of the Government of Canada.

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PREFACE

In recent years, the Canada Pension Plan (CPP) has become one of Canada's largest income security programs, the largest one currently being the Old Age Security. Indeed, during 1994, CPP benefits, totalling more than $15 billion were paid to over two million retired pensioners and approximately one million survivor and disability beneficiaries.

Partly because the CPP was implemented on a pay-as-you-go financing basis rather than on a fully funded basis, occasional concerns have been expressed about its financial viability. The following study is a monograph that addresses a range of CPP-related financial issues from several different perspectives. The monograph applies accepted actuarial standards, supplemented by the comprehensive projections of the CPP Actuarial Valuation Model, and provides references and tools that can be used for a proper assessment of the CPP's financial status. One of the main objectives of this monograph is to illustrate the extent to which public concerns about the CPP are justified, and also how popular proposals for changing the existing CPP benefit or financing designs would also carry their own share of shortcomings. Therefore, it is not intended here to propose solutions but mainly to set as objectively as possible the pros and cons of both the existing situation and alternatives that have recently received favourable public attention.

Under the sponsorship of the Minister of Human Resources Development Canada, the authorship of this CPP monograph is two-fold, with the main author being J. Bruce MacDonald, an experienced and renowned actuary with over 40 years experience in the private sector, mainly as a consulting actuary. Richard J. Morrison, PhD (economics), an officer in the Income Security Policy Branch of Human Resources Development Canada, initiated this project by setting out in some detail its structure and areas to be covered.

It is hoped that the readers of this monograph will benefit from a paper that was prepared by a team of professionals representing both the public and the private sector, and both the actuaries' and the economists' professions. Although further analyses could be done to explore the topic, this monograph should positively contribute to a better understanding of the CPP and its vital role within the Canadian Retirement System.

EXECUTIVE SUMMARY

Implemented in 1966, the **Canada Pension Plan** (CPP) is a unique pension plan that covers virtually the entire working population of Canada, (excluding those in Québec, who are covered by the Québec Pension Plan). It is fully portable, it is fully indexed, and it provides immediate vesting of retirement benefits.

The CPP is functioning more or less as was intended. All of its actuarial reports, including those before its inception, projected increasing contribution rates in the future because of the maturing of the plan -- people over age 70 in 1966 were not covered and full benefits were not granted for ten years -- and the changing of Canadian demographics causing the population to age, with an ultimate age distribution comparable to that in most western European countries. Many of the concerns expressed about the CPP have resulted from a lack of understanding of how it was projected to evolve. Many of the critics are unaware of the considerable documentation on the plan and its financing which is publicly available.

The long term pay-as-you-go rates, which approximate the contribution rates in the Fifteenth Actuarial Report (December 31, 1993) of about 14%, and which are reached shortly after 2025, are higher by about 8.5% than originally projected. More recent experience has resulted in an increase in costs over those in the Fourteenth Report; this was caused almost exclusively by the increased utilization of the disability provisions. The reasons for the increase over the original projections are listed in decreasing order of importance, *i.e.* with the most significant reason given first. The percentage is the amount of the increase for which the reason identified is responsible.

1. Less favourable economic conditions than originally assumed, as measured by the difference between the rate of wage and price increases. (33%)
2. Benefit enhancements. (32%)
3. Increased use of the disability benefit. (18%)
4. Longevity increases more than originally assumed. (8%)
5. Less immigration than originally assumed. (4%)
6. Fertility rates somewhat lower than originally assumed. (2%)
7. All other causes combined, including changes in methodology. (3%)

The expected increase in the CPP contribution rates for the next thirty-five years, *i.e.* from 1995 to 2030, are mainly attributable to low fertility rates, which are also the main reason for the aging of the population, and, to a lesser extent, the projected improvements in longevity; this is a normal consequence in these circumstances when a pay-as-you go approach to financing is used. This projected increase is not unique to Canada. It also applies to most industrialized countries having social insurance programs financed on a pay-as-you-go basis. This increase is not caused by the “high” level of benefits, in relation to the years of contributions paid to the first generation of beneficiaries. This increase is in contrast with the increase from 1966 to 1995 which resulted mainly from staring a social security plan on a pay-as-you-basis, with no benefits

being provided to those over seventy at its inception, and full benefits not being provided for some years after its inception.

The CPP, in conjunction with OAS, is, in general, a better designed plan than many other social security schemes. A recent study conducted by the **World Bank** commented on social security schemes throughout the world. While it did not comment specifically on Canada's, it criticized many social security plans, and established certain criteria that should be met. When these criticisms and criteria are applied to the combination of CPP and OAS, the Canadian system scores fairly well, and better than the schemes of most other countries.

CPP and OAS are an essential part of the income of older Canadians. Without them, benefits payable under the Guaranteed Income Supplement and the Spouses' Allowance (GIS/SPA), and other income tested programs, would be considerably higher, resulting in higher taxes, and more elderly Canadians living in poverty. In this sense the CPP has contributed to a decline in poverty since its inception in 1966.

The CPP financing method, largely pay-as-you-go, is prescribed by the Act, and provides all the flexibility needed to avoid bankruptcy. The CPP is supported entirely by contributions from employers and employees: the Act establishing the CPP does not require any government funding. Thus increases in contribution rates impose no direct burden upon government. It does, however, constrain the taxing power of the government in the sense that monies contributed towards the CPP are not available for other purposes.

CPP benefits are taxable, and generate substantial tax revenues; CPP contributions, however, are either deductible from taxable income by employers, or create tax credits for individuals, and so reduce tax revenues. On the other hand, OAS and GIS/SPA are completely funded by government out of general tax revenues. OAS benefits are taxable, while GIS/SPA benefits are not.

Affordability, which is somewhat subjective though a real source of individual concerns, has been considered from a number of perspectives in this study. Allowance has been made for the increases in contributions projected in the Fifteenth Actuarial Report, unless specifically noted otherwise, and the reasons for allowance not being made is given.

The expected increase in contribution rates for the next thirty-five years, taken from the CPP Fourteenth Actuarial Report, does not result in a decrease in disposable income from the present level, but the partial de-indexing of tax brackets, if continued, makes this a near thing. Even if allowance is made for the higher contribution rates that will probably result from the Fifteenth Report, this will not change.

Disposable income is defined as income after paying income tax and social security contributions. Allowance is made for inflation in the calculations. While disposable income does not decrease, there is no appreciable increase in living standards as the majority of the increase in income goes towards increased taxes and CPP contributions. Thus the CPP could be as affordable in the future as it is now.

When adjusted for benefit levels, and including the cost of OAS, Canada's retirement system at present, and in the near future, costs less than that in the other G-7 countries. In the long run the cost will be comparable. Canada generally provides a lower level of benefits than in the other countries, only 25% of average earnings for the CPP, and requires contributions on a lower tranche, (or portion), of earnings than in other countries. Thus, in absolute terms, the cost is less as well. The CPP thus has a cost comparable to, if not lower than, similar plans in the other leading industrialized countries.

The real rate of return on contributions in the past has been excellent. In the near future it will be acceptable, when compared with low risk investments, and even more so when allowance is made for the very low rate of expense on the CPP, compared with those on private investments. In the long term the rates of return will be less attractive, but may still be acceptable.

This means that all future generations are expected to receive in current dollar benefits well over five times what they and their employer contributed, contrary to the belief that that they will receive less in benefits than the amount contributed. More importantly, although the real, *i.e.* the inflation adjusted, rate of return may be low, it is positive.

Very few employer sponsored defined benefit Registered Pension Plans (RPPs) provide the full inflation indexing of benefits that the CPP does, and it is virtually impossible for defined contribution RPPs or Registered Retirement Savings Plans (RRSPs) to provide such indexing except at the cost of a reduced income initially. Some features of the CPP, like full portability with indexing maintained, cannot be duplicated by private plans.

The CPP is properly priced, considering the benefits provided, and the financing method used. Virtually all contributions are used to provide benefits, and the amount utilized to cover expenses is extremely low.

Pay-as-you-go financing, which is used in all the other G-7 countries, has traditionally been considered as the most appropriate method for social security plans, despite the intergenerational inequities that it implies. Full funding would avoid most of these intergenerational inequities, but in its turn would create some very important economic problems.

The investment policy for the existing CPP fund could be changed to increase the yield, but this could also create some problems, although to a lesser extent because the size of the fund is much smaller than it would be under a fully funded plan. In any event, the rate of investment return on the present CPP fund is only marginally important because of the pay-as-you-go approach to financing.

Many commentators believe that Canada is currently facing serious financial problems. The problems are not with the CPP *per se*, but rather with the increasing costs of Canada's entire social security system, which includes medicare. This is exacerbated by the deficit, the interest that has to be paid on the accumulated debt, and the high level of taxation in Canada.

A contributing factor to the problem from the individual's perspective is the partial de-indexing of the income tax brackets, which only increase at the rate of increase in the Consumer Price Index (CPI) less 3%, and so increase at a much slower rate than increases in income; at present they do not increase at all, although incomes are increasing, albeit slowly.

Finally, the effect of any changes in the CPP that might be considered to reduce its cost must take into account the effect upon other government programs, and upon private arrangements such as RPPs and RRSPs.

I

INTRODUCTION

There has recently been much criticism of the **Canada Pension Plan (CPP)**[1] in the media, in professional and academic circles, and by individuals, suggesting that contribution rates will ultimately reach unacceptable levels, that the CPP is going bankrupt, and that it will not be there to provide benefits when Canadians[2] retire. There have been suggestions about cutting back benefits, such as raising the retirement age, reducing indexing, and increasing the contribution base. A recent series of articles in the *Globe and Mail* by Andrew Coyne concluded by recommending that the CPP be phased out over a twenty year period, with those now under age forty five receiving nothing; in that proposal the CPP was to be replaced with a forced savings plan to be used for retirement benefits only, financed by mandatory contributions of 10% of earnings in each year, similar in its overall concept to the plans in effect in Chile, Malaysia, and Singapore.

Some, but not all, of the criticism may be justified. Some criticisms stem from a lack of knowledge of the CPP. The **World Bank** published a Policy Research Report, Averting *the Old Age Crisis,* in September 1994. Some of its findings are incorporated, although not in great detail in this paper. Its analysis of social security systems throughout the world indicates that the combination of the CPP and the Old Age Security (OAS) pension in Canada, while not meeting all of their criteria, score higher than the systems in most other countries. This is discussed briefly in the chapter comparing the Canadian system with that in the other G-7 countries[3]. I hope that this paper will both enable readers to make their own assessment of the criticisms levelled against the CPP, and to allay many misconceptions that exist about the CPP.

This paper attempts to broaden the knowledge that Canadians have about the CPP, a generally well designed, if somewhat complex plan, in order that any debate about the CPP will be on a more informed basis. The motto of the Canadian Institute of Actuaries (CIA) is *Nobis Cura Futuri,* which roughly translated means *"our care is the future."* This reflects the growing concern of Canadians about the CPP. Bearing this in mind, this paper attempts to rely as much as possible on the motto of the Society of Actuaries, *"to substitute facts for appearances and demonstrations for impressions,"* in order to put the public issues about the CPP in proper perspective.

Just as this monograph was nearing completion, the Fifteenth Actuarial Report on the CPP, as of 31 December 1993, was tabled in the House of Commons on February 24, 1995. It

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[1] Much of the material in this paper also applies to the Québec Pension Plan (QPP), but as the terms of reference are specifically for the CPP, there is usually no specific reference to the QPP. It should not be assumed that everything said applies automatically to the QPP, although obviously much of it will be applicable.

[2] Throughout this paper the terms *Canadians* will be used as equivalent to contributors or beneficiaries under the CPP as a matter of convenience in writing, although there is no requirement of citizenship in order to be eligible for benefits under the CPP. For brevity, Canada will mean Canada, excluding Québec, unless the context makes it clear that the entire country is meant.

[3] The G-7 countries are Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States.

was decided to delay publication in order to update many of the figures to reflect the results of that report. In a few instances figures derived from the Fourteenth Report were retained in order to save time as the author felt that that would be no significant change in using figures from the Fifteenth Report. This is identified whenever done.

Among other issues, this paper considers the affordability of the CPP. The term *affordability* can have many meanings, so it is useful to begin by indicating some of the various definitions that may apply.

- Being able to pay for the CPP without cutting either other social security plans or living standards
- Having a cost comparable to that of social security plans in the other G-7 countries, adjusting for the level of benefits provided.
- Providing a reasonable rate of return comparable to other investments
- Being difficult to do better than the CPP by using private pension plans or individual savings
- Having a cost not disproportionate to the economy
- Being reasonably priced given the benefits provided
- Sustainable on its own without government funding

The CPP cannot be considered as providing benefits at an overly generous level: a replacement ratio of 25% of pensionable earnings hardly so qualifies. As shown in the monograph, all of the G-7 countries have higher replacement ratios, even if the benefits provided by OAS are added to those of the CPP. If the CPP is expensive, it is because retirement pensions themselves are inherently expensive. Moreover, as will be seen in this paper, the issue of affordability should not be addressed by taking the CPP in isolation, but rather in relation to the whole spectrum of public and private pension plans, as well as the other social security plans and the overall level of taxation.

Nevertheless, if after taxes and the aggregate of contributions to social security programs, there are substantial reductions in the disposable income of Canadians, then the situation may not be acceptable. Conversely something might be very affordable by some standards, but have virtually no appeal or use to anyone.

In parts of this monograph, I address the various definitions of affordability with respect to the CPP, as well as many other aspects of the CPP. I have avoided the more subjective definitions of affordability.

The structure of this paper is as follows:

Chapter II provides an overview of the social security aspects of the Canadian retirement system. A more detailed description of the CPP, the OAS, the Guaranteed Income Supplement, (GIS), and the Spouses' Allowance (SPA) is contained in Appendix A, while a detailed history of changes in the CPP is contained in Appendix B.

Chapter III briefly addresses the actuarial aspects of the CPP, and includes a history of the projected contribution rates from all of the statutory Actuarial Reports on the CPP. It indicates how the cost of the CPP relates to the benefits provided. This entire subject is considered in greater detail in Appendix C.

Chapter IV derives, using several different methods, rates of return for the CPP; while it concentrates on the *internal rate of return*, both *nominal* and *real*, other methods are also discussed.

Chapter V gives the rates of return on other forms of investment, and compares them with the rates of return developed in Chapter IV; the effect of expenses and taxes on rates of return for both the CPP and alternative investments is considered as part of this comparison.

Chapter VI describes the extent of private arrangements for retirement income in Canada, both Registered Pension Plans (RPPs), *i.e.* pension plans established by employers for their employees[4], and Registered Retirement Savings Plans (RRSPs). Sources of income for those aged 65 and over are shown. The effect of the CPP on the design of RPPs, and changes that might occur in both RPPs and RRSPs, if changes were made in the CPP are indicated. Finally there is a reconciliation of the cost of the CPP with one private plan that demonstrates that the apparent differences in cost between the CPP and RPPs result primarily from differences in plan provisions and funding methods.

Chapter VII examines the interaction of CPP with other government sponsored plans, especially the Guaranteed Income Supplement (GIS). It gives an indication of how the CPP has reduced the costs of such plans.

Chapter VIII compares the Canadian social security retirement system with systems in the other G-7 countries, and shows that the costs are comparable, given the differing benefit levels. It also summarizes the criticisms of the World Bank of typical social security schemes, and indicates their applicability, if any, to Canada.

Chapter IX examines the financing and funding aspects of the CPP, and how they affect the costs of the plan. It also considers the effect that increased contribution rates have upon disposable income. Further, it discusses intergenerational transfers, an aspect of a criticism frequently made of the CPP.

Chapter X considers the current investment policy of the CPP fund, and discusses the effects of possible changes in it.

Chapter XI discusses briefly the costs of other social security systems in Canada, including OAS, GIS, SPA, Unemployment Insurance (UI), Medicare, and Workers' Compensation, and places these costs in the context of the general level of taxes in Canada.

Chapter XII summarizes our conclusions.

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[4]These are called *Registered Pension Plans* because they are registered under the Income Tax Act.

Appendix A is a detailed description of the various components of the public retirement system: CPP, OAS, GIS, and SPA. Appendix B is a detailed history of the changes in the CPP since its inception. Appendix C provides a more technical discussion of the actuarial aspects of the CPP.

Appendix D contains the proof of an important theorem establishing that, under stabilized conditions, the internal rate of return on an earnings-related pension plan that is financed on a pay-as-you go basis corresponds to the assumed annual rate of increase in total employment earnings. Appendix E is a reproduction of the paper *Fund Development of an Earnings-related Social Insurance Plan under Stabilized Conditions*, by Pierre Treuil, an actuary who worked in the Office of the Superintendent of Financial Institution (OSFI) up to his retirement; this paper was originally published in Volume XXXIII of the Transactions of the Society of Actuaries and is reproduced here with permission. Appendix F is a description of the SIMTAB model used for developing certain figures in the paper.

There is also a Glossary of terms used in this paper, and a brief Bibliography, which contains source materials which I have used, and suggestions for further reading.

This paper does not address social policy, except very peripherally, and concentrates on the financial aspects of the CPP. A discussion of social policy lies beyond both the mandate and scope of this paper.

Because of both budgetary and time constraints associated with this study, there has been much that it has not been possible to address. More detailed analysis of the income tax statistics would be valuable. The information needed is available, but requires the implementation of a specific computer program to do the relevant analysis. I have been able to do some work in this area by using SIMTAB, a model of the Canadian population by family income and type, based on a sample of Canadians, developed by Health and Welfare Canada (now Human Resources Development Canada or HRD); this is described in Appendix F. This information is thus developed from a sample, rather than complete tax statistics. Other useful areas would include detailed studies of the effect of changes in income tax rates on the rates of return determined, and the effect of the use of tax credits rather than deductions from taxable income.

II

BACKGROUND: OVERVIEW OF THE PUBLIC CANADIAN RETIREMENT SYSTEM

This Chapter provides an overall view of the Canadian Retirement system, highlighting its social security aspects. Private arrangements, whether by means of employer sponsored pension plans, or individual arrangements, are considered in Chapter VI of the paper.

To consider the CPP meaningfully, it is necessary to know what benefits are provided by the CPP, and by other social security plans, and what currently is provided by other arrangements in the private sector. A more complete description of the CPP is contained in Appendix A, which also includes descriptions of OAS, GIS, and SPA. This chapter also includes an abridged history of the improvements that have been made in the CPP since its inception in 1966[5], and the effect these have had upon projected costs of the CPP. These are important considerations with respect to the projected costs of the CPP, since the combined effect of all these improvements is a major reason why the projected costs are now substantially higher than those originally anticipated.

The Canada Pension Plan and other Social Security Plans

It has been argued that the CPP has been one of the major successes of Canada's social security system. It provides retirement and disability coverage, plus benefits for surviving spouses and orphans, for virtually the entire Canadian employed labour force outside Québec. Québec has its own Québec Pension Plan (QPP), one that is similar in most, but not all aspects, to the CPP. The exceptions to the near universal coverage are relatively minor, embracing people such as employees of foreign governments, Canadians working abroad for non-Canadian employers, and members of religious orders who have taken a vow of poverty. Perhaps the biggest group not covered consists of workers, who each and every year from age 18 to 70 earn less in a year than the Years' Basic Exemption (YBE) under the CPP, which in 1995 is $3,400. Any year in which earnings are less than the YBE does not create pension credits, but a certain number of such years can be dropped out in the ultimate calculation of retirement benefits. Of course, those without earnings from employment from age 18 to age 70 are not covered at all. It is estimated that the CPP covers 92% of the labour force, that 62% of the population between ages 18 and 65 contribute to it, and that ultimately 98% of males and 90% of females in Canada (excluding Québec)[6] will receive retirement benefits.

The CPP has many advantages.

- It is a compulsory plan for all with employment earnings above a modest level, *i.e.* the YBE ($3,400 in 1995), whether employed or self-employed.
- It covers employment earnings to the YMPE, ($34,900 in 1995), which is approximately 115% of the average wage in Canada. It therefore automatically provides mandatory

[5]This is covered in more detail in Appendix B.
[6]The figures would essentially be the same if Québec were included.

coverage for an extensive range of retirement, disability, survivor, and death benefits for those who would not normally be covered under plans established by their employer, or who would not or could not purchase such coverage on their own.

- The employer contributes as well as employees, with the cost being shared equally between them.
- It covers the self-employed, who contribute at the combined employer/employee rate.
- No evidence of insurability is required for any of the benefits; this is especially valuable for those payable in the event of disability or death.
- Benefits, once in pay, are fully indexed to increases in prices, while pensionable earnings, upon which the initial levels of most benefits are based, are fully indexed to the increase in the average wage.
- Benefits are completely portable, and cannot be lost, reduced or de-indexed upon termination of employment.
- Benefit rates do not vary by sex.
- There are provisions for dropping out periods of low earnings and periods of child-rearing, as well as periods during which CPP disability benefits are received.
- All individual contributions currently give rise to a federal income tax credit of 17% of the contribution, and roughly 27% once provincial income tax is taken into account, while the employers' contributions are deductible from their taxable business income, and do not create a taxable benefit for employees.
- No contributions are required on a first tranche of earnings, the YBE, which is set at 10% of maximum pensionable earnings, the Years' Maximum Pensionable Earnings (YMPE), while benefits are accrued on this tranche of earnings, provided earnings exceed the YBE. (The YBE and YMPE are $3,400 and $34,900 respectively in 1995.) It thus provides greater benefits, relative to contributions, for those with low earnings. The contribution can thus be considered as *progressive* up to the level of the YMPE in the sense that lower proportional contributions are required from low earners. This also means that the contribution rates, when expressed as a percentage of pensionable earnings, are at least 10% lower than they would be if they were expressed as a percentage of contributory earnings; this amount of 10% applies to those earning at least the YMPE, and a higher figure applies to those earning less than the YMPE.

This is not to say that the design of the CPP has not been subject to criticism. Some of those that have been made are:

- No benefits for those who had retired before the inception of the CPP, and reduced pension benefits for those who retired in the first ten years of the CPP's operation.
- Pensions indexed with prices rather than wages, with the consequence that pensioners do not share in the economic growth of the country that occurs after their retirement.
- No provision for using years in which earnings exceed the YMPE to top-up earnings in years in which they are less than the YMPE.
- No benefits accruing in years in which earnings are less than the YBE, except to the extent provided by the drop-out provisions.
- No coverage for unpaid workers, such as homemakers, except to the extent provided by the drop-out provisions.
- No contributions on earnings below the YBE or above the YMPE.

- Intergenerational inequities.

A comprehensive discussion of these criticisms is beyond the scope of this paper, although some will be considered. However, the knowledge of the CPP provided by this paper should help the reader in assessing these criticisms.

It should be remembered that when the CPP was inaugurated in 1966, some criticized it for doing nothing for those then over age 70, and for requiring ten years of contributions, all by age 70, in order to be entitled to maximum retirement benefits. On the other hand there were those who argued that maximum retirement benefits should require twenty years of contributions, versus the ten years actually required. Even at the very beginning of the CPP, it was criticized both for being not generous enough, and, at the same time, for being overly generous.

If the CPP had been altered to eliminate the first criticism, it would have been necessary to raise contribution rates sooner, and not nearly as large a fund would have been built up. In retrospect, this approach might have eliminated many misconceptions about the funding of the CPP. If it had been altered to meet the second criticism, and the same contribution rates used, then a much larger fund would have been built up, and the need to increase contribution rates could have been deferred even further into the future.

The CPP, as it is today, is described in more detail in Appendix A. That Appendix also includes fuller descriptions of the OAS, GIS, and SPA programs. In brief, OAS was originally a universal demogrant, not dependent upon earnings or contributions, but solely upon residence during the working life. GIS and SPA are income-tested supplementary pensions, as now are OAS benefits since the introduction in 1989 of the “claw-back” of OAS in the income tax system whereby Canadians with incomes in excess of a certain level have their OAS benefits reduced in whole or in part.

The CPP has been enhanced from time to time over the years, either by providing more benefits, or benefits with fewer restrictions. Compared to the plan provisions of today, the original CPP had:

- More restrictive indexing on both covered earnings and pensions-in-pay for an initial period of ten years.
- No child-rearing drop-out.
- An original retirement age of 70 that did not reduce to 65 until 1970.
- No provision for retirement benefits before the normal retirement age, except in the event of disability.
- A reduction of the pension payable before age seventy if earnings were above a certain level.
- A survivors benefit limited to widows and disabled widowers.
- A provision that survivors pensions ceased on remarriage.
- Reduced benefits for orphans beyond the fourth child.
- A more restrictive requirement on the number of years of contributions that must have been made in order to be eligible for a disability pension.
- A lower level of the flat rate component of disability pensions.

- A more restrictive limit on the pension a surviving spouse could receive, taking into account both the retirement pension received as a result of the survivor's own contributions and that as a survivor.

These are only the most important areas in which the CPP has been liberalized. A more complete history of the changes appears in Appendix B.

The result of all the improvements that have been made was projected to be an increase in the overall CPP contribution rate of 2.65%, or 265 basis points[7], in the year 2025. Every time an improvement was made, the Chief Actuary at the time projected, as is required by the legislation, what the effect upon costs would be. Amendments to the CPP could only be implemented after passage through the House of Commons and the Senate, **and with the consent of two-thirds of the provinces containing at least two-thirds of the Canadian population.** This effectively means that the consent of Ontario is required for any amendment.

It may thus be concluded that a large part of the past and projected increase in CPP costs came from liberalizations of the plan, and that the increases were considered acceptable at the time at which they were implemented. If such improvements had not been made, the contributions to the CPP could be less now, and in the future, and so the plan might be more affordable. It would, however, be a less beneficial plan than is now in effect. These increases should not be confused with the projected increase in the CPP contribution rate from now to about 2030. Much of that increase would have had to occur whether or not benefits had been enhanced. This last increase is discussed in Chapter IX.

Chapter VI provides information on the sources of income for Canadians age 65 and older. These show that 80% of Canadians in this age group receive CPP retirement or survivor benefits, and 98% receive OAS pensions, while only 45% receive pensions from private pension plans, and perhaps a further 15% from RRSPs. This indicates that most Canadians will be looking to the CPP, along with OAS, as a major component of their retirement income, and there will be many who will have little or no income from RPPs or RRSPs. Without the presence of the CPP, poverty, or near poverty, among the elderly would be a much more serious problem, and the number qualifying for income-tested benefits, such as GIS and SPA would be much higher. Such a situation would result in higher taxes being necessary to fund the increased amounts of GIS and SPA. GIS and SPA are funded out of general tax revenues, unlike the CPP which is funded by employer and employee contributions, along with investment income earned by the CPP fund, with no subsidy from government. (The effect of this CPP/GIS/SPA interaction is discussed more fully in Chapter VII.)

This Chapter has indicated the very important role the CPP plays in the overall retirement income picture. It also indicates that contribution rates have increased partly because of enhancements to the CPP. Other reasons for the increase are discussed in later chapters. Thus the CPP may be seen as more costly now than originally by virtue of these enhancements.

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[7]The term *basis point* will be used frequently. It means 0.01%. It is used to avoid confusion when the statement is made, for example, that the cost went up by 5%. If the original cost was 6%, say, does this mean the cost went up to 11%, (6%+5%), or to 6.3% (6%x1.05)? If the cost increased from 6% to 11%, by saying that the cost went up by 500 basis points this confusion is avoided.

Certainly, if the CPP did not exist, it would be necessary to have some substitute in the social security system, or to require mandatory private plans like RPPs or RRSPs, because, as will be shown in Chapter VI, RPPs and RRSPs are not at present providing sufficient income to enough Canadians on their own to prevent dependence upon government sponsored benefits.

III

ACTUARIAL ASPECTS OF CPP PROJECTIONS

In order to understand how projected costs for the CPP are determined, it is necessary to have some knowledge of the data, methods, and assumptions used. This is essential for any meaningful study of the CPP. This chapter's analysis will indicate briefly how the contributions to the CPP relate directly to the benefits provided, with only a very small amount not being used to provide benefits, and so document the extent to which the CPP is reasonably priced on a pay-as-you go basis, given the benefits provided. It will also give the underlying economic assumptions, which are an important component of the CPP's costs. It also indicates what part of the increase in projected costs comes from changes in the underlying actuarial assumptions, which are adjusted as the plan's experience deviates from the original assumptions. It will also indicate that the CPP is not dependent upon government financing. It must be admitted, however, that the requirement for CPP contributions constrains the government's taxation power, and funds contributed to the CPP cannot be used by government in any other way. Finally it reconciles the original projected costs from 1964 with those in the Fifteenth Actuarial Report as of December 31, 1993. All the material in this Chapter is considered in greater depth, and in a more technical manner, in Appendix C.

It must be understood that actuarial methods and assumptions have no effect upon the actual cost of any pension plan. The cost is determined solely by the actual experience, *i.e.* by the benefits actually paid. The actuarial assumptions and funding or financing methods merely affect the projected *incidence* of the costs, *i.e.* when the costs will be incurred, which may mean being paid by different generations of contributors.

Mandate for Actuarial Reports

The **Canada Pension Plan Act** requires the preparation of an actuarial report every five years (the quinquennial report) for the purpose of reviewing and setting contribution rates by the federal and provincial ministers of finance. In addition, any amendment that involves a material change in the CPP also requires an actuarial report, although frequently the effect of the amendment can be derived from the last report. Finally, in 1986 a private member's bill required a report every three years for monitoring purposes.

The **Canadian Institute of Actuaries** (CIA) has established standards for the valuation of pension plans; these are contained in its *Standards of Practice for the Valuation of Pension Plans*. Section 1.01 of that document, however, specifically excludes "social security plans, such as the Canada Pension Plan, the Québec Pension Plan, and the Old Age Security Act" from these standards. Nevertheless the Statutory Actuarial Reports on the CPP have conformed to those parts of the standards relating to data, actuarial assumptions, asset valuation, and reporting. The only section to which they have not conformed is that with respect to actuarial cost methods, which were written with funded private pension plans exclusively in mind, and so are of very

limited applicability to social security plans that are intentionally pay-as-you-go rather than fully funded.

There is no prescribed objective in the Act to build up a substantial fund, nor to achieve "full actuarial funding", and contributions in any year are approximately equal to the benefits paid in that year Pay-as-you-go funding is thus used for the CPP, as for the vast majority of social security plans throughout the world, including OASDI in the USA. The CPP fund built up is merely a contingency fund to enable the CPP to cope with temporary downward fluctuations in contributions, or upward fluctuations in benefits, as might be caused by an economic downturn. The existence of this fund also allows contributions to be increased in a smooth manner from year to year. Without the fund, contributions would at times be subject to abrupt changes, either increases or decreases. It must not be confused with the funds that exist under private plans, where the aim is normally that benefits be fully funded in advance as they accrue, *i.e.* with a plan having a fund equal to the present value of accrued benefits. While the word *fund* will be used, this essential difference from funds for RPPs should not be overlooked.

So far there have been fifteen actuarial reports since the inception of the CPP in 1966, not counting that prepared in 1964 before its introduction. The most recent report was prepared as of December 31, 1993.[8]

Actuarial Methods

In valuations of private pension plans, the present value of benefits that have been accrued to date, and will be paid in the future, is calculated; this item is held as a liability of the plan. The value of the pension fund is held as an asset. Depending upon the actuarial funding method used, the present value of both benefits to be accrued in the future, and contributions to be made in the future, may also be determined; these are additional liability and asset items respectively. The contribution rate is determined, and there are several acceptable actuarial methods for doing so. The difference between the assets and liabilities is either an unfunded liability, or a surplus; the actuarial report normally contains a recommendation as to how to use the surplus, or to retire the unfunded liability.

With the exception of the special analysis contained in Appendix C of the Reports, the methodology used in all Actuarial Reports on the CPP is quite different from that employed in the valuation of private pension plans, given the non fully funded and pay-as-you-go nature of the CPP. In the CPP valuations, neither present values of benefits, nor of contributions, are calculated. Instead, for each year of the forecast period, which in the latest report runs up to the year 2100, the amounts of benefit payments, contributions, and investment income are projected. The main bodies of the actuarial reports on the Canada Pension Plan are thus cash flow studies, rather than conventional present value studies. Present values have, however, been incorporated in Appendix C of the actuarial reports on the CPP since 1976, with the exception of those reports which were only measuring the effect of amendments to the plan

[8]The Fifteenth Actuarial Report on the CPP, prepared as of 31 December, 1993 was tabled in the House of Commons on February 24, 1995 just as this paper was in its final review process. It was decided to delay the publication of this paper in order to incorporate as many references as possible to this latest report.

Another major difference in the CPP reports from a conventional actuarial valuation is the injection of projected future entrants into the valuation. Still another difference from valuations of private plans is that data in respect of contributors and beneficiaries are not used on an individual basis, but with some aggregation (*e.g.* age, sex, years) to forecast the contributions and benefits. The population projection of Canada (excluding Québec) is used as a base from which contributors and beneficiaries are derived.

This methodology is consistent with the practice used in other countries, including the USA, for their social security plans. Moreover, the CPP methodology is validated, (*i.e.* projections from 1966 to the present are compared with the experience), and each actuarial report is reconciled with the previous one; such validations and reconciliations are generally omitted in actuarial reports on the social security systems of other countries.

Actuarial Assumptions

Assumptions used in an actuarial valuation may be divided into demographic ones and economic ones. The most important demographic assumptions include fertility, mortality, disability and immigration. There is also a plethora of minor demographic assumptions that are described in Appendix C; some of these might be characterized by some people as "major", *e.g.* marriage rates. In parallel there are three major economic assumptions: the annual rates of increase in both prices and wages, and the annual rates of interest earned on the CPP fund and the three month operating reserve respectively; there are also various minor economic assumptions.

There is also an allowance for expenses of 0.1% of pensionable earnings. This is the only part of CPP contributions that is not used to provide benefits. This is a very low level of expenses. This matter discussed in greater detail in Chapter V.

Some assumptions have a greater effect on contributions than on benefits, while others have a greater effect upon benefits. Some have an immediate effect, while others have an effect in the long term. For example, a decline in fertility has little immediate effect on contributions, but ultimately results in a decline in the number of contributors. It ultimately results in a lower number of beneficiaries as well, with a very small immediate reduction in benefits paid to orphans, but one major effect, a reduction in the number of pensioners, is not felt until well after the decline in contributions. An increase in immigration results in an immediate increase in the number of contributors, and ultimately an increase in the number of beneficiaries, but the former impact occurs much sooner than the latter. The CPP's actual experience is used to review and revise the actuarial assumptions. This entire subject is discussed in greater detail in Appendix C.

Appendix C also presents a history of the changes in the actuarial assumptions. Of these, the most important changes, in decreasing order of importance, have been the decrease in productivity, (as measured by the difference between the rates of increase of wages and prices), the increase in the incidence of disability, especially that revealed in the Fifteenth Report (1993), and the improvements in longevity. All experience has been monitored at each successive

actuarial report, and changes made in the actuarial assumptions when warranted. This also is discussed in greater detail in Appendix C.

In Appendix C are shown the projected costs for the years 2000, 2025, and 2050 contained in all the actuarial reports.[9] Note that these are the projected pay-as-you-go costs, and not the contribution rates required by the legislation; in the long term, however, these are very similar, and the pay-as-you-go rates are shown for reasons of consistency and practicality, since formal contribution rates are set only for the next twenty-five years and reviewed every five years; in any event, contribution rates based on the Fifteenth Report have not yet been set. While the 1964 Report projected results to 2050, the First Report (December 31, 1969) did not project costs beyond 2000, and costs were not again projected to 2050 until the Sixth Report (December 31, 1977). The following table is an abbreviated version of the one in the Appendix.

Projected CPP Pay-As-You-Go Cost in Year

Report	2000	2025	2050
1964	4.88%	5.11%	5.31%
1972	4.44%	6.08%	NA
1977	5.53%	8.62%	8.76%
1991	7.66%	12.40%	12.97%
1993	8.25%	13.49%	14.11%

From this table it can be seen that the projected cost in 2025 is 838 basis points (1349 minus 511) higher in the 1993 Report than in the original 1964 Report.

The following table was derived from a reconciliation made in conjunction with the Fifteenth Report (1993); it shows the effect on the pay-as-you-go cost in 2025 of changes in the actuarial assumptions since the 1964 Report. These changes are distinct from, and additional to, those associated with the improvements in benefits described in the previous Chapter. The first column describes the change in the assumption, the second the increase in basis points caused by the change, and the third the percentage of the total change the particular change caused.

"Decreased productivity" is the narrowing of the spread between the annual increase in wages and prices. In the First Actuarial Report (1969) it was assumed that the spread between the increase in wages and prices would be 250 basis points. By the Fourteenth Report (1991) this spread had been narrowed to 100 basis points. The current assumption is an annual increase in wages of 4.5%, with an annual increase in prices of 3.5%

Change in Assumption	Change in Basis Points	Percentage of Change
Decreased productivity	273	47.9%
Increased disability	152	26.7%
Increased longevity	71	12.4%

[9]The plan valued in the 1964 Report was slightly different from the CPP actually adopted; the differences are described in Appendix B.

Decreased immigration	33	5.8%
Decreased fertility	21	3.7%
Other demographic changes	20	3.5%
Total	514	100.0%

The changes in the economic assumptions have had the greatest effect, followed by the changes in the disability assumptions occasioned by the Fifteenth Report (1993), and the increasing longevity. The other changes are relatively minor.

In addition there was an increase of 55 basis points in the cost for 2025 caused by switching from the "low-medium-high" sets of assumptions in the 1964 Report to the unique set of assumptions used in the later reports. Finally there was a decrease of 52 basis points created by refinements in the methodology of projections.

As described in Chapter II, enhancements to the CPP provisions resulted in an additional increase in costs in the year 2025 of 265 basis points. Thus, the increase of 828 basis points is a combination of an increase of 570 from changes in the actuarial assumptions, an increase of 55 from switching from "high-low-medium" assumptions to a unique set, a decrease of 52 from changes in methodology, and an increase of 265 from benefit enhancements.

The costs projected in the Fifteenth Report (1993) are consistent with those projected at the inception of the CPP, after making allowance for the changes made to the CPP itself, and for the changes in actuarial assumptions, as necessitated by the economic and demographic experience; in aggregate, the economic changes had a greater effect than the demographic ones.

Thus the sources of the increase of 838 basis points in CPP pay-as-you-go costs, which are now projected to reach about 13.5% by 2025, over those originally projected are:

- 33% from less favourable economic conditions than were projected in 1964
- 32% from legislated enhancements and changes to the CPP
- 18% from increases in the rates of disability
- 8% from increased longevity
- 4% from lower immigration
- 2% from lower fertility
- 3% from various other changes, including methodology

The largest part of the increase in the current projected costs, in fact about a third of the increase, compared to those made originally, has come about through the deterioration in economic conditions from the mid 1960s to the 1990s, certainly an evolution that few had anticipated. Almost another a third has resulted from increases in benefits. The effect of these was determined, disclosed, and accepted by federal and provincial legislators at the time when these changes were made. It must be remembered that changes to the CPP require the consent of two-thirds of the provinces with at least two-thirds of the Canadian population. The third largest cause has been the increased utilization of the disability benefits, disclosed in the Fifteenth Actuarial Report.

Subsequent to the calculation of the above figures, the Chief Actuary discovered that the change in the fertility methodology from the use of a "net reproduction rate" to using a "total fertility rate" made in the ***Sixth Actuarial Report*** *had caused a greater portion of the increase in cost than had previously been estimated. While this has no effect upon the total increase, it does change the allocation of the increase among the various components, increasing some and decreasing others.*

It must be remembered that contribution rates were projected to increase in the future in all of the actuarial reports from the very beginning. This was because of both the maturing of the CPP, and the aging of the Canadian population. The CPP has matured to the extent that it now pays full benefits, which it did not in the first ten years of its existence. Retirement benefits are now available for the population up to age 95. The average age of the Canadian population has increased, as it always was expected to, with the ratio of the number of pensioners to the working population increasing. More details on this evolution are contained in Chapter IX. However, the increases resulting from plan enhancements and changes in the assumptions have made the contribution rates increase more than was originally projected.

Unfunded Liabilities

Concern is often expressed about the "unfunded actuarial liability" of the CPP. This is not a figure that the CPP Act requires to be shown. It is shown in Appendix C of the Actuarial Reports because the Auditor-General requested in the mid 1970s that this be determined, and shown in the next Actuarial Report. This request was repeated for a number of years, but such a request has not been made since 1986. The information has, however, continued to be shown in the Actuarial Reports to provide a basic explanation of the differences between pay-as-you-go and fully funded pension plans.

What has been determined in Appendix C of the Actuarial Reports is the hypothetical additional lump sum amount that, together with future contributions at the full cost rate -- the entry age normal rate[10] -- and the existing fund, would be necessary to provide all benefits to be paid under the CPP, both those accrued to date and those to be earned in the future. In the private sector this amount is the responsibility of the plan sponsor, and so is quite rightly a liability on the employer's balance sheet.

The situation is completely different under a pay-as-you-go arrangement, as with the CPP. The contributions are determined in such a way as to be sufficient to provide the benefits on a pay-as-you-go basis, so there is no formal notion of an unfunded liability. Further, the CPP is designed to be financed completely by contributions from employees and employers, with no contribution whatsoever from the government, beyond that which it makes in its capacity as an employer for its employees in the public service. There is no liability imposed on the government by the CPP Act to make up any shortfall. An unfunded liability has no more meaning for the CPP than it has for OAS or medicare, where in both cases the costs are also increasing. The expected increase in CPP costs over the next thirty-five years may be a cause for

[10]"Entry age normal" is an actuarial cost method that calculates a level cost for each member based on the age at entry into the plan. For the CPP, this is age 18, or the age in 1966, if that was higher.

concern, but it does not create an unfunded liability as such, and is not a result of the existing "unfunded liability." This increase is discussed in Chapter IX.

Nevertheless, the hypothetical CPP unfunded liability would become a real one if the CPP were to be discontinued or transferred in one way or another to the private sector. As long as the CPP remains as it is, the financing burden will continue to rest upon current employers and employees, who will continue to pay for the benefits of current recipients by means of contributions based upon employment earnings.

Conclusion

This Chapter, in conjunction with the more detailed discussion in Appendix C, indicates that the CPP is reasonably priced, considering the benefits provided, and the assumptions used. The actual assumptions are described in Appendix C, and one can only make a meaningful judgement as to their appropriateness after taking into account the contents of this Appendix. The author considers that the assumptions are generally appropriate, but realize that there can be different opinions concerning them. There certainly has been no accusation from the actuarial community that they are inappropriate.

The CPP does not require any funding from government as it is financed completely by employee and employer contributions.

The rationale for the financing method used, pay-as-you-go, has not yet been discussed, however, and so no conclusions have been reached about it. That subject is discussed in Chapter IX.

IV

RATES OF RETURN ON THE CANADA PENSION PLAN

This Chapter addresses the CPP from the point-of-view of an individual investor who wishes to know what return has been, or is projected to be received, on the contributions made. It simultaneously addresses the concern that the CPP might not be good value for the money contributed. Several methods of measuring the return are examined. It thus makes a start on comparing the rate of return on the CPP to those on other forms of investment, and on considering whether it is possible to do better using private arrangements.

Then, in the next chapter, the rates of return developed in this Chapter are compared with those on other types of investment. Further, a comparison of the expense levels in both the CPP and private pension plans is made, as is the effect of income tax. This last consideration is necessary in order to put the rates of return developed in this chapter into their proper context. Another relevant consideration is the effect on the return of the possible loss or reduction in the income-tested GIS and other income-tested benefits; this is discussed in Chapter VII.

The rate of return for a stream of contributions and benefits corresponds to the rate of interest at which the present value of the contributions is equal to the present value of the benefits paid. The present value is the lump sum amount, *e.g.* at the date of calculation, that is equal to the present value of the series of amounts valued, using interest and, if applicable, rates of increase in both wages and prices, probabilities of surviving, dying, and becoming disabled, the assumed distribution by age and sex of surviving spouses, and the assumed numbers and age and sex distribution of surviving children. This lump sum amount is thus equivalent to the series of amounts.

A rate of return so calculated is called a *nominal* rate because it uses the actual or projected dollar amounts contributed or paid. It makes no allowance for increases caused solely by inflation, even though both benefits and contributions may increase or may have increased for this reason. The return can be recalculated to reflect what some economists call *constant dollars*, or what actuaries, economists, and investment professionals call *real* terms, by adjusting both contributions made and benefits received by the changes in the Consumer Price Index (CPI), from the date at which the first contribution was made, to the date that each contribution was made or each benefit paid.[11] The aim is to determine the yield, after allowing for the decline in the purchasing power of the dollar.

A simple example may make this clear. Suppose we have an account with $1,000 in it on January 1, and have a nominal rate of interest throughout the year of 10% per annum. To simplify the example we will not assume that any contributions or withdrawals were made during the year, but the same techniques would apply. There will then be $1,100 in the account on December 31. Now further suppose that during the year there was inflation, measured by the increase in the CPI, of 4%. Because of inflation, this $1,100 will only purchase as much as

[11]Technically, the amounts can be normalized to any date and not just to the starting date; the results will be the same.

$1,057.69 would have at the beginning of the year ($1,100/1.04). This gives a real rate of return of 5.77%, which can be calculated either as 100*(1057.69/1,000 minus 1), or 100*(1.10/1.04 minus 1).

Some commentaries on the CPP are a bit confusing to those with only an investment background. The term *internal rate of return* is used. In investment circles, this means the rate of return earned by a fund, taking into account the net cash flows into the fund; this is identical to the rate of return defined above. This is to contrast it with the *time-weighted rate of return*, which takes into account the timing rather than the amount of the cash flows, and which is a measure of the skill of the investment manager. In this paper the simple term "rate of return" will be used because the internal rate is not being compared to a time-weighted rate.

Another method, confusingly called the *present value method*, which has also been used by some actuaries, is to calculate these present values at a selected rate of interest. If the present value of the contributions is more or less than the present value of the benefits, this merely indicates that the rate of return is less or more respectively than the interest rate at which the present values were calculated. If the present value of the benefits is less than the present value of the contributions, some commentators have made the misinterpretation that the rate of return is negative, rather than merely less than the interest rate chosen for the calculation. This approach has little merit in determining the actual rate of return, and has created serious misunderstandings and fostered unproductive concerns. One such study has led many to believe wrongfully that future generations will receive only 80¢ of benefits for every $1 of contributions that are made to the CPP. All that has been determined is that, at the arbitrary interest rate chosen, the present value of benefits is 80% of the present value of contributions, which merely indicates that the rate of return is less than the rate at which the present values were calculated.

It is both impossible and meaningless to attempt to calculate a rate of return for the CPP as a whole: impossible because it means projecting CPP contributions until the end of time, although the present values of cash flows far in the future is minute, and meaningless because it relates to no one individual or any group of individuals. It is quite possible and useful, however, to calculate meaningful rates of return for cohorts and individuals. A cohort is the set of all individuals with similar characteristics, and in this paper is taken in its most traditional usage as the set of all individuals born in a given calendar year.

In Appendix D is contained a proof of an important theorem, developed by Bernard Dussault, which establishes that, under stabilized conditions for an earnings-related pension plan financed on the pay-as-you-go method, the rate of return is exactly equal to the assumed annual rate of increase in total employment earnings. For the CPP this gives a nominal rate of return in the long run of 5.06%, using the assumptions of the Fifteenth Actuarial Report, (a 4.5% increase per year in average earnings, and a 0.54% increase per year in the retired population). Appendix E contains an important paper by Pierre Treuil, which sets out the relevant pension mathematics, and served, *inter alia*, as a precursor to the above theorem. This paper was originally published in Volume XXXIII of the Society of Actuaries. Mr. Treuil, an actuary who retired in 1991, was a long-term member of the staff of OSFI, and of its predecessor, the Department of Insurance.

Cohort Returns

This is the return favoured by economists and social scientists, who concentrate on the treatment of a group of comparable individuals with certain common characteristics, rather than on a specific individual. It does not apply to any particular individual, except by chance, and may well be dismissed by any specific individual as not reflecting his or her own circumstances.

The rate of return for a cohort can be determined in two ways. The first, the *contributor oriented* approach, determines the rate of return taking into account all benefits paid on behalf of the cohort. This qualification is important because benefits paid to a surviving spouse or children of a contributor are allocated to the cohort to which the contributor belonged. The second, the *beneficiary oriented* approach, allocates benefits to the cohort to which the recipient belongs; conversely the cohort to which the contributor belongs, where the contributor is also the beneficiary, will be allocated benefits arising from, and paid for by, different cohorts. There are arguments in favour of either approach, and they shall not be developed here. Readers may make their own choice as to which is particularly appropriate. Both returns will be given.

Exact calculations consistent with both the Fourteenth and Fifteenth Actuarial Reports have been made for six different cohorts, labelled A, B, C, D, E, and F. These are the cohorts of the contributors who became 65 in 1976 and 1994, and who will become 65 in 2013, 2033, 2053, and 2067 respectively, i.e. those born in 1911, 1929, 1948, 1968, 1988, and 2012. The first was chosen as it was the first cohort to which maximum CPP retirement benefits could be paid, the second as it contained those attaining age sixty-five in 1994 (when this study was undertaken), and the third as the first cohort for which it is possible to make contributions for forty-seven years before age 65, *i.e*. the first cohort for which contributions could be made from age eighteen through to age sixty-five. The fourth and fifth are merely twenty and forty years after the third. The sixth cohort was chosen as one in which the contribution rates were more or less the same from year to year, and could be seen as closely approximating steady state conditions. The cohorts are thus roughly spaced about one generation, or twenty years, apart. Characteristics of these cohorts are shown in the following table.

Characteristics of Cohorts

Cohort	Year of Birth	Age 65 attained in	Characteristic	Year of Last Payment to a Cohort Pensioner	Year of Last Payment to any Surviving Spouse
A	1911	1976	First with full benefits	2018	2043
B	1929	1994	Current retirees	2036	2063
C	1948	2013	First with 47 years' contributions	2055	2084
D	1968	2033	C plus 20 years	2075	2104
E	1988	2053	D plus 20 years	2095	2124
F	2012	2077	Steady contributions	2119	2148

In all cases the return has been calculated on total CPP contributions, including those from the employer. Even though some taxpayers may be inclined to disregard the employer contribution in calculating their returns, and so calculate higher ones than indicated in this paper, employer contributions must be included, because the findings of labour economists suggest that, in the absence of employer contributions to the CPP, wages themselves would be higher. Further, the self-employed contribute at the combined rate, and the results obtained must be applicable to them.

The first approach to calculating the rate of return is merely to compare total contributions with total benefits. It answers the question: "how many dollars of benefits are received for every dollar of contribution." For the Fourteenth Report, both benefits and contributions are the sum of those actually made or paid up to 1991, and of those projected in the Fourteenth Actuarial Report from 1992 on. For the Fifteenth Report the dates change to 1992 and 1993 respectively. This approach is rather simplistic in the sense that it completely disregards the time value of money, and makes no allowance of any sort for inflation, or for the differing levels of inflation experienced by the different cohorts. It is thus not a rate of return as defined above.

The following tables summarize the contributions made and benefits received from both the Fourteenth (1991) and Fifteenth Actuarial Reports. In these tables the benefits paid in respect of children include benefits paid to the children of both disabled and deceased

contributors. The ratio of benefits to contributions may be considered a rough measure of the return. Although the amounts of contributions and benefits are shown on a contributor oriented basis only, the ratios are shown on both a contributor and beneficiary oriented basis in the Table from the Fourteenth Report, except for Cohort F. This cohort was added when the paper was nearly finished, and it was decided not to take the time and expense of calculating the beneficiary oriented ratio for this cohort, as it had already been established that these ratios did not differ significantly for Cohorts D and E. Similarly I did not take the time and expense of calculating beneficiary oriented ratios from the Fifteenth Report as I did not expect the relationship between these ratios to change between the two reports.

Benefits and Contributions in Millions of Dollars
Fourteenth Report

Cohort	A	B	C	D	E	F
Contribution	107	1,037	10,310	48,947	168,251	532,978
Benefits						
Retirement	3,529	21,237	39,716	241,519	710,127	2,310,206
Disability	8	507	3,788	8,575	22,016	62,012
Survivors	1,446	6,246	21,604	54,274	146,013	429,038
Children	8	93	368	813	1,617	3,720
Death	110	620	2,702	7,103	20,263	63,720
Total benefits	5,101	29,023	118,178	312,283	900,039	2,876,702
Ratio Contributor oriented	47.7	28.0	11.5	6.4	5.3	5.4
Ratio Beneficiary oriented	42.1	26.8	11.0	6.5	5.2	Not available

Fifteenth Report

Cohort	A	B	C	D	E	F
Contribution	106	1,148	12,363	61,257	180.843	588,483
Benefits						
Retirement	3,561	19,999	97,255	269,420	687,111	2,330.986
Disability	8	876	7,545	19,815	43,833	127,924
Survivors	1,543	6,876	24,278	62,645	148,740	429,252
Children	8	95	552	1,542	2,838	6,933
Death	114	675	3,055	8,277	20,484	66,932
Total	5,234	28,521	132,685	361,700	903,006	3,012,027
Ratio Contributor oriented	49.4	24.8	10.7	5.9	5.0	5.1

These tables indicate that all cohorts have received, or are expected to receive, considerably more than their contributions, and very much more in the case of the earlier cohorts. Even in the distant future, projected benefits will be over five times anticipated contributions. In the near and mid-term projected benefits will be much higher. The ratios are

not significantly different between contributor and beneficiary oriented, but as might be expected, the latter are somewhat lower. While this does not determine a rate of return, it does indicate that the underlying nominal rate of return, discussed below, is positive.

The figures do not vary much between the Fourteenth and Fifteenth Actuarial Reports. While the ratios are somewhat lower on the later report, they are not significantly so. This is not surprising as the increase in costs from the Fourteenth to the Fifteenth Report resulted almost exclusively from an increase in disability benefits paid, or projected to be paid. Thus the increase in contributions is returned in the form of increased benefits.

Still another way of measuring the return is to compare the contributions made, expressed as a percentage of earnings, to the benefits received, also expressed as a percentage of earnings. This implicitly makes allowance, via wage normalization, for both the increase in the contribution base, which is indexed with average earnings, the increase in the initial pension, also indexed with earnings, and the increase in the pension after retirement which is indexed with prices.

The next table shows only for Cohorts D, E, and F[12] the total contributions, expressed as a percentage of a years' earnings; this is merely the sum of the actual or projected CPP contributions from the Fourteenth Actuarial Report. Also shown is the "equivalent years of retirement benefits," which is the ratio of this sum of contributions to the 25% pension. This calculation indicates how many years of retirement benefits must be received in order to break even. I have used calculations based on the Fourteenth Report because the results will not change significantly: although contributions will be higher under the Fifteenth Report, the discount for eliminating the disability benefit will also increase, and the net effect of these offsetting adjustments is effectively zero. The results in the above table, and both the rate of return calculations and the analysis of the entry age normal costs, contained a bit later in this Chapter, confirm that figures derived from the Fourteenth Report should still be applicable.

Certain adjustments have to be made to the initial calculation, and these are included in the table below. First, there are no contributions on earnings to the YBE, so for anyone earning the YMPE or more, the total contributions must be reduced by 10%; for anyone earning less than the YMPE, the adjustment would be more. Secondly, the initial comparison is between total contributions and retirement benefits only. For comparability, the cost of disability, survivor, and death benefits should be removed. For Cohort D, only 77.22% of benefits paid are retirement benefits, while for Cohorts E and F the figures are 78.78% and 80.31% respectively. (These figures can be obtained from the second table above.) Thus there should be further reductions of 22.78%, 21.22%, and 19.69%, respectively. These adjustments will apply to all contributors.

The assumption used in the calculations here is that of a full forty-seven years of contributions. Allowance might also be made for the various drop-out provisions. Firstly, there may be a further reduction of 15% on the assumption that there were years of zero earnings

[12]Cohorts A, B, and C were excluded from the calculations since they have done very well, and in any event the concern is with what will happen in the future, and not with what has largely happened already.

dropped out of the calculation; this reduces the number of years of contributions to forty. Secondly there is assumed to be a further drop-out of eight years for child-rearing purposes. There will be those to whom these drop-outs do not apply at all, and in other cases, where they do apply, they may be in a lesser amount than those in the table. They will, however, apply to some contributors.

Comparison of Total Contributions to Retirement Benefits as a Percentage of Earnings

Cohort	D		E		F	
	Total Contributions	Equivalent Years of Retirement Benefits	Total Contributions	Equivalent Years of Retirement Benefits	Total Contributions	Equivalent Years of Retirement Benefits
First contribution in	1985		2005		2029	
Last contribution in	2031		2051		2075	
Total contributions adjusted for no contributions to YBE, and to eliminate survivor, death, and disability benefits	275.62	11.0	391.88	15.7	446.34	17.9
Adjusted for 15% drop-out	234.28	9.4	333.10	13.3	289.84	11.6
Adjusted for child-rearing drop-out	187.42	7.5	266.48	10.7	231.87	9.3

As shown in the table, for Cohort D all contributions will be recovered, under the CPP's 25% replacement rate, if the recipient lives 11.0 years after retirement at age 65, *i.e.* only to age 76, and in considerably fewer years if any of the drop-out provisions have been used. For Cohort E, the results are not as attractive, and require the pensioner to live an additional 4.7 years, *i.e.* 15.7 rather than 11.4 years. For Cohort F it is necessary to live almost 18 years to age 83. At present, the life expectancy at age 65 is 16.4 years for males, and 19.9 years for females according to a paper by Harry H. Panjer, FCIA, FSA and Ken Seng Tan being presented to a future meeting of the CIA. When members of any of cohorts D, E, or F retire, life expectancy should be somewhat more as longevity continues to improve. Even without using any of the drop-out provisions, and making no allowance for improvements in longevity, females in all cohorts should live long enough to receive back more than their contributions, if they have average life expectancy. For Cohort F, males will only do so if the drop-out provisions are used, and/or if longevity continues to improve. On a unisex basis the results are quite acceptable.

A more sophisticated and better approach -- in fact in the judgement of the author, the best approach -- is to calculate the rate of return in both nominal and real terms, using the method described earlier in this chapter. Actual contributions, benefits, and rate of inflation were used up to December 31, 1991, the date of the Fourteenth Actuarial Report. From that date on, the calculation used the amounts projected, adopting the actuarial assumptions and methodology in the Fourteenth Report. For the Fifteenth report the same technique was used, but with a date of December 31 1993 for switching between actual and projected amounts.

The next two tables give the results on both the contributor and beneficiary oriented approaches, and in both nominal and real rates of return from both reports; the reader is reminded that the real rate of return is the rate after allowing for inflation. As mentioned previously, Cohort F was a late addition to the paper, and it was decided not to calculate beneficiary oriented rates of return for that cohort for the Fourteenth Report both because there was not much difference between this and the contributor oriented return for Cohort E, and because such results were available based on the Fifteenth Report.

Nominal and Real Rates of Return

Fourteenth Report

Cohort	Nominal Contributor Oriented	Nominal Beneficiary Oriented	Real Contributor Oriented	Real Beneficiary Oriented
A	31.1%	30.8%	22.4%	22.1%
B	16.5%	16.5%	10.4%	10.3%
C	9.0%	8.9%	4.9%	4.8%
D	6.4%	6.5%	2.8%	3.0%
E	5.2%	5.3%	1.7%	1.7%
F	5.0%		1.5%	

Fifteenth Report

Cohort	Nominal Contributor Oriented	Nominal Beneficiary Oriented	Real Contributor Oriented	Real Contributor Oriented
A	31.2%	30.9%	22.5%	22.2%
B	16.2%	16.2%	10.2%	10.1%
C	9.5%	9.4%	5.4%	5.3%
D	6.4%	6.5%	2.9%	3.0%
E	5.2%	5.2%	1.6%	1.7%
F	5.0%	5.1%	1.5%	1.5%

There is not much difference between the contributor oriented and beneficiary oriented approaches, so no further comment will be made in this paper. The high rates of return of both Cohorts A and B are a function of the full benefits being paid after only ten years of contributions and the low rates of contribution in the early years of the CPP. Cohort C also has good rates of return, even though it is scheduled to contribute for the full 47 years; it benefited from the low initial contribution rates as well.

There is very little difference between the results from the Fourteenth and Fifteenth Reports, as the increase in contributions is offset by the increase in disability benefits, as might have been expected. This justifies not recalculating some of the figures based on the Fourteenth Report.

These rates of return indicate what rate of interest would have had to be earned on the contributions to provide all the benefits. For example, using the contributor-oriented approach for Cohort B, which is the cohort just retiring, if all the contributions were deposited in an earmarked fund to provide solely the benefits for that cohort, the fund would have had to have earned a rate of 16.6% each year both in the past and in the future in order that the fund would be exhausted on the day that the last survivor died. If the effect of inflation on the return is eliminated, both that which actually occurred in the past, and that which is projected to occur in the future, the after-inflation return required drops to 10.4%.

The first three cohorts, where contributions have been made since 1966, are obviously greatly influenced by the actual experience. Cohort D is much less influenced, since its contributions began only in 1986, as are Cohorts E and F, where contributions will not begin until 2006 and 2030 respectively. In Cohorts E and F the result depends solely upon the actuarial assumptions, as there has been no experience at all as yet. For these last three cohorts the rate of inflation is essentially that assumed in the Fourteenth and Fifteenth Reports, *viz*. 3.5% ultimately.

These calculations have excluded expenses from expenditures, and so are returns after expenses. If expenses were included as a benefit, rates of return would be about five basis points, or 0.05% higher, a very minor effect. This is because of the relatively low administrative expenses of the CPP, a subject covered in the next Chapter.

Individual Returns

To this point I have discussed returns for cohorts as a whole, and not for any specific individual. An individual may well not care what the average experience of the cohort to which he or she belongs has been, or is projected to be, and be only concerned with his or her personal experience. Knowing that, on average, all members of the cohort have done well, or are projected to do well, is little comfort if an individual believes he or she has not or will not.

I do not intend to calculate rates of return for any one individual. Such a rate can only be determined after the individual's death, and will depend, *inter alia,* on just when death occurred, the age and duration of life of any surviving spouse, and whether disability benefits were paid. Rather I provide illustrative, individual calculations because it is very valuable to see how the use of drop-out periods, early retirement, and similar items that vary from individual to individual affect the rate of return, particularly since some of these are within the control of the individual; the effect of some of these items will be indicated.

Individuals have tended to concentrate on the retirement aspects of the CPP, and compare what their total CPP contributions would have provided if contributed to an RRSP, or a money purchase (defined contribution) RPP, which would then be used to purchase an annuity at retirement. They tend to ignore the substantial survivor, disability and death benefits included in the CPP. In so doing they must keep in mind that although their employer is required to contribute to the CPP, it may choose not to contribute to their RRSP. The expenses of private investments and of managing and administering private pension plans are also frequently overlooked. Individuals must keep in mind that CPP benefits are indexed for wage increases up to retirement, and for price increases thereafter. One survey in the late 1980's revealed that only 41% knew that CPP benefits were earnings related, and only 32% knew they were indexed; only 9% could estimate what benefit they might receive. They did not know any more, however, about any private plan to which they may have belonged.

For purposes of this illustration, individual rates of return were calculated only for members of Cohort D, as members of Cohorts A, B, and C have done, or should do, well by any standard. The rate of return will vary considerably from individual to individual depending upon the various possible circumstances. For example, someone who becomes disabled after satisfying the minimum eligibility requirements will have a much higher rate of return than someone who contributes for the maximum period and retires at age 65. Similarly, someone who lives to age 100 will have a much higher rate of return than someone who dies at age 70 without a surviving spouse. Further, the rates of return will vary by sex; females live longer, and are more likely to receive survivor benefits as they outlive their spouses on average, yet contribution rates are the same for both males and females.

To begin, we should determine what part of the estimated full cost rate, which provides retirement, survivor and disability benefits, provides only for retirement benefits. From the level or entry age normal costs in the Fourteenth Actuarial Report, summarized in the table below, it can be seen that the sex adjusted full cost of retirement benefits alone is 6.19% of contributory earnings for males and 9.53% for females. The entry age normal cost on a combined basis was 9.62%, i.e. unisex in respect to all types of benefits.

Entry Age Normal Costs -- Fourteenth Report

	Combined	Males	Females
Retirement	7.47%	6.19%	9.53%
Disability	0.77%	0.82%	0.69%
Survivors, Children, and Death	1.28%	1.78%	0.47%
Expenses	0.10%	0.10%	0.10%
Total	9.62%	8.90%	10.78%

Corresponding figures from the Fifteenth Report are contained in the next table.

Entry Age Normal Costs --Fifteenth Report

	Combined	Males	Females
Retirement	7.45%	6.22%	9.40%
Disability	1.65%	1.31%	2.19%
Survivors, Children and Death	1.31%	1.78%	0.53%
Expenses	0.10%	0.10%	0.10%
Total	10.50%	9.41%	12.22%

While the total cost has increased from the Fourteenth to the Fifteenth Report, the cost for the retirement portion is virtually unchanged. The increase in the total entry age normal costs between the two reports has resulted from the increase in the cost of the disability component.

The table from the Fifteenth Report indicates that 90% of the unisex contribution rate for females goes towards providing their retirement benefits and expenses, while only 60% of that for males goes towards retirement and expenses. Thus, the unisex contribution rates result, roughly speaking, in males paying for their retirement benefits, and a large part of the disability, survivors', children's and death benefits for both sexes. This can result in distortions in calculating yields, and accordingly calculations for yields were made on a unisex basis, where it was assumed the 77.65% of the contribution rate, (this figure obtained from the Fourteenth Report), went toward providing retirement benefits, and the balance to providing the ancillary benefits. Again, I decided to retain the figures I had derived on the basis of the Fourteenth Report, because the increase between the two reports resulted almost entirely from the increase in the cost of the disability component. Further, contribution rates based on the Fifteenth Report have not yet been established. Finally, as will be seen below, the essential element which I am measuring is based on differences, and so will be even less affected by switching to figures from the Fifteenth Report.

Using this last figure, *viz.* 77.65% and the calculation method described earlier, which implicitly assumes purchase of an annuity at net rates[13], *i.e.* without any loading for the insurance

[13]This makes no adjustment for longevity being either less or more than expected.

company's expenses, it was calculated that the nominal average rate of return, for retirement at age 65, and assuming contributions had been made for a full forty-seven years and that earnings had always at the level of the YMPE or higher, was 5.4% on a unisex basis for the retirement element only.

There will still be a variation from individual to individual as these rates assume that the individual lives to the normal life expectancy, and does not die prematurely, or live to a great age. They are thus comparable, ignoring expenses, to what would occur if money were saved through a RPP or RRSP, and an annuity purchased. Annuities indexed to the full increase in the CPI are not available[14], however, so an annuity that provides comparable benefits to the CPP cannot in fact be purchased. Consequently the hypothetical alternative course of investing the CPP contributions and buying an annuity is just that, hypothetical, and cannot be done in actuality.

Real rates of return can be determined approximately by allowing for an average inflation factor of 3.5% which applies throughout much of the period; this is the ultimate rate assumed in both the Fourteenth and Fifteenth Reports. If allowance is made for the lower inflation, both actual and assumed in the 1990's, an average figure of 3.4% can be justified. This gives real rates of return of 1.9% (1.054/1.034).

Adjustments, however, may need to be made to these rates or return depending upon individual circumstances. These adjustments are to measure the effect on the rate of return of having no contributions on earnings to the YBE, of utilizing the 15% drop-out provision, of using the child-rearing drop-out provision, and of electing early retirement. Such adjustments almost invariably, but not always, increase the rate of return over those determined in the above paragraph. What is important is the *changes* in the rate of return that any of these cause.

These adjustments will be almost identical, whether nominal or real rates of return are considered, and whether figures are based on the Fourteenth of Fifteenth Report. Further, they will also be almost identical from cohort to cohort. Thus the basic rate of return to which they are added (or subtracted) is not too important.

We next proceed to consider these adjustments, which reflect individual circumstances, some of which are within the control of the individual. These adjustments are now described, with their effects shown in the next table. The effect varies by the sex of the contributor.

Contributions are not made on earnings to the YBE which is equal to 10% of the YMPE. The calculations made above were for someone contributing at the maximum rate, *i.e.* on earnings from the YBE to the YMPE. Someone earning 75% of the YMPE, however, contributes on only 72.2% of pensionable earnings, as compared with 90% for someone earning 100% of the YMPE. Both receive ultimately a pension of 25% of wage indexed ("adjusted")

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[14]Annuities that increase by a specified percentage each year can be purchased, but the increase will only be equal to the increase in the CPI by chance. Some insurance companies have offered indexed annuities with a maximum on the annual amount of indexing, but the rates charged virtually assumed an increase at the maximum rate each and every year.

average earnings. Allowing for this gives an increased return relative to the individual earning 100% of the YMPE.

Another important factor is the general drop-out provision, where the 15% of years with lowest earnings are dropped out of the calculation of adjusted average earnings. If it is assumed that these years had zero earnings, and so no contributions were made, the rate of return is increased. The timing of the drop-out enters into the calculation. Once it was considered that earnings were more likely to be dropped out earlier, when the contributor was at an educational institution. At present, however, with involuntary retirement being more frequent, the drop-out will be at the end more frequently than formerly. The later the drop-out period occurs, the greater the increase in the rate of return.

The child rearing drop-out may also be relevant, and in practice this applies essentially only to women. Here the drop-out is more likely to be in the middle of the contributory period; it is not likely to be at the end. The effects of such a drop-out at both the beginning and end were calculated to determine its upper and lower limits. The effect is shown for a drop-out of four years; this corresponds to the drop-out assumed on average for all females in the valuation of the CPP. In all probability those who benefit from the drop-out will tend to drop out seven or eight years, and so the increase in the rate of return would probably be about twice those shown. This effect is in addition to the fifteen per cent drop-out, and anyone who qualifies for both will have the yield increased by the combination of these effects.

Finally, if retirement occurs at age 60, there is an increase in the rate of return of seventeen basis points for males, and a decrease in the rate of return of two basis points for females. This indicates that, at the rate of interest involved, the 30% reduction in this situation is not quite enough for males, and very slightly too high for females, if the aim is to provide actuarially actuarial equivalent pensions in the event of early retirement.

The following table summarizes the adjustments just discussed. All these adjustments are measured from the basic calculation, assuming forty-seven years of contributions at earnings of at least 100% of the YMPE, with retirement at age sixty-five.
All the adjustments produce increases in the rate of return, with the exception of the one negative one, indicated by ( ).

Adjustments to Individual Rates of Return on the Retirement Benefits for Cohort D

	Males	**Females**
Adjustment for earnings at 75% of YMPE	0.13%	0.10%
15% Drop-out at beginning	0.42%	0.34%
15% Drop-out at end	0.55%	0.61%
4 years of child rearing drop-out at beginning	NA	0.35%

4 years of child rearing drop-out at end	NA	0.29%
Retirement at age 60	0.17%	(0.02%)

Combinations of the above, such as retiring at sixty (for males), and benefiting from the drop-out provisions, will result in even greater increases in the rate of return. It is thus quite possible for these special provisions to increase the rate of return by between fifty and a hundred basis points or more, with the greater increase applying to females who utilize the childbearing drop-out provision. Thus, on the basis of this calculation, it is quite possible for members of this cohort to get a nominal rate of return of around 6%, and a real rate of return of from 2½% to 3% per annum.

As already mentioned, the adjustments in the above table will apply whether nominal rates or real rates of return are considered. They should also apply whether the rate of return is more or less than the average rate because of living to an old age, or dying shortly after retirement. What is important is how these items, some of which are within the control of the pensioner, affect the rate of return.

It is obvious that apparently quite satisfactory returns on average are available on the retirement portion of the CPP, *i.e.* with the insurance elements excluded, whether or not allowance is made for inflation in the returns. The use of the drop-out provisions can materially increase these rates of return, and the use of these may be within the control of the individual. Beyond these adjustments, comparisons should be made with the rates on other forms of investment. Appropriate allowance, however, must be made for expenses and taxes in any comparison with alternative investments. For example, the comparison of CPP returns with those on other forms of investment must include an adjustment for expenses, and probably taxes as well, in order to ensure comparability. This is considered in the next Chapter.

Conclusions about Methods

For most actuaries and economists the real rate of return is the best measure as it makes allowance for inflation and the time value of money. The layman may understand the nominal rate of return more easily, as there is no adjustment for inflation, and it is comparable to the way he or she usually thinks of investment returns. The ratio of benefits to contributions is by far the easiest to comprehend, but it makes no allowance for either inflation or the time value of money. The comparison of contributions as a percentage of earnings with benefits expressed in the same way is also easy to comprehend, and it does implicitly make allowance for increases in earnings and prices. Individual rates of return, as opposed to cohort returns, can only be accurately determined after the death of the member or the surviving spouse, but expected rates can be determined.

Conclusion

The expected rates of return on contributions may appear to some to be acceptable. The average expected nominal rate of return is always quite positive, but the proper measure is the real rate of return, which is also positive across cohorts. It must be remembered that the rates of return use actual experience up to 1991 or 1993, and the assumptions of the Fourteenth or Fifteenth Actuarial Report thereafter, and so are a mixture of actual experience and projected experience.

Ratios of benefits to contributions, measured using the assumptions of either the Fourteenth or Fifteenth reports, have shown that, contrary to the common belief, all future generations, even in the distant future will receive in excess of $5 of benefits for every $1 of contribution. The cohort retiring in 2013 will receive about $10 of benefits for every $1 of contribution, while that retiring in 2033 will get $6.

A final conclusion on the adequacy of the projected rates of return cannot be reached, however, without considering the rates of return on other forms of investment, and the effects of both expenses and taxes. These are covered in the next Chapter.

V

RATES OF RETURN ON OTHER FORMS OF INVESTMENT AND THE EFFECT OF EXPENSES AND TAXES

In this Chapter I begin by indicating what the rates of return have been on various forms of investment that are available to the private investor in order that the rates of return on the CPP developed in the previous Chapter may be compared with them. I then discuss the effect of taxes on both the CPP and private investments. Finally, the effect of expenses on returns, both for the CPP and in the private sector is considered.

While it may appear that some of the rates of return for the CPP developed in the previous Chapter are quite acceptable, and others perhaps not acceptable at all, a conclusion on this cannot be made in isolation. Any rate of return must be compared, and the comparison made, on a consistent basis with rates of return on other types of investments which are realistically available. In addition, the effect of both administrative expenses, which include investment expenses, and taxes, on any rate of return must be taken into account. This is another standard for affordability, as the CPP may not be perceived as affordable if it gives lesser returns than alternative forms of investment.

The following rates of return on other types of investment are derived from those in the Canadian Institute of Actuaries Report on Economic Statistics 1924-1993, published in May 1994. Yields on US stocks make allowance for changes in the value of the Canadian dollar. Yields, both nominal and real, are shown for the period from December 31, 1965 to December 31, 1993, the period during which cohorts A, B, and C have both contributed and/or received benefits, and also for the period December 31, 1985 to December 31, 1993, the period during which Cohort D has contributed so far.

Period	Basis	Canadian Stocks	Long Bonds	Mortgages	T Bills	US Stocks
1965-93	Nominal	9.9%	8.7%	10.7%	9.0%	11.0%
	Real	3.8%	2.6%	2.6%	2.9%	4.7%
1985-93	Nominal	8.6%	13.3%	13.2%	9.5%	13.3%
	Real	4.7%	9.2%	9.1%	5.5%	9.2%

These rates are not strictly comparable in the way they are determined to those that I have derived for the CPP in the previous Chapter; rather these rates are the average rate of increase in the value of the security class over the period assumed. Essentially, they are what would have been obtained if an investment had been made in the type of security at the beginning of the period with interest and dividends re-invested, but with no other cash flows in or out during the period. Obviously, this is not directly comparable to a pension plan in which both contributions and benefits are made and paid periodically over time. They are used, however, because they are both readily available, and other simulations, more directly comparable, could not be made

because of both time and budgetary constraints. Nevertheless, they are a reasonable measure of investment returns in the same periods. This is another area for further work.

It must also be remembered that, even though tax treatment affects the effective rate of return, these are yields before tax, and also before any administrative or investment expenses. The subject of taxes and expenses is discussed later in this Chapter.

The real rates of return for Cohorts A and B, determined in the previous Chapter, are well in excess of 20% and 10% respectively, and are obviously exceptional by any standard. That for Cohort C is almost 5%, and is more than satisfactory by historical standards. That for Cohort D is around 3% and is nonetheless quite acceptable by historical standards, considering that indexing is guaranteed, that there is practically no risk of benefits not being paid in full because of the bankruptcy of the employer, and after making allowance for the expense factor described below. It must also be remembered that benefits are indexed with wages up to retirement, and that such indexing is not lost upon changing jobs, as almost always happens in the private sector. The rates of return for Cohorts E and F are only 1.7% and 1.5% in real terms, but these may be acceptable taking into account the factors mentioned in the preceding sentence, and the higher rate of expense on other investments, which is discussed later in this Chapter.

Taxes

So far I have not considered the effect of taxes on returns. To quote Sir John Templeton, both a spectacularly successful long term investor and an investment guru, (certain mutual funds bear his name), "There is only one objective for long-term investors: maximum total real return after taxes." Taxes can have a major effect on all measures of affordability, and not just rates of return. For an overly simple example, assuming a tax rate of 50%, a tax-free rate of return of 4% is more attractive than a taxable rate of return of 7%. Unfortunately, none of the aspects of the effect of tax upon returns is as simple as this example.

CPP contributions by individuals currently generate a non-refundable tax credit[15], while CPP benefits are taxable in full. The tax credit is at the rate of tax for the lowest tax bracket in effect at the date it was made. If the tax rate at retirement is only in the lowest bracket, and tax rates have not increased, then the rates of return quoted need not be adjusted, assuming no change in tax rates. This, however, is not a particularly reasonable assumption.

Contributions to RPPs or RRSPs are <u>deductible</u> from taxable income, as opposed to generating a tax credit, and so create a greater tax savings than CPP contributions, unless the contributor is in the lowest tax bracket. Benefits paid from these plans are also taxable in full, but there is a non-refundable tax credit at the lowest rate on the first thousand dollars of pension income from a RPP or RRSP.

Another consideration that is difficult to quantify is the use of the tax savings on CPP, RRSP, or RPP contributions. For example, consider a contribution of $500 to one of these plans,

[15]Originally CPP contributions for individuals were a deduction from taxable income, as still are RPP and RRSP contributions, but this was changed in the mid 1980's.

as compared with similar contributions to a non-tax-sheltered plan. After making allowance for tax credits or deductions, the after tax cost may be only around $365 for the CPP, and around $250 for a RRSP or RPP, while it is $500 for the non-sheltered plans. The saving is available to spend or invest in other areas.

What is even more important is the overall average rate of tax. Although it is often expected that rates of tax after retirement will be lower than those before retirement, both because of reduced income and tax advantages given older Canadians, this may be more than offset by increases in the rate of tax over the years. The following table, showing average rates of federal and provincial income tax over time, illustrates this evolution. It shows the ratio of federal and provincial income taxes to total income, with all the figures being taken from Revenue Canada's official Taxation Statistics publication for the tax year indicated.

Average Federal + Provincial Tax Rates

Year	Males Under 65	Females Under 65	Males 65 and Up	Females 65 and Up
1966	10.24%	8.25%	10.02%	7.89%
1971	15.81%	12.53%	14.59%	11.14%
1976	15.75%	10.23%	10.43%	6.52%
1981	16.81%	11.66%	12.96%	10.39%
1986	18.61%	13.86%	13.38%	10.14%
1991	20.36%	15.71%	15.53%	12.27%

While tax rates for those over 65 are always lower than for those under 65 in a given year, it may well occur that the tax rate after age 65 is higher than the tax rate over much of the working career. For example, the average tax rate for males sixty-five and older in 1991 is about fifty percent higher than that for males under sixty-five in 1966, and only marginally lower than that for males under sixty-five in 1971 and 1976, which is only a single generation earlier. It should also be remembered that the 1993 Budget reduced the age tax credit for many Canadians, and will thus increase average tax rates for seniors.

There is still another factor in the present Income Tax Act that, with other things being equal, will create an increase in the average tax rate over time, even with no increase in tax rates *per se*. This is the partial de-indexing of the tax brackets, which are indexed only at the rate of increase in the CPI minus three hundred basis points. In periods of low inflation, such as today, the tax brackets do not move at all, although earnings and incomes may increase modestly. Thus, even though the nominal rates of tax may not change, and the top rate of tax remains the same, the average rate of tax will increase as a greater portion of earnings is taxed at the higher rates. It is thus quite possible that the tax paid on benefits received will be at a higher rate than the tax relief in respect of the contributions. This effect will apply to RRSP and RPP payouts as well, and will be accentuated for those in receipt of income-tested GIS benefits, and those for whom the OAS clawback is relevant. Income testing the GIS is similar in its effects to a positive income tax system.

To give an illustration, for the 1994 tax year, the basic federal tax rate is 17% on the first $29,590 of taxable income, 26% on the next $29,590 of taxable income, and 29% of the excess

over $59,180. Provincial taxes are in addition to these rates, but, except in Québec, are a percentage of the federal rate, ranging from 45% in the North West Territories to 69% in Newfoundland, with something around 60% as the most common. Québec taxes fall in this range. Federal and provincial surtaxes may also apply. For purposes of this Chapter it is sufficient to concentrate upon the basic federal tax rate, as the other taxes generally move in parallel with it. The vast majority, if not all, of the deductions from total income (pension contributions, RRSP contributions, union dues, carrying charges, etc.) to get taxable income will not apply to those over sixty-five, and so total and taxable income may be regarded as more or less equivalent. There will still be many tax credits that apply to these people, however.

The following table expresses the tax brackets thresholds as percentages of the YMPE, which is currently approximately equal to 115%[16] of the average wage in Canada, assuming that wages and prices increase at the rates assumed in the Fifteenth Actuarial Report, which ultimately is 4.5% for wages and 3.5% for prices. This means that the tax bracket thresholds do not increase at all until 2000, and thereafter only at 0.5% per year, *i.e.* 3.5% minus 3.0%, while earnings increase at a much higher rate. This method of presentation was chosen because projections of earnings at 4.5% give rather large figures, both for average earnings and the YMPE, that may be difficult to comprehend.

Projected Impact of Continued Partial De-indexing of Tax Brackets

Projected Income Level at Which Tax Rate Shown First Applies (as percentage of YMPE)

Year	26%	29%
1995	84.8%	169.6%
2010	49.5%	99.0%
2025	27.6%	55.1%
2050	10.4%	20.8%

The CPP provides a maximum pension of 25% of adjusted individual average earnings while the OAS provides a pension of 15.3% of the average wage in Canada in 1995. Under the assumptions described above, this latter percentage will decrease to 13.6% in 2010, 11.5% in 2025, and only 9.0% by 2050. This is because increases in OAS reflect only the increase in prices, and prices are assumed to increase at a lower rate than wages. This indicates that OAS will play a lesser role in providing retirement income in the future than at present, unless either the initial OAS pension is wage-indexed from year to year (indexing with prices after commencement could remain), or the gap between wage and price increases narrows appreciably. The same statement applies to the GIS as well, since it is also price-indexed. The implications of the lesser role for both OAS and GIS in retirement income are beyond the scope of this paper, but this lesser role should be noted.

[16]The YMPE rose above average earnings when it was being increased at 12.5% per year to catch up to average earnings, and for a variety of technical reasons not germane to this paper has remained above average earnings ever since.

As a result, someone whose only taxable income after retirement consists of the maximum CPP and OAS pensions will be in the lowest tax bracket in both 1995 and 2010. If partial de-indexing were to continue, by 2025 some income would be in the second bracket, and, by 2050, 47% of income would be taxed at the top rate. If there is any retirement income from RPPs or RRSPs, or investment income, even more income will be taxed at the top rate. The partial de-indexing of tax brackets, if continued for long periods under the present tax structure, would cause severe problems of equity, and might well result in and of itself in higher overall tax rates after retirement than before.

A more ambitious analysis would involve the calculation of adjusted rates of return taking into account the effect of tax credits and various assumed levels of income and taxes payable. The effect is certain to be a reduction in the yields obtained under the CPP, as well as for alternative investments. I can, however, conclude that making allowance for income tax will make rates of return less attractive than indicated earlier, and that it is quite probable that benefits will be taxed at a higher rate than that for which a tax credit was given on CPP contributions, especially when the reductions in GIS and SPA benefits are included where they are applicable. These reductions are discussed more fully in Chapter VII.

It should be noted that, under present tax rules, contributions to RPPs and RRSPs give rise to deductions from taxable income rather than tax credits, so they may give better returns than the CPP, because the contributions in all probability get more favourable treatment. Continuation of the partial de-indexing of the tax brackets, however, would ensure that virtually all income from these plans is taxed at the highest rate ultimately, even although the tax relief on contributions may have been granted at a lower rate. The negative effect upon these plans would not be as great as upon the CPP, however.

The CPP is thus not treated as beneficially as certain private arrangements, such as RPPs and RRSPs. All of these -- CPP, RPPs, and RRSPs -- receive more favourable tax treatment than savings arrangements that are not tax-sheltered. CPP retirement payments may well be taxed at a higher rate than was allowed as a credit on the contributions when made. This certainly makes the CPP less attractive, and in itself makes it less affordable, *ceteris paribus,* than either RPPs or RRSPs, but considerably more so than private savings that are not tax sheltered.

Expenses

Before CPP rates of return can be compared with those from other types of investments, administrative and investment expenses must be taken into account on a consistent basis. Thus, we shall next consider the effect of such expenses on various forms of investment.

An allowance of 0.1% of contributory earnings is included in the CPP contribution to cover all expenses, both administrative and investment. In 1994 this is $31 per year per contributing member, for someone contributing at the maximum rate. In 1994 actual administrative expenses, including investment expenses, for the CPP were about $200 million. This works out to about $20 per contributor, or just under 2% of combined employer/employee contributions.

In the calculation of the rates of return for the cohorts the expense allowance was included in the contributions, but not included as a benefit, so that the yield shown is net of expenses. In the individual rates of return calculated, no allowance was made for expenses; that part of the contribution deemed to be solely for retirement benefits was equated just to retirement benefits. Thus, in comparing the rates of return for the CPP with those available in the private sector, appropriate allowance for expenses must be made on the contribution side, generally reducing, relative to the CPP, the effective rates for alternative savings vehicles.

For RPPs and RRSPs these expenses fall into two broad categories, investment and administrative. Investment expenses are usually expressed as a percentage of the funds invested, and generally fall in the range of from 0.25% to 2.5%, depending upon the type of investment, the fund manager, and the amount invested. The usual range is from 0.75% to 1.00%. Thus it is necessary to either deduct this amount from the rate of return in the private sector, if net returns are not being used, or add it on to the CPP return, to make a valid comparison.

For administrative expenses, one-third party manager in the private sector charges $15 per year per member for record keeping and issuing annual statements. In addition a charge of $250 is made for each set of calculations in the event of retirement, death, disability, or termination of employment. Occasionally a flat charge of $30 per member is made to cover all of these items. These charges are for plans considerably simpler than the CPP, and do not include those for actuarial valuations or consultations on plan design, nor investment expenses.

One fairly complex provincial pension plan for teachers, though not as complex as the CPP, which has a separate entity administering its plan, and so can calculate costs quite accurately, estimates that it costs $75 per active member per year to cover all expenses, including actuarial and consulting ones, but not including investment charges.

These expenses are all for fairly large employer-sponsored pension plans with their associated economies of scale. For an individual, expenses would, of course, be higher. For example, the administration charge with a stockbroker for a self-directed RRSP is from $125 to $175 per year, with brokerage charges in addition. When an annuity is purchased there will also be paid the insurance company's loading for expenses, which is usually from 3.5% to 5% of the premium paid. Taking into account all the expenses considered in this paragraph, the investment yield of a private savings arrangement will probably reduce by about 10%, *i.e.* a gross yield of 6% reduces to 5.4%. The reduction will be more for those who contribute only small amounts to an RRSP, and less for those who contribute larger amounts.

Appropriate allowance for these expenses must be made in comparing the rates of return on the CPP with those in the private sector. By any standard, the administrative costs of the CPP are low. This reinforces the claim that the CPP is reasonably priced, as very little of the contributions is used to cover expenses.

It is safe to assume that, if allowance is made for the expenses associated with RPPs or RRSPs, yields on them, whether nominal or real, need to be as a very minimum 50 basis points, and more likely 100 to 150 basis points higher, in order to compensate for the low expense level of the CPP. The increase could be even higher in some cases since there are mutual funds where

the annual investment expenses, expressed as a percentage of funds invested, are as high as 2.5%, as mentioned above. Thus, rates of return on the CPP should be increased by these amounts, or alternatively gross rates of return on other forms of investment should be correspondingly decreased for purposes of comparison.

The real rates of return on fixed income securities over the period from 1965 to 1993 have all been under 3%. Admittedly real rates since 1983 have been much higher. As has been noted by many observers, Canada is in the anomalous situation of having high nominal rates of interest, despite extremely low inflation, resulting in high real rates of return. This supposedly is a result of lack of confidence by foreign investors in our ability to manage our debt difficulties. Whether this situation of high real rates of return will continue is problematic.

Projected real rates of return for Cohort D, *i.e.* those retiring in 2033, were determined to be around 3%. They are thus comparable to long term historical yields on fixed income securities even without making allowance for the much lower level of expense. For Cohorts E and F, *i.e.* those retiring in 2053 and 2077, the projected real rates of return are only 1.7% and 1.5% respectively. When the adjustment described in the second paragraph is made, these yields are comparable to historical yields on fixed income securities.

For a RPP, allowance must also be made for the plan being discontinued while it is not fully funded, with the result that not all benefits would be payable in full. Further, allowance must also be made for benefits that may be lost on termination of employment. While vesting requirements in pension benefits legislation are stringent, almost always either two years of plan membership, or five years of service, depending upon the jurisdiction, some Canadians will lose benefits because they terminate before becoming vested. Even more importantly, vested benefits are almost invariably based on earnings to the date of termination, with no indexing, in any form, between the date of termination and retirement. This contrasts with the CPP where termination of employment cannot result in either the loss of benefits, or the loss of indexing. This factor significantly lowers the effective rate of return on RPPs unless the employee can count upon remaining with the employer until retirement, a situation that appears progressively less likely in today's employment environment.

When allowance is made for the various factors just described, and the lower expense rate of the CPP, the CPP returns are comparable to, or better than those, on the type of securities generally considered to be risk free. Returns on equities have generally been higher than those on long-term federal bonds or on T-bills, as the table at the beginning of this Chapter illustrates. The table indicates that they have not always been higher, however. Further, equities carry the risk of having to be sold to provide a pension when the stock market is down; high stock prices do not coincide with everyone's date of retirement. Thus, if the definition of affordability is being unable to do better in some other way, the CPP is generally affordable in this sense.

Other Forms of Investment

So far the comparison has been with certain forms of tax-sheltered saving, RPPs and RRSPs. Non-tax sheltered forms of saving need not be considered specifically, since their tax treatment may well make them unattractive as a means for providing for retirement income.

Perhaps the greatest attraction of such investments is that the funds in them are more readily available for alternate uses than in the CPP, RPPs, or RRSPs, and have no restrictions upon their use. There are, however, certain tax-sheltered means of saving that may give preferable results.

One is the owning of a principal residence. Capital gains on the sale of such are not currently taxable, though it is possible that they may be in future. This gives an opportunity to shelter one form of investment income, *i.e.* the increase in value of the house. The sale of the house, to be replaced with a more modest residence, because the children have left home, or one in a less expensive locality, because it is no longer necessary to be near the workplace, in order to provide additional funds at retirement may be a way of saving that has merit.[17]

While it was once expected real estate prices for homes in prime housing areas could only go up, recent experience has cast doubt upon this assumption. With the passing of the baby boom, and the market for real estate consisting of members of the baby bust generations, the demand for real estate may well decline; this will slow up the increase in real estate prices. It will be quite possible for the increase in real estate prices to remain below the level of inflation. Further, it may not be possible at any given moment to sell for the desired price, and perhaps not at all. Consequently real estate may not be as attractive an investment in the future as it has been in the past. Further, while capital gains from the sale of the principal residence may offer a tax advantageous way of saving at present, the current tax treatment cannot be counted upon to remain unchanged.

Capital gains are currently taxed at a lower rate (75% of the usual rate) than other income. This is in partial recognition that capital gains are typically associated with longer-term investments in which a significant portion of the gain reflects inflation, rather than a real gain. Thus, investing in securities, where capital gain, rather than income, is expected partially shelters the increase in value. The increased level of taxes imposed on capital gains in recent years, and the elimination of the $100,000 lifetime exemption, other than capital gains from the sale of a principal residence, suggests that this more favourable treatment of capital gains may not continue indefinitely. Further, many years ago the Carter Commission recommended that all capital gains, including unrealized ones, be taxable as ordinary income. With governments seeking increased tax revenues, this proposal may resurface.

Conclusion

Real rates of return on the CPP have been excellent in the past, and even for the cohort that will retire in 2033, should be comparable to those on other forms of investment on an historical basis. That for future cohorts may be less favourable. When allowance is made for the much higher level of expense on private arrangements, the relative yields on the CPP become still more attractive, and even that for the cohort retiring in 2077 may be considered acceptable. The CPP may thus be considered affordable, at least for the next forty years or so, in the sense that it gives a comparable rate of return to those on other risk-free investments, such as treasury

[17]In the USA capital gains on the sale of a residence are tax exempt only if a more expensive residence is purchased within a specified time after the sale. Thus the exchange of a large residence for a smaller one, or for one in a less expensive area, creates a tax liability.

bills or long term federal bonds, if considered on a long-term historical basis, and especially if expenses are taken into account. For some time periods it would be difficult, if not impossible, to do better in private arrangements. For the future it may well be possible to do better, but only if certain risks are taken, such as investing in equities -- risks that some may not wish to take. It is worth noting in this context that most RRSP owners do not invest in equities. In any event, the availability of indexed investments, which would be necessary to provide the indexing features of the CPP, is limited.

The tax treatment of CPP contributions (a tax credit) is not as generous as that for RPPs and RRSPs (a deduction from taxable income). There has been speculation, however, that the Income Tax Act may be changed to convert the deductions for RPPs and RRSPs to tax credits as a means of increasing tax revenues; if this happens those plans will lose that advantage. It does not appear, however, that this present advantage of RPPs and RRSPs significantly affects the conclusions reached. Putting alternative retirement savings vehicles on the same tax basis as the CPP would only improve the competitiveness of the CPP.

More importantly the continued partial de-indexing of the tax brackets would affect negatively the rates of return on both RPPs and RRSPs, since income might well be taxed at a higher rate than that at which tax relief was given on the contributions. This would apply to a greater extent to the CPP as the initial tax relief granted to contributions towards it is almost certainly less than that currently granted to RPPs and RRSPs, though this different treatment may disappear in the future.

VI

THE CPP AND PRIVATE PENSION PLANS

In this Chapter the interrelationship of the CPP with private pension plans is analyzed. Because the interrelationship is complex, it is only considered briefly in this Chapter.

To begin we shall consider various aspects of private pension arrangements. These will include both Registered Pension Plans (RPPs), *i.e.* plans sponsored by employers for their employees and Registered Retirement Savings Plans (RRSPs). As well, to provide a better perspective on the retirement income system as a whole, we shall examine other sources of income for seniors. We shall look at the proportion of seniors receiving various sources of income, and the interaction of the CPP, OAS, and GIS with private pension plans. Finally there is a reconciliation of the cost of the CPP with the cost of one representative RPP.

Private plans have an effect upon the affordability of the CPP. If private plans did not exist, the CPP might well be under pressure to provide higher retirement benefits, in which case the cost of the CPP would be higher, or it would be necessary for Canadians to save more personally for their retirement. Conversely, the very existence of the CPP has allowed private plans to provide lesser benefits. In fact when the CPP was introduced in 1966, most private plans integrated their benefits with the CPP in some way, reducing the benefits to be accrued in future to allow for the existence of the CPP.

Coverage under the CPP must be compared with that under private plans in order to determine whether the CPP is a necessary part of the retirement system. The interaction indicates that much of the CPP cost would merely be transferred to private plans if the CPP did not exist. The cost reconciliation developed later in this Chapter demonstrates that the CPP costs are consistent with those of RPPs, considering the differences in the financing method, *i.e.* the cost differential resulting from pay-as-you-go funding under the CPP compared with full funding under RPPs, and assuming that the actuarial assumptions are considered acceptable.

Coverage under Private Arrangements

The proportion of the working population covered under the CPP can be compared with that under employer sponsored private pension plans, called RPPs. When the CPP was first proposed in the early 1960's, it was estimated that 34% of the employed labour force in 1960 belonged to RPPs, and the majority of them were employees in the public sector. By 1965 this had increased to 38%. By 1984 the percentage had increased to 47.3%, but it declined thereafter for a number of years before recovering to 47.4% in 1993; there is some evidence that this recent increase is more a result of high unemployment resulting in a decline in paid employment rather than an increase in the number of members in RPPs. Further 48.6% of those members of RPPs are in the public sector, which accounts for much less than half of the employed labour force.[18] Thus, the hopes expressed that the introduction of the CPP would spur increases in private coverage have been largely disappointed, and the CPP, along with the OAS, remains the most

[18] All these figures are for Canada as a whole, including Québec.

important source of retirement income for most Canadians, although RPPs provide larger incomes for those who belonged to them.

The 1991 taxation returns bear this out.[19] Both to get a refund of taxes that were deducted, even though income was below the taxable level, and because of the introduction of refundable tax credits, many Canadians file income tax returns, even if no tax is payable: 88.8% of residents age 65 and older filed income tax returns in 1991. Of this age group, 60.3% of all filers paid tax. The following tables show various sources of income for both taxpayers, and non-tax paying tax filers, aged 65 and older, from the 1991 tax statistics. These income tax statistics thus give us a reasonably good income profile for the majority of Canadians aged 65 and older. The gaps will primarily be with elderly Canadians at the lowest income levels.

The tables that follow show the sources of income, the percentage of tax filers who received income from this source, and the average annual amount received by those filers who actually received such income, not averages for the entire group. GIS and SPA are not recorded in the tax statistics as they are not taxable, and so are excluded from these tables. These figures are all on an individual basis rather than a family basis.

Income Sources for Tax Paying Tax Filers Age 65 and Over in 1991

Source	Percentage Reporting Income from Source	Average Amount of Income for Recipients from Source
C/QPP	89.5%	$4,870
OAS	98.4%	$4,318
RPP	61.0%	$9,622
RRSP	6.5%	$6,609
Annuities	18.5%	$4,645
Bank interest	88.0%	$7,531
Bond interest	31.6%	$3,890
Dividends	18.4%	$7,216
Taxable capital gains	7.4%	$14,008

[19]Since the writing of this paper began, statistics for the 1992 taxation year have become available. As the differences do not affect the conclusions drawn, we decided to use the 1991 figures.

Income Sources for Non-taxpaying Tax Filers Age 65 and Over in 1991

Source	Percentage Reporting Income from Source	Average Amount of Income for Recipients from Source
C/QPP	65.7%	$2,933
OAS	96.1%	$3,898
RPP	19.7%	$3,405
RRSP	0.9%	$2,406
Annuities	3.3%	$1,436
Bank interest	56.0%	$1,852
Bond interest	8.7%	$1,219
Dividends	4.1%	$2,012
Taxable capital gains	1.6%	$12,258

Income Sources for All Tax Filers Age 65 and Over in 1991

Source	Percentage Reporting Income from Source	Average Amount of Income for Recipients from Source
C/QPP	80.1%	$4,239
OAS	97.3%	$4,163
RPP	44.6%	$8,535
RRSP	4.2%	$6,274
Annuities	12.4%	$4,308
Bank interest	77.1%	$5,723
Bond interest	22.5%	$3,477
Dividends	12.8%	$6,554
Taxable capital gains	5.1%	$13,788

The figures for capital gains is for *taxable* capital gains, which is lower than the actual amount; capital gains on the sale of a principal residence are not included at all as such gains are not taxable. Capital gains figures may be somewhat distorted as all unrealized capital gains are deemed to be realized at death, and so are included in the taxpayer's final tax return. The age group being considered will obviously have many returns that fall into this category, but the published figures do not reveal this. That there are large capital gains for taxpayers in the over age 75 bracket tends to confirms this.

Several points must be kept in mind with respect to the average incomes in these tables, and others quoted elsewhere in this paper from the same source. They are derived from published taxation statistics. Averages may be calculated for all who file a tax return, all who pay income tax, and all who file but do not pay tax, which is what is done in the tables here. They may be calculated for all, including those who do not receive income of the type being considered, or only those who receive income of that type. The figures shown in this paper are always the average for only those who receive income of the type described, unless it is specifically stated otherwise.

Further these averages give no idea of the shape of the underlying distribution: *i.e.* whether they are grouped closely around the mean, or widely distributed on either side of it. There are also no observations of how many who receive one type of income also receive another type. As well, there is no indication of the correlation of the amounts under the various types of income. While it may be reasonable to assume that those who get the largest amounts of income from the CPP get the largest amounts from certain other sources as well, this is not addressed here.

Finally the tax system operates largely on an individual basis, and so there is little information about family income; for senior couples this can be very important. Thus, adding up these figures would not be logically consistent. Although it is possible to obtain all these kinds of information from the underlying administrative microdata, neither the time nor budgetary constraints for this study allowed this to be done.

I have, however, been able to get equivalents to some of this information from **SIMTAB**, a computer microsimulation model developed within Health and Welfare Canada, (now in Human Resources Development Canada or HRD), described in Appendix F. The detailed analysis is not especially germane to this Chapter, but is used in Chapter VII.

In the tables above, RRSP income includes all direct payments from RRSPs, including lump sum withdrawals and payments from Registered Retirement Income Funds (RRIF), but does not include income from annuities purchased with RRSP funds. Annuity income includes the *taxable* portion of annuities purchased from sources other than RRSPs, as well as from RRSPs; the taxable portion of the former is less than the total annuity income, while in the case of the latter it is taxable in full. It is not likely that many individuals will have any RRSP income, after the RRSP is annuitized. This is borne out as well under 1% of tax-filers aged 75 and up have any RRSP income: RRSPs must be matured before the 71st birthday.

"Bank interest" in the taxation statistics includes all forms of interest with the exception of that on bonds and mortgages. I also show bond interest (many seniors own Canada Savings Bonds), and the taxable amount of dividends from Canadian corporations, which is more than the actual amount received because of the "grossing-up" for tax purposes, with the concomitant dividend tax credit; not shown is mortgage interest, foreign investment income, income from employment, etc., because relatively few seniors have income from these sources.

While 34.3% of the non taxpayers aged 65 and older who filed returns did not receive C/QPP income, many of these were probably never in the labour force after 1965, such as non-working spouses, those too ill to ever have worked, and those who were permanently unemployed. There would also be a few who were too old at the inception of the CPP, i.e. over age 70 in 1966, and so never earned any benefits for either themselves or their surviving spouses. This is borne out as the taxation statistics show that the percentage of those aged 75 and up who do not receive C/QPP is markedly higher than those in the age 65 to 74 group.

That 61.0% of taxpayers received income from RPPs does not contradict the participation figures in the mid 40% range quoted earlier. First the percentage of *all* filers,

including those who do not pay income tax, who received income from RPPs is only 44.6%; secondly the participation percentages quoted earlier are a snapshot at a particular period in time: non-participants may have been members of a RPP at some point in time in the past, and may again be members of a RPP, and may have pension rights under those past and future plans. Many are receiving spousal survivor benefits under a RPP, and were never members of a RPP in their own right. On the other hand, some members of RPPs may terminate employment before vesting occurs, and so will not receive pension benefits.

Benefits from RPPs are an important source of retirement income for those who have belonged to them, but fewer than 45% of Canadians over age 65 receive benefits from this source.

Another popular method of retirement saving is through RRSPs. These are a tax-assisted and tax-sheltered form of savings for retirement; they were first introduced in 1957. They were designed to give a means of saving for retirement to those who did not belong to private pension plans. This included, as well as employees of companies who did not have plans, the self-employed, sole proprietors, and partners. These last three classes of individuals are not allowed under the Income Tax Act to establish RPPs for themselves: this group includes most doctors, dentists, lawyers, accountants and similar professionals. RRSPs also give members of private plans an opportunity to top up their pensions. Finally, the round of pension reform that began in the 1980's allowed employees terminating from a RPP the right, under certain conditions, to transfer the value of their pension credits to a RRSP.

Looking at the sources of income of those aged 65 and up gives an indication of the effectiveness of RRSPs. Fewer than 17% of Canadians over age 65 receive income from either RRSPs, which in the tax statistics includes income from RRIFs, or annuities, and it must be remembered that not all annuity income derives from RRSPs; the amounts, however, are significant for those who receive them. The average annual incomes from RRSPs and annuities for all taxfilers age 65 and up is $6,274 and $4,308 respectively; as indicated earlier, much of the annuity income probably comes from RRSPs. With RRSPs having been available for well over thirty years, and in a period with high investment returns, it is both surprising and disappointing that the average incomes arising from RRSPs are so low. This may well be because contribution limits to RRSPs were very low for many years so that relatively little was accumulated. Further, if a RRSP is converted to a RRIF, the payments may be low in the early years to allow the fund to build up so that withdrawals may be increased if inflation increases.

In addition to looking at what income RRSPs are actually providing to those age 65 and over, it is also necessary to look at what they might provide in the future. In 1991 there were 4,618,000 contributors to RRSPs, 24.2% of all tax filers, with an average contribution of $2,896. Of these contributors 63% had earnings of over $30,000 and made an average contribution of $3,927. For the 37% of contributors earning under $30,000, the average contribution was only $1,657. Looking at the figures another way, well under 30% of taxpayers earning less than $30,000 contributed to a RRSP, while well over 60% of those earning over $50,000 did so. This would seem to indicate that not many lower paid individuals will receive retirement benefits from RRSPs, and bears out the contention that the largest RRSP contributions are made by the self-employed. This should not be surprising as the self-employed, whether individual

proprietors or partners in a firm, are prohibited by the Income Tax Act from establishing a RPP, and can only use RRSPs to provide for tax-sheltered savings for their retirement. This group includes most doctors, lawyers, and accountants, as well as small businessmen who have not incorporated. As they are not members of a RPP, they are allowed to contribute more to a RRSP than members of RPPs may.

There is also evidence that the average amount contributed to RRSPs is declining, if expressed in constant dollars, *i.e*. adjusted for inflation. While the average contribution to a RRSP increased by 41% from 1982 to 1992, the average contribution, when expressed in constant dollars, has decreased by 7%. This may also be an effect of the recession which depressed incomes, and consequently RRSP contributions as well. Constraints on contribution limits, such as those introduced in the 1995 Budget, may accentuate a decline in the average contribution in constant dollars.

While it was originally contemplated that the amounts in RRSPs would be used largely or exclusively to provide retirement income, it is possible, with the exception of amounts transferred from RPPs, to select other options, such as a lump sum withdrawal. There is substantial evidence from taxation statistics to suggest that a considerable amount of RRSP money is not used to provide retirement income, *e.g.* RRSP "income" being reported for those under age 60. For example, in 1991, almost 110,000 tax-filers under age 60 received over $3.1 billion dollars of payments from RRSPs, practically all of which would have been withdrawals. Over 75% of these, both by number of filers and amounts received, were under age 50. In fact 37% of those receiving income from RRSPs were under age 40. Most, if not all, of these amounts would have been lump sum withdrawals and not periodic payments of retirement income.

This is not to imply that none of these payments was for "legitimate" uses. Because of layoffs resulting from downsizing and the recession, many unemployed workers may have been living on their RRSP withdrawals as an alternative to publicly funded welfare. RRSPs may also be used by those near retirement to provide a bridge income from the date of a job loss to the age at which their pensions begin. Nonetheless, it does mean that this money will not be available to provide long term retirement income.

Thus, it is possible that RRSPs may not be a much more significant source of retirement income in the future than they are at present, and they will at best continue to supplement rather than replace the CPP, or to provide bridge pensions until regular pensions commence.

It appears that RPPs and RRSPs, while providing substantial income for those who have them, apply to somewhat less than half of Canadians, as opposed to the CPP which covers virtually all.

A few employers use Deferred Profit Sharing Plans as a vehicle for retirement income, but the laws governing these do not require them to be used to provide pensions. No statistics are available on these plans that would be useful for our purposes, and in any event their use is very limited.

Taxpayers also save without tax assistance for their retirement. The most significant category of investment income is labelled "bank interest" in the tax statistics. A significant number of seniors receive income from this source, even those seniors who do not pay tax. This amount, as a fraction of seniors' income, is likely to decrease in the short term because of the drop in nominal interest rates since 1991, although real interest rates have not changed that much.

Many experts expect lower nominal interest rates in the future than prevailed in 1991; interest rates are very volatile however. To use the rate on 91-day Treasury Bills as a measure, the average rate in 1991 was 9.58%. It dropped to 6.50% in 1992, 5.28% in 1993, and increased to 7.60% in February 1995. Thus the average amount of "bank interest" received in 1993 might be only about 55% of the corresponding figure in 1991, although it might increase to 80% in 1995. While inflation has declined substantially, it has not reduced by an amount to compensate for the reduction in interest income. To maintain the standard of living for seniors largely dependent upon "bank interest," it may be necessary for them to live on capital, which can only be done for a limited period of time in most cases. Admittedly, however, this is more feasible in periods of low inflation. Thus "bank interest," while remaining a substantial source of retirement income, may well account for a lower proportion of retirement income than it has historically, unless interest rates increase markedly.

Substantial amounts of other kinds of investment income, such as mortgage interest and capital gains, are also reported in the tax statistics, but because the percentages of seniors who received such income was usually well under 30%, they are not an important source of retirement income for the majority, and so I have shown figures only for bond interest and dividends, the two most important categories of them, and for capital gains, for which the average amounts for those who receive them, are relatively high.

Finally, I shall take a look at the average income from all sources of all Canadians over age 65, and not just those who receive income from a particular source. The earlier tables show substantial incomes from various sources *for those who receive them*, but we must remember that many do not, as the percentage receiving them indicated. Looking at broad averages can be misleading, but it is still useful to do so, providing the limitations are kept in mind.

The following table shows average income from various sources for those aged 65 and up who filed tax returns, taken from the same sources as the earlier tables in this chapter. In those tables was shown the average income for those who received income from the source indicated. Here the averages are for all in the group, and so are lower than those in the earlier tables. It must be remembered that not all receive income from the source indicated, and the percentage who do is indicated in the tables above. RRSP and annuity incomes are combined in this table, because much, although not all, of the annuity income originated from RRSPs. "Other" includes income from employment, as well as investment income from all sources, and other miscellaneous sources, including capital gains. It must be remembered that taxable income may differ from actual income, being higher in the case of dividends on Canadian equities, and lower in the case of capital gains and some annuities. As GIS/SPA are not taxable, the taxation statistics do not record them, but I know from other sources that roughly 40% of taxfilers age 65 and up receive GIS or SPA because of their low level of incomes.

Average Taxable Income by Source for Taxfilers over Age 65 in 1991

	Taxable	Non-taxable	Total
Number	1,701,120	1,117,900	2,819,020
CPP	$ 4,361	$1,928	$ 3,396
OAS	4,250	3,745	4,049
Pension	5,868	671	3,807
RRSP/Annuity	1,288	680	804
Other	14,721	786	9,446
Total	$30,488	$7,810	$ 21,502

There is certainly quite a substantial difference in the amounts and sources of income between the taxpayers and non-taxpayers, which is not unexpected.

The CPP is an important source of income for both groups, being 14.3% of average taxable income for those who paid tax, and 24.6% for those who did not.[20] CPP income can be expected to become slightly more important in the future as the number of pensioners who retire after the CPP matured increases, while OAS will become less important as its initial level is price, rather than earnings, indexed..

[20]It must be remembered that, because of credits and deductions, it is possible to have taxable income without having to pay tax.

Effect of the CPP upon the Design of Private Plans

It is relevant to this review that the existence of the CPP has also had a marked effect upon both the design and costs of pension plans in the private sector. In setting their target pensions, most sponsors of private plans have taken the existence of the CPP into account. This is most commonly done by having a lower rate of pension accrual on earnings on which benefits are earned under the CPP than on earnings over this limit. For example, the accrual rate each year may be 1.3% on earnings to the YMPE under the CPP, and 2% on earnings in excess of the YMPE. A variant of this is to provide a pension of 2% of all earnings, less 1/35 of the CPP benefit actually paid, for each year of service. Even plans which apparently are not integrated with the CPP, such as flat benefit plans providing, say, a pension of $30 per month for each year of service, may be implicitly integrated in the sense that the existence of the CPP was probably taken into account in setting the monthly accrual rate: without the CPP, it would likely have been higher.

As a result of concerns about the increasing costs of the CPP, coupled with a desire to keep CPP retirement benefits at current levels, there have been various suggestions for reducing CPP costs, or contribution rates -- proposals that do not require a reduction in the level of benefits. One major contribution came from a report prepared by a Task Force of the Canadian Institute of Actuaries, which was published in November 1993.

A method that has received much attention, and is discussed in the CIA Report, is a proposed increase in the normal retirement age under CPP, as was implemented by legislation under OASDI in the United States, though it has not yet come into effect. Retirement ages are also being increased in the social security plans of many other countries, although many of these had, especially for women, a lower normal retirement age than the CPP. A rationale for this approach has been a restoration of the previous relationship between the number of years worked and the number of years retired. Increased longevity has increased the number of years of retirement substantially, but the number of years worked has remained the same. Consequently, it is necessary to save more during each working year to provide the same pension, if the retirement age remains unchanged. Thus, if the normal age at retirement is increased, lesser amounts need be saved each year because the number of years during which funds are saved will increase. The study by the World Bank, mentioned earlier, argues for this approach in all countries.

The merit of this approach to cost reduction is that it does not reduce the level of benefits, although it delays their receipt; if retirement benefits are drawn before the normal retirement age, there will be a reduction in pension benefits. Flowing from this approach is that private plans or individuals only have to provide additional benefits for a short bridging period, rather than additional benefits for life. Nevertheless, it would still have an affect upon the design and cost of private arrangements.

Most private plans have a normal retirement age no higher than 65, although many allow retirement on an unreduced pension at an earlier age. All allow retirement before the normal retirement age on a possibly reduced pension; pension benefits legislation requires that

retirement on an actuarially reduced pension be allowed during the ten-year period before the normal retirement date. Pension benefits legislation, including the federal Pension Benefits Standards Act, also will not permit a normal retirement age any higher than the first day of the month before the attainment of age 66.[21] Thus RPPs have been virtually forced into using a normal retirement age no higher than 65, even though a higher age might be appropriate in the given circumstances.

Thus, any isolated increase of the retirement age under the CPP would create a gap between the age at which private plans start paying a pension and that at which the CPP does. Of course the CPP may be payable in a reduced amount, but again there is a reduction in the amount of anticipated pension. As a result, either employees would have to accept a lower pension income, or they and their employers would have to contribute more to fund bridge pensions.

The alternative is that RPPs would be amended to increase the normal age at retirement to coincide with the new retirement age under the CPP. From a cost viewpoint. this would decrease the employer cost of RPPs. Other things being equal, RRSPs would provide larger pensions, assuming that the retirement age under the RRSPs was deferred, both because the pension would start at an older age, and because the funds would be invested for a longer period. This might mean that lower contribution limits to RRSPs could be justified. On the other hand, if the retirement age under private plans remained lower than under the CPP, there would probably be increased contributions to RRSPs, and pressure for increased contribution room, in order to fund the bridge pensions.

The short-term problem is whether, in a period of downsizing, employers would want to keep employees on longer, and whether employees would accept a postponed retirement. The changing demographics -- an insufficient number in the workforce, resulting from the "baby bust" -- will probably ultimately force an increase in the retirement age, but this will not likely happen immediately. Further, increased longevity may well mean that retirement at age 65 is too expensive to be retained as the norm.

While an increase in the retirement age under CPP thus makes sense, it would create problems of one sort or another unless the normal age at retirement is also raised under private plans. A short-term effect would likely be higher unemployment among the "young seniors" who now would be expected to work for a longer period before retirement. These problems would only be severe if the normal retirement age were raised suddenly, *e.g.* an increase from 65 to 68 say, over a very short period. If the change were gradual, the problems would be much less, and there would be time to adjust financially to the changing retirement age. With an increase in the retirement age, there would almost certainly be an increase in the utilization of the disability benefit between age 65 and the revised retirement age; to the extent that this occurred, there would be no reduction in costs.

Next will be considered the effect of any reduction in the level of CPP benefits, as opposed to a reduction in the value of benefits resulting from an increase in the retirement age.

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[21] This provision was designed to accommodate teachers and university professors who normally retire at the end of the academic year in which they reach age 65.

Any reductions in CPP benefits would have an effect upon the members of private plans, either by reducing the total retirement income they would receive, or by forcing them, or their employer, to contribute more to offset the reduction in the level of CPP benefits. It would also likely result both in an increase in actual RRSP contributions, and in pressure for more room for contributions to RRSPs, since workers would need to fund a greater proportion of their retirement income through private savings.

Thus, if CPP costs were reduced by reducing the level of CPP benefits, there might well be a shift in costs from the CPP to private pension plans or individuals, if private plans paid higher benefits or more were contributed to RRSPs, or some combination of these. This is not to say that such a shift would necessarily result in an overall increase in costs if measured in the long run, although it certainly would change the incidence of costs since RPPs are fully funded, and do not use pay-as-you-go funding.

The effect upon part-time workers should also be considered. Anyone who earns at least the YBE earns benefits under the CPP. While pension benefits legislation requires that part-time workers who meet certain earnings standards have the right to join their employers' pension plans, most employers have made such membership voluntary, and not mandatory, with the result that few part-time workers have chosen to belong, probably because they do not wish to make contributions. Thus, reductions in the level of CPP benefits would have a great effect upon such workers. An increase in the retirement age, as opposed to reduced benefit levels, would not have so drastic an affect, as part-time workers might well continue working after age 65 in any event.

It must be remembered that, under the present tax provisions, contributions to RPPs and RRSPs are deductible from taxable income, while CPP contributions create a tax credit at the lowest rate. Thus a reduction in CPP benefits, or an increase in the retirement age, which resulted in lower CPP contributions than currently projected, and so lower tax credits, might result in increased contributions to RPPs or RRSPs. There might be no net increase in tax revenues at all, and possibly even a decrease in taxes for those in RPPs or using RRSPs.

Reconciliation of the Cost of the CPP with the Cost of Private Plans

Next I shall reconcile the cost of the CPP with one private plan to illustrate how the respective financing and benefit structures differ, and to allow for the differences in actuarial assumptions employed. This reconciliation demonstrates that the pricing structure of the CPP is comparable to that for private plans, although it ignores the effect of continuing low fertility upon CPP costs, reflected by the difference in CPP costs on the pay-as-you-go and full cost bases, about 14% vs. about 10.5%; the costs of private plans are not affected by the levels of fertility or immigration, as they are fully funded.

Concern has sometimes been expressed that the cost of the CPP appears to be much higher than that for private plans, considering the lower level of benefits -- 25% of adjusted career average earnings compared with a level of from 60% to 70% in private plans. Apart from the effect of the fertility rate on pay-as-you-go financing mentioned above, this impression is misleading, because this higher percentage is inclusive of an allowance for CPP benefits. On

earnings to the YMPE, private plans usually provide a benefit range of 35% to 45%, and the higher percentage is on earnings on which CPP benefits are not earned.

Next I shall mention some of the differences between private pension plans and the CPP; this is necessary in order to understand the reconciliation.

First, most private plans do not have the ancillary survivor and disability benefits contained in the CPP, few are indexed with the full increase in the CPI, and no plans have drop-out provisions in the same form as the CPP, although final and best average salary plans do base benefits on average earnings in only a small number of years. For private plans, however, coverage is usually only given for complete years of employment, with years of less than full time employment counting only for a pro-rata part, and years not employed not counting at all.

It must also be remembered that, in the private sector, benefits may be lost upon termination of employment. While pension benefits legislation requires vesting, usually after either two years of membership in the plan or five years of service with the employer, there will be many workers who terminate before meeting those requirements. Further there is no requirement that these vested deferred pensions be indexed in any way with increasing prices or wages, so the pension ultimately paid could have considerably less purchasing power than it had when it was granted. Only a very few private plans provide indexing on deferred pensions in the period from the termination of employment until retirement.

Many private plans do not base benefits on final average salary. The CPP indexes accrued benefits with the increase in the YMPE, which approximates the average wage in Canada, although not on the increases that apply to a specific individual. Plans that base benefits on earnings over the entire career, and flat benefit plans, promise only a specified amount of pension. While these plans frequently have pension benefits increased to reflect increase in prices or wages, such increases are typically granted on an *ad hoc* basis with no obligation to do so. Finally, defined contribution or money-purchase plans provide only what the accumulated contributions to them will purchase at the time of retirement, and their benefits have no direct relation to earnings at all.

The lack, in most plans, of the features described in the three preceding paragraphs limit costs in private plans in ways that do not apply to the CPP. If private plans had the indexing, survivor, and disability benefits that are contained in the CPP, their costs would be considerably higher. The comparison of costs between the CPP and private plans is often with stripped-down plans in the private sector, and allowance must be made for the differences in plan provisions.

Private plans are not financed on a pay-as-you-go basis as is the CPP. The decision to use pay-as-you-go financing resulted in contributions initially to the CPP being lower than they would be to a hypothetical comparable private plan using full funding, but ultimately being about 30% higher, not by intent, but as a result of the changing demographics, *i.e.* the aging of the Canadian population, resulting in large part from the assumed low rates of fertility.

As given earlier, the entry age normal cost for the CPP for the cohort aged 18 at December 31, 1993 was 10.50%, as shown in Appendix C to the Fifteenth Actuarial Report

(1993) on the CPP. It is worth digressing to look at corresponding figures from earlier actuarial reports. The first report which included these figures was the Eighth (1982). For the CPP, as it then existed, and using the actuarial assumption of that report, the entry age normal cost was 7.79%. Perhaps the most significant difference in assumptions from the Fifteenth Report was that the rate of wage increase was fifty basis points higher, as was the rate of interest assumed. These rates were 5.0% and 6.5% respectively, as compared with 4.5% and 6.0% in the Fifteenth Report.

The Eighth Report also gave costs on a number of other sets of economic assumptions. For example, it used those of the Sixth Report, where the rate of wage increase used was 5.5%; this gave a cost of 8.65%. From the results on the five sets of economic assumptions shown, it can be estimated that the entry age normal cost, using the economic assumptions of the Fifteenth Report, would be 8.27%.

The entry age normal cost for the present CPP was determined for the cohort aged 18 at December 31, 1993 using rates of increases in prices and wages of 2.0% and 4.5% respectively, a spread of 250 basis points, with an interest rate of 6.0%, as an approximation to the economic assumptions used at the inception of the CPP. The current demographic assumptions were used, with the exception of the fertility rate, where a rate of 2.0 was used; fertility rates do not much of an effect upon entry age normal costs, while they do upon pay-as-you-go costs. This gave a cost of 8.77%, compared with 10.50% in the Fifteenth Report.

Thus even if entry age normal funding had been used, costs would have gone up both because of changes in the CPP itself, and changes in the actuarial assumptions.

With these preliminaries completed, I can now proceed to the reconciliation of costs between a private plan and the CPP.

The CPP costs will be reconciled with those of one specific private plan, the one provided under the Public Service Superannuation Act (PSSA). The Chief Actuary in OSFI is responsible for the actuarial valuations of both these plans. The PSSA was chosen as it has a greater range of ancillary benefits -- disability, survivors' and orphans' pensions, etc., than most private plans, and, unlike most private plans, provides fully indexed pensions; deferred pensions granted on termination of service are also indexed with prices, (not wages as in the CPP), during the period up to retirement. In this sense it is closer to the CPP than many private plans, and thus a reconciliation involves fewer items, and is more straightforward.

PSSA also has a greater cost than most RPPs simply because it provides greater benefits. The reconciliation of the cost of PSSA with another plan in the private sector is easier, as such plans have the same overall design, but allowance has to be made for the different plan provisions and actuarial assumptions; these differences, however, are not nearly as great as those between the CPP and the PSSA. I have not made such a reconciliation, however, primarily because there is no obvious plan to choose, and neither the author nor Mr. Dussault serve as the actuary for any such plan.

The reconciliation will be done by a series of adjustments to each plan's full cost rate to force comparability on a sequence of factors, and measuring the change in costs as these factors are changed. A table at the end will summarize these steps.

The PSSA is funded on the unit credit method, whereby benefits accrued in a year are fully funded in that year. The cost under this method will vary from year to year both as the average age of the members changes, and the distribution of the members by sex changes. Costs under this method are particularly sensitive to changes in long term interest rates, average earnings, and prices. Nevertheless, in practice it gives reasonably stable costs from year to year as, for a large plan, none of these change too much from year to year. The unit credit cost for the PSSA in 1993, as shown in the actuarial report prepared as of December 31, 1992, was 12.53% of earnings.

The PSSA uses an interest rate of 8.2% for twenty years, decreasing to an ultimate rate of 6.0% thereafter, while a constant rate of 6.0%[22] is used for the entry age normal cost for the CPP, developed in Appendix C of the Actuarial Report. The ultimate rate of 6% interest chosen for the valuation of both plans is consistent with the rates earned on their investment portfolios. Other plans in the private sector with different portfolios might well use still different valuation assumptions with respect to interest.

If the PSSA costs were calculated at the ultimate rate of 6.0% the cost would be 20.24%, an increase of 771 basis points.[23] The ultimate pay-as-you-go rate for the CPP is around 14.25%, and the entry age normal cost for the CPP is 10.50%. These changes are made merely to enforce comparability of costs, and not because the interest assumption used for either plan is inappropriate.

Entry age normal is an actuarial cost method that calculates a level cost for each member based on the age at entry into the plan. Costs will be very stable under this method, and will change only if the average age at which membership in the plan commences changes, i.e. the age at employment changes. For a private plan this is most unlikely to change, even with a temporary hiring slowdown associated with downsizing. For the CPP this is the average age at which contributions begin, *viz.* age 18. Costs will also increase gradually over the years as longevity improves.

I start with entry age normal costs for the CPP, because they are contained in the Actuarial Report, but I have either to switch to unit credit for the CPP, or entry age normal for PSSA, to enforce comparability. Because the actuarial calculations were less complicated, it was decided to switch to unit credit for both plans.

- If the CPP cost had been calculated using the unit credit rather than the entry age normal method of funding, the cost would decrease by about 105 basis points, or 1.05%.

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[22]More precisely, the effective annual rate is 6.09% as 6% is the nominal rate compounded semi-annually.

[23]This is the only adjustment made to the PSSA costs, and it was made to it because it was technically easier to adjust them to allow for the difference in interest rates. All other adjustments are to the CPP costs.

- If the retirement benefit rate of 25% under the CPP were increased to be equal to that under PSSA, making allowance for the lower accrual rate under the PSSA on earnings to the YMPE (70% minus CPP benefits on earnings to the YMPE), the cost would increase by 945 basis points.
- If contributions were made on all earnings to the YMPE, including the portion below the YBE, (there is no similar provision in the PSSA comparable to the YBE exemption), the CPP cost would decrease by 217 basis points.
- If pensions under the CPP were based on the last six years' YMPE, rather than the last three, in order to be comparable to the PSSA, the CPP cost would decrease by 104 basis points.
- If the CPP benefit were funded over 35 years, as is the PSSA, rather than 47 years, the CPP cost would increase by 538 basis points.
- Finally, if the expense allowance were removed from the CPP -- there is no such allowance in the PSSA calculations -- the cost would decrease by 10 basis points.

The following table summarizes this reconciliation, rounding to one place of decimals, with ( ) indicating a negative number.

Reconciliation of PSSA and CPP Actuarial Costs

	Increment to PSSA Cost	PSSA Cost	Increment to CPP Cost	CPP Cost
Starting cost		**12.53%**		**10.50%**
To interest rate of 6%	7.71%			
Subtotal		20.24%		10.50%
To unit credit cost method			(1.05%)	
For benefit level			9.45%	
For contributions not made to YBE			(2.17%)	
To last 6 years' earnings			(1.04%)	
For funding period			5.38%	
To remove expense allowance			(0.1%)	
Total		**20.24%**		**20.97%**

We thus have a cost of 20.97% for the CPP compared with 20.24%% for PSSA. There are still several relatively minor differences for which allowance has not been made: differences in orphans' and survivors' benefits, the various CPP drop-out provisions, larger disability benefits under CPP, and the possibility of retirement on an unreduced pension even before age 60 under PSSA, as contrasted with only reduced pensions being payable before age 65 under the CPP, and not before age 60 at all, except for disability. Considering these differences, and the approximate methods used in the reconciliation, the difference of 73 basis points is understandable.

This reconciliation demonstrates that the major difference in costs between the CPP and PSSA result from the difference in funding methods used and the plan provisions themselves,

and that if the same funding methods were used for both plans, the costs would be comparable if differences in benefits and assumptions were taken into account. The major difference in the actuarial assumptions is in the interest rate used for the two plans. The assumption used in the costing of the CPP is quite appropriate, since the CPP costs on a pay-as-you-go are not particularly sensitive to changes in the interest rate, as has been shown elsewhere. In any event, the anticipated yield on the CPP fund is based on the actual interest rates that the bonds in it earn.

As has been stated elsewhere, actuarial funding methods and assumptions have no effect upon the cost of any pension plan. The cost is determined by the actual experience, *i.e.* the amount and timing of the benefits paid, and the investment return on the fund. What actuarial methods affect is the *incidence* of the costs. They may result in increased costs initially and lower costs ultimately, or the converse. In the case of the CPP this can move the cost from one generation to another. One reason for actuarial valuations is to measure the effect of the actual experience with the actuarial assumptions, and an essential part of every valuation is a reconciliation with the previous one.

From the preceding analysis, it can be seen that CPP costs are comparable on a fully funded basis to those for private plans, and the main difference in the level of costs results from the plan provisions and the pay-as-you-go method of financing. This method of financing appears to be an appropriate method for social security plans, as will be discussed in Chapter IX.

Pay-as-you-go financing results in higher contribution rates than other methods of funding in this instance solely because of the decline in fertility rates, which reduces entrants into the plan for a considerable period of time. Pierre Treuil, in his paper *Fund Development of an Earnings-Related Social Insurance Plan under Stabilized Conditions*, discussed this in detail, and demonstrated that under stabilized conditions pay-as-you-go costs are level. This paper is reproduced as Appendix E. In these appendices it is demonstrated that the pay-as-you-go rates match the fully funded rate if it is assumed that the annual increase in aggregate employment earnings is equal to the interest rate assumed.

Conclusions

The CPP by its very existence has enabled governments to reduce spending in other areas. This is considered in more detail in Chapter VII. The CPP has had a marked effect upon both the design and costs of RPPs. It has also affected the rate of private savings for retirement through RPPs or other means. Reductions of any sort in CPP benefits would most likely result in increased taxes to cover increased benefits under other government programs, as will be demonstrated in the next Chapter, and possibly increased costs for private plans, and increased contributions to RRSPs.

The coverage of Canadians under both RPPs, RRSPs, and other private arrangements is not nearly as extensive as the virtually universal coverage of workers under the CPP. The CPP thus fills a gap that private arrangements have not yet covered. Membership in RPPs, measured as a percentage of the labour force, has increased slowly since the mid 1960's, when the CPP was introduced, although it has been virtually static since 1980.

CPP contribution rates are determined using economic and demographic assumptions generally comparable to those used in the private sector. Private plans do not need to make assumptions on some matters that are vital to the CPP, such as fertility or immigration rates. It has been demonstrated that the costs of the CPP, were it operated on a fully funded basis, would be comparable to those in the private sector once allowance is made for the difference in plan provisions; this is confirmed by the reconciliation of costs a few pages earlier. There would thus be no reason to expect a lowering of costs if the CPP were to be run like a fully funded RPP.

The difference in financing methods, however, entails a different incidence of costs. The pay-as-you-go approach used for the CPP results in contribution rates about 30% more than would apply if a fully funded approach were used. Allowance must also be made for the effect of fertility rates on CPP costs; fertility has no effect on the costs or contribution rates for RPPs while it has a profound effect upon the CPP. To a somewhat lesser extent this comment applies to immigration as well.

The CPP is not expensive when compared to private plans, once an adjustment is made for the differences in benefits provided, and financing methods. The CPP provides benefits that few private plans can, although benefit levels are usually lower for the CPP. It would be difficult, if not impossible, to do better operating the CPP in a manner similar to a private plan.

VII

THE CPP AND GOVERNMENT BENEFITS FOR SENIORS

This chapter discusses the interaction of the CPP with other publicly sponsored benefit plans, and what changes would or might occur if there were reductions in CPP benefits, or if the CPP did not exist at all. We determine the amount of additional income tax paid by individuals as a result of CPP benefits, and the reduction in income tax for individual caused by CPP contributions creating tax credits. We also determine the reduction in GIS/SPA benefits, and the reduction in tax credits created by the existence of CPP benefits. The CPP is very relevant to the cost of the whole retirement income system, as it affects not only income taxes, but also the level of benefits payable under other programs. More specifically, if the CPP were altered to make it less costly in and of itself, such actions might not be as successful as some might expect in terms of the overall picture, because they might result merely in increases or reallocated expenditures in other areas. Also considered is the effect that reductions in GIS benefits, occurring because of CPP benefits being included in the GIS income base, have upon the rates of return of the CPP.

The CPP interacts with many plans both in the public and private sectors. The one that comes to mind first is the GIS, and the related SPA. Both these public programs are income tested. For the most part, GIS benefits are reduced by $1 for every $2 of income from other sources, excluding the Old Age Security Pension. The maximum income under SPA is equal to the combined full OAS pension and the maximum GIS at the married rate. The income under SPA is reduced by $3 for every $4 of the beneficiary's other monthly income for widowed spouses, or the combined monthly income for a couple until the OAS equivalent portion is reduced to zero; thereafter for a couple the reduction is $1 for every $4 of the couple's income, while for a widow or widower it is $1 for every $2 of income. SPA stops at age 65 when potential eligibility for OAS and GIS starts.[24]

Published tax statistics do not allow an accurate estimate of how much the benefits payable under these plans have been reduced by virtue of the C/QPP. It is possible to do so, but budgetary and time constraints, especially the former, did not allow this to be done using the tax statistics. This is another area worthy of further research. It must be remembered that the amounts of GIS and SPA vary with family status and income, with different amounts being paid to singles than to each member of a couple. The published tax statistics do not reveal family status, however.

The tax statistics, summarized briefly in Chapter VI of this paper, showed that among the 2,819,200 individuals over age 65 who had filed tax returns, (almost 89% of all Canadians age 65 and over), 1,117,900 (or almost 40%) did not have to pay income tax. These statistics do not reveal how much was received in the way of GIS, as GIS is not taxable. These people had an average annual income of $7,810, of which $3,746 came from OAS and $1,927 from C/QPP. Thus $4,064 came from sources other than OAS. If it were assumed that all individuals in this group had exactly the average incomes quoted (this is not true, as for example only 65.7% had

[24]For a fuller description of SPA, as well as GIS and OAS, see Appendix A.

income from C/QPP), then each individual would be receiving GIS in the amount of $3,029 if single, and $1,265 if married with a spouse having identical earnings. If they had not been receiving C/QPP, GIS payments would have increased by $963 per year per person, or by almost $1.1 billion.

There were 1,701,120 individuals over age 65 who paid income tax. As their average income was $30,488, few will be receiving GIS. Finally there are 355,000 individuals over 65 who did not file tax returns at all. Many of these will be not be receiving C/QPP, so the possible increase in GIS payments, were they not to receive any CPP benefits at all, is probably not extensive.

In addition there will be individuals from age 60 to 64 who receive SPA, either because a spouse over age 65 is receiving GIS, or because they are the surviving spouse of such an individual; it has not been possible to quantify the effect upon them from the published tax statistics. We do know that 233,990 filed tax returns but did not pay tax; the average income was $4,434 and the average income from C/QPP was $1,837. These, of course, cannot automatically all be classified as SPA recipients, but it appears that a substantial number may be. Only 47.7% of this group received C/QPP in an average amount of $3,847. Unfortunately, the way the tax statistics are presented does not permit even a rough guess, especially as SPA income is dependent upon family status.

A few years ago an estimate was made by the Office of the Chief Actuary of the effect that the introduction of flexible retirement ages in the CPP had upon GIS payments. Flexible retirement allowed for pensions to be drawn as early as age 60 under the CPP, but in a lesser annual amount, and continuing for life. There would thus be lesser amounts of CPP income available after age 65 for purposes of reducing GIS payments. The result, projected at that time, was a 5% increase in GIS payments.

A better estimate of many of the effects of the CPP can be made using SIMTAB, a microsimulation model developed by HRD from a 1994 sample. Reference was made to this in the previous Chapter, and there is a fuller description of SIMTAB in Appendix F. Using SIMTAB, even more detailed analyses can be made than are contained in this paper. The results, however, are calculated using projections based on a smaller population than is reflected in the taxation statistics. It is essential to note that the results are based on families, rather than on individual taxfilers, as the tables in the previous Chapter were.

The following table indicates the number of families in Canada, not resident in Québec, extrapolated from the SIMTAB sample, in the model, and the number of such families who are either in receipt of CPP benefits, or are contributing to the CPP.

Number of Families in SIMTAB

Age of Family Head	Under 65	65 and up	Total
Number	6,899,924	2,216,773	9,166,697
CPP Recipients	353,360	1,674,183	2,000,543
CPP Contributors	6,118,070	264,528	6,382,598

Only 5.1% of families with the head under 65 are in receipt of CPP benefits; these include disability, survivor, and orphans' benefits, as well as early retirement benefits. On the other hand, 75.5% of families with the head at least 65 are in receipt of CPP benefits. Conversely, 88.7% of families in the under age 65 group contribute to the CPP, while only 11.9% of the age 65 and older group do. Of those over 65 who contribute to the CPP, all are under age 70, and most are under age 67.

The next table shows for those families who receive CPP benefits, the total amounts of such benefits, the increase in federal and provincial income taxes caused by the receipt of such benefits, and the decreases in GIS/SPA benefits and refundable tax credits caused by the receipt of CPP benefits. For families with the head age 65 and up, the results are shown for family incomes of up to $25,000 per annum, and for family incomes in excess of this amount. Next is shown the effective recovery by the government sector (the sum of increases in income tax and decreases in benefits) caused by the CPP, both in absolute terms and as a percentage of CPP income, and the increase in disposable income for Canadians caused by the CPP. All figures are shown in millions of dollars, (000,000 omitted), except for family incomes in the headings.

The apparently anomalous result in one table entry of credits increasing slightly because of CPP income is because some credits are a percentage of income, and increase with increasing income before subsequently reducing or vanishing: it is in the lower income group that credits actually increase. There is no reduction in GIS/SPA income in the segment under age 65 because such people are not eligible for GIS at all, and we chose to treat all SPA recipients as being in the "family head" age 65 and over segment; see Appendix F. Increases in government revenues plus the increase in disposable income do not equal CPP benefits as there are other changes not shown in the table.

CPP Income, and Changes Caused by CPP Income in Millions of 1994 Dollars

Age of Family Head Income	Under 65	65 and older Up to $25,000	65 and older $25,000 and up	65 and older All incomes	Grand Total
CPP Income	$2,510	$3,701	$8,730	$12,431	$14,941
Increase in Tax	$635	$384	$2,385	$2,770	$3,405
Decrease in GIS/SPA	Nil	$1,657	$739	$2,396	$2,396
Decrease in Tax Credits	$29	($5)	$80	$76	$105
Effective Recovery	$664	$2,036	$3,204	$5,241	$5,905
As % of CPP	26.5%	55.0%	36.7%	42.2%	40.3%
Increase in Disposable Income	$1,913	$1,897	$4,961	$6,858	$8,771

We can see from this table that the payment of $14.9 billion of CPP benefits resulted in increased tax revenues, or decreases in benefits otherwise payable, of $5.9 billion, and an increase of disposable income to Canadians of all ages of $8.8 billion. There have been other reductions in government benefits, described a bit later, but the model did not quantify them. In particular GIS/SPA benefits have been reduced by $2.4 billion and refundable tax credits by $0.1 billion. Over 40% of all CPP benefits come back to the government sector in the form of increased income tax, decreased benefits under only one government program, and decreased tax credits.

For Canadians age 65 and over, the $12.4 billion of CPP benefits has resulted in increased income tax and decreased GIS/SPA benefits and decreased refundable tax credits of $5.2 billion. Thus over 42% of CPP benefits for this group comes back to the government sector in the form of income tax, decreased benefits under only one program, and decreased tax credits.

The table also shows that lower income Canadian seniors benefit proportionately less from their CPP benefits than higher income ones, despite the progressive nature of the income tax system, because of the decrease in the GIS/SPA benefits that they would otherwise receive. Higher income Canadians, however, pay considerably more of the CPP benefit back in the form of direct income taxes.

The next table expresses the figures from the preceding table as averages per family unit. It should be noted that the averages shown are for all families who receive CPP benefits, not all families in the age group. Thus the average reduction in GIS/SPA, for example, is for all families who receive CPP, and not just those who receive GIS/SPA. (There are also family units that receive GIS/SPA, but not CPP.) The average reduction would be more for those in receipt of GIS/SPA, but most of the units with incomes of under $25,000 per year per family will be receiving GIS/SPA, so the reductions shown for this group probably are close to the average reduction for those who receive GIS/SPA.

Average Annual CPP Income for CPP Recipient Families and Changes Caused by It

Age of Head Income	Under 65	65 and up Up to $25,000	65 and up $25,000 and up	65 and up Total
CPP Income	$7,104	$5,035	$9,571	$7,568
Increase in Tax	$1,798	$ 522	$2,615	$1,681
Decrease in GIS/SPA	Nil	$2,254	$ 810	$1,454
Decrease in Credits	$ 82	$ (6)	$ 88	$ 46
Effective Recovery by the Government	$1,880	$2,770	$3,513	$3,198
Increase in Disposable Income	$5,415	$2,581	$5,439	$4,164
As % of CPP	76.2%	51.3%	56.8%	55.1%

In the age 65 and over group, the increase in disposable income for families with incomes under $25,000 is $2,581 or 51% of CPP income, compared with $5,439 and 57% for families with incomes over $25,000. If the increase in disposable income were measured as a percentage of family income, rather than in absolute dollars, the percentage increases would not be much different. The percentage of CPP income that is translated into disposable income is not much different between the two earnings groups.

Next we shall look at the effect that CPP contributions, which create non-refundable tax credits, have upon income tax and, for the age 65 and over group, how the contributions affect GIS/SPA benefits, inasmuch as they are deductible in calculating the income base for GIS/SPA.

The next table shows the annual amount of CPP contributions, and the annual effects that they cause--the reduction in income taxes, and the increase in GIS/SPA. Figures are shown for those families who make CPP contributions. There is also an increase in refundable tax credits, but this is not shown as figures are being shown in millions of dollars and the total increase for all contributors is only $14,000, with $13,000 occurring in the age 65 and up group. Results are shown by the age of the family head; for those under 65 they are split between family incomes of up to and over $25,000 per year.

CPP Contributions and Changes Caused by Them in Millions of Dollars

Age of Head and Income	Under 65-Income up to $25,000	Under 65-Income over $25,000	Under 65 All Incomes	Age 65 and up	All ages
Number of Families	999,602	5,118,468	6,118,070	264,528	6,382,598
CPP Contribution	$282	$5,067	$5,349	$158	$5,507
Decrease in Income Tax	$70	$1374	$1,445	$43	$1,487
Increase in GIS/SPA	Nil	Nil	Nil	$2	$2

The tax credits resulting from CPP contributions have reduced tax revenues by not quite $1.5 billion.

The next table expresses the figures in the last table as averages for all in each sub-group in the table. It must be remembered that these are all on a per family basis.

Average CPP Contribution for Contributing Families and Changes Caused by It

Age of Head and Income	Under 65-Income up to $25,000	Under 65-Income over $25,000	Under 65-All Incomes	Age 65 and up	All ages
CPP Contribution	$282	$990	$874	$597	$863
Decrease in Income Tax	$70	$268	$236	$161	$233
Increase in GIS/SPA	Nil	Nil	Nil	$7	Less than 30¢

The decrease in income tax is 27% of the CPP contribution in all groups, except for those under age 65 with family income under $25,000, where it is only 24.8%. This indicates that lower income Canadians do not get proportionately as much of a tax break from the CPP tax credits as higher income ones, because they may not be able to use the full credit; the difference is not substantial.

In addition to the effect upon GIS and SPA, CPP benefits have reduced the income-tested supplementary pensions provided by several provinces. In addition to such supplementary pensions, there are many programs that are income-tested, or require the recipient to be in receipt of GIS to be eligible. These include pharmacare (in some provinces), subsidized public housing, property tax rebates, rental assistance, assistance to seniors to enable them to remain in their own homes, homes for seniors requiring special care, etc. This list is not all-inclusive. In addition there are social assistance plans operated by municipalities on an income-tested basis. The existence of CPP has certainly reduced the costs of many programs operated by the provinces and municipalities, but it has not been possible to quantify them in the time available.

What would be valuable, but may well be impossible to do, would be to quantify these other savings by cohort, and determine by how much they have been reduced because of the existence of the CPP. They can thus be regarded as savings in other areas that have been caused by the existence of the CPP, and so a positive effect of the CPP.

To sum up, there have been CPP benefits paid of $14.9 billion. The net increase in income tax revenues, taking into account the tax credits on contributions is $1.9 billion. The decrease in GIS/SPA benefits is $2.4 billion, while the decrease in tax credits to seniors is $0.1 billion. There are other recoveries as well under programs we have not been able to quantify, such as various provincial programs that base eligibility or benefits upon income. Thus, the government sector has recovered at least $4.4 billion, or almost 30%, of the $14.9 billion of CPP benefits in one way or another.

It can also be argued that the various program savings effectively constitute negative benefits that reduce the rate of return on CPP contributions. These “savings” are at the expense

of individuals who would otherwise receive higher benefits under other programs, but they accrue to the benefit of governments, and so to taxpayers generally. The CPP thus has reduced benefits under other programs, resulting in lower taxes, but has reduced the return on CPP contributions for lower income Canadians. On the other hand, lower income people have an appreciable higher return on their CPP contributions because of the lack of contributions to the YBE, and the drop-out provisions, benefit them substantially more than higher income Canadians.

Effect of Guaranteed Income Supplement on CPP Returns

GIS, which is received by over 40% of the population aged 65 and higher, is an income-tested retirement benefit payable to those receiving the Old Age Security Pension. Generally speaking, it is reduced by 50¢ for every $1 of income from other sources, including CPP, with the exception of OAS. At January 1, 1995,[25] the maximum individual OAS benefit was $4,653 per annum , while maximum GIS to a single person was $5,529 and to a couple, both receiving OAS, was $7,203; this assumes sufficient Canadian residence to qualify for maximum benefits. Thus a single person was effectively guaranteed a minimum annual income of $11,182 per annum, consisting of OAS and GIS exclusively. Because of the income testing, GIS vanishes if total income for an individual, including OAS, exceeds $15,711. The corresponding figures for a couple, both receiving OAS, are $16,509 and $23,712.

At first glance this reduction in GIS benefits does not seem to be a problem as it takes two dollars of other income to reduce GIS payments by one dollar, and so the recipient has more income than would be provided by GIS alone, with no other income, after the reduction, than before. It is not quite that simple, however.

First GIS is not subject to income tax, while CPP is. Thus, a $2 increase in taxable CPP income results in a loss of $1.00 of tax exempt GIS income. If tax has to be paid on CPP income[26], then the $2.00 of CPP income is only $1.46 after taxes, if we assume that a combined federal and provincial tax rate of 27% applies to the first tranche of taxable income. Thus $1.00 of GIS income may only be replaced by $1.46 of disposable income, rather than $2.00, if allowance is made for income tax. It may be less, or even negative, if other income-tested benefits, such as provincial GIS supplements, are reduced. Thus the presence of CPP benefits may not result in an appreciable increase in disposable income for some families.

Secondly, contributions to CPP originally generated a non-refundable tax credit. If, however, earnings were so low that the individual did not have to pay income tax, the tax credit would have been of no benefit. As a result the contributions would have resulted in no income tax reductions in the first place, while the benefits are potentially taxable, and will reduce GIS benefits in any event.

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[25]Both OAS and GIS/SPA are indexed quarterly, so the amount actually received in 1995 may be slightly more than the amounts determined as of January 1.

[26]It is possible that the effect of tax credits and deductions will eliminate tax on the CPP benefits.

Before getting too deeply into the various scenarios that are possible, and their effect upon the CPP yield, we should look at actual tax statistics for 1991. In 1991 both OAS and GIS were lower than in 1994: as at January 1, 1991 the maximum figures were $4,259, $5,061, and $6,594 for OAS, and singles and couples GIS guarantees respectively. The taxation statistics for those aged 65 and up are summarized in Chapter VI of this paper.

Those 65 and up who paid tax had average income, before deductions, of $30,488. (This figure includes capital gains, or losses, Canadian dividends, and annuity income at the taxable amount, and so is not quite the same as actual cash income.) The average payment from OAS was $4,249 (1.6% did not receive OAS), while that from C/QPP was $4,359, with 89.5% receiving such benefits. It would appear that few in this group would be receiving GIS benefits, and that sources of income other than CPP shared the responsibility for reducing or eliminating the GIS.

Of the 1,197,900 (39.7% of all Canadians) age 65 and up who filed, and did not have to pay tax, the average income was $7,810. The average payment from OAS was $3,746 (2.7% did not receive OAS at all) while the average payment of C/QPP benefits was $1,927, with 65.7% receiving such benefits. GIS is not recorded, as it is not taxable, but it is safe to conclude that a considerable majority of this group received at least partial GIS payments. Here it is safe to conclude that no non-taxable GIS was replaced by taxable CPP benefits as this group did not pay tax at all, although CPP benefits did serve to reduce GIS benefits. It is even quite possible that tax credits for CPP contributions were received in the past that resulted in CPP benefits that turned out to be non-taxable. CPP income, however, would have resulted in a reduction in GIS payments. Even in the group who did pay tax, the CPP income received would have been greater than the GIS forfeited.

From the SIMTAB model, it would appear that the GIS/SPA forfeited was 44.8% of the CPP benefits received for the families with incomes under $25,000 per annum, while the corresponding figure for the families with incomes in excess of $25,000 was only 8.5%. Thus the interaction between CPP and GIS has resulted in an increase in disposable income.

It is possible, however, as indicated above, that the return on the CPP contributions would have been unattractive, or even negative, if allowance were made for the GIS benefits lost, and the possibility that the CPP contribution did not create a usable tax credit originally because of low income. This reduction will be offset in part, at least, by the favourable effects of not contributing on earnings to the YBE and the drop-out provisions have on the returns for low-income contributors. This is an area in which further work would be warranted, *e.g.* using representative samples of longitudinal histories of earnings, CPP contributions and pensions, etc.

Thus while it is theoretically possible for the CPP and taxes to take away, after making allowance for tax, more GIS and other benefits than is replaced, both the taxation statistics and SIMTAB indicate that this does not appear to have happened to any appreciable extent in aggregate. On the other hand, if the reduction in GIS and possible increase in taxes is considered as a negative CPP benefit, then rates of return on the CPP for those Canadians who would qualify for full or partial GIS in the absence of CPP benefits, will be reduced.

While CPP payments reduce or eliminate GIS payments, this does not seem to create a problem for the majority of Canadians who will have sufficient income after retirement to be disqualified from receiving GIS, whether or not they receive CPP benefits.

Another area for further work is to quantify the effect of CPP income on other benefits, such as the child tax benefit, that are income tested. While there may be little effect upon some of these, which were designed for low income Canadians, the effect upon those like the age exemption and OAS, which are now effectively income-tested through changes in the Income Tax Act, could well be significant, reducing the effective rate of return on the CPP.

The Memory of Canadians

When one considers possible changes to the CPP, the history of OAS, which was first introduced in a limited amount in 1952, and was means-tested before age 70, should be remembered. It was accompanied by an identified tax of 2% of taxable income, which proved to be insufficient. There were also taxes of 2% on corporations, and on many manufactured items. The OAS fund went into deficit and the level of income tax was increased to 4% in 1964. Subsequently, *ad hoc* increases in OAS were made, and ultimately OAS became fully indexed with prices, had its age of commencement reduced from 70 to 65, and had means testing eliminated. In 1972 the identified tax was abolished, or rather folded into the regular rates of income tax, so that taxpayers were still paying it even though it was no longer specifically identified. The OAS fund itself was dissolved in 1975.

When the “claw-back” tax on OAS was introduced a few years ago, taxing back OAS from those with higher incomes, many elderly Canadians claimed that this was inequitable because “they had paid for it”, even though the identified tax as such had not been paid for twenty years, and was for a much leaner OAS benefit than now exists. The identified tax had been insufficient in any event, and OAS had operated on a pay-as-you-go basis anyway. The memory of the taxpayer is long, although not necessarily totally accurate.

Conclusion

The reduction in GIS payments, and other income-tested benefits, that results from CPP income will reduce the rates of return on the CPP for those Canadians who are affected by such reductions. On average, however, such people have a somewhat offsetting increase in their returns under the CPP because of the effects of not contributing on earnings to the level of the YBE, which was discussed in Chapter IV, and the drop-out provisions. The majority, however, should not be so affected. For them, and other taxpayers, the reduction of the taxes that would otherwise have been necessary to finance the foregone benefits can be regarded as a hidden CPP benefit, and so result in an increase in their yields. Unfortunately it has not been possible to quantify these effects.

More importantly, the existence of the CPP, which has no government funding, has enabled the federal government, and provincial and municipal governments as well, to reduce spending on many other social programs. As a result taxes are at a lower rate than they would be in the absence of the CPP, and this can be considered as a hidden benefit for those Canadians who pay tax, and are not eligible for those programs.

VIII

COMPARISON WITH SOCIAL SECURITY PLANS IN OTHER COUNTRIES

If the cost of the social security system in Canada were higher than in other industrialized countries, then the CPP might be considered as too expensive, and so not affordable. If, however, other similar countries, such as the other members of the G-7 group, have costs comparable to, or higher than that of the Canadian public pension system, and can accept such costs, then, *ceteris paribus*, then there is no reason to believe Canadians cannot accept such costs, and will not be willing to pay them. Of course the future trend of costs in both Canada and these countries must also be considered, and a social security system that is affordable now by this standard, may not be so in future.

For greater consistency and comparability, there should also be included in the cost of the Canadian system that of OAS, which is an integral part of the Canadian retirement income system, although separate from the CPP. This Chapter of the paper compares the costs of the Canadian system with that in the other G-7 countries.

The table on the following page, taken from the Report of the Canadian Institute of Actuaries *Task Force on Social Security Financing on the Canadian Retirement Income Social Security Programs*, provides a general comparison of the Canadian system with that in the other G-7 countries in 1993, and with Australia as well. It should be noted that many social security programs will not pay a retirement pension unless a specified number of contributions has been made. Some will only pay a pension to residents of the country. Neither of these restrictions is indicated in the table. This contrasts with the CPP where a single contribution will generate a retirement pension, albeit a minute one, and there are no residence requirements.

The replacement level shown in the CIA Table for Canada includes the OAS pension, which is proper, but the contributions shown do not include the cost of that program, which is paid out of general tax revenues. According to the Second Actuarial Report on OAS, prepared as of December 31, 1991, the cost of the OAS in 1993 is 4.29% of employment earnings: it should be noted that this definition of earnings is not the same as either CPP *pensionable* or *contributory* earnings.

Contribution rates to the CPP are almost always expressed as a percentage of *contributory* earnings, which are the tranche of earnings between the YBE and the YMPE. Contribution rates, if expressed as a percentage of *pensionable* earnings, *i.e.* all earnings to the YMPE, would be lower, and if expressed as a percentage of total earnings, on average would be lower still.

The next table revises the CPP pay-as-you-go rates[27] from the Fifteenth Report to be expressed as a percentage of total employment earnings, *i.e.* as if the contributions were also

[27]Contribution rates based on the Fifteenth Report have not yet been set.

made on earnings to the YBE, and on earnings in excess of the YMPE, in order to make them comparable to the costs for OAS. This results in a lower contribution rate, but generates the same total contributions to the CPP. This has the added effect of making them more comparable to contribution rates in the other G-7 countries, where there is usually no tranche of earnings on which contributions are not made, and where the maximum level of contributory earnings is usually much higher than in Canada, if expressed as a percentage of average earnings. In Canada the YMPE is at present approximately equal to 115% of average earnings.

Cost of Canadian Social Security as Measured by a Percentage of Total Employment Earnings

Year	CPP	OAS	CPP+OAS
1995	5.35%	4.19%	9.54%
2000	5.51%	3.99%	9.50%
2025	8.97%	5.23%	14.20%
2050	9.42%	4.58%	14.00%
2100	9.89%	3.13%	13.02%

On a contribution basis, the long-term costs of the CPP are not out of line with present costs of retirement plans in other countries in the G-7 group. I shall shortly make an adjustment to allow for the differing level of benefits provided. The United States is the only one of the six countries, other than Canada, where the *current* combined employer/employee contribution rate to their retirement income social security plan is under 13%, and there it is already 12.4%. The contribution formulae in both France and the UK are complicated, but obviously give current contribution rates in excess of the ultimate Canadian rate. Of the other G-7 countries, only Germany finances part of its social security system out of general taxation revenues, as Canada does its OAS. It must also be remembered that the costs in other countries, including the USA, will have to increase because of the changing demographics. With the exception of the USA and Japan, however, the increase will likely be less than in Canada; the results for the USA are shown below.

In comparing contribution rates, allowance must be made for earnings on which contributions are made. In Canada no contribution is made on earnings to the YBE which is 10% of the YMPE, and contributions are only made to about 115% of average earnings in Canada. (As mentioned above, the CPP contribution rates have been adjusted to reflect this.). In 1993 the YMPE was $33,400. The following table converts on an approximate basis the contribution levels, taken from the CIA table, to Canadian dollars at July 1994 exchange rates. If current exchange rates were used, the level in all of the other countries would be even higher.

Earnings on which Contributions are Made to Social Security Plans

Country	Earnings Level in 1993 in 1994 Canadian Dollars

Canada	$3,300 to $33,400
USA	$79,500
UK	$6,100 to $46,000
France	$38,100
Germany	57,800
Italy	No limit
Japan	$89,500

In France contributions, albeit at a lower level, are also made on earnings above the maximum indicated above.

The upper limit on pensionable earnings is, with the exception of France, at least 50% higher than in Canada, and in the case of the United States, Japan, and Italy over twice the limit in Canada. In the USA the upper limit is almost 240% of that in Canada. Thus, not only are ultimate contribution rates to the CPP by themselves comparable to those in the other G-7 countries, they are on a smaller tranche of earnings, and so much less in absolute terms. Of course, retirement pensions are also calculated on a higher level of earnings in the other countries.

Most of the other G-7 plans give a higher replacement ratio than the CPP, even if OAS is included for Canada, though those in the USA and UK are quite comparable, and only that in Italy very much higher.

The following table gives the ratio of the 1993 contribution rates[28] to the replacement level. This ratio gives a measure of the cost of a replacement benefit of 1% of earnings, with the lower the number, the lower the cost; in this sense it measures the effective "price" paid for subsequent benefits. For example, in the USA the total contribution rate from employers and employees is 12.4%, and the replacement ratio is 41%. If 12.4 is divided by 41 the answer is 0.302, which is rounded to 0.30. For Canada it is shown on two bases: ignoring OAS and making allowance for it in both replacement rates and costs.

The Canadian ratio is adjusted to allow for the absence of contributions on earnings to the YBE, and applies only for someone earning exactly the YMPE or more; for someone earning less than the YMPE, the ratio is lower. Thus for the CPP by itself the ratio is obtained by dividing 90% (the YBE is 10% of the YMPE) of 5.0% (the CPP contribution rate for 1993) by 25%, to get 0.18. The UK ratio does not make allowance for the flat rate contribution required, nor the tranche of earnings on which contributions are not made, nor the non-retirement benefits included. The ratio for France does not make allowance for the contributions required in excess of the maximum level of pensionable earnings.

Ratio of Contribution Rate for 1993 to Replacement Ratio

Country	1993 Ratio

[28] 1993 is used as figures for other countries were readily available and changing to a later year was not expected to have much effect.

Canada-CPP alone	0.18
Canada-CPP and OAS	0.23
USA	0.30
UK	0.35 to 0.50
France	0.29
Germany	0.30
Italy	0.33
Japan	0.29

. It thus appears that the cost of social security in Canada is for each 100 basis points of covered earnings, after adjusting for benefit levels, is less at the present time than in the other G-7 countries. The ratio for Canada will increase over the years, as has already been indicated. There will, however, also be an increase in other countries as well, although in most cases by a lesser amount than in Canada, because most of the G-7 countries now have a more mature population than Canada has at present.[29] With the exception of the USA these projections are not readily available, so we cannot compare future rates in Canada with most of the other G-7 countries.

By the year 2050 the ratios for Canada will increase to 0.38 and 0.42, depending upon whether OAS is not included, or is. The ratios for OASDI in the USA will be 0.42%, as can be derived from figures given just a bit later.

A 1993 OECD study indicated that the cost of the public pension program in Canada is now lower, measured as a percentage of Gross Domestic Product (GDP), than in any other of the G-7 countries except the USA, and by about 2030 will be the lowest. This, however, measures the cost of social security as a percentage of GDP, which is not an approach this paper has taken because it does not take into account the benefit levels provided. It does reinforce the conclusions reached, however.

Certainly Canadians are paying less for their CPP benefits at present than elsewhere, and this is likely to continue for a number of years. Thus, to the extent that Canadian costs are lower or comparable to those in other countries, the CPP is affordable. Further, as CPP contributions are made on a smaller tranche of earnings, they are considerably lower in absolute terms, and accordingly even more affordable.

A comparison with the OASDI contribution rates in the United States is of particular interest. The OASDI is chosen because actuarial studies of it are readily available. The April 1992 Report projects, on Alternative II, (which is the closest to the CPP actuarial assumptions), pay-as-you-go costs. The following table compares the pay-as-you-go costs from the OASDI Report with the combined costs from the Fifteenth Actuarial Report on the CPP and the Second Actuarial Report on OAS for certain future years.

[29]As will indicated in Chapter IX, Canada is not the most rapidly aging of the G-7 countries, though it is one of the leaders.

Comparison of Projected Costs for OASDI with CPP and CPP+OAS

Year	OASDI	CPP	OAS	CPP+OAS
1995	11.42%	5.35%	4.19%	9.55%
2000	11.24%	5.51%	3.99%	9.50%
2025	15.66%	8.97%	5.23%	14.20%
2050	17.02%	9.42%	4.58%	14.00%

The CPP costs have been adjusted to be on a basis similar to that used for OASDI, *i.e.* expressed as a percentage of total employment earnings to the maximum level covered, and adjusting for the effect of the YBE. The OAS costs were originally on that basis. The replacement ratios for the two plans are similar, around 41% for OASDI and 40% for CPP+OAS at present, although the Canadian ratio declines to 34% by 2050, as OAS is indexed with prices, not wages. The normal retirement age for OASDI is being gradually being increased from 65 to 67, while that for the CPP and OAS is currently at 65.

The cost for the Canadian system is currently lower, and remains slightly so even if allowance is made for the lower replacement ratio in 2050 by increasing the Canadian costs by 20% in that year. If allowance is made for the higher retirement age scheduled under OASDI, the Canadian costs appear even more favourable. The Canadian system certainly appears to be as affordable as the US system.

OASDI has a fund that ranges, depending upon the year, from 150% to 300% of a year's benefits, a level not too dissimilar to the CPP. While the CPP fund has a target of two years' benefits, there is no formal target for OASDI; there is an informal target of a fund at least equal to a year's benefits, but no maximum.

In the USA, except on the most optimistic assumptions, the legislated contribution rates, which are currently above the pay-as-you-go costs, will become inadequate between 2015 and 2020 (on the Alternative II actuarial assumptions), unless the legislation is changed. If the contribution rates were changed to be equal to the pay-as-you-go rates, the effect would be an increase of 259 basis points in the year 2025, 385 in the year 2050, and ultimately over 500. If OASDI contribution rates were increased to these levels, *i.e.* to more than the contribution rates shown above, the above comparison would be in favour of the Canadian system, and so make it relatively more affordable.

None of these calculations has taken into account the effect of the claw-back tax on OAS. While no calculations have been made, this should reduce costs more than replacement ratios. The effect will be to reduce income taxes for everyone, while the replacement ratio will only be reduced for relatively high-income earners. Further, because of the high income levels coupled with the fixed amount of OAS, the reduction in replacement ratios, for those subject to the claw-back, will be much less than for those at lower levels. That the claw-back threshold only moves with the CPI minus 3% does mean, however, that over time more Canadians will be affected by the claw-back, but the effect on costs should still be more than that on replacement ratios.

The World Bank Study

In the fall of 1994 the **World Bank** published a policy research report *Averting the Old Age Crisis.* This book considered the problems created by an aging population throughout the world. A discussion of its findings and recommendations is beyond the scope of this paper, and to a large extent not within its objective. In its survey of existing social security schemes, the World Bank study made many criticisms of social security systems generally, and it is useful to see how they apply to the Canadian system of CPP and OAS. It is not implied that I necessarily agree with all the World Bank criticisms listed below, but it is interesting to see how well, or badly, CPP and OAS fares on the World Bank's criteria. The World Bank's criticisms are shown in regular typeface, and my assessment of their applicability to CPP and OAS in *italics.*

- Many plans have too low a normal retirement age, and pay benefits while the recipients are still earning money, or are capable of being employed. *CPP and OAS has one of the highest normal retirement ages (65), and benefits payable before age 65 under the CPP are actuarially reduced, and benefits are not paid prior to age 65 under OAS at all. The second part of the criticism applies, as benefits are paid after age 65 even if working; further, CPP benefits taken before age 65 will continue to be paid if employment is resumed, as the test for retirement is only made at the date of retirement, and there is no continuing requirement of retirement*
- Too few years are used in calculating the average earnings on which pensions are based, thereby benefiting the rich, and too few years of contributions are required to qualify for the maximum pension, thereby giving an incentive to avoid contributions. Some plans have an accrual rate of benefit that increases with years of membership. Much of this benefits the rich rather than the poor. *These criticisms do not apply in any way to CPP and OAS.*
- Pensions are not indexed regularly, and indexing is frequently skipped. *These do not apply at all to CPP and OAS.*
- There is too high a replacement ratio, and too high an earnings base on which benefits are calculated; both of these benefit the rich. *The first criticism might apply as the replacement ratio is around 40%; not high by G-7 standards, but perhaps too high in the eyes of the World Bank. The second does not apply as the earnings base for the CPP is just over the average wage, and the effect of the YBE reduces the contributions for low wage earners.*
- It is too easy to avoid making contributions without losing benefits. *This does not apply to CPP and OAS, except as allowed by the various drop-out provisions, including the disability drop-out.*
- Contributions are at the same rate irrespective of earnings. Contributions are based only on pensionable earnings, and not all employment earnings. Both of these result in those with low income contributing relatively more. *CPP escapes the first through not requiring contributions to earnings to the YBE, but the second criticism applies as no contributions are made on earnings over the YMPE. For the CPP, the net effect is that low-income people contribute relatively less.*
- Benefits are sometimes tax free, and may not be means tested. *All benefits in Canada, with the exception of GIS/SPA, which is paid only at the lowest income levels, are taxable, while OAS benefits are income tested, admittedly at a high level currently, by virtue off the claw-back.*

- The criteria for establishing eligibility for disability pensions are too easy. *In theory the rules for CPP are very strict, but the recent rise in the number of disability pensions gives rise to some concern about the implementation.*
- The investment performance of social security funds, which are almost always controlled by the government, is very much below average, and they are rarely invested in stocks or in foreign investments. *The CPP has lent to the provinces at the same rate as that for the federal government, admittedly a somewhat preferential rate, but the yields have been comparable to private funds that invested solely in long-term federal bonds; the second criticism does apply.*
- Costs are hidden in the government accounts and are paid out of general revenue without being disclosed. *There is no government money going into the CPP, which relies solely on contributions. The CPP pays various government departments, such as OSFI and Revenue Canada, for the services that they supply to it. The projected costs of OAS have been fully disclosed since 1988 in the Actuarial Reports.*

While the Canadian system does not escape criticism on all of the World Bank standards, it fares very well on most of them, and escapes many of the serious criticisms made by the World Bank of other social security schemes.

Conclusion

Currently CPP contribution rates are the lowest in the G-7 countries. This does not change if the cost of OAS is included. Ultimate CPP pay-as-you-go rates in Canada after 2030 are around 14.25%, from the Fifteenth Actuarial Report. Such rates, after adjusting for the level of income replacement provided, would not be out of line with the other G-7 countries, where the current contribution rate is already at that level or higher. If allowance is made for the lack of contributions on earnings to the YBE, the projected contribution rate of 14.25% can be reduced by about 10% to about 12.8%, and so be seen as equivalent to a rate of somewhat under 13%. Even when allowance is made for the cost of OAS, Canadian costs should be comparable to those in the other G-7 countries in the long run, if expressed as a percentage of earnings, and lower in absolute terms, both because of the CPP's lower level of both replacement ratios and pensionable earnings.

It thus appears that, by themselves, the long-range CPP contribution rates should be acceptable, and should be considered affordable, even if the cost of OAS is added to them, if the measure of affordability is the costs of similar plans in other developed countries. By this measure the CPP has been more affordable in the past than the social security plans of the other G-7 countries, and will continue to be so in the near future. While some commentators have said that the ultimate contribution rates will be at levels that Canadians will refuse to pay, it can well be queried why Canadians would refuse to make contributions at levels comparable to, or lower than, those in the other G-7 countries, including the USA. Further, the design of the Canadian system merits much less criticism by the World Bank than the social security systems of many other countries.

IX

FINANCING AND FUNDING

This chapter addresses the financing and funding aspects of the CPP, and this lead to the subject of intergenerational transfers. Such transfers have frequently been criticized for requiring future generations to pay for their predecessors pensions, and it has been suggested that they may be unwilling to do so. It has been suggested that the CPP would be more affordable if there were changes in the policies with respect to funding, and this subject is considered. Since much of the concern has been caused by the recent increases in CPP contribution rates, and their projected increases in the future, we shall begin by considering this aspect.

The recent and expected increases in CPP contribution rates projected in the Fourteenth Report have caused concern by themselves, even leaving aside the method of financing, which is discussed later in this Chapter. The recently released Fifteenth Report projects even higher future contribution rates than were projected in the Fourteenth Report, with the additional cost resulting from the increased utilization of the disability provisions of the CPP. The increment associated with disability is for a benefit that is for that the current generation, rather than some future generation. It has been suggested by some critics that the CPP contribution rates in the future will be so high that the disposable income, *i.e.* the income after taxes and social security contributions, of Canadians will be reduced in real terms, and so make the CPP unaffordable. This subject is also considered.

Doubts have been expressed recently, both by writers in the media and individual Canadians, about the continued viability of the CPP. Much of it has been presumably triggered by the increase in CPP contribution rates every year, with the increase being much more visible in an economic climate in which increases in wages have been small or non-existent, and the growing recognition that projected contribution rates ultimately are more than double the current level. Contributions to the CPP have increased both because of increases in the contribution rate itself, and increases in the earnings base on which contributions are made. For some, there may have been a greater increase in the CPP contributions from year to year than in their earnings.

Another factor contributing to public concern is the experience of the OASDI fund in the USA where the fund decreased, and almost was depleted, in the mid 1980's because contributions did not increase to the same extent that benefits did.

The suggestion is sometimes made that the CPP would be much sounder, and more affordable, if actuarial funding had been employed, as for RPPs, and this is considered below.

The annual contribution rates for the CPP up to 2016 are set out in a schedule to the CPP Act, as amended effective January 1, 1992; the schedule contains a twenty-five year series of contribution rates, which can be revised after the regular federal-provincial quinquennial reviews by the Ministers of Finance. The next review of contribution rates is planned to begin in the fall

of 1995, somewhat earlier than originally contemplated, because of the results of the Fifteenth Report. Under the legislation, such a review must be completed before January 1, 1997; if revised contributions are to apply in 1997, the review must be completed well before the end of 1996. For purposes of the actuarial valuations, the rates after the end of the twenty-five year schedule are set by the *fifteen-year formula*, which contemplates that the fund be about equal to two years of benefits.

The following table shows, for various years, both the combined employer/employee contribution rates currently in effect, which were either established, or projected under the Fourteenth Report, and the corresponding pay-as-you-go costs projected in both the Fourteenth and Fifteenth Actuarial Reports. Contribution rates based on the Fifteenth Report will not be set until after the review mentioned above, and so cannot be shown.

Projections of CPP Contribution Rates and Costs

Year	Contribution Rate 14th Report	Pay-as-you-go Cost 14th Report	Pay-as-you-go Cost 15th Report
1995	5.40%	7.40%	7.80%
2015	9.90%	9.98%	11.03%
2025	12.40%	12.40%	13.49%
2050	13.11%	12.97%	14.11%
2100	13.73%	13.95%	14.76%

It should be noted that the contribution rates are currently significantly less than the pay-as-you-go rates, even those from the Fourteenth Report. They remain lower than those in the Fourteenth Report up to 2006, after which they are slightly less up to 2017; thereafter they exceed the pay-as-you-go rates slightly up to 2055. The Fourteenth Report projects the fund to dip below the two year benefit target in 2003, and not to reach the target again until 2051, although the projection never shows it dropping below 154% of a year's benefits.

Despite the target of a fund equal to two years' benefits, this projected evolution occurs because the fifteen-year formula is designed to make use of the two-year fund in the event of economic or demographic fluctuations. Examples are the increased use of the early retirement provisions in recent years, the recessions in both the early 1980's and 1990's, and the upsurge in disability payments since 1989. The use of the early retirement provision does not create a "cost" as the early retirement pensions are actuarially equivalent to the normal pension, but they do reduce contributions and increase benefits in the short term; this evens out eventually as the benefits are paid at a reduced level. The effect is upon the incidence of the costs, not the present value of the costs.

The present contribution rates are below the pay-as-you-go rates from the Fifteenth Report in all years. The Fifteenth Report projects that, if the current schedule of contribution rates, which runs to 2016, remains unchanged, the present CPP fund, which at the end of 1995 should amount to about 232% of a year's benefits, would dip below the target level of two years' benefits in 1997 and would be exhausted in 2015.

Contribution rates are currently below the pay-as-go rates, and, if benefits currently provided are to be paid, will ultimately have to be increased to the pay-as-you-go level, irrespective of any other reasons. Contribution rates are below the pay-as-you-go rates at present because the fund was, and still is, in excess of two years' benefits, and one of the objectives is to adopt a smooth schedule of rate increases that will reduce it to that level. Moreover, the smoothing effect of the fifteen-year formula used to achieve this objective changes the contribution rates gradually. The recent draw down of the CPP fund, greeted with alarm by some, resulted from an upward fluctuation in benefits and a downward fluctuation in contributions, both associated with the economic downturn, and is precisely the kind of event that the fund was designed to absorb.

The increase in pay-as-you-go rates that has occurred, and which was always projected to occur, leaving aside those that resulted from plan enhancements and changes in actuarial assumptions, has surprised many who were not aware that such increases were always foreseen. There are two major reasons for this projected increase in the contribution rates.

- The first is the dynamics of starting up a pay-as-you-go plan with no benefit entitlements for all people over age 70 at the inception of the plan, and only partial entitlements for those who retired during the first ten years of the plan's operations. This results in a series of increases during the first thirty-five years or so of the plan, *i.e.* up to about the year 2000.
- The other major reason is the changing demographics of Canada, which is still a relatively young country. The second series of increases covers about the next thirty years, *i.e.* about up to 2030, and reflects the gradual effect of the continuing low rates of fertility and the improvements in longevity.

This second reason is not a uniquely Canadian phenomenon as a recent paper by Wolfgang Ettl, an Austrian actuary, entitled *Aging of the Population -- A Phenomenon of All Developed Countries*, published in the 1994 *Transactions of the International Association of Consulting Actuaries*, illustrates. Hamish McRae, in his book *The World in 2020,* also shows this.

It is worth noting that by the year 2000 all Canadians who were over age 65 at the inception of the CPP in 1966 will be at least age 100, while those who first received full retirement benefits at age 65 in 1975 will be age 90. Thus, the CPP has largely matured as a plan run on a *quasi* pay-as-you-go basis, in the sense of providing full benefits to a large majority of eligible retired Canadians, even if no one will have made contributions for a full forty-seven years until 2013.

The Canadian population, however, has not yet matured in terms of the aging process caused by the low fertility rates that have occurred since the mid 1960's. This can be seen in the following table, which shows the proportion of the population of Canada over age 65, across both historical and projected points in time. The projected figures are taken from the Fifteenth Actuarial Report on the CPP, while the historical ones are either from earlier actuarial reports or *Historical Statistics of Canada* (second edition) published by Statistics Canada.

Percentage of Population Over Age 65

Year	Percentage
1966	7.7%
1971	8.1%
1976	8.7%
1981	9.6%
1986	10.7%
1991	11.5%
2025	19.3%
2050	21.7%
2100	23.2%

Such shifts were projected by the CPP actuaries in all of the actuarial reports. The shifts, both to date and projected in the future, have actually been somewhat greater than originally projected because of both greater longevity and, to a lesser extent, immigration and birth rates lower than originally assumed, although the actuarial assumptions in all these areas were revised when appropriate. The improvement in longevity increases the duration of retirement benefits, but defers survivors' and orphans' benefits further into the future. It also increases contributions, as fewer die before retirement, but by a much lesser amount than the benefits, which continue for years more. The decrease in both immigration and the birth-rate reduces contributions in the mid-term, as there will be fewer people making contributions, but does not reduce benefits significantly until the long term, *i.e.* until retirements start occurring. If the amount of contributions decreases more and sooner than the amount of benefits, then it becomes necessary to raise the contribution rates.

Some tables in Hamish McRae's *The World in 2020*, based on work done by the OECD, provide evidence that Canada is not the most rapidly aging of the G-7 countries, as is frequently alleged. The measure chosen was the percentage of the population over age 65. In 1950, Japan was by far the youngest country, with Canada being second, although Canada was not much younger than Italy or the United States; France was the oldest country. By the mid 1990's Canada was the youngest and Germany the oldest. By 2025 the United Kingdom and the United States were projected to be the youngest, with Canada in third position and Japan the oldest. These tables indicate that Japan was by far the most rapidly aging country, and with respect to aging, there was not too much difference between Canada, Germany, and Italy. Thus, while Canada has problems resulting from an aging population, they are not the worst in the G-7, and may not be significantly different than those in some other G-7 countries.

Lower birth rates mean fewer workers supporting each pensioner, and *ceteris paribus*, the necessity of higher contributions from each worker. Ultimately, as the low birth rates continue, the balance between workers and pensioners becomes stable, and contribution rates cease to increase, but this is a long way into the future.

We have calculated that, if an ultimate fertility rate of 2.5 were used, rather than 1.85 as in the four most recent actuarial reports, the pay-as-you-go rates after 2030 would be about 105% of the entry age normal rate, a type of full funding. (Entry age normal funding is discussed later in this Chapter). A fertility rate as high as 2.5 was never used in the CPP valuations--the highest

being 2.0[30] -- but is a rate that has been experienced in Canada in the not too distant past. The rate currently used in OASDI calculations in the USA is 1.9. Both Germany and Japan currently have fertility rates much lower than in Canada. In Sweden, which for many years had one of the lowest fertility rates, the rate has recently increased to be slightly over 2.0, so the trend in fertility rates is not always down. Thus it is not impossible for fertility rates to increase, with a reduction in projected contribution rates.

Another way of seeing why contribution rates will increase is to look at the ratio of those receiving retirement, disability, and survivors' benefits to those making contributions, and to see how it shifts over the years. If the number of recipients increases faster than the number of contributors, then the contribution made by each contributor must increase. The following table, derived from the Fifteenth Actuarial Report, illustrates the projected ratios.

Ratio of Beneficiaries to Contributors

Year	Retirement	Disability	Survivors	Total
1975	.056	.006	.015	.077
1985	.128	.015	.043	.186
1995	.230	.037	.083	.350
2000	.237	.047	.086	.370
2025	.457	.069	.118	.644
2050	.509	.065	.150	.724

In the year 1995 there are 350 people receiving CPP benefits of all types for every 1000 contributors, compared with only slightly over half this number ten years earlier, and only a fifth twenty years earlier. By 2025 the number will increase to 644 beneficiaries for every 1000 contributors; thereafter the number of beneficiaries continues to increase to 724, or more than double the 1995 level, by 2050. In view of the doubling of the number of beneficiaries supported by each contributor, it is not surprising that contribution rates are expected to double as well.

The projected increases here that result from a combination of the maturing of the CPP and the maturing of the Canadian population are represented by the increase in contribution rates from the initial contribution rate of 3.6% to that of 5.11% projected for the year 2025 in the 1964 Actuarial Report, the one prepared before the implementation of the CPP in 1966. Even so, this understates the increase from this cause because, as we will see later in this Chapter, the initial contribution rate was set well above the initial pay-as-you-go rate, which was around 0.1% in 1966.

The projected increases discussed here must not be confused with the increases in future contribution rates that were projected every time that the CPP was enhanced since its inception, as described in detail in Chapter II. Nor should they be confused with the increases that were projected every time it became necessary to revise the valuation assumptions, as discussed in Chapter III and Appendix C. It should also be remembered that the changes in economic

[30] A net reproduction rate roughly equivalent to a net fertility rate of 2.1 was, however, once used.

assumptions had a greater effect than the changes in demographic assumptions, if we exclude the recent change in the disability assumptions. The following table summarizes the various increase that have been discussed, starting with the initial contribution rate of 3.60% in 1966, and ending with the projected pay-as-you-go cost of 13.49% from the Fifteenth Actuarial Report.

Initial Contribution Rate	**3.60%**
Increase from Maturing of Plan and Population	1.51%
Increase from Plan Enhancements	2.65%
Increase from Less Favourable Economic Conditions	2.17%
Increase from Changes in Demographics	2.97%
Increase from all Other Causes	0.59%
Projected Contribution Rate in 2025	**13.49%**

It must be remembered that part of the increase from plan enhancements and changes in the actuarial assumptions are related to the maturing of the population and of the CPP as well, but we have not determined this portion.

Effect of Increased Contributions on Real Disposable Income

It has sometimes been suggested that the increase in CPP contribution rates will be so much that, by themselves, they will result in a decrease in real disposable income (RDI), *i.e.* the income in constant dollars available after income tax and CPP contributions. In considering this, I shall rely on calculations made by OSFI for a companion study made by Paul T. Dickinson of McGill University for HRD Canada.

For his analysis, Mr. Dickinson used the same assumptions with respect to increases in wages and prices as in the Fourteenth Actuarial Report; these are ultimate rates of increase in wages and prices of 4.5% and 3.5% respectively; the select rates are shown in Appendix C. He used various scenarios of future CPP contribution rates; we shall only consider the one which used the contribution rates projected in the Fourteenth Actuarial Report. It should be remembered that contribution rates based on the Fifteenth Report have not yet been set.

He also investigated several scenarios with respect to the annual change in tax brackets. Here I shall show three of them. The first assumes a continuation of the present system, *i.e.* tax brackets are indexed each year at the increase in the CPI minus 300 basis points. The second assumes a continuation of the present system until 2010, after which the brackets are indexed at the full increase in the CPI. The third assumes an immediate switch to full CPI indexing of the brackets.

The following table shows the increase in real disposable income (RDI), *i.e.* the inflation adjusted income remaining after income tax and social security payments, from 1992 to 2030 for someone earning exactly the YMPE in each year. These figures apply to an employee, and only

make allowance for the employee contribution to the CPP. They do not apply to the self-employed, who contribute at double the employee rate.

Increase in Real Disposable Income from 1992 to 2030 for a Person earning 100% of the YMPE

Tax brackets indexed at	Increase in RDI
CPI less 300 basis points	2.9%
CPI less 300 basis points to 2010 and full CPI indexing thereafter	8.6%
Full CPI Indexing	25.6%

These figures are higher for someone earning either less or more than the YMPE, because CPP contributions will be a smaller percentage of earnings. For the person earning less than the YMPE, it occurs because the YBE, on which no CPP contributions are made, will be a greater proportion of earnings. For someone earning over the YMPE, it happens because no contributions are made on earnings in excess of the YMPE. Dickinson estimates that that for someone earning in all years only 50% of the YMPE, RDI will increase by about 570 basis points more, while for a person earning 150% of the YMPE in all years, the increase will be about 300 basis points more, in relation to the figures shown in the above table.

This table indicates the dramatic effect that the partial de-indexing of the tax brackets has upon RDI. If, in keeping with the practice that was in effect up to 1984, the brackets were indexed with the full increase in the CPI, there would be quite a strong growth in RDI by 2030, despite the increases in CPP contribution rates. If the present method of indexing the brackets continues, the combination of this, with increased CPP contribution rates, results in a much smaller increase in RDI.

Allowance should be made, however, for the probably higher contribution rates that will result from the Fifteenth Actuarial Report. In this Report, the pay-as-you-go rates are about 115 basis points higher, as a maximum, than those in the Fourteenth Report, which Dickinson used. If allowance is made for the lack of contributions to the YBE, the pay-as-you-go rates, expressed as a percentage of pensionable, rather than contributory, earnings, would be about 100 basis points higher for someone earning the YMPE exactly, with a lower percentage applying to those earning more or less than this amount. An increase of contributions of this magnitude would result in approximately an equivalent decrease in RDI. While this would not invalidate the conclusions based on the preceding table, it would mean that there would be virtually no increase in RDI in the year 2030, if the partial de-indexing of the tax brackets continues. In a discussion with one of the author's colleagues, Dickinson said that he had made such calculations, and indicated that the results agreed with the conclusion which I had reached independently.

Dickinson concluded that increases in CPP contributions by themselves will not reduce RDI, that RDI will still be subject to a net increase, and that if RDI does decrease "it will be caused by much stronger forces than (the) projected CPP contribution rates." Such forces might

include, for example, lower economic growth than is used in the projections, and increases in income taxes, in the cost of other social programs, and in sales taxes like the GST.

Financing

Some of the concerns and criticisms of the CPP result from the method of financing employed by the CPP, which is essentially pay-as-you-go, although a fund, about equal to two years' benefits, exists to cover fluctuations in benefits or contributions, such as those caused by recessions. This contrasts with RPPs, where a fund is accumulated that is intended to be equal to the full value of benefits as they accrue. Pay-as-you-go financing leads, by its very nature, at the inception of a plan, to a need for gradually increasing contributions, except under the unlikely situation that there is a fully covered population in the first place, (*i.e.* full immediate entitlement to benefits at all ages from the inception of the plan), and with an age distribution that will not change. Thus a contribution rate that is seen as affordable at one point in time may seem less so at some future date.

There is certainly a lack of understanding of the financing method, which is essentially pay-as-you-go, with the contributions set to be approximately equal to the benefits paid in any one year, and increasing in their aggregate amount from year to year as aggregate benefits increase. This has been the intention since the very beginning, and has been documented in all the statutory actuarial reports on the CPP, and on the QPP as well. Yet the author of a letter in the *Globe and Mail* on July 26, 1994 complained about the increasing pay-as-you-go costs and said that no one "had bothered to work out the numbers". Rather, many of the critics seem not to have read any of the actuarial reports prepared since the CPP's very beginning, including that before the inception of the plan.

There was never any intention that a large fund be built up. The CPP was never intended to be a vehicle for public debt management or private investment. The arguments for funding private plans were not considered appropriate for a public plan. In private plans there is the risk of bankruptcy of the employer who establishes the plan. This degree of risk is much lower with a public plan, although governments in some countries have been known to renege on their promises. Further, the CPP is entirely supported by employee and employer contributions, with no government contribution at all. As a result, a Canadian government strapped for cash would have no reason to reduce benefits in order to reduce its expenditures, as has actually happened in some countries where benefits are paid from general revenue.

The Hon. Judy LaMarsh said in 1963: "While full funding may be provided under private pension plans, it is not the practice in government old age insurance programs. Indeed, full funding on the scale of a nation-wide plan would be a quite excessive form of saving enforced by the state." The Hon. Paul Hellyer in 1963-64 did propose a full-funding alternative in order to raise money "to buy back Canada", but this proposal did not receive serious support.

All social security plans that provide defined benefits, including OASDI in the USA, are financed on a pay-as-you-go basis. Plans such as Singapore's Provident Fund, and similar plans in Malaysia and Chile, where the benefits are what the accumulated funds will provide, and no specific benefits are promised, are obviously in a different category. The CPP fund is targeted to

be equal to two years' benefits, simply to cover the effects of the inevitable fluctuations in income and expenditures over the course of a business cycle.

The CPP is sometimes criticized for not being actuarially funded, as a plan in the private sector must be. The actuarial community considers full funding of private pension plans to be absolutely necessary, and this view is reflected in the various pension benefits acts which set standards for funding pension plans; pay-as-you-go funding is not allowed in the private sector. Yet, as has been noted earlier, the Canadian Institute of Actuaries specifically exempts social security plans form their requirements for funding, and, of, course, the pension benefits acts do not apply to the CPP at all. Such full actuarial funding does not appear necessary for a social security plan of the nature of the CPP, as has already been indicated. There has been little, or no, criticism from the actuarial community in any country of pay-as-you-go as a financing method for social security plans, nor in Canada of the exemption of the C/QPP from funding requirements. Full funding might solve some of the problems of the CPP, and create a pool of capital that could be put to good use. It would also create new and different problems.

If the *entry age normal funding method* (a method of level and full funding) had been used, the contribution rate in the past would have been considerably higher than it was, and would in fact be higher than it now is. The entry age normal contribution is the level rate of contribution that would be required from age 18 to retirement to fund in full, before retirement, the benefits to be received. The contribution rate would not change unless the actuarial assumptions were changed, the average age at which contributions began to be made to the CPP changed, or the benefits provided changed, which includes changing the normal retirement age. Technically, a slightly different and increasing contribution rate would be required for each cohort of contributors, *i.e.* all those born in a specified year, because of the assumption of improvements in longevity, with each cohort living longer than its predecessor. This could be further complicated by changes in the fertility rates and immigration levels, not to mention the economic assumptions. Even a method of nominally level funding would thus involve some changes, and probably increases, in contribution rates, though such changes would be quite small, most likely not more than 0.025% of contributory earnings, from the cohort born in one year to that born in the next year.

The Fifteenth Report indicated an entry age normal cost of 10.50%[31] compared to the pay-as-you-go rate of 7.80% in 1995, (and an actual contribution rate of 5.4%), but this would be a level rate and the contribution rate would never reach the level of almost 14½% under the pay-as-you-go approach, as is projected by 2035. This cost, however, was determined for the cohort aged 18 at December 31, 1993, and so with the potential for making contributions for forty-seven years before reaching age sixty-five. If allowance were made for the earlier cohorts who could not make forty-seven years of contributions because they were over age 18 at the inception of the CPP, this cost would be substantially higher. Thus entry age normal funding would have resulted, under current assumptions, in contribution rates lower than pay-as-go rates in the long term, but would also have required substantially higher contributions rates in the past, the

[31]This applies to the cohort which is age 18 at December 31, 1993, and makes no allowance for the theoretical increase for future cohorts just described.

present, and the near future. The CPP thus might be more affordable in the future, but at the cost of being considerably more costly in the past and at present.

As mentioned earlier, the use of a hypothetical fertility rate of 2.5 in the projections of the Fifteenth Report would result in a future pay-as-you-go rate about equal to the entry age normal contribution rate. Thus pay-as-you-go rates are not necessarily higher than level premium funding. They could even be lower, *ceteris paribus*, if the actual fertility rate was more than 2.5; while this may not be likely in the future, it is a rate that has been experienced in Canada within the past forty years. It is worth remembering that fertility rates in Sweden have started to increase, though they are still far from 2.5.

Full actuarial funding would result in an extremely large fund, and there would be a variety of investment problems associated with it. These are discussed in more detail in the next Chapter. If such a fund were invested in government bonds, as the present CPP fund is, it would merely result in more CPP revenues coming from interest on the bonds, and less from contributions. Canadians would still be paying about the same amount for the CPP, but part of the cost would be paid by means of income taxes, and other taxes, rather than expressed explicitly as contributions to the CPP. Again, this is discussed in the next Chapter.

If full actuarial funding were adopted at this point in time, it would mean that the present generation would have to pay both for their own benefits, and for those who received benefits without having made contributions at the entry age normal rate for forty-seven years. The actuarial liability associated with this latter item is $487.5 billion, according to Appendix C of the Fifteenth Report. To fund this $487.5 billion would obviously involve a contribution rate of well above the 10.50% quoted above, which only pays for the benefits of the generation aged 18 at the end of 1993.

` There is one other relevant advantage of pay-as-you-go funding. As today's benefits are paid with current dollars, it is possible to index benefits with the CPI. If inflation occurs, both contributions and benefits increase, and contributions probably by more both because there are more contributors than pensioners, and because wages usually increase faster than prices.

In an actuarially funded plan, there is a long period between when contributions are made and benefits are paid. A large part of funds to provide for benefits comes from the investment income of the fund. If it has not been invested properly, this may not increase sufficiently in periods of inflation. Even if it has, the increase in return resulting from inflation may be reflected in part by increased prices for equities, and it may be necessary to sell some of the portfolio to realize the necessary income; this can have an effect upon securities markets.

Thus it is necessary to have a high correlation between the rates of investment return and inflation that actually occur. To put it another way, it is necessary for the spread between the interest rate and the increase in the CPI in the actuarial assumptions to be right. If they are not, deficits might arise as a result; it is also possible for surpluses to arise.

Another concern expressed is that the CPP fund has ceased growing, and has recently been used to pay benefits that were in excess of contributions received. (This has already been

mentioned, and the reasons for it given.) This decrease has been cited as further evidence of the impending "bankruptcy" of the CPP. To understand this situation more fully, it is necessary to know just how the CPP fund built up to its present level of $41.2 billion at the end of 1994.

When the CPP was established in 1966, maximum retirement benefits of 25% of adjusted average earnings were not payable until 1976; retirement benefits between these dates were pro-rated. Moreover, all people over age seventy in 1966, and therefore never having contributed to the CPP, were excluded from any benefits at all from the CPP, including benefits for their surviving spouses. Initially the contribution rate was planned to be just somewhat in excess of that required to pay for the initial level of benefits, but the Province of Québec, which established its own Québec Pension Plan (QPP), (which was almost identical initially, although there have been subsequent divergences,) wanted a larger fund so it could "channel Québec savings into provincial economic development." As it was not considered desirable to have different contribution rates for the CPP and QPP, the initial contribution rate was set well above the amount necessary merely to cover benefits, and a relatively large fund was built up, though still substantially less than that which would have occurred under full funding. The initial contribution rate was set at 3.6% of contributory earnings, compared to a projected level of benefits in 1966 of 0.10% of contributory earnings. At that time an increase in the contribution rates was projected to be necessary in the mid 1980's by the CPP and QPP actuaries; this projection proved to be quite accurate.

As a result of contributions being considerably in excess of benefits paid for the first twenty years, a substantial fund was built up, leading many to believe that the CPP was actuarially funded, and creating alarm when the fund's rate of increase slowed down, or when it actually decreased with withdrawals being made to pay benefits.

Intergenerational Transfers

The CPP has been frequently criticized for its intergenerational transfers, with the accusation being made that a past generation established a rich pension plan for itself in the expectation that a future generation would have to pay for it. This is certainly true to the extent that costs necessarily fall on future generations under any pay-as-you-go plan, including the CPP, since current contributions pay for current benefits. This is an inherent feature of all social security plans that operate on a pay-as-you-basis, as the vast majority of social security plans in other countries do. The long term costs of Canada's retirement programs, however, have been shown in Chapter VIII to be comparable to those in the other G-7 countries. The rates of return calculations in Chapter IV show the extent to which the earlier cohorts are projected to benefit.

It is sometimes suggested that future generations of workers will revolt and refuse to pay contributions to support the pensioners, even though the costs will be comparable to those currently being paid in other countries. Whether this will ever happen in Canada, even if it might in other countries, is at best a moot point.

The CPP has another intergenerational aspect that is often overlooked. Benefits are provided to children of deceased and disabled contributors, which is a transfer in the opposite

direction, although this transfer is very much smaller than that in the other direction for retirement benefits.

In any event, intergenerational transfers are common in all societies. The infrastructure of the country -- railways, roads, airports, hospitals, public buildings, sewers, waterworks, power installations, etc. -- have been built, and paid for, in part at least, by previous generations for the benefit of succeeding ones. It could admittedly be argued that the current generation is not maintaining these to the extent necessary, and that future generations may still have to pay interest on some of the funds borrowed to build them. The current generation certainly pays for the education of following ones. All these transfers are from the present and past generations to future ones, and so in the opposite direction to that of concern in the CPP. The current generation will also leave its accumulated personal wealth to its children.

Traditionally, children have assumed a major role in looking after their parents. Singapore has legislation that will allow parents to sue their children for support. What generally happens through the CPP is that one generation looks after the following one on a group basis, rather than an individual one. This makes sense both because children may no longer live anywhere near their parents, and because of the smaller average number of children parents now have. What is happening is an institutionalizing of what was formerly a personal responsibility, with an inherent pooling of risk appropriate for a social insurance program.

The same reduction in the number of children may result in parents giving more to each child than would have been possible if they had had more children, so the increased burden on the children imposed by their fewer number may be largely compensated for, in part at least, but not, of course, in every case. Examples of this would include better post-secondary educational opportunities and a larger share of inheritances through having to provide for fewer children. A recent study in the United States determined the average inheritance to be $90,000. There is no reason to expect a much different figure in Canada, and with the higher rate of savings here as compared to the United States, it might well be even more.

The CPP has many intra-generational transfers as well, e.g. transfers from living active workers to disabled workers through disability benefits and to surviving spouses via spouses' benefits, from single to married, from those without children to those with children, from employers to employees, and from males to females. The recent increase in disability benefits should be noted as an increase in intra-generational transfers; it is certainly not an intergenerational transfer. Strictly speaking, some of these transfers may be intergenerational transfers since a spouse may, and children certainly, belong to a different birth year cohort than the contributor.

Thus, while the criticism of future generations paying for maintaining the present generation in retirement is certainly true in part, there is certainly much more to the CPP than this implies, and this has been a situation which has always existed in society generally. What has changed is the demographics, with a decrease in the ratio of the working population to the total population.

Conclusion

The financing method of the CPP, pay-as-you-go, has certainly made it very affordable in the past. Full funding would have made it more expensive in the past, but might well make it more affordable in the future. It does not appear that increases in CPP contribution rates by themselves, if tax brackets were fully indexed, would result in a reduction of real disposable income, but such increases, in combination with other forces, may have this effect. Even the likely increase in CPP contribution rates resulting from the Fifteenth Report will not result in a decrease in RDI if the present partial de-indexing of tax brackets is continued, although any growth in RDI will be slight. Thus the CPP may meet the definition of affordability that contributions to it are not at such a level as to require cutbacks in other social security plans or living standards.

We have also established that intergenerational transfers, in one form or another, have always been a part of the economic system; they are just becoming more visible. Further, the CPP also contains intergenerational transfers to following generations, admittedly in lesser amounts, and substantial intra-generational transfers, such as the recent increase in disability payments. Such intergenerational transfers are a hallmark of the vast majority of social security systems in the world, and of those of all of the G-7 countries. Financing a plan like the CPP on a full funding arrangement would prevent many intergenerational inequities, although it would create other problems in return. If the CPP did not exist, some intergenerational transfers would still occur, but they would be channelled differently under other public or private plans or efforts.

Much of the criticism of the CPP discussed in this part of the paper indicates a lack of understanding of the working of social security retirement programs. Some people seem to think each contributor has an individual account to which contributions are credited, and from which benefits are paid, as is the situation in Chile, Malaysia, and Singapore. How this account can pay substantial benefits in the event of disability or premature death is rarely considered, or that the benefits are inflation protected. Neither is it considered that the CPP gives protection for periods of absence from the work-force because of unemployment, disability, child-rearing, or education, these being periods during which reduced or no CPP contributions are made. Further, many seem to compare the accumulated amount of their total CPP contributions with the value of their retirement benefits alone, and ignore the substantial disability and survivor benefits, which in 1995 are estimated to amount to 32% of all benefits paid.

At the very least, it must be understood that a portion of each CPP contribution goes to provide survivor, death, and disability related benefits, and not all of the contribution goes to provide retirement pensions. If there is to be a constructive public debate on any changes to the CPP, Canadians must know what is provided by the CPP, and how it was designed to operate. Any changes must be based on knowledge, and not misconceptions. I hope that this monograph makes a contribution to public understanding.

X

INVESTMENTS

It has also been suggested that a change in the investment policies of the CPP could lower costs, and so make it more affordable, by reducing contribution rates.

. The CPP fund, which is the accumulated excess of contributions and investment income over benefits, is lent back to the provinces, other than Québec, which has its own plan and fund. The provinces issue non-marketable bonds bearing the same interest rate as would apply to long term twenty year federal government bonds, in theory a slightly better rate than the provinces would have had to pay on their own bonds. This fund at January 31, 1995 amounted to $37.3 billion.

The provinces were thus able to borrow at a preferential rate, which was true up to 1988. Since then, some provinces, such as Ontario, have been able to borrow elsewhere at a lower rate than charged by the CPP; thus the current rate cannot be regarded as necessarily preferential. Further, with benefits exceeding contributions and the fund being drawn upon to provide for the payment of benefits, there has recently been little, if any, new money available to lend. The preferential rate does continue, however, on the stock of bonds already issued. It has been suggested that if the provinces paid the market rate, CPP costs would be markedly less. Some have even suggested that the provinces are not credit-worthy in the first place, and should not be allowed to borrow from the CPP because they face bankruptcy. The implications of a province going bankrupt are frightening, and beyond the scope of this monograph.

If the Provinces, however, had been charged an interest rate comparable to that which they would pay on the open market, which at most would be one hundred basis points higher, the effect on contribution rates would not have been substantial because of the pay-as-you-go funding which does not result in a large fund being built up, as contrasted to actuarial funding. Even if the interest rate earned were a full 100 basis points higher, the effect would only have been a reduction of fourteen basis points in the contribution rates in 2025, (and a lesser amount thereafter), hardly a significant reduction. This is shown in the sensitivity tests in the Fifteenth Actuarial Report, contained in Appendix C of this paper. If investments had always been at a higher interest rate, then the CPP fund would be higher, and contribution rates perhaps somewhat lower. A study made in 1985 by the federal government[32] indicated that, under this scenario, the fund would increase by only about three months' contributions.

At the same time, requiring the provinces to pay a higher interest rate would merely increase the taxes that the residents of the provinces would have had to pay both in the past and in the future; the interest on government bonds is paid by the tax-payers.

If the CPP were fully funded, as is sometimes suggested and has already been discussed, there would be even more investment concerns. If fully funded, there would have been a fund of some $529 billion at the end of 1993, an amount about equal to the accumulated federal debt. By

[32]*Keeping the Canada Pension Plan Healthy.*

way of comparison, the total assets of private pension funds in Canada at the end of 1992 were only $271 billion. (This does not include public service plans notionally funded though consolidated revenue funds.) There is a further $147 billion in individual Registered Retirement Savings Plans. A fully funded CPP would have thus assets about 27% more than all existing retirement funds in Canada, thirteen times as much as the present CPP fund, and be about the same size as the national debt. One must, however, keep in mind that the estimates of the CPP's unfunded liability, contained in Appendix C of the actuarial reports, are made on a conservative basis, using a real interest rate of only 2.5%.

The increased contributions that such a fund would have required in the past would have had an effect upon the savings patterns of Canadians. Funds might have been diverted from conventional vehicles, including RRSPs and RPPs, to the CPP. A comprehensive treatment of the effect of this upon the size and structure of the economy is beyond the scope of this paper. Some of the effects, however, will be briefly considered here, although the specific quantitative outcome projected depends strongly upon the model used for the Canadian economy.

If such a hypothetical full fund were invested in government bonds, whether federal or provincial, it might possibly encourage unnecessary projects or spending by some future government because of the enormous amounts available; I mention this only as a possibility, and not because I think it would necessarily happen. Even if it did not, there would still be problems as described below. There might also be pressure from Canadians to increase benefits, even though such increases might not be sustainable in the long run, simply because of the size of the fund; this has actually happened in other countries.

If this hypothetical fund were invested in government bonds, either federal or provincial, the interest on the bonds would have to be paid out of tax revenues. Further, the size of such an investment pool would almost certainly affect interest rates.

What this means is that less of CPP revenues would come from contributions, and more from general tax revenues. In the absence of reductions in government expenditures, income or other taxes would have to be increased to cover these interest payments. Even if it were unnecessary to increase taxes, there would still be a reallocation of costs. As far as individuals were concerned, more of the costs might be paid by those with high employment income through taxes. Taxpayers with investment income and pensions would contribute their share on taxes on these incomes; pensioners would be paying in part for their CPP pensions through increased income tax on their pension and investment income. For many, the reduction in CPP contributions would probably be offset, in part at least, by an increase in income taxes: some might pay more and others might pay less; pensioners would certainly pay more. As far as corporations are concerned, there would ultimately be less paid by those with lower profits, and perhaps more by highly profitable ones.

It is not meant to suggest that such a reallocation of taxes would necessarily be unfair or undesirable, but merely to note it as an implication of shifting part of the cost of the CPP from contributions to interest on public debt.

Under another investment scenario for a hypothetical fully funded CPP, the fund might be invested, as private funds are, in a mixture of government bonds and corporate securities, including stocks. This would reduce the effect of paying the interest on government bonds that we have just discussed. The influence of such a fund upon the Canadian economy would be enormous. Whether the fund would be allowed to attempt to increase its yield, as many private plans do, by investing offshore, is a good question. Many investment experts consider that there is greater growth potential outside Canada, and certainly there are investment opportunities in certain industries, such as some forms of high technology and pharmaceutical manufacturing, that are not available in Canada to any extent. The World Bank study argued that part of social security funds should be invested offshore. The recent performance of the Canadian dollar also makes offshore investments more attractive.

Would Canadians agree to investing the CPP fund outside of Canada, especially if Canadian companies were having difficulty attracting capital investment, even though foreigners were paying for part of their CPP benefits? If there were offshore investing, would there be resistance in foreign countries to investing in them by a fund ultimately controlled by the Canadian government?[33]

Whoever was managing the hypothetical CPP fund would be able to affect profoundly the destinies of Canadian corporations. This could be minimized by requiring the fund to be invested in an indexed manner, buying into all stocks listed on Canadian stock exchanges. Even this would create problems, as companies without their securities listed might consider that they were discriminated against. Such companies would include many small companies, in need of financing. It would also include some large companies, which are not listed on a stock exchange; examples of these are the various Irving and McCain companies Further, there would have to be some quality constraints, as there are many listed securities, such as “penny” stocks, that probably should not be purchased for a pension portfolio. There might also be objections by some to purchasing “sin” stocks, such as those in tobacco, liquor, and armaments companies, even if from a strictly investment perspective they were suitable, and even if they were included in standard stock market indices.

The temptations to the government to interfere in the investment process would be enormous, and might be difficult to resist. The government of Québec has been criticized on this very point on several occasions; part of the QPP fund is invested in stocks. Further there will always be pressure to make “socially desirable” investments, or investments that create or protect employment, or protect previous investments, even though the anticipated investment yield is not truly satisfactory.[34]

While it might be possible to design controls so that the government could not interfere directly in the investment process, these controls would have to be such that it would be

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[33]The Singapore Provident Fund lent money to the Singapore government, which invested it offshore, and kept the difference between what it earned and what was credited to members of the Provident Fund. While this difference benefited Singapore as a whole (there is no suggestion of corruption), it certainly did not directly benefit members of the Provident Fund.

[34]This all assumes one overall manager for the fund, and not individual managers for each individual, as is the situation in Chile

impossible for future governments to change them. This makes the design of such controls that much more difficult. Further, how indirect government influence, as opposed to official directives, could be eliminated is an even more daunting problem. This is not to say that such controls could not be established, but to indicate the magnitude of the problem.

The concerns expressed in the preceding five paragraphs would also apply, although to a lesser extent, if the investment policy of the present CPP fund were changed to invest in non-governmental securities, including stocks. The potential problems would be of lesser magnitude, simply because the present fund is less than a tenth of the hypothetical full fund, but those of principle, such as the method of choosing stocks, would still exist.

If full actuarial funding had been used in the past, the disposable (and taxable) income of individual Canadians would have been reduced by the amount of the increased contributions. So would the profits and taxes of corporations. This certainly would have reduced tax revenues in the past, and might have led to higher rates of tax. Further, the reduction in disposable income of individuals would have led to decreased consumption, or decreased savings, or both. This would certainly have had an effect upon the growth of the economy. Pursuing this effect in detail is well beyond the scope of this paper, but the implications should be noted.

Conclusion

The investment policies followed have certainly resulted in somewhat higher contribution rates, although not to a significant extent, as pay-as-you-go funding has been employed, which minimizes the effect of the rate of investment return. Full funding would open up a whole new set of investment problems, and might merely rearrange the cost sharing, moving part of the cost to income and sales taxes, if the fund were invested only in government bonds. If the fund were also invested in the private sector, there would be serious challenges with respect both to the influence of the fund on the economy, and the choice of investments. If pay-as-you-go funding is used, these challenges are of a lesser order of magnitude, simply because the fund is much smaller. If full funding had been employed in the past, it is almost certain that the growth of the Canadian economy would have been affected.

XI

THE CANADA PENSION PLAN IN THE CONTEXT OF THE SOCIAL SECURITY SYSTEM AND TAXES

The CPP should not be considered in isolation, but rather in the context of all of the other social security plans in Canada, and related to the overall tax rates in Canada. In this Chapter we shall examine briefly the cost of other social programs in Canada, and the level of taxes in Canada, and the effect that they might have upon the CPP.

Something might well be quite affordable if taken by itself, and from some given perspective, but not be affordable from another, because too much was being spent elsewhere, and so insufficient funds were available for it. In this event it may be necessary to prioritize programs, and to decide where changes may be made to come up with a package that is affordable.

Being affordable by itself, or from one point-of-view, but not from another, may apply to the CPP. As demonstrated by several different characterizations of affordability, the CPP by itself is affordable, but the combined level of the costs of all social programs and taxes in Canada may be more than the taxpayers will choose to bear. I now provide a brief review of the costs of other social security programs, and the level of taxes in Canada.

The cost of OAS, a benefit related essentially to residence in Canada before retirement, and not earnings, and the GIS and SPA combined, is at present about another 7% of the earnings on which CPP contributions are based. Their combined cost peaks at around 9% in 2030. These figures are based on work done by the Chief Actuary of these three programs, the officer in OSFI responsible for the actuarial work for them. OAS and GIS/SPA are financed out of general revenues, with no identified tax.

In 1995 unemployment insurance required combined employer and employee contributions of 7.27%, (more than the combined employer/employee contribution rate of 5.4% to CPP) of insurable earnings, which are 21% higher than the earnings on which contributions are made to the CPP, ($42,380 vs. $34,900), and there is no tranche of earnings, similar to the YBE, on which contributions are never made. Recent changes made to the UI program are expected to reduce its cost by about 25%

Workers' compensation, whose cost falls exclusively on employers, is provincially administered, and varies from province to province, and industry to industry. The cost can be as little as 0.05% of earnings, and as high as 29.01% Most costs are probably around 1% for companies in non-hazardous areas, and in the 3% to 5% range for manufacturing. On the other hand, many Workers' Compensation Funds are presently in serious financial difficulties, and this can only be reversed by increased levies on employers or the taxpayer, or by cuts in the levels of

benefits provided. While the recent recession has reduced the number of claims, many funds have large accumulated deficits that must be addressed.

As well, there are the country's medicare programs. These are provincially run, but with joint federal and provincial financing. They must conform with the standards prescribed in the Canada Health Act. The methods of financing vary considerably. Alberta and British Columbia charge premiums of $64 and $72 respectively per family per month. Manitoba, Newfoundland, Ontario, and Québec levy payroll taxes on employers of from 1.05% (Ontario) to 3.75% (Québec)[35]; Québec also imposes an additional income tax of 1% on residents, to a maximum of $1,000. None of these direct charges covers anywhere near the cost of medicare, so there is a significant contribution from general taxation revenues as well. In the other provinces, medicare is financed entirely out of general revenues.

As shown in Chapter IX, the percentage of the Canadian population over age 65 will increase by well over 50% by 2025, and will double by shortly after 2050. Seniors account for a high proportion of medicare costs, simply because older people have more health problems. Thus, the overall cost of medicare, and of programs mainly for seniors, will increase substantially, even if there is no increase in utilization rates or unit costs beyond present levels, simply because of the increase in the number of seniors.

Estimates made in 1994 by the CPP Chief Actuary in OSFI indicate that medicare costs would be fairly stable at around 13% of earnings, or about 6.5% of GDP, despite the aging of the population, if health care costs increased by the same amount as the Consumer Price Index. This is because earnings were assumed to increase at a greater rate than prices, and the increase in the earnings base offset the increase in medical costs for the aging population.

Health care costs, however, have been increasing at a faster rate than prices in general . If the cost of health care increases by 100 basis points more than the CPI, then the cost of medicare would increase, when measured as a proportion of earnings, by 50% by 2050, while at 200 basis points more the cost increases by about 175%. This would put the ultimate cost of medicare in the range of 20% of earnings, or about 10% of GDP, if health care costs increase at 100 basis points more than the CPI, and 35% of earnings, or 17.5% of GDP, if the increase is 200 basis points more than the CPI. These increases would be even more if the spread between the increases in wages and prices narrows.

Federal income tax is 17% in the lowest bracket, and 29% in the highest. Provincial income taxes, except in Québec, which has its own system, range from 45% of the federal tax rate in the Northwest Territories to 58% in Ontario, and 69% in Newfoundland. The Québec system produces taxes within this range. Thus the top marginal tax rate, federal and provincial combined, is around 46% on average. There are various federal and provincial surtaxes in the income tax system as well. When these are taken into account, the average top rate will be around 50%, and perhaps a bit higher. The average rate of tax will be higher than the lowest rate, and less than the top rate. These tax rates do not include the contributions to CPP and UI mentioned above, although they do include that part of medicare which is financed out of general

[35]The 1995 Québec Budget raised this to 4.26%.

federal revenues, and the cost of programs such as OAS and GIS/SPA which are financed from general federal revenues.

Taxes in the future are likely to be at even higher average rates, if only because of pressures for broadening the tax base, the closing of perceived "loopholes," the removal of tax incentives, and especially the cumulative impact of the partial de-indexing of the thresholds of the tax brackets. These thresholds are indexed at the increase in the CPI, minus 300 basis points. Thus at present, when inflation is low, they are not increasing at all.

At present, the top bracket is not reached unless taxable income is $59,180, which is 170% of the 1995 YMPE ($34,900) under the CPP, which is a reasonable proxy for the average wage.[36] Using the actuarial assumptions in the Fifteenth Actuarial Report, by 2025 the top rate will be reached at earnings of only 55% of the YMPE, and by 2050 at only 21% of the YMPE. In the absence of changes in the tax system, this would give the anomalous result that those GIS recipients who have any other source of income would be in the top tax bracket, and might be subject to the "claw-back" tax on their OAS. It seems, however, likely that changes would be made in the tax system before this actually happens.

In addition to the income tax system, there is the federal GST of 7%, which is similar to the Value Added Tax (VAT) in European countries. On top of this there are provincial sales taxes, which range from 6.5% in Québec, to 8% in Ontario, and to 10% to 12% in the Atlantic Provinces; Alberta does not have a sales tax. GST and provincial sales taxes do not all apply to the same items, but on a combined basis they average out to something in excess of 15%. While this is lower than the VAT rate in most European countries, it is much higher than comparable rates in the USA. There is no federal tax comparable to GST in the USA, and state sales taxes are usually lower than the corresponding Canadian provincial ones.

From the perspective of the overall system of taxes and social security benefits, the question is not so much whether CPP contribution rates, treated in isolation, will reach unacceptable levels, but whether the cost of all Canadian social programs and taxes will reach unacceptable levels. Will Canadians consider that they are getting value for their contributions and taxes? And even if they do, will they accept a perhaps-Spartan existence as the price for having excellent health, education, unemployment insurance, and pension systems?

There are occasional stories in the media about Canadians who do not believe that the CPP will be around when they retire. Yet other surveys show that few are acting on this premise, for example, not saving more to compensate for the perceived loss. Does this indicate improvidence, or that they know they are being unnecessarily alarmist? Or does it mean that they believe there is little point in saving because they believe the tax system will ultimately confiscate much of their savings, and thus that their money should be spent and enjoyed now? These may all be symptoms of a deep unease about Canada's financial health and prospects, though not directly so expressed.

[36] At present the YMPE is about 15% higher than the average wage.

Not as many seem to be predicting the complete demise of the medicare system, or the end of free or relatively inexpensive education, or all the other myriad programs provided by governments, although some are. It seems unlikely that any changes in Canada's tax and transfer programs will be limited to the CPP. We are already seeing the reduction or elimination of many ancillary benefits in the medicare system that are not required under the Canada Health Act, and cutbacks in UI. Many Canadians seem to be resistant to cost-cutting measures that affect them directly, as witnessed by the outcry against the proposed de-indexing of OAS pensions a number of years ago, the claw-back on OAS, reductions in UI, and changes in Pharmacare being made in Nova Scotia in 1995. The acceptance of the implementation of cost containment measures will be difficult to achieve without a good explanation as to why it is necessary.

Operating the country at a deficit, the accumulated deficit (the national debt), and the cost of servicing the national debt are also causes of concern for Canadians. It should be noted that UI, CPP, and Workers' Compensation do not contribute to the deficit as they are self-financing. UI does borrow from the government from time to time when it has cash flow problems. The contributions to these programs, by Canadians and their employers, do, however, cut down on taxation room.

I shall next look briefly at a recent study made in the USA, which reached some disturbing conclusions. This study may have some relevance to our examination of the Canadian situation.

This study, made by the Employee Benefit Research Institute (EBRI) in Washington, is disturbing, predicting a saving and fiscal crisis in the USA. It identifies a drastic reduction in the savings rate in the USA, which is already only 20% of that in Japan and many other developed countries. The savings rate dropped from 9.1% in the 1960's and 8.5% in the 1970's to only 2.2% in 1992. A reduced savings rate results in a smaller and poorer economy in the future, resulting in a reduced tax base; this in turn implies higher tax rates. Higher taxes make saving less rewarding, which leads to a poorer economy, which results in a lower tax base, which in turn forces higher tax rates: a vicious circle if ever there were one.

The General Accounting Office in the USA forecasts federal deficits of 20% of GDP by 2020. The Health Care Financing Administration projects that federal spending on the existing Medicare and Medicaid programs will grow from 4.4% to 12.4% of GDP by 2030. The Social Security Administration projects a deficit over the next 75 years, requiring an immediate and permanent increase in the social security payroll tax of 146 basis points under the "intermediate assumptions". If the increase is deferred until 2036 the increase will be 400 basis points. (Under the "pessimistic assumptions" the increases are 498 and 900 basis points respectively.)

Further, the USA is aging, just as Canada is, which results in fewer workers to pay for the benefits of the elderly. (This was shown in the projected increase in OASDI costs shown in Chapter VIII.). This, together with the fiscal forecasts, will make successive generations pay a higher share of earnings in net taxes, i.e. taxes paid less transfer payments received. The generation born around 1900 paid less than a quarter of their earnings in net taxes; the generation just born will pay 37%.

This study by the EBRI uses a technique called *generational accounting.* This determines the present value of net taxes paid by a generation over the remainder of their lives. This is then compared with the present value of future government purchases and of the outstanding official net debt. The difference is the financial burden being passed on to future generations. The ratio of this to the present value of employment income gives the lifetime net tax rate facing future generations. The study concludes that this results in a net tax rate of 82%, which implies a gross tax rate of almost 100%, a completely unacceptable situation. This rate can only be reduced either by increasing taxes now, or reducing expenditures both now and in the future.

The biggest single item in this scenario is the cost of health care. If it were possible to restrain the increase in health care to that caused by the changing demographics, and economy-wide productivity improvements, the lifetime net tax rate of future generations would be 46%. But the proposed health care reforms of President Clinton, which were not implemented, would have put up the net tax rate to 66.5%, using the proposal's own cost estimates. (These estimates have been criticized as being too low.) While lower than 82%, this is hardly an unacceptable rate.

The EBRI study suggests eight different policies to eliminate the imbalance. They include raising income taxes and/or cutting social security and health care. This paper is not the place to describe them in detail. The interested reader should read this study, and decide how much is applicable to Canada. Our discussion here is simply a précis of the executive summary.

The situation in the USA is not the same as in Canada. The savings rate is presently higher in Canada, and a full-scale medicare plan is already in place at a cost less than Americans are currently spending for their mix of private and public health benefits. On the other hand, the Canadian deficits are higher, both accumulated and on an annual basis, whether measured as a percentage of GDP or per capita. The USA has more room to increase taxes than Canada does, and more room to cut Defence spending. While the conclusions of this US study cannot be transferred directly to Canada, they are sufficiently applicable to reinforce some of the concerns already expressed. Even if none of the predictions apply to Canada directly, any problem in the USA would likely have unpleasant side effects upon Canada.

Conclusion

The costs of most social programs are rising, and not just that of the CPP. Possible increases in the cost of medicare are especially worrying. Recent changes in UI provisions have reduced its cost, however. The annual deficit, and the size of the national debt, the accumulated deficits, are major causes of concern. Taxes and the cost of social programs in combination are almost certainly heading to what some may be regard as unacceptable levels, unless some action is taken to contain or reduce them. Reductions in a variety of programs, in order to make them more affordable collectively, may well be necessary, and not just in the CPP.

XII

CONCLUSIONS

It is well known that Canada has serious financial problems: the size of the deficit, the cost of interest on the debt, and the increasing cost of social programs, of which the CPP is only one component. Thus while this paper has focused primarily on the CPP, it must be remembered that it is only one of many programs that may require change. One cannot solve of our problems by changing only the CPP, but changes in the CPP may need to play their part.

The C/QPP and OAS (including GIS/SPA) are major sources of income for most Canadians age 65 and up. Over 80% receive C/QPP, and over 97% receive OAS. For many, they are the only substantial source. With the exception of "bank interest", which seems to be a source of income for somewhat over 75% of seniors, less than 30% of seniors have income from other sources, with the exception of RPPs, where the percentage is 45%.

Without C/QPP and OAS the average income of such Canadians would decline by a third. The CPP also provides substantial disability and survivor benefits for Canadians under the age of 65.

Fewer than 50% of the paid labour force are members of private pension plans, and the membership is relatively concentrated in the public sector, which is not to say that there are few plans in the private sector, just not enough of them. Many companies, especially smaller ones, do not have retirement plans at all. Private pension plans are, and will continue to be, a major source of retirement income for those who belong to them.

Fewer than 25% of taxpayers currently contribute to RRSPs, and these are concentrated in the higher income brackets. They include many of the self-employed, who are prohibited by law from establishing RPPs; thus RRSPs are not solely a benefit for the rich, but the only tax-sheltered way some Canadians can save for their retirement. It should also be remembered that many of these people finance the entire cost of their retirement themselves, as there is no employer to make a contribution on their behalf.

Despite access to RRSPs for almost forty years, well under 20% of Canadians over age 65 receive income from them. The average amounts are substantial for those who have used them, but it should be remembered that the largest amounts go to those who did not belong to RPPs, and so have no income from that source. These are individuals who could contribute more to RRSPs because they could not contribute to RPPs, and so were able to contribute the larger amounts that yield the higher incomes.

Thus we may conclude that the CPP is an important source of income for retired Canadians, and integral to the retirement savings plans of many. Allowance for both the presence and size of CPP benefits has been made in private pension plans to which they may

belong, and its existence has been anticipated in their savings for retirement, by means of RRSPs and otherwise. Any reduction or elimination in CPP benefits would thus have a significant effect. In all cases it would mean a lesser retirement income than had been expected; in some cases it would mean poverty in old age.

If the CPP were terminated, or the benefit level reduced substantially, there would be insufficient time for many to accumulate enough savings to cover the shortfall, although it would be possible for younger Canadians to start saving additional amounts to compensate for the loss. It would also mean that employers might have to enrich their pension plans, and certainly there would be pressure from employees to have them do so. Further, unless GIS were also changed, it would mean merely transferring significant amounts of pension benefits from the CPP to GIS. As GIS would only make up at most half of the CPP reduction, there would, in the absence of retirement income from alternative private sources, be a reduction in the incomes of the elderly who now rely mainly on the CPP and OAS. This would apply to a substantial number of retired Canadians.

The method of financing used, pay-as-you-go, entails some intergenerational inequities, but appears proper for a social security system, and is similar to that used in social security plans around the world. All of the actuarial reports on the CPP have projected contribution rates far into the future, and have consistently shown increasing costs as the covered population matured. Pay-as-you-go contributions projected for the year 2025 have increased by more than originally estimated because of enrichments in the plan (265 basis points), necessary changes in the actuarial assumptions (514 basis points), and changes in methodology (54 basis points). By far the one change in the actuarial assumptions that has had the most effect has been the reduction in productivity *i.e.* the narrowing of the spread between the rate of increase of wages and prices. The next most important single change has been the increased allowance for disability, necessitated by the experience revealed in the Fifteenth Actuarial Report.

While the investments made by the CPP fund may be criticized as not giving a high enough rate of return, this is not a vitally important factor since the aim is to have a fund equal to only about two years' benefits, and it would not result in materially lower rates of contribution if a higher rate of investment return had been earned. It would also have resulted in higher taxes being paid by Canadians to the provinces, as taxes are the source of interest payments made by the provinces.

Concern has been expressed about the equity of intergenerational transfers, entailed as a result of the pay-as-you-go financing approach, in a maturing population, in the sense of putting too great a burden on future generations. Such transfers work both ways, however, and are inevitably inherent in our society. They are common in social security programs throughout the developed world. The recent increase in disability benefits, as identified in the Fifteenth Report, is essentially an intra-generational transfer, not an intergenerational one.

Currently, contribution rates for the CPP are lower, no matter how measured, than those for plans in the other G-7 countries. Projected contribution rates in the long term for the CPP are, when adjusted for replacement rates, generally comparable to, or slightly lower than, those currently in effect in the other G-7 countries, although the projected contribution rates in Canada

do not include the cost of OAS, which is an integral part of the Canadian retirement system. Even if the cost of OAS is included, the projected Canadian rates are still not out of line. In absolute terms, the cost of the Canadian system is lower than in the other G-7 countries because it provides a lower replacement ratio on a lower tranche of earnings than in the other G-7 countries. Even when allowance is made for the lower replacement ratio, the ultimate contribution rates are comparable.

Many of the concerns expressed by Canadians about the CPP show a lack of knowledge about the CPP, and how it has always been planned to work. All of this information has been readily available in the actuarial reports on the CPP, in other government documents, and in various published papers. Unfortunately, most of this information has not received the readership that it deserves. For example, the increasing costs have always been identified, and if they were unacceptable, concern could, and should, have been expressed many years ago. While it would have been desirable to start the process of educating Canadians about the CPP thirty years ago, it is not too late now.

The rates of return, both nominal and real, received to date by contributors have been excellent. Those projected to be received in the future are somewhat less so, but even the cohort which will retire in 2033 is expected to have an acceptable rate of return. For those retiring after that date concerns may be raised as the real rates of return are under 2% per annum. This may still be acceptable, considering the low administrative expense level of the CPP, the full portability of benefits, the universal coverage of all workers, the full indexing of all benefits, and that the financial risk should be less than in any private arrangement. Further, most of the deficiency in the rate of return for this cohort results from the low rate of fertility. A corollary of low fertility is that there will be fewer children on which parents must spend money, and so greater room for saving during the working years. Unfortunately, the partial de-indexing of tax brackets, if it continues, may make after-tax returns less than indicated in this monograph. This partial de-indexing, however, also reduces returns on alternative retirement savings instruments, such as RPPs, RRSPs, and non-tax sheltered savings, and not just the CPP.

In the absence of the CPP, payments for GIS and SPA under the present structure would increase substantially, probably by 2.4 billion dollars per year. Contributions to RPPs and RRSPs would probably also increase. There might merely be a shifting of contributions from one plan to another, and there might well be no more disposable income for Canadians than at present, and quite possibly lower tax revenues as well, since deductions would replace tax credits under the current tax structure.

The CPP, if viewed in isolation, is operating generally as planned, and many criticisms of it are not fully justified.

The CPP has met most, if not all, of the criteria of affordability listed in Chapter I. Many of these have already been mentioned in this Chapter, but they bear repeating.

- The projected increases in contribution rates in themselves will not be associated with a reduction of disposable income from the present level, and so the cost is not, in this respect, disproportionate to the economy. Even the increase in contributions that may result from the

Fifteenth Report, coupled with continued partial de-indexing of tax brackets, will not change this conclusion, provided that the assumed increases in productivity are achieved.

- The financing method provides all the flexibility needed, and does not require any financing from government.
- The cost of the Canadian system is at present lower, both relatively and absolutely, than the systems in the other G-7 countries. Ultimately the cost will be comparable, if adjusted for earnings replacement levels, and will still be lower in absolute terms.
- Past rates of return have been excellent, and those projected for the near future should be acceptable; they have been comparable with those on other forms of investment, especially when allowance is made for the low rate of expense on the CPP. In the long term the rates of return will be less attractive, but may still be acceptable relative to the alternatives.
- It may be difficult to do better overall than the CPP by using private arrangements, and such arrangements usually do not, and in some cases cannot, offer some of the key features of the CPP such as full indexing, complete portability, and the drop-out provisions.
- The CPP is properly priced considering the benefits offered and the financing method used, as very little of contributions go towards expenses, and virtually all contributions are returned as benefits.

When one looks at the projected increases in the CPP's future costs, the CPP should not be considered in isolation. It should instead properly be considered within the framework of all of Canada's social security programs and taxes.

In 1995 the combined employer/employee contribution to CPP is 5.4%. The corresponding contribution to UI is 7.2%, with the UI rate applied to a higher level of earnings, $42,380 as compared to YMPE under the CPP of $34,900. Further, there are no CPP contributions on the first $3,400 of earnings.

The average top rate of tax is around 46%, not including surtaxes, and will over time apply at a lower and lower level of income because of the partial de-indexing of the tax brackets. The combination of federal GST and provincial sales taxes average around 15%, although they do not apply to all purchases. They do, however, take up a substantial portion of expenditures, and reduce disposable income accordingly. Income tax and sales taxes, plus payroll taxes in some provinces, are used to finance medicare; the cost of medicare will likely increase as the average age of Canadians increases, unless some method of cost containment is successful.

We should not conclude that the CPP does not need changes, either in design, or in order to make it more affordable. If it were not for the other financial problems facing Canada, those of the CPP would not be so pressing. It is only when it is viewed as one of a panoply of social programs, and put into the context of the entire level of taxes and contributions, that changes may appear necessary, as part of an overall restructuring of the entire social security program, and not just that for retirement. Any changes in the CPP should be made only in conjunction with changes in other programs, and possibly the tax system as well, and not in isolation. It is imperative that the effect of changes in the CPP on other government programs and private plans be taken into account before any changes are made.

Canadians have taken the CPP into account in their retirement planning for thirty years, and any changes that might be made must give them sufficient to time to make alterations in their planning and saving for retirement.

APPENDIX A

CANADA'S RETIREMENT PROGRAMS

This appendix is taken from **Overview: Income Security Programs,** published by the Minister of Human Resources Development in 1994, and contains a description of OAS, GIS/SPA, and CPP.

Introduction

Canada's social security system has evolved gradually in response to a variety of social, economic and political factors. From modest beginnings in the early decades of this century, a system has developed which consists of universal benefits, social insurance plans, social assistance programs, and a wide array of health and social services.

Under the Canadian constitution, the federal and provincial governments share the responsibility for social security. Both play important roles in the planning, administration, delivery and financing of income security, health and social service programs.

In the field of income security, Human Resources Development Canada (HRD) administers the following four federal government programs which provide financial benefits directly to individuals:

- the Old Age Security program (which includes the Guaranteed Income Supplement and the Spouse's Allowance);
- the Canada Pension Plan;
- the Child Tax Benefit program; and
- the Children's Special Allowances program.

HRD also administers the Canada Assistance Plan. Under this plan, the federal government pays a share of eligible costs the provinces and territories have contributed for social assistance benefits and related social services provided to people in need.

HRD, through the Canada Employment and Immigration Commission, is responsible for the Unemployment Insurance program. Other federal agencies involved in income security include Revenue Canada which collects Canada Pension Plan contributions and jointly delivers the Child Tax Benefit with HRD; and the Department of Veterans Affairs which is responsible for pensions and allowances for veterans and their dependents.

Provincial and territorial governments are responsible for social assistance programs which ensure minimum levels of income to people in need. The provincial and territorial authorities determine the conditions of eligibility and the amount of benefits for these programs. These authorities also have jurisdiction over workers' compensation plans which provide benefits in case of injury or death occurring at work. Several provinces provide income support to seniors by supplementing the benefits from the federal Old Age Security program.

The federally administered Canada Pension Plan operates in nine Canadian provinces and the two territories. The Canada Pension Plan allows a province not to be part of the federal pension plan if it sets up a comparable program. Quebec, for example, has established the Quebec Pension Plan which operates in that province in place of the Canada Pension Plan. The two plans have similar coverage and benefits.

All information collected from clients of Income Security Programs is considered private and confidential, and is legally protected by the *Old Age Security Act*, *the Canada Pension Plan*, and *the Privacy Act*.

Old Age Security Program

The Old Age Security (OAS) program is the cornerstone of Canada's retirement income system. Benefits include the basic OAS pension, the Guaranteed Income Supplement (GIS) and the Spouse's Allowance (SPA). After briefly describing the program's history and overall features, each of the specific benefits is described in turn.

Legislative history: *The Old Age Security Act* came into force in 1952, replacing legislation from 1927 requiring the federal government share the cost of provincially run, means-tested old age benefits.

The Act has been amended many times. Among the most important changes have been:

- the drop in age of eligibility from 70 to 65 (1965);
- the establishment of the GIS (1967);
- the introduction of full annual cost-of-living indexation (1972);
- quarterly indexation (1973):
- the establishment of the SPA (1975);
- payment of partial pensions based on years of residence in Canada (1977);
- the inclusion of OAS in international social security agreements (ongoing); and
- the extension of the SPA to all low-income widows and widowers aged 60 to 64 (1985).

Funding: The OAS program is financed from federal government general tax revenues.

Administration: The Income Security Programs Branch of HRD administers the OAS program through regional offices located in each province and territory. The International Operations Division in Ottawa, as its name suggests, is responsible for benefits stemming from Canada's international social security agreements.

Indexation: All benefits payable under the *Old Age Security Act* are increased in January, April, July and October of each year based on increases in the cost of living as measured by the Consumer Price Index.

Payment outside Canada: Once a full or partial OAS pension has been approved, it may be paid indefinitely outside Canada, if the pensioner has lived in Canada for at least 20 years after reaching 18 years of age. Otherwise, payment may be made only for the month of a pensioner's departure from Canada and for six additional months, after which payment is suspended. The benefit may be reinstated if the pensioner returns to live in Canada.

The GIS and the SPA may be paid outside Canada for only six months following the month of departure from Canada.

Reconsidering and appealing a decision: Pensioners may request an explanation or a reconsideration of a decision. This request must be forwarded to the Regional Director within 90 days after receiving the decision. If not satisfied with the reconsideration, a pensioner may appeal, again within 90 days to a Review Tribunal. The legislation provides that the decision of the Tribunal is final and binding.

Old Age Security Pension

The OAS pension is a monthly benefit available, if applied for, to anyone 65 years of age or over. OAS residence requirements must also be met. An applicant's employment history is not a factor in determining eligibility, nor does the applicant need to be retired. OAS pensioners pay federal and provincial income tax. Higher income pensioners also repay part or all of their benefit through the tax system.

Eligibility conditions: To qualify for an OAS pension, a person must be 65 years of age or over, and

(1) must be a Canadian citizen or a legal resident of Canada on the day preceding the application's approval; or

(2) if no longer living in Canada, must have been a Canadian citizen or a legal resident of Canada on the day preceding the day he or she stopped living in Canada.

A minimum of 10 years of residence in Canada after reaching age 18 is required to receive a pension in Canada. To receive an OAS pension outside the country, a person must have lived a minimum of 20 years in Canada.

Amount of benefits: The amount of a person's pension is determined by how long he or she has lived in Canada, according to the following rules:

A person who has lived in Canada, after reaching age 18, for periods that total at least 40 years, may qualify for a full OAS pension.

A person who has not lived in Canada for 40 years after age 18 may still qualify for a full pension if, on July 1, 1977, he or she was 25 years of age or over, and

(1) lived in Canada on July 1, 1977, or

(2) had lived in Canada before July 1, 1977, after reaching age 18, or

(3) possessed a valid immigration visa on July 1, 1977.

In such cases, a person must have lived in Canada for the 10 years immediately prior to approval of the OAS application. Absences during this 10-year period may be offset if, after reaching the age of 18, the applicant lived in Canada before those 10 years, for a period of time that was at least three times the length of absence. In this case, however, the applicant must also have lived in Canada for at least one year immediately prior to the date of the application's approval. For example, an absence of two years between the ages of 60 and 62 could be offset by six years of residence after age 18 and before reaching age 55.

Absences from Canada: Canadians working outside Canada for Canadian employers, such as the armed forces and banks, may have their time working abroad counted as residence in Canada. To qualify, the person must have returned to Canada within six months of ending employment or have turned 65 years old while still employed. Both proof of employment from the employer as well as proof of physically returning to Canada, if only for one day, must be provided. Under certain conditions this benefit may also apply to spouses and dependents and Canadians working abroad for international organizations.

A person who cannot meet the requirements for the full OAS pension may qualify for a partial pension. A partial pension is earned at the rate of 1/40th of the full monthly pension for each full year lived in Canada after his or her 18th birthday. Once a partial pension has been approved, it may not be increased as a result of added years of residence in Canada.

Late applicants of the OAS pension as well as the GIS and SPA may receive retroactive payments. In the case of OAS, payments may be made for up to five years before the claim was made. For the GIS and the SPA, payments may be made for up to one year before the claim was made provided all conditions of eligibility were met.

The Guaranteed Income Supplement

The GIS is a monthly benefit paid to residents of Canada who receive a basic, full or partial OAS pension and who have little or no other income. GIS payments may begin in the same month as OAS pension payments. Recipients must re-apply annually for the GIS benefit. Thus, the amount of monthly payments may increase or decrease according to reported changes in a recipient's yearly income. Unlike the basic OAS pension, the GIS is not subject to income tax. The GIS is not payable outside Canada beyond a period of six months, regardless of how long the person lived in Canada.

Eligibility conditions: To receive the GIS benefit, a person must be receiving an OAS pension. The yearly income of the applicant or, in the case of a couple, the combined income of the applicant and spouse, cannot exceed certain limits.

Amount of benefits: The amount of the GIS to which a person is entitled depends on his or her marital status and income.

Income for GIS purposes is defined the same way as it is for federal income tax purposes, with a few specific exceptions - the most important of which is OAS pension

income. Income, therefore, includes any other money which a pensioner receives, such as an earnings-related retirement pension, foreign pensions, interest, dividends, rents or wages. If married or living in a common-law relationship, the combined income of the pensioner and spouse must be taken into account.

Generally, income earned in the previous calendar year is used to calculate the amount of benefits paid in a fiscal year beginning April 1. However, if a pensioner or spouse has retired or has a loss of pension income, an income estimate for the current calendar year may be substituted for the income of the preceding calendar year.

There are two basic rates of payment for a maximum GIS. The first applies to single pensioners – including widowed, divorced or separated persons; and to married pensioners whose spouses do not receive either the basic OAS pension or the SPA. The second applies both to legally married couples and couples living in common-law relationships, where both spouses are pensioners. The GIS single rate is higher than the GIS married rate. However, each spouse in a couple is entitled to a benefit, so the combined benefits for a couple are higher than those for a single person.

If a person is receiving a partial OAS pension, the maximum GIS is increased by the difference between that partial pension and the full OAS pension. This ensures that all OAS pensioners are guaranteed the same minimum income.

For a single, widowed, divorced or separated pensioner, the maximum monthly supplement is reduced by $1 for each $2 of other monthly income.

If both spouses in a couple are receiving the OAS pension, the maximum monthly supplement of each pensioner is reduced by $1 for every $4 of their other combined monthly income.

There is one exception to these two basic rates – for a couple in which only one spouse is a pensioner and the other is not eligible for either the basic OAS pension or the SPA. In this case, the pensioner can receive the GIS at the higher rate paid to those who are single. Moreover, the maximum monthly supplement is reduced by $1 for every $4 of the couple's combined monthly income, excluding, as usual, the pensioner's OAS benefit. Also, the first reduction of $1 is made only when the combined yearly income of the couple reaches 12 times the basic monthly OAS pension plus $48.

Spouse's Allowance

The SPA is paid monthly. It is designed to recognize the difficult circumstances faced by many widowed persons and by couples living on the pension of only one spouse.

Recipients must re-apply annually. Benefits are not considered as income for income tax purposes. The SPA is not payable outside Canada beyond a period of six months, regardless of how long the person lived in Canada.

Eligibility conditions: The SPA may be paid to the spouse of an OAS pensioner, or to a widow or widower. To qualify, an applicant must be between the ages of 60 and 64 and must have lived in Canada for at least 10 years after turning 18. An applicant must also have been a Canadian citizen or a legal resident of Canada on the day preceding the application's approval. To qualify, the combined yearly income of the applicant and the pensioner spouse, or the annual income of the surviving spouse, cannot

exceed certain limits. For a couple, OAS and GIS benefits are not included in their combined yearly income.

The SPA stops when the recipient becomes eligible for an OAS pension at age 65, if the beneficiary leaves Canada for more than six months, or dies. For a couple, the SPA stops if the pensioner spouse ceases to be eligible for GIS or if the spouses separate or divorce. In addition, the SPA stops if a widow or widower remarries.

Amount of benefits: The SPA is an income-tested benefit. The maximum amount payable to the spouse of a pensioner is equal to the combined full OAS pension and the maximum GIS at the married rate. The maximum amount for a widowed person is somewhat higher. The maximum monthly SPA is reduced by $3 for every $4 of the beneficiary's monthly income for a widowed spouse or the couple's combined monthly income. This happens until the OAS-equivalent is reduced to zero. Then, for a couple, both the GIS-equivalent portion of the SPA and the pensioner's GIS are reduced by $1 for every additional $4 of the couple's combined monthly income. For a widow or widower, the GIS-equivalent portion is reduced by $1 for every additional $2 of monthly income.

Canada Pension Plan

The CPP is a contributory, earnings-related social insurance program. It ensures a measure of protection to a contributor and his or her family against the loss of income due to retirement, disability and death. The plan operates throughout Canada. Québec has its own similar program, the Quebec Pension Plan (QPP) which is closely associated with the CPP. The operation of the two plans is co-ordinated through a series of agreements between the federal and Quebec governments. Benefits from either plan are based on pension credits accumulated under both, as if only one plan existed.

Benefits paid by the CPP are considered as income for federal and provincial income tax purposes.

Legislative history: The CPP was enacted in 1965 and came into force on January 1, 1966. The legislation has been amended several times. Among the most important amendments have been:

- the introduction of full annual cost-of-living indexation;
- the availability of the same benefits to male and female contributors as well as to their surviving spouses and dependent children;
- the elimination of the retirement and employment earnings test for retirement pensions at age 65; and
- the exclusion of periods of zero or low earnings while caring for a child under the age of seven.
- division of pension credits (credit splitting) between spouses if there is a marriage breakdown;

In January 1987, several major new provisions came into effect. These included:

- flexible retirement benefits payable as early as age 60;
- increased disability pension;
- continuation of survivor's benefits if the spouse remarries; and
- sharing of retirement pensions between spouses.
- credit splitting was expanded to cover the separation of married or common-law spouses.

In 1991, legislation was passed to assist those people who were denied a credit split as a result of provisions contained in a spousal agreement entered into before June 4, 1986. The amendment provides that applicants, who were divorced or whose marriage was annulled on or after January 1, 1987, will be credited with the same amount of credits which he/she would have received otherwise.

In 1992, three major amendments came into effect – a new 25-year schedule for employer-employee contribution rates was established, children's benefits were

increased and provision was made for individuals who were denied disability benefits because of late application.

Coverage: The CPP covers nearly all employed and self-employed persons in Canada (except Quebec) who are between the ages of 18 and 70 and who earn more than a minimum level of earnings in a calendar year. This minimum level, which changes annually, is known as the Year's Basic Exemption (YBE).

Funding: The CPP is financed through contributions from employees, employers and self-employed persons as well as interest from the Canada Pension Plan Fund.

Surplus funds which are not needed to pay benefits and administrative costs are maintained in the Canada Pension Plan Fund. According to the plan's financing principles, the objective is to have a reserve equal to about two years' worth of benefits.

Amount of contributions: Contributions are made on the portion of an individual's annual earnings above the YBE and up to a ceiling known as the Year's Maximum Pensionable Earnings (YMPE). The YMPE is linked directly with the average Canadian wage and the YBE is equal to approximately 10 percent of the YMPE in any given year.

From 1966 to 1986, employees contributed 1.8 percent of covered earnings and their employer paid a matching contribution. Self-employed persons contributed at the rate of 3.6 percent on the same range of annual earnings. Between 1987 and 1996, the contribution rate increased annually by 0.1 percent of covered earnings for employees as well as employers (0.2 percent for self-employed persons). The contributory rate for 1994 is 2.6 percent of covered earnings for employees and employers (5.2 for self-employed persons).

For the next five years, the rates will be:

	Employees	Employers	Self-employed
1994	2.6%	2.6%	5.2%
1995	2.7	2.7	5.4
1996	2.8	2.8	5.6
1997	2.925	2.925	5.85
1998	3.05	3.05	6.10

To ensure the fiscal health of the plan, contribution rates will continue to rise gradually under the current contribution rate schedule. Federal and provincial finance ministers must review and update this 25-year schedule every five years.

Record of earnings: A record of earnings is an account of an individual's earnings and contributions to the CPP. Under the Contributor Information Program, a contributor may request, once in any 12-month period, a personal record of contributions to the plan.

Amendment formula: The legislation governing the CPP contains a unique formula for making major changes to the plan. Such changes must be approved not only by the federal Parliament but also by the governments of at least two thirds of the provinces with at least two thirds of the population of Canada.

Administration: The Income Security Programs Branch of HRD administers the CPP through regional offices located in each province and territory. The International Operations Division in Ottawa is responsible for benefits that fall under Canada's international social security agreements.

Indexation: All CPP benefits are adjusted in January each year to reflect increases in the cost of living as measured by the Consumer Price Index.

Payment outside Canada: All benefits under the CPP are payable no matter where the beneficiary lives, whether in Canada or abroad.

Appealing a decision: CPP recipients have the right to appeal any decision that affects their entitlements or the amount of their CPP benefit. To appeal, a pensioner must apply in writing to the Minister of HRD within 90 days after receiving the decision. If not satisfied with the decision of the Minister, a contributor may appeal, again within 90 days, to a Review Tribunal. Decisions of a Review Tribunal may be appealed to the Pension Appeals Board within 90 days by the Minister or the applicant.

Retirement pension

Eligibility conditions: Any person who has made at least one valid contribution to the CPP is eligible to receive a monthly retirement pension after his or her 60th birthday. People making valid contributions to the CPP and to the QPP are considered dual contributors. Dual contributors who, at the time of application, live outside Quebec but who have contributed to both the CPP and the QPP, receive benefits from the CPP. The CPP then bills the QPP for its share of the benefit payment. The reverse also occurs. Dual contributors who, at the time of application live in Quebec or have lived in Quebec before leaving Canada but who have contributed to both the CPP and the QPP, receive benefits from the QPP.

Before 1987, a person could not receive a retirement pension before the age of 65. Since 1987, a retirement pension may be paid at age 60. However, the contributor must have wholly or substantially ceased pensionable employment. Contributors are considered to have substantially ceased pensionable employment if their annual earnings from employment or self-employment do not exceed the maximum retirement pension payable at age 65 for the year the pension is claimed. Once turning 65, a pensioner is not required to stop work to receive a retirement pension.

Amount of benefits: A retirement pension payable to a person at age 65 is a monthly benefit equal to 25 percent of a contributor's average monthly pensionable earnings during the contributory period.

An individual's contributory period is defined as the period

(a) starting on January 1, 1966, or when the contributor reached 18 years of age, whichever is later, and

(b) ending, usually, when the individual takes a retirement pension or reaches age 70 (whichever occurs first)

However, any month during which a contributor was considered to be disabled according to the terms of the CPP or the QPP is excluded from the contributory period.

In calculating average monthly pensionable earnings, actual pensionable earnings from past years are adjusted to reflect current values.

Certain periods of low or zero earnings - up to 15 percent of an individual's contributory period - may be excluded in calculating average monthly pensionable earnings. This omission is intended to compensate for periods of unemployment, illness, schooling, and so on.

Months of low or zero earnings while caring for a child under the age of seven may also be excluded from the contributory period. This provision ensures that reduced earnings during child-rearing years will not result in lower future pension benefits. This provision applies to those who received Family Allowances benefits or to the spouses of Family Allowances recipients. It also applies to those who are eligible for the CTB.

In addition, people who have continued to work and make contributions after reaching age 65 may substitute periods of pensionable earnings after turning 65 for periods of similar length before they were 65 when they had low or zero earnings. As a result, their pension benefits are increased.

The amount of a retirement pension beginning before age 65 is adjusted downwards by a factor of 0.5 percent for each month between the beginning of the pension and the month after the beneficiary's 65th birthday. Similarly, the amount of a retirement pension beginning after age 65 is adjusted upwards by the same factor for each month between the month after the 65th birthday and the month for which the first payment is made. No adjustment, however, is made for any month after the

month of the 70th birthday. Thus, a maximum adjustment of 30 percent, up or down, may be made to the retirement pension.

Claimants who apply for a retirement pension after reaching age 70 may be paid retroactively for up to 12 months, but not for the period before they reached age 70 or the month of the birthday. This does not apply to a claimant who is less than 70 years of age.

Assignment of retirement pensions: Spouses in a continuing marriage and partners in a common-law relationship may apply to receive an equal share of the retirement pension earned by both parties during their life together. Only one spouse has to apply for this assignment of pensions between spouses. Both spouses must be at least 60 years of age and have applied for their retirement pensions. However, an assignment of pensions may not take place if there has been an agreement between the parties that there is to be no pension assignment and that this agreement is binding on the Minister.

Disability pension

Eligibility conditions: To receive a disability pension, a contributor must have been disabled according to the terms of the CPP legislation, must have made sufficient contributions to the plan, must be under the age of 65, and must apply in writing.

A contributor is considered to be disabled under CPP if he or she has a physical or mental disability which is both severe and prolonged. "Severe" means that the person cannot regularly pursue any substantially gainful occupation. "Prolonged" means that the disability is likely to be long continued and of indefinite duration, or is likely to result in death.

To qualify for disability benefits, contributors must have met the minimum contribution requirements when they became disabled. The minimum contributory requirement is five of the last ten calendar years, or two of the last three calendar years in the contributory period. In some cases, applications may be made retroactively.

As a result of recent CPP legal changes, applicants who were previously denied disability benefits because they had applied late, now may possibly qualify for benefits if all other conditions of eligibility are met.

The contributory period of a disabled person ends with the month in which that person is found to be disabled.

Amount of benefits: A disability pension is a monthly benefit which consists of a flat-rate component (an amount, unrelated to previous earnings, paid to all beneficiaries) and an earnings-related component. The earnings-related component

is equal to 75 percent of a retirement pension, calculated as if the contributor became 65 years of age in the month when the disability pension became payable.

A disability pension begins in the fourth month after the month a person is considered disabled. It is payable until the beneficiary turns age 65, or recovers from the disability (if this occurs before age 65), or until the beneficiary dies. When the recipient of a disability pension reaches age 65, the pension is automatically converted to a retirement pension.

The CPP files of disability clients are periodically re-examined to determine if recipients continue to be eligible for their disability benefit. This is called "reassessment" and results in either a confirmation of continuing eligibility or a decision to terminate benefits.

Vocational rehabilitation: Under CPP regulations, vocational rehabilitation is provided to recipients of disability benefits. A national vocational rehabilitation project is providing services to selected CPP clients across Canada. Once rehabilitation has been successfully completed, clients are entitled to a three-month job search or trial work period. After this time, clients who are no longer disabled stop receiving disability benefits.

Benefits for the child of a disabled contributor

Eligibility conditions: A benefit may be paid on behalf of the child of a disability pension recipient, if that child is:

(1) under age 18, or

(2) between the ages of 18 and 25, and is in full-time attendance at school or university. Benefits are suspended if the child is no longer in full-time school attendance, but may be reinstated if schooling is resumed.

Amount of benefits: The monthly benefit for each child is a flat-rate amount. This amount does not depend on a parent's past earnings.

Payment begins the same month in which the disability pension becomes payable to the contributor or the month after the month in which the child was born or adopted. Payment stops if the contributor is no longer considered eligible for a disability pension, or when the contributor's disability pension is converted to a retirement pension, or if the child no longer meets the eligibility conditions described above, or if the child dies.

Children may receive up to two disabled contributors benefits and/or orphans benefits, if both parents are deceased and/or disabled, and if both have made the required contributions.

Surviving spouse's pension

Eligibility conditions: A spouse of a deceased contributor or a person of the opposite sex who lived in a marital relationship with a contributor before his or her death, may be eligible for a survivor's pension. To qualify, the deceased must have contributed to the CPP during at least one third of the number of calendar years in his or her contributory period. If the deceased's contributory period was less than nine years, then at least three years' worth of CPP contributions are needed. If the contributory period was more than 30 years, at least 10 years' worth of contributions are required.

Note: If the contributor dies before reaching age 65, the contributory period ends in the month of death.

To qualify for a benefit, the surviving spouse must:

(1) be 45 or more years of age, or,

(2) in the case of a surviving spouse who has not reached the age of 45,

- **(a)** have, at the time of the death of the contributor, reached 35 years of age; or
- **(b)** have been, at the time of the death of the contributor, a surviving spouse with dependent children; or
- **(c)** be disabled.

Amount of benefits: The pension payable to a surviving spouse aged 65 or over is equal to 60 percent of the retirement pension which the deceased contributor could have received at age 65. If the contributor died before turning 65, a retirement pension is calculated as if the contributor had become 65 in the month of death.

The pension payable to a surviving spouse under age 65 is composed of two parts – a flat-rate component and an earnings-related portion. The flat-rate component of the surviving spouse's pension is considerably smaller than the same component of a disability pension. The earnings-related portion of the spouse's pension is equal to 37.5 percent of the actual or calculated retirement pension of the deceased contributor. However, if the contributor was a dual contributor and the surviving spouse lives in Quebec, the surviving spouse is eligible for a survivor's pension under the age of 35.

If a surviving spouse is between the ages of 35 and 45, has no dependent children and is not disabled, the survivor's pension is reduced by 1/120th for each month his or her age is less than 45 at the time when the contributor died. If the surviving spouse is under the age of 35, a survivor's benefit is not available unless a spouse is disabled or if the spouse has children. However, if the contributor was a dual contributor and the surviving spouse lives in Quebec, the surviving spouse is eligible for a survivor's pension under the age of 35.

If a surviving spouse ceases to be disabled or to have dependent children in his or her care and is between 35 and 45 years of age, the pension is reduced. If the survivor is under 35 years of age, the pension is suspended until he or she turns 65.

Before January 1, 1987, a surviving spouse's pension stopped if the recipient remarried, but was reinstated if the marriage ended. This rule has been cancelled. Benefits previously terminated may now be reinstated on application.

Only one survivor's pension can be paid to a surviving spouse although he or she may have been widowed more than once. In such a case, the highest of the pensions is paid.

Combined benefits

People who are receiving a surviving spouse's pension may also have contributed to the CPP on the basis of their own earnings. Thus, they may be entitled to a retirement or disability pension in their own right. In such cases, the surviving spouse receives a combined pension which is calculated as follows:

(1) If the survivor is under age 65, one flat-rate benefit is payable. Thus, if the survivor also receives a disability pension, the larger of the two flat-rate amounts is paid.

(2) In addition, any earnings-related benefits or benefit components may be added to each other, but their total may not exceed the maximum retirement pension payable for the year in which the contributor becomes eligible for the second pension;

(3) If a person takes early or late retirement, the rate adjustment to the retirement pension will be made only after the above rules have been applied to determine the survivor's pension.

Incapacity

An application for CPP benefits or a request for a credit split can be made retroactively if the applicant was considered unable to apply because of a severe incapacity. A person may be considered to be incapacitated in this case if incapable of forming or expressing the intention to make such an application or request.

Credit splitting

Since 1978, the CPP has contained a provision allowing CPP credits to be divided between ex-spouses after a divorce or legal annulment. In January 1987, the provision was broadened to include couples who separate from a legal or common-law union.

A division of credits results in a permanent amendment to each spouse's record of earnings and may affect current or future benefits. CPP credits are divided for each year the couple lived together.

Originally, there was a three-year time limit to apply for a credit split. As of January 1987, there is no time limit except for common-law situations. Common-law spouses must have been living apart for at least one year before an application is submitted. If one of the former spouses dies after they have been living apart for at least one year, the application must be submitted within three years after the death. Contributors may obtain a credit split even if they have remarried.

A credit split is mandatory by law in cases of divorce once the Minister of HRD receives the required documentation. Once a request for credit splitting is made in such cases, it cannot be withdrawn. Separated couples who were married or in a common-law relationship can withdraw within 60 days after being notified of a division. No division will be made if it results in a loss of credits to both spouses.

Documentation required for credit splitting includes proof of marital status, dates of birth of both spouses, social insurance numbers and evidence as to the period(s) of co-habitation.

Spousal agreements must also be submitted. Some agreements which contain a general property waiver or specific waivers of pension credits can prevent a division, particularly if they were signed before June 4, 1986 or if they were signed in Saskatchewan or Quebec. Most waivers, however, do not prevent a division of pension credits.

Orphan's benefits

Eligibility conditions: An orphan's benefit may be paid for the child of a deceased contributor, if the application is made in writing and if contributions have been made for the minimum qualifying period, similar to that described on page 23 for a surviving spouse's pension, and the child is:

(1) under age 18, or

(2) between the ages of 18 and 25 and in full-time attendance at school or university. Benefits are suspended if the child is no longer attending school full-time, but may be reinstated if schooling is resumed.

Amount of benefits: Children may receive up to two disabled contributors benefits and/or orphans benefits, if both parents are either deceased or disabled, or if

one parent is deceased and the other is disabled. To be eligible both parents must have made the required contributions.

Payment of an orphan's benefit begins in the month after the month when the contributor died. Payment stops if the child no longer meets the eligibility conditions described above, or if the child dies.

Death benefit

Eligibility conditions: A death benefit may be paid to the estate of a deceased contributor, if contributions to the CPP were made for the minimum qualifying period. This minimum period is the same as for a surviving spouse's pension (see page 23). The death benefit is paid, as well, where there is no will or estate. In this case, the benefit is usually paid to the person or agency responsible for funeral costs.

Amount of benefit: The death benefit is a lump-sum payment equal to six times the monthly retirement pension of the deceased contributor or roughly 10 percent of the YMPE, whichever is less.

Reciprocal Social Security Agreements

Reciprocal social security agreements allow for the co-ordination of two countries' social security programs and make social security benefits portable between countries.

Canada Pension Plan: Agreements are designed to avoid duplicate coverage – that is, the need to contribute to both the CPP and the comparable program of the other country for the same work.

Agreements may also help people to qualify for disability, survivor's and death benefits under the CPP. As noted earlier in this booklet, each of these benefits has minimum qualifying conditions. An agreement may allow periods of contribution to the other country's social security system (or in some cases periods of residence abroad) to be added to periods of contribution to the CPP in order to meet these conditions. Once eligibility has been established, the amount of benefits is based on actual contributions to the CPP.

The CPP retirement pension is not included in agreements since it is payable to anyone who has made at least one valid contribution. It is not necessary, therefore, to use periods of contribution in the other country to establish eligibility for the retirement benefit.

Social Security Programs of another country

In many countries, nationality is an important criterion in determining eligibility for social security benefits. Non-citizens may be required to meet special conditions before they can receive a pension, and the payment of benefits to non-citizens living abroad may be severely restricted or even prohibited. Through a social security agreement, citizens and non-citizens become entitled to those benefits on the same conditions as the citizens of the other country. Most important, Canadian residents may start to receive benefits from the other country.

Most social security programs require contributions during a minimum number of years before a benefit can be paid. There may also be requirements for contributions in the period just before application for a benefit. People who have contributed to the programs of another country may not have sufficient periods of contributions to meet such requirements. Under an agreement, periods of residence in Canada and/or periods of contributions to the CPP may be used to satisfy the eligibility conditions of the other country's social security system.

APPENDIX B

HISTORY OF BENEFIT IMPROVEMENTS UNDER THE CANADA PENSION PLAN

One of the reasons that costs are higher under the Canada Pension Plan (CPP) than originally projected is that many improvements have been made in the plan, virtually all of which have had the effect of increasing costs. Further, the plan for which costs were estimated in the 1964 Report was somewhat different from the one that was actually implemented in 1966. The costs projected in that report are thus not those for the plan that was actually implemented in 1966 nor for the plan as it stands today. For a definition of the terms used for the provisions, reference should be made to Appendix A.

The major differences (there were many minor ones as well) between the original proposal and the plan actually implemented were as follows:

- A drop-out period for periods of low earnings of only 10% rather than 15% of the contributory period.
- No benefits for the children of disability pensioners.
- A maximum on the total amount payable with respect to orphans that provided virtually no additional benefits if there were more than four orphans (a maximum of only $50 per year in total for all orphans in excess of the first four).

In turn, the plan implemented in 1966 has undergone a variety of changes to become the one in place today. Reference should be made to Appendix A which describes the CPP as it is today. The major differences between the original CPP implemented in 1966 and that currently in effect are that the 1966 version had:

- More restrictive indexing on both covered earnings and pensions-in-pay
- No child-rearing drop-out
- A retirement age that did not reduce to 65 until 1970
- No provision for retirement before the normal retirement age
- Up to age 70, a reduction in the pension payable if earnings after retirement were above a certain level
- A survivors' benefit limited to widows and disabled widowers
- A provision that survivors' pensions stopped on remarriage
- A half orphan's pension in respect to orphans beyond the fourth
- A more restrictive requirement on contributions to be eligible for a disability pension
- Lower disability pensions

to name only the most important areas in which the plan has been liberalized. A more comprehensive description of the changes in these areas follows.

Covered Earnings

In 1966, maximum covered earnings were limited to $5000 per year, which was approximately the average wage then. Covered earnings (the YMPE) were supposed to increase with prices for ten years, after which they would increase with the earnings of CPP members; there was to be no increase for the first two years, and thereafter, until 1976, the maximum increase in any year was limited to 2%. If the history of price and wage increases in the years up to 1965 is considered, these limitations do not appear as restrictive as they now do.

The introduction of the CPP was followed by the onset of a period of inflation, and, as a result, covered earnings were soon much less than average earnings, and the majority of members was earning more than the YMPE. To correct this, the YMPE was increased on an *ad hoc* basis to $6600 in 1974 and $7400 in 1975. Thereafter it was increased by 12.5% per year until it reached the average earnings, which it did in 1986. In fact, the last 12.5% increase put the YMPE above average earnings. Since then it has been indexed with average earnings, and so has stayed above average earnings; it is currently 115% of average earnings. The YMPE in 1995 is $34,900.

Indexing

Pensions-in-pay were to be indexed in accordance with the increase in the Consumer Price Index, subject to a maximum increase of 2% per year during the first ten years. This limitation was removed retroactively in 1974.

Contributions

Originally, no contributions were required on the first 12% of earnings to the YMPE, called the Years' Basic Exemption, or YBE. This was changed to 10% in 1975. Benefits, however, are credited on earnings below the YBE once earnings exceed the YBE in that year. The treatment of contributions in a month when the earnings are less than one twelfth of the YBE is a bit complicated, and not especially germane to this appendix where changes are being recorded. Because of the drop-out provisions described below, a year with no contributions recorded does not necessarily reduce the ultimate level of the retirement pension, although it may. It may also affect the eligibility for disability, survivor, and death benefits, which specify a certain number of years of contributions. (It is possible for an employer to make non-refundable contributions on earnings to the YBE even if the employee receives no credit, for technical reasons not directly relevant to the objective of this paper.)

Contributions (employee and employer combined) were originally set at 3.6% of earnings between the YBE and YMPE, although it was projected that benefits would not exceed contributions until sometime in the mid 1980's.[37] The rate for calculating contributions began to increase in 1987, and in 1995 are 5.4% of covered earnings, with a twenty-five year schedule of

[37] Why contributions were set at a level in excess of the level of benefits was explained in Chapter IX.

increases set out in legislation. Every five years, this schedule of increases is reviewed, changed, if necessary, and extended for a further five years.

Calculation of Pensions at Retirement

The basic formula of providing a pension of 25% of average adjusted earnings (*i.e.* indexed with the increase in wages) has remained unchanged. It should be remembered that full pensions were not payable until after ten years, *i.e.* until 1976. In calculating average earnings, the 15% of years with the lowest earnings are dropped out, as are periods in which the contributor was in receipt of a CPP disability pension. Thus, although to qualify ultimately for the maximum pension, 47 years of contributions are required, this pension will be paid if contributions are at the maximum level for only 40 years, and even less if either the disability, or the child-rearing drop-out next described, are applicable.

In 1983 the child-rearing drop-out was added. (While the legislation to provide this was passed in 1978, Ontario and British Columbia withheld their approval until 1983.) This allowed a further drop-out of any years for which the member had reduced or no earnings while looking after a child under the age of 7, if this drop-out is beneficial to the contributor. The provision is too new to comment upon its long-range effect as yet, but the average pension increase for married women as a result has been between $20 and $30 per month, with some increases as high as $100 per month. The effect is thus far from negligible. The Chief Actuary has estimated that the effect will be on average an 8% increase in retirement benefits for female pensioners.

Retirement Age

The original age at retirement was 68, which was in effect until 1967, after which it was scheduled to reduce by a year each year until it reached 65 in 1970. There was no provision for the payment of a retirement pension any earlier than the normal retirement age, which was 65 from 1970. In 1987 flexible retirement age provisions were added. This allowed pensions to be payable as early age 60, with a reduction of ½% per month (6% per year) for each month between the date of early retirement and age 65. Years between the date of early retirement and age 65 were dropped out of the calculation, so a maximum pension could be paid if maximum contributions were made for 85% of the period from age 18 to 60, i.e. not quite 36 years; such a pension is subject to the reduction just described. Even fewer years of contributions are required if the disability and/or child-rearing drop-outs are also applicable.

There is a corresponding increase of ½% per month if retirement is deferred beyond age 65, but with no increase beyond age 70, the maximum retirement age for purposes of the CPP.

Earnings Test

Originally there was an earnings test at retirement. For the years before age 70 was reached, the CPP pension was reduced by 50¢ for each $1 of earnings between $900 and $1500 per annum, and dollar for dollar for annual earnings in excess of $1500. This earnings test was removed in 1974.

Since 1987, pensions can be payable before age 65, provided there are no significant earnings from employment or self-employment. Significant earnings are defined as the maximum age retirement pension, which in 1995 is $8,558 per year. This test, however, is only applied at the date of retirement. If the member subsequently obtains employment, the CPP retirement pension is not reduced.

Survivor Benefits

It should be noted that these benefits include both a flat rate component and an earnings related component, as do also the disability benefits described next, The initial flat rate component is indexed with prices. Once in pay, both the flat rate and earnings-related component are indexed with prices.

There have been no changes in the rules regarding the number of contributions required in order for a benefit to be paid. Originally benefits, other than the lump sum death benefit, were payable only to widows who met the requirements with respect to their age or having dependent children, or to disabled widowers. This was changed in 1974 to extend survivor pensions to all widowers who met the qualifications with respect to age and/or dependent children, and to remove the disabled widowers' benefit.

Survivor pensions originally ceased upon remarriage, with provisions for reinstatement in the event of the death of the new spouse, or divorce. All provisions relating to remarriage were eliminated in 1987.

The survivor pension for many was also increased in 1987. Previously, for survivors age 65 and over, the survivor's pension was the greater of

(a) 60% of the deceased contributor's retirement pension minus 40% of the retirement pension earned by the survivor in his or her own right, and

(b) 37.5% of the decreased contributor's retirement pension,

subject to an overriding maximum in an amount, which together with the pension earned by the survivor in his or her own right, would equal the maximum retirement pension. This was changed to provide a basic survivor's pension of 60% of the deceased contributor's retirement pension, which would be greater than either (a) or (b), but subject to the same overriding maximum. For survivors between ages 60 and 65 in receipt of an early retirement pension, the maximum is the sum of the maximum retirement pension, adjusted for early retirement, and the flat rate survivor benefit. It was projected that this change would ultimately increase survivor's benefits by 25%

Orphans' Pensions

A flat rate pension, indexed with prices, is paid to surviving orphans under age 18 (or under age 25 if still at school). Originally, the full pension was payable only for the first four children, and a half benefit to the remainder. In 1987 the half benefit was increased to a full benefit, and double benefits were paid if both parents, if contributors, were dead; previously a benefit was paid only in respect of one CPP contributor. In 1992 the flat rate orphans' benefit was increased by $35 per month.

Disability Benefits

The definition of disability has not changed, although some recent comments by various observers suggest that it is being administered differently. The eligibility requirements have been changed, however.

Originally to be eligible for a disability pension three conditions with respect to contributions had to be met:

(i) contributions for at least five years, and

(ii) contributions for 1/3 of the contributory period, or ten years, whichever was the shorter period, and

(iii) contributions for 5 of the last 10 years.

This requirement was relaxed in 1987 to require only either

(i) contributions for 2 of the last 3 years, or

(ii) contributions for 5 of the last 10 years.

The flat rate portion, which is indexed with prices, was increased in 1987 by $142.32 per month, to make it equal to the flat rate portion under the Québec Pension Plan, which had changed its disability provisions a few year earlier.

Changes in the benefits to children of a person receiving a disability pension, similar to those for orphans described above, were also made in 1987.

Other

In addition there have been many other changes, mostly of a fairly technical nature, or having minor effects upon cost, which it is not proposed to describe. To give an indication of their nature, however, three will be mentioned. One prescribed the use of compound interest rather than simple interest in calculating arrears. Another allowed benefits to be paid in respect of an eligible child, even if the child was married, and so possibly no longer a dependent of the contributor. A third allowed for spouses of contributors, who were *bona fide* employees of the contributor, to make contributions and earn benefits. While none of these by themselves had a significant effect upon costs, virtually all of them had the effect of a slight increase in costs. The cumulative effect may well be more significant, but there has never been a costing of all these changes, which were made at different times, taking into account their cumulative effect.

Effect

As can be seen, a substantial number of changes, almost all of which were enhancements of benefits, have been made. They may be summarized as follows, with this being a more extensive list than that given earlier, though only the most important changes are shown:

- Limitations on the annual increase in covered earnings and on annual indexing of pensions during the first ten years removed with a retroactive effect.

- Reduction in the tranche of earnings on which contributions not required reduced from 12% to 10% of YMPE (the only change listed here that was not an enhancement). Child rearing drop-out added in respect of any years during which the contributor was caring for a child under age 7.
- Introduction of pensions payable as early as age 60 subject to a reduction of ½ of 1%. For each month between early retirement and age 65, with drop-out of the period from early retirement to age 65, although this change was designed to be cost neutral.
- An increase of ½% for each month that retirement was postponed after age 65 up to age 70.
- Elimination of the earnings test for periods up to age 70.
- Payments of pensions to all widowers who meet the age and dependency tests rather than only to disabled widowers.
- Survivor pensions continuing after remarriage.
- Increase in the maximum on combined pensions, if survivor also in receipt of a pension in own right.
- A doubling of benefits to orphans in excess of four.
- An increase in flat rate orphans' pensions.
- A less stringent contributory requirement to be eligible for disability benefits.
- An increase in the flat rate portion of disability pensions.
- Increases in the benefits paid in respect of the children of disability pensioners similar to those made for orphans.

Every time a material improvement was made the Chief Actuary at that time projected what the effect upon costs would be. The sum of all these material improvements was projected to be an increase in the pay-as-you-go cost of the CPP, over the 1964 projections, of 2.65% (or 265 basis points) in 2025. The actual increase, of course, may turn out to be more or less than this, depending upon the actual experience. As indicated earlier, there were other changes that were not expected to have a significant cost, and so were not specifically costed. An example of this was the amendment that allowed spouses who were *bona fide* employees to contribute to the CPP; after a detailed discussion, the Seventh Actuarial Report concluded that the effect would be "marginal", and did not show changes in the projected contribution rates. Most of them, however, would have tended to increase costs slightly.

In Appendix C is included the history of projected costs in the future from the various actuarial reports.

APPENDIX C

THE CANADA PENSION PLAN

Actuarial Aspects

In this appendix are considered in more detail the actuarial aspects of the CPP discussed in Chapter III of the paper; there is some duplication with Chapter III. Even more detail is available in Appendix B of the various Statutory Actuarial Reports; that in the Fifteenth Report occupied some 66 pages. It will be of interest primarily to the reader who wishes a deeper understanding of the actuarial methods and assumptions, and their implications, but may be skipped by the less technically minded. It thus supplements Chapter III. While it introduces some new material, and discusses some matters in greater depth, it does not change any of the conclusions reached in Chapter III.

What must be stressed and always remembered is that the cost of any pension plan depends upon its actual experience, and not upon the actuarial methods or assumptions. These can change the actual *incidence* of the contributions, but not the costs themselves.

The actuarial method employed determines *when* contributions are made, and the *slope* of the contributions. By slope is meant whether the contribution rate expressed as a percentage of contributory earnings is:

- low initially, but increases over the years
- more or less level
- high initially, but decreases over the years

The present value of the actual benefits, however, is the same, no matter what actuarial method or assumptions are used. Consequently the present value of the contributions to fund the benefits is also the same, no matter their incidence.

In a social security plan the actuarial method and valuation assumptions can thus affect which generation contributes how much. The actuarial assumptions can result in costs being understated initially, or overstated, relative to the actual experience that emerges, *i.e.* as a result of differences between the actual and assumed rates of

- mortality
- fertility
- disability
- immigration, etc.

but contribution levels will ultimately need to be changed to reflect the actual experience.

Actuarial Reports

Although the Canadian Institute of Actuaries has established standards for the valuation of pension plans, contained in its *Standards of Practice for Valuation of Pension Plans,* Section 1.01 of that document specifically excludes "social security plans, such as the Canada Pension Plan, the Québec Pension Plan, and the Old Age Security Act " from these standards. Nevertheless, in his valuations, the Chief Actuary has conformed to these standards, to the extent that they are applicable. In particular, he has conformed to Sections 2 (Data), 4 (Actuarial Assumptions), 5 (Asset Valuation), and 6 (Reporting). Because of the pay-as-you-go funding method employed, the one that is prescribed by the Act establishing the CPP, he could not conform with Section 3 (Actuarial Cost Methods), which applies only to funded private pension plans. Nevertheless, Appendix C to the Fifteenth Report gives both contributions and actuarial liabilities on the entry-age normal actuarial method of funding. Section 7 (Accounting for Pension Costs) does not apply since the actuarial valuations have not been prepared for accounting purposes, and Section 1 is merely an introduction.

Actuarial reports are required to disclose the purpose of the valuation, describe the data used, state the provisions of the pension plan, describe the actuarial methods and methodology used, disclose the actuarial assumptions used, and give the method used for valuing the assets. They must show the effective date of the valuation, and give a summary of the results in a form that can be understood and used. There should be a reconciliation with previous reports, usually referred to as a "gain and loss" analysis, that shows the effect of the various differences between the actual experience and the actuarial assumptions.

The name of the actuary performing the valuation must be given, as well as the individual or entity commissioning the report. The actuary must make a statement as to the accuracy of the data, the suitability of the actuarial assumptions and methods, and conformity with accepted actuarial practices. The actuarial reports on the CPP contain all this information, although they are not required to do so.

The CPP is also not subject to the federal Pension Benefits Standards Act, which applies to RPPs that fall under federal jurisdiction. The CPP valuation reports are, however, subject to scrutiny by the auditor-general, and various other internal auditing bodies.

At each quinquennial and triennial report the experience since the last valuation--the "inter-valuation experience" -- is monitored, and if necessary, in the judgement of the Chief Actuary, the actuarial or valuation assumptions are altered. (Actuarial assumptions are discussed below.) At each quinquennial valuation, contribution rates are scheduled for the next twenty-five years by the federal and provincial ministers of finance, with the target that the accumulated fund will be equal to two years of benefits.

Actuarial Methods

The methodology used by the Chief Actuary in all actuarial reports on the CPP, as described briefly in Chapter III, is quite different from that employed in the valuation of a private

pension plan. In the valuation of a private plan, the value of accrued benefits earned to the date of the valuation is always determined, as is a value for the assets. Certain actuarial funding methods also require a determination of the present value of benefits to be earned after the valuation date, which is considered to be a liability, and the present value of contributions to be made in the future, which is considered to be an asset. A contribution rate to fund benefits is determined, and also either an unfunded liability or a surplus, which is the difference between the assets and the actuarial liabilities.

In the CPP valuation, no present values of benefits or future contributions are calculated, (except in Appendix C to the 15th Report, and in corresponding appendices in earlier reports), but rather the amount of emerging benefit payments and contributions and investment income in each year of the projected period is calculated. The valuation is thus a cash flow study rather than a present value one. The contribution rate is essentially calculated as the amount required to cover benefits paid in that year, and to maintain a fund equal to approximately two years' of benefits payments, with a smooth pattern of changes in contribution rates from year to year.

Another difference from a private pension plan valuation is that data in respect of contributors and beneficiaries are used on an aggregate distributional basis, rather than an individual one. Because the coverage under the CPP is so large, and the covered population changes only slowly, and in a predictable way, it does not make sense to incur the expense of processing at the level of an individual when an aggregate distributional approach is cheaper, and gives essentially the same results. A population projection of Canada (excluding Québec) is used as the base from which contributors and beneficiaries are derived.

As well, projected future contributors are incorporated in the calculations; these projected contributors may be either those too young to contribute at present, including those not yet born, and those who have not yet immigrated. This contrasts with the vast majority of private pension plan valuations, which use a snapshot of the present plan members at a particular period in time.

Finally, the treatment of the interest rate employed is a bit different. The rate used in CPP valuations is that actually being earned on the present assets, taking into account the period for which it is guaranteed, plus that expected to be earned on future investments, which includes the reinvestment of existing assets, again for the applicable guaranteed period. This method thus simulates very closely the portfolio of bonds with different terms and interest rates in which the CPP fund is actually invested. Most, although not all, private plan valuations use one average rate of interest.

This methodology is consistent with the practice used in other countries for their social security plans. There are, of course, many differences in the detail of the calculations between countries. Of specific relevance, the methods used are by and large consistent with those used in the USA.

So far there have been fifteen actuarial reports on the CPP, not counting the one in November, 1964, the last prepared before the plan's inception on January 1, 1966. The legislation requires an actuarial review every five years, which is for the purpose of setting contribution rates for the next twenty-five years. A private member's bill in 1986 requires an

actuarial report at least every three years, for the purpose of reviewing the experience, without removing the necessity for the quinquennial review for setting contributions. There are thus both five and three year cycles for preparing the actuarial reports, which sometimes coincide, and the reports prepared are referred to as either quinquennial or triennial reports. In addition, any proposed amendment that, in the opinion of the Chief Actuary, involves a significant change also requires an actuarial report. Sometimes the effects of such amendments are incorporated in a quinquennial or triennial report, while at other times an interim report is prepared, with the cost being derived from the most recent quinquennial or triennial report, using its assumptions unless new ones must be introduced.

The First (1969), Second (1972), Third (1973), Sixth (1977), Eighth (1982), Tenth (1985), Eleventh (1988), Fourteenth (1991), and Fifteenth (1993) Reports are all detailed reports, prepared as of December 31 of the year indicated, and are either quinquennial or triennial reports The Fourth, Fifth, Seventh, Ninth, Twelfth, and Thirteenth are much briefer interim reports, describing and costing changes tabled in the House of Commons, and deriving their results from the last preceding detailed report, using the assumptions in that report, with any necessary modifications that the change being costed may require.

Valuation Assumptions

Assumptions for the purposes of an actuarial valuation may be divided into demographic and economic ones.

Most of the assumptions are not static, but vary with the year to which they are projected. The term “select and ultimate” applies to these, and this will now be explained. The ultimate rate is a level rate, used after some date in the future, The select rates are those used from the date of the valuation to the date at which the ultimate rates apply. The first select rate in the schedule of such rates is usually quite close to that being currently experienced, and the rates increase or decrease until they reach the ultimate rate. Different select periods may be used for different assumptions.

An example will clarify this. In the Fifteenth Actuarial Report (1993) actual rates of increase in the prices and earnings were used up to 1994; although prepared as of December 31, 1993, the Chief Actuary was able to use the preliminary actual rate for 1994 in his projections, as the report was not released until early 1995, because of the necessary time required to perform the valuation. From 1995 to 1999 he used rates designed to blend smoothly into the ultimate rates used from 2000 on. Here the select period is for six years, from 1994 to 1999. For other assumptions with a select period, a different select period may be used. The select period for the same assumption may also vary from report to report.

The following table gives the annual rates of increase assumed for both prices and wages in the Fifteenth Actuarial Report. Those shown from 1994 to 1999 are the *select* rates, while that for the years 2000 and on is the *ultimate* rate.

Year	Increase in Prices	Increase in Wages
1994	0.0%	1.9%

1995	1.0%	2.0%
1996	1.5%	2.5%
1997	2.0%	3.0%
1998	2.5%	3.5%
1999	3.0%	4.0%
2000 and beyond	3.5%	4.5%

I shall generally concentrate on the ultimate assumptions in this paper, but I will usually mention the length of the select period, though not usually the specific rates in the select period.

The terminology "select and ultimate" derives from life insurance where the mortality experience in the years shortly after the issuing of an insurance policy was lower than normal, and thus called "select," because the insured life had passed a medical examination in order to obtain the policy.

Demographic Assumptions

The major demographic assumptions associated with actuarial reports on the CPP include rates of disability incidence, fertility, mortality, and migration. Secondary demographic assumptions include the ratios of earners and contributors to the population, which vary by age and sex, the average employment, pensionable, and contributory earnings of contributors, the degree and amount of credit splitting on marital breakdown, the employment mobility rate, the utilization of the child rearing drop-out, the effect of contributions made after age 65, the proportion electing retirement at an age other than 65, disability termination rates, the proportion of contributors married at death, and the number of children they have, the age distribution of such spouses and children, and the distribution, by amount, of the average retirement pension expressed as a proportion of the maximum pension.

All of the assumptions are compared with the actual experience, and the effect of deviations of the actual experience from that assumed is shown. If the experience warrants a change in the actuarial assumptions, in the judgement of the Chief Actuary, such a change is made, and the effect of it shown.

Economic

In contrast to the demographic assumptions, there are only three major economic assumptions

- the annual rate of increase in wages
- the annual rate of increase in prices
- the rate of interest earned on the CPP fund

although there are a few minor ones as well; for a description the reader is again referred to Appendix B of the Fifteenth Actuarial Report.

Effects

Valuation assumptions for the CPP are determined from a slightly different perspective than those in the private sector. For private plans there has been a traditional emphasis on conservative assumptions, both to protect plan members in case of the bankruptcy of the plan sponsor, and to protect the plan sponsor from sudden increases in the pension cost. This has often led to the development within the pension plan of surplus, which could be used either to increase benefits for members, or to reduce future contributions by either the members or the sponsor, or both.

In the CPP the aim has been to have contributions and investment income sufficient to pay benefits, and to maintain a modest contingency fund. There is no plan sponsor as such, and no reason to have contributions any higher than the minimum amount necessary. Hence the actuarial assumptions tend to be realistic, without margins introduced solely for reasons of conservatism.

An example may help to clarify this. Both the CPP and private plans assume that rates of mortality will decrease in the future. While a private plan might conservatively assume that the rate that will apply from the year 2025 on, say, will also apply at present, the CPP starts with the current rate and reduces to the ultimate rate over time. The private plan follows the former procedure both because it is technically simpler, and because the conservatism should result in a surplus and a stabilization of employer costs.

The effect of the various assumptions must be understood in order to see the effects upon both contributions and benefits: some assumptions have a greater effect upon contributions, and others upon benefits. Increases in wages will increase contributions immediately and will ultimately increase benefits that are based on earnings, but do not increase benefits already in pay. On the other hand, increases in prices will increase benefits in pay, but do not, *ceteris paribus*, increase contributions, or the initial level of future benefits that are based upon wages.

A drop in fertility rates eventually decreases the number of contributors, and so reduces future contributions; future benefits are decreased ultimately as well, but the decrease in contributions occurs much sooner. Orphans' benefits, and benefits for the children of disabled contributors, decrease before retirement benefits do, but they are a minor item.

An increase in immigration increases contributions immediately, and benefits ultimately, but again the first effect occurs much sooner.

A decrease in mortality, assuming it occurs at all ages, as it almost always does, increases the number of contributions made, defers the payment of death benefits, and increases the period of time during which retirement pensions are paid. An increase in disability, or an increased utilization of the early retirement provisions, reduces the number of contributors, and so contributions, and means that benefits are paid sooner, though possibly in lesser amounts. The periods during which the pensions are paid will also change, probably decreasing in the event of disability, and increasing in the event of early retirement. Credit-splitting on marital breakdown moves benefits from one contributor to another person, who may not have been a contributor, with a different age and sex, with complex results.

As already mentioned, the actuarial assumptions are continually tested against experience and modified when necessary. This will become apparent as changes in the assumptions are described.

Actuarial Reports--Presentation

The form in which the results were presented changed during the early years, but has subsequently been maintained ever since the Third Report in 1973. The 1964 Report showed "short range" estimates, covering the first ten years up to 1975, and "long range" ones, covering the period up to 2050. Results were shown for two different assumptions for the increase in earnings, and on a "high cost", "low cost", and " intermediate cost" basis, *i.e.* six different results. The "high cost" scenario assumed higher increases in prices, and lower rates of fertility and immigration, while the "low cost" scenario assumed lower increases in prices, and higher rates of fertility and immigration.

The First Report (1969) showed results on the basis of "reasonable stability" and "moderate inflation", with the latter using higher rates of interest and of increases in prices and earnings. Results were only projected to 2000. The Second Report (1972) maintained this format, but projected results to 2025. The Third Report (1973) dropped the "reasonable stability" basis, as experience was not conforming to it. All subsequent reports have presented results on only one basis, but with sensitivity tests included to show the effects of varying various individual assumptions. The Sixth Report (1977) projected costs to 2050, while the Eighth (1982) and all subsequent reports have projected costs to 2100.

Next we shall describe the changes in the main assumptions that have occurred over the years.

Changes in Economic Assumptions

The 1964 Report showed, for its "long range" projections, which were after ten years, results at an annual rate of increase in earnings of both 3% and 4%. Prices increased at 1.5% per annum for the "low cost" figures, and at 2% per annum for the "high cost". The rate of interest was 4% per annum. All of these assumptions applied after the ten-year select period.

The First Report (1969) had a select period running to 1975. For the "moderate inflation" scenario, the ultimate annual rates of increase were 5.5% for earnings and 3.0% for prices, with interest at 6.5%. For the "reasonable stability" scenario, these rates were decreased by 200 basis points, i.e. to 3.5%, 1.0%, and 4.5%. The Second (1972) and Third Report (1973) made no changes, but the latter no longer showed the results on the "reasonable stability" basis since it had clearly become inappropriate. The Sixth Report (1977) merely made the ultimate rates apply from 1983 on.

The Eighth Report (1982) reduced the ultimate rate of increase in earnings to 5.0%, and had the ultimate rates start in 1993. The Tenth Report (1985) decreased the ultimate interest rate to 6.0%, and had the ultimate rates first apply in 1995. The Eleventh Report (1988) reduced the ultimate rate of increase in earnings to 4.8%, and ultimate rates applied from 1998 on. The

Fourteenth Report (1991) further reduced the ultimate rate of increase in earnings to 4.5%, and had the ultimate rates start in 2000. The Fifteenth Report (1993) maintained the ultimate assumptions of the Fourteenth Report, although the select assumptions changed somewhat.

The significant change here is the increase in the spread between wages and prices from 100 or 200 basis points in the 1964 Report to 250 basis points in the First Report (1969), and the subsequent narrowing, in stages, of the spread to only 100 basis points in the Fourteenth (1991) and Fifteenth (1993) Reports. The overall effect of this change is to increase costs from those in the First Report, because it reduces contributions by more than it does benefits.

Changes in Demographic Assumptions

Mortality

The rates of mortality have always been based on the most recent Canada Life Tables, derived from census returns, and prepared by Statistics Canada. A full-scale census is made every ten years, in years ending in "1". A mini-census is performed in years ending in "6". Mortality Tables are constructed from the census data, and labelled *Canada Life Tables 1980-1982,* for example. These tables are not available until two to four years after the census. Thus for both the Fourteenth (1991) and Fifteenth Reports (1993) the most recent tables available were those for 1985-1987.

Allowance was made for mortality improvements in all the actuarial reports, based on the rate of reduction in mortality rates experienced in the past. The techniques used by social security actuaries in the United States were studied, and used as input for forecasting improvements in Canada.

In the initial reports mortality was projected to improve only until 2000. In the Sixth Report (1976), improvements were forecast to continue until 2050, and there was a reduction in mortality rates at the higher ages. The Eighth Report (1982) utilized the most recent experience available, which resulted in a marked drop in mortality rates at all ages. The Tenth Report (1985) again reflected the most recent experience, which indicated a further substantial reduction in mortality rates. The method of moving from current actual mortality to the assumed future rates was refined, but the methodology was still essentially that of the US Study.

The Eleventh Report (1988) continued to reflect the continuing improvement in mortality, and now the improvements were assumed to continue to 2100. There was a substantial reduction in mortality rates, even though allowance was made for the first time for the expected extra mortality resulting from AIDS. The Fourteenth (1991) and Fifteenth (1993) Reports made no changes, as no new mortality experience had been published in the interval.

The overall effect of the improved mortality has been that retirement benefits are paid for a longer period, more contributions are made, and death benefits are paid later. The overall effect is an increase in the contribution rate required to finance the benefits.

Fertility

In the 1964 Actuarial report it was noted that Canadian birth rates were then considerably higher than those for almost all other developed countries. In 1960 Canadian birth rates were perhaps 10% higher than those in the United States, Australia, and New Zealand, and about 50% higher then in England, France, Germany and Italy. This period was at the end of the "baby boom." A quotation from a US study said "Previous estimates of future fertility have generally been too low... It seems clear that a decrease must eventually occur, since the population cannot go on increasing indefinitely." That is to say that the demographers had not predicted the baby boom, but noted that it could not continue.

The earlier actuarial reports used an assumption with respect to a "net reproduction rate." The net reproduction rate corresponds to the rate of increase in the population resulting from fertility, and is the number of female children each female will bear. A net reproduction rate of 1.000 is the rate which would stabilize the size of the population, assuming no immigration and no improvements in mortality. In the "high fertility" scenario it was assumed that the then current net reproduction rate of 1.811 would gradually increase to 1.859 in 2000 and remain level thereafter; in the low fertility scenario it was assumed that the current net reproduction rate would decline to 1.000 by the year 2000, and remain level thereafter. It should be remembered that some females will die before reaching the reproductive age, that others will not have children at all, and that more male children are born than female children, so a net reproduction rate of 1.000 assumes that each female who has children bears somewhat more than two children on average.

As we now know, birth rates declined markedly at the end of the baby boom, and a "baby bust" ensued. The First Report (1969) lowered the net reproduction rate to 1.000 for all years, and this assumption was maintained in the Second (1972) and Third (1973) Reports. Thus, from the very beginning, an allowance was made for a substantial decrease in the fertility rate, but as will be seen, fertility decreased more than had been projected.

In the Sixth Report (1977) the methodology and terminology was changed. The change was to assume a "total fertility rate", rather than a "net reproduction rate". A total fertility rate is the number of children each female will bear over her reproductive years. A total fertility rate of 2.112 corresponds approximately to a net reproduction rate of 1.000.

The total fertility rate assumed was 1.875 in 1974, the then current level, increasing to 2.112 in 2000. In the Eighth Report (1982) the ultimate level of total fertility was reduced to 2.000, still being reached in 2000. In the Tenth Report (1985) the ultimate rate was not assumed to be reached until 2010. In the Eleventh Report (1988) the ultimate rate was reduced to 1.850, still being reached in 2010. In the Fourteenth Report (1991) the rates were maintained, but the ultimate rate was now reached in 2000 as there was some evidence that fertility rates were increasing a little faster than previously assumed. The Fifteenth Report (1993) maintained the ultimate assumptions of the Fourteenth Report.

In all of these reports the current level of fertility, which in all cases was lower than the ultimate rate, was assumed to increase to the ultimate level. For example, in the Fifteenth Report (1993) the current level was 1.710. All the rates quoted are for all of Canada, including Québec,

which experienced lower rates than the rest of Canada; the rates used in the calculations in all the reports were those that applied to Canada excluding Québec.

The short-term effect of lower fertility rates is minor. The mid-term effect is to reduce the number of contributors, and so total contributions, (assuming no change in contribution rates), without any immediate effect upon benefits, with the exception of orphans' benefits, a minor item. This results in increased contribution rates. In the long term there will be fewer receiving benefits, with contributions stabilizing, with a reduction in absolute costs, but an increase in contribution rates. This last effect will not occur, however, until at least sixty years in the future.

Immigration

As used in the reports, this term refers to *net* immigration, i.e. the excess of immigrants over emigrants. The 1964 Report assumed for its high immigration scenario net immigrants of 100,000 per year in all years, while the "low" assumption was 40,000 per year. The First Report (1969) assumed immigration of 100,000 in 1969, with immigration in future being 0.5% of the Canadian population. The Sixth Report (1977) made a slight change, to reflect the experience, reducing the number of net immigrants each year by about 7%. The Eighth Report (1982) made a substantial reduction, changing the number to 0.32% of the population. The Tenth Report (1985) decreased the percentage to 0. 302%, and the Eleventh Report (1988) increased the percentage to 0.40%, which was continued in the Fourteenth (1991) and Fifteenth (1993) Reports.

The effect of immigration is to increase the number of contributors immediately, as about 65% are of working age. This proportion is likely to continue despite the attention given to family reunification. The changes in immigration policy announced in the fall of 1994 should tend to increase the number of contributors, unless emigration is affected to the same extent. The increase in benefits comes later. Thus increased immigration lowers contribution rates in both the short and mid-term.

Disability

The original rates of disability incidence were derived from experience in other countries, and were maintained until the Sixth Report (1977), at which time they were increased substantially based on the actual Canadian experience. The Eighth Report (1982) made a slight increase, and the Eleventh Report (1985) increased the rates by a further 10% to 15%, depending upon the age. The Fourteenth Report (1991) made a substantial increase in the assumed rates.

Disability rates have remained higher than previously expected since 1991. While work is being done to identify the cause, no one cause has yet been determined. There has been a similar increase in disability rates under OASDI in the United States, although not under the QPP. It is not, however, expected that disability rates will revert to previous levels. As a result, the Fifteenth Report (1993) increased the ultimate disability rates for males by 23% and for females by 140%. Ultimate disability rates are now unisex. Previously, the rates had been sex specific, with lower rates applying to females than to males.

Termination rates for disability benefits have decreased, which means that disability recipients are neither dying nor recovering as fast as before. Consequently disability benefits are being paid for a longer period. Adjustments were also made in the Fifteenth Report (1993) to reflect this.

Increases in disability incidence rates increase costs both because contribution income is reduced, and benefits are paid sooner, than would happen in the absence of disability.

Flexible Pension Retirement Age

Assumptions with respect to this were first introduced in the Eleventh Report (1985), when Bill C-116 was tabled in the House of Commons. Previously, they were unnecessary as this provision did not exist. The Eleventh Report assumed that 25% of males would retire at age 60 and 40% at age 65, with the balance retiring at intermediate ages. The corresponding assumptions for females were 40% and 25%. The Fourteenth Report (1991) revised these assumptions to reflect the experience that occurred between the valuations ("the inter-valuation experience"). The figures for males were changed to 31% at age 60 and 36% at age 65; the corresponding assumptions for females were 35% and 35%. This change reflected a trend towards earlier retirements. The Fifteenth Report (1993) revised the figures for males to 31% and 38%, and for females to 35% and 37%.

The short-term effect is an increase in costs since some contributions stop and some benefits, although in a reduced amount, start to be paid. Initial benefits are reduced both because of the reduction for early retirement, and because benefits will be based on the YMPE at the date of early retirement, which will almost certainly be lower than the YMPE at age 65. The ultimate effect will be negligible if the earlier benefits are actuarially equivalent, as they approximately are, but the short term effect can well be an increase in costs, albeit a temporary one. The introduction of early retirement resulted in a draw down upon the fund in the short term, and a sharp drop in the ratios of the fund to annual expenditures.

Effect of Changes in Actuarial Assumptions

Virtually all of the changes in the actuarial assumptions have had the effect of increasing costs. While, with the benefit of hindsight, it might be suggested that the original actuarial assumptions were erroneous, it must be remembered that there was little or no criticism of the assumptions by the actuarial community at the date of release of each actuarial report.

Few predicted either the dramatic improvements in mortality or the continuing low fertility rates. Neither were the high rates of inflation that were experienced throughout the 1970's and 1980's predicted; as late as 1970 the increase in the Consumer Price Index was only 1.31% The average rate of inflation in the 60's was 2.6%, compared to 7.6% in the 70's and 6.2% in the 80's.

Similarly, few predicted the reduction in economic productivity, which is reflected in the narrowing of the spread between wage and price increases. From 1964 to 1984 the average

spread was 185 basis points, while from 1984 on the average spread has been near zero, if not negative.

Private pension plans have also had to make similar changes because of changes in the economic and demographic experience from those assumed. In some areas private plans may have made fewer changes, because, for example, a more conservative assumption with respect to mortality had been made for technical reasons in the first place, as described earlier. Conversely some private plans may have made more drastic changes in their economic assumptions, because of both investment returns and rates of inflation that were much higher than anticipated. The latter usually resulted in higher costs which were then offset by using a higher rate of investment return. There are also many assumptions that private plans need not make, such as those with respect to fertility and immigration, because they have no relevance to private plans, while they are important for the CPP. Further, private pension plans rarely provide substantial disability benefits.

Changes in the assumptions for private plans may be made less frequently in some areas because, with a smaller number of members, their own experience may be less significant in itself, and are based on overall averages rather than ones specific to the plan. For example, a pension plan with only a hundred members might have three deaths in a year, if members died in a common accident; equally it might have none. The plan's actuary will not assume a continuation of mortality at either of these levels, but will use a standard mortality table. With the significant experience that the CPP generates, even relatively minor changes need to be made as soon as possible.

The effect of the changes in actuarial assumptions, estimated in the various reports in which they were made, is an increase in the projected pay-as-you-go rates for 2025 of 570 basis points. 48% of this change came from the changes in the economic assumptions. Of the 297 basis points resulting from changes in the demographic assumptions, 51% have come from the increased allowance for disability, and 24% have resulted from improvements in mortality. There was a further increase of 3 basis points from changing from the "low-medium-high" sets of assumptions in the 1964 Report to the unique set in the later reports, and from other changes in actuarial methodology.

Costs

The table following shows the costs estimated for the CPP in the various actuarial reports for the years 2000, 2025, and 2050. For the 1964 Report are shown the "intermediate cost" results assuming a 4% increase in wages, as probably being closer to the assumptions in the First Report (1969) than any of the other scenarios; none of the scenarios in the 1964 Report are identical to those in subsequent reports. For the First (1969) and Second (1972) Reports the figures shown are for the "moderate inflation" scenario, which were the only ones given in the Third Report (1973). All reports from the Third (1973) on showed results on only one set of assumptions, with sensitivity tests to indicate the effect of changes in the assumptions.

Some of the earlier reports did not show figures for 2025 and 2050, and this is indicated by "NA". The table also shows figures from some of the interim reports that costed the effect of

various amendments; these figures were essentially derived from the preceding quinquennial or triennial report. As mentioned earlier, the 4th, 5th, 7th, 9th, 12th, and 13th are interim reports, while the remainders are either more detailed quinquennial or triennial reports. Some of the interim reports indicated that the amendment had no substantial effect upon costs. All reports are at December 31 of the year indicated.

PAY-AS-YOU-GO CONTRIBUTION RATES
FOR CERTAIN YEARS
FROM ALL THE ACTUARIAL REPORTS
AS A PERCENTAGE OF CONTRIBUTORY EARNINGS

SOURCE	COST IN 2000	COST IN 2025	COST IN 2050
1964	4.88	5.11	5.31
First (1969)	4.46	NA	NA
Second (1972) as is	4.44	6.08	NA
Proposed	5.11	6.90	NA
Third (1973) as is	5.11	6.90	NA
Proposed	5.85	7.91	NA
Fifth (1973)	5.86	8.21	NA
Sixth (1977)	5.53	8.62	8.76
Eighth (1982)	6.08	10.12	10.47
Tenth (1985) as is	6.34	10.44	10.99
Proposed	6.75	11.27	11.49
Eleventh (1988)	7.43	12.20	13.04
Twelfth (1988)	7.47	12.23	13.06
Thirteenth (1988)	7.49	12.24	13.07
Fourteenth (1991)	7.66	12.40	12.97
Fifteenth (1993)	8.25	13.49	14.11

The figures show an increase in the cost in all reports after the first, resulting either from improvements in the CPP or changes in the actuarial assumptions. It is unfortunate that, with the exception of the 1964 Report, no reports until the Sixth (1977) gave costs for the year 2050, and that the First Report (1969) did not give costs after the year 2000. Costs in the Fifteenth Report (1993) are 337 basis points higher in 2000 than indicated in the 1964 Report; those in 2025 are 828 basis points higher, and those in 2050 are 880 basis points higher. As indicated elsewhere in this paper, 265 basis points of the increase in 2025 of the Fifteenth Report (1993) over the 1964 Report come from changes in plan provisions, 514 basis points from changes in actuarial assumptions, and 59 basis points from changes in actuarial methodology.

The increases in cost are certainly in line with the original projections, taking into account both the changes in the plan that have occurred, and the changes in the actuarial assumptions that the experience has warranted.

Sensitivity Tests

At this point it is worth looking at the changes in the costs in the Fifteenth Report (1993) that would occur if the experience deviated from that assumed. These are contained in the *Sensitivity Tests* in the report. This is not to say that any, (or all), of these changes are expected to happen. The sensitivity tests are merely a tool to allow interested readers to determine the effect of possible changes, if, in their judgement, the experience will change.

For consistency in presentation all changes are shown in such a way that they result in *decreases* in costs. This is not to imply that cost increases cannot occur. If the change is in the opposite direction from that indicated, which is just as likely since the valuation assumptions are best estimates, the effect would be an increase in costs.

These decreases are all expressed as percentages of contributory earnings. Thus a decrease in cost of 0.13% in 2025 means the pay-as-you-go cost for that year reduces from 13.49% to 13.36%.

DECREASE IN CPP PAY-AS-YOU GO COST CAUSED BY CHANGE INDICATED

	2025	**2050**
Pay-as-you-go cost from Fifteenth Report	**13.49**	**14.11**
Fertility rates are 0.10 higher than assumed	0.13	0.56
Immigration is 10% higher than assumed	0.16	0.20
Annual mortality reduction factors are 10% less than assumed	0.06	0.14
Earnings increase by 0.25% more than assumed	0.38	0.51
Prices decrease by 0.25% less than assumed	0.34	0.47
Interest is 1.0% higher than assumed[38]	--	--
Disability rates are 0.5 lower than assumed	0.22	0.22

Some examples in the use of this table will be helpful. If earnings were to increase by 25 basis points more, *i.e.* earnings increase by 4.75% per year rather than the 4.5% assumed, then costs in 2025 would be 38 basis points lower. Conversely if earnings increase at only 4.25%, then costs in 2025 would be 38 basis points higher than projected in the 1993 Report. If both prices and earnings were to increase by 25 basis points more than assumed, the changes would largely offset each other. And if earnings were to increase by, and prices to decrease by, 25 basis points more than assumed, then the costs in 2025 would reduce by 72 basis points, as the

[38]A change in interest rate does not affect pay-as-you-go rates at all, although it does affect contribution rates. The change indicated would decrease contribution rates in 2025 by 0.14 and increase contribution rates in 2050 by 0.02.

increase in initial benefits, which are related to wages, would have a greater effect. Finally, a decrease in disability incidence rates of 100 basis points would reduce costs by 44 basis points.

For changes at the level shown, which were those shown in the Fifteenth Report (1993), the effect of changes in either prices or earnings is more pronounced than virtually any other change. This is not to say that the levels shown are the likely levels of changes. As the example just given indicates, even more important are changes in the spread between the increases in prices and wages.

It is thus quite possible, though perhaps not too probable, for the projected costs to vary by as much as 100 basis points in either direction. Perhaps what should be kept in mind is the ultimate assumptions with respect to the increase in earnings and prices: 4.5% and 3.5% respectively, both well above those being experienced at present, and even more important, the spread between them, which is assumed to be only 100 basis points, a much smaller amount than in the earlier reports, but more than is currently being experienced. A reversion to the spreads both experienced and assumed earlier would have a great effect upon the costs, reducing them considerably.

Conclusion

It must be remembered that actuarial methods and assumptions alter only the incidence of the contributions, and not the actual ultimate costs, which depend upon the experience. As has been shown, the evolving experience has resulted in changes in the actuarial assumptions, with an increase in the contribution rates required. Perhaps the most important factor affecting the costs, both actual and assumed, is the spread between the rate of increase in wages and prices, which is by far the most difficult to predict. As has been revealed by the Fifteenth Report, disability is a very important factor. The improvement in longevity is also most important, but actuaries have generally been successful in allowing for this.

Immigration is also important, and is more difficult to predict. While there may be virtually no limit on the number of people wishing to immigrate, the number is set by government policy, which in turn reflects the attitudes of Canadians to immigrants. Future levels of fertility are important, and have always been most difficult to predict. The baby boom was largely unforeseen, as were the continuing low levels of fertility after its end. Neither was the dramatic lowering of fertility rates in Québec, which went from having perhaps the highest rate in Canada to having the lowest in a short period. Neither actuaries nor demographers have been very successful at forecasting changes in fertility. Both immigration and fertility are affected profoundly by social attitudes, and the changes in them, neither of which are particularly susceptible to mathematical analysis.

APPENDIX D

THEOREM REGARDING THE INTERNAL RATE OF RETURN

To be demonstrated

For an earnings-related pension plan that is financed on a pay-as-you-go basis, the internal rate of return is equal, under stabilised conditions, to the assumed rate of increase in total employment earnings, and hence to the projected annual rate of increase in either contributions or benefits. *Stabilised conditions* means economic projections based on constant economic assumptions (rates of increase in average employment earnings and in prices) and on an initial stabilised population projected using its underlying constant demographic assumptions (fertility, migration and mortality). For example, a stabilised population does not necessarily itself remain constant over the years but is deemed to increase at a constant annual rate of increase.

Definitions

x **= age last birthday**

p **= assumed constant annual rate of increase in the population by age, sex and calendar year**

s **= assumed constant annual rate of increase in average employment earnings by age, sex and calendar year**

e **= (1+*p*)*(1+*s*) - 1 = assumed constant annual rate of increase in total employment earnings by age, sex and calendar year**

B_x^n = *Total benefits payable during year n at attained age x of beneficiaries*

S_x^n = *Total employment earnings during year n at attained age x of contributors*

PGR = pay-as-you-go rate

Derivation

As shown in Pierre Treuil's note (appendix E) FUND DEVELOPMENT OF AN EARNINGS-RELATED SOCIAL INSURANCE PLAN UNDER STABILIZED CONDITIONS, under stabilised conditions, the PAYGO rate is constant over the years. This means that irrespective of the value "n" (year),

$$PGR = \frac{\sum_{x=65}^{\omega} B_x^n}{\sum_{x=18}^{64} S_x^n}$$

The following demonstration rests on the implicit assumption that labour participation rates are constant over the years. To measure the internal of return underlying the financial transaction consisting of contributions and benefits in respect of a given cohort of people (i.e., all persons born in a given calendar year of birth), the present value of the cohort's contributions must be confronted with the present value of the cohort's benefits, and the rate of return that renders equal these two entities must then be found one way or another (e.g., isolation, trial and error). Under static conditions (i.e., static assumptions regarding all economic and demographic factors, like employment, inflation and fertility rates) this financial transaction corresponds to:

Present value of contributions = Present value of benefits

Therefore,

where v corresponds to the present value (discounting factor) using the rate IRR (i.e., $v=(1+IRR)^{(x-18)}$ and

the subscript IRR means internal rate of return and corresponds the unknown rate at which values are discounted.

Isolating the PGR in the equation above, one gets

$$PGR = v_{IRR}^{47} * \frac{\sum_{x=65}^{\omega} v_{IRR}^{x-65} * B_x^{(n+x-65)+47}}{\sum_{x=18}^{64} v_{IRR}^{x-18} * S_x^{n+x-18}}$$

But under stabilised conditions, even for a price indexed plan,

$$B_x^{n+1} = B_x^n * (1+e)$$

and

$$S_x^{n+1} = S_x^n * (1+e)$$

Therefore, replacing these values for B and S in the equation for the PGR above, we have

$$PGR = \frac{v_{IRR}^{47} * \sum_{x=65}^{\omega} v_{IRR}^{x-65} * B_x^n * (1+e)^{x-65+47}}{\sum_{x=18}^{64} v_{IRR}^{x-18} * S_x^n * (1+e)^{x-18}}$$

Setting IRR equal to "e", the above equation reduces to

$$PGR = \frac{v_e^{47} * \sum_{x=65}^{\omega} B_x^n * (1+e)^{47}}{\sum_{x=18}^{64} S_x^n}$$

which finally reduces to

$$PGR = \frac{\sum_{x=65}^{\omega} B_x^n}{\sum_{x=18}^{64} S_x^n}$$

This expression for the PGR remains having replaced IRR by "e", a correct expression for the PGR since it corresponds to its definition under stabilised conditions. Therefore, "e", the rate of increase in total annual employment earnings, is a solution for the internal rate of return IRR. It can be demonstrated that this solution is unique, but it is not the intention of this study to go into this kind of developments.

Obviously, if someone assumes constant rates of increase "p" and "s" for an earnings-related retirement pension plan financed on a pay-as-you-go basis, the resulting IRR is automatically equal to "e" (where (1+e) = [1+p]*[1+s]) irrespective of the plan replacement rate. On the other hand, the higher the replacement rate, the higher the (constant) PGR, but the IRR remains equal in any case to "e".

The rest of this note is devoted to providing examples of some practical applications of the above relationship, i.e., under stabilised conditions, the IRR is equal, in respect of an earnings-related plan purely financed on a pay-as-you-go basis, to the assumed rate of increase in total employment earnings, and hence, to the projected annual rate of increase in either contributions or benefits.

Even if economic and demographic assumptions used for CPP actuarial reports were to reach their ultimate relatively soon (i.e., about year 2000), the resulting projected total employment earnings would not increase at a perfectly constant rate because of the non stabilised status of the initial starting population. However, due to the long projection period involved, the variations in the annual rate of change (increase) in the population tend to level off over the years. Therefore, using the projected average geometric increase in the population from 2075 to 2100 (e.g., using figures on page 41 of the

fifteenth CPP actuarial report, TOTPOP2100/TOTPOP2075 - 1 = 0.37%) and the assumed ultimate rate of increase in average employment of earnings (4.5%) should be valuable in approximating the IRR of future cohorts of retirees. The calculation yields (1.0037)*(1.045) - 1 = 4.89% as the approximation.

This approximation for the value of the IRR of ultimate cohorts underestimates the exact result, e.g., 5.1%, for the cohort of contributors reaching age 65 in 2077 obtained keeping track of contributions and benefits for that specific cohort as shown earlier in this study. The discrepancy between the exact and the approximated value for this IRR is not caused entirely by the approximation. Some of it is caused by the higher rate of increase in population at higher ages, which is due to the higher mortality improvements at higher ages.

This approximated IRR can accordingly be improved by using the particular population increase at ages 65 and over rather than the overall increase in the population (our focus here does not allow to prove in detail that under such condition, i.e., population increasing at retirement ages *r* at a constant rate p_r higher than the constant population increase p_c for contributing ages *c*, the theoretical IRR is obtained using p_r rather than the overall population increase p). Using corresponding figures on page 41 of the CPP fifteenth report, the average population increase form 2075 to 2100 at ages over 65 is 0.533%, i.e., $[(8771/7680)^{(1/25)}-1]$. The improved IRR using this demographic increase is 5.06%, i.e., 1.00533*1.045. And 5.06% is closer to 5.1% than 4.89%.

A simpler but not as accurate approach to approximate the IRR using projections of the actuarial reports is to calculate the long-term annual increase in contributions or benefits. Indeed it was demonstrated above that under stabilised conditions the IRR is equal to the increase in total employment earnings, and under a pure PAYGO plan, expenditures equal contributions. Using relevant figures on page 6 of the fifteenth report for 2075 and 2100, the approximated IRR is 4.97% using contributions (4760851/1416607 - 1) and 4.96% using expenditures (4868777/1451202). These values are both close to the IRR of 5.1% computed for the cohort born in 2012, which does to some extent validate the CPP actuarial projections.

Another interesting relationship, also demonstrated in Pierre Treuil's note *FUND DEVELOPMENT OF AN EARNINGS-RELATED SOCIAL INSURANCE PLAN UNDER STABILIZED CONDITIONS* (reproduced in Appendix E), is that if, under stabilised conditions, "e" (alternatively the IRR) is equal to the interest rate "i", the PGR is equal to the full cost rate. One may then wonder what could make the CPP PGR equal to its full cost rate. This depends on the choice of economic and demographic assumptions, and obviously an indeterminate number of scenarios could be imagined. A simple one is to look only at the total fertility rate. The matter is to find what, instead of 1.85, should be assumed to raise the population annual rate of increase from 0.53% to 1.435% (i.e., 1.06/1.045 - 1). Computer runs made using the CPP actuarial model lead to an answer for the fertility rate of about 2.5. Another scenario consists more simply of assuming an annual rate of increase in average earnings of about 5.44% instead of 4.5%, whereby 1.0053*1.0544 = 1.06. Understandably, these alternate assumptions may not appear as reasonable, if at all, as the original ones.

ADDENDUM of 1 March 1996

On page 101 on the fifteenth actuarial report on the CPP as at 31 December 1993, the bottom table shows that the IRR of 5.1% computed in respect of ultimate cohorts of contributors is associated with each dollar of contribution providing $5.40 of benefits. The underlying average period between contributions and benefits payments is 34, is, $\$1*(1+IRR)^{34} = \$5.40$. This underlying average period should theoretically correspond to the time elapsed between the average contributors' age and the average beneficiaries' age. Taking the average beneficiaries' age as 74, i.e., the normal retirement age of 65 plus half the current unisex life expectancy of about 18, the underlying average contributors' age would be 40, that is 74-34. This result (40) makes sense in that it is close to the mean (41) of the starting (18) and finishing (64) age of the contributory period. However, the underlying answer for the starting age (40) does not necessarily have to be that close from the mean (41) because:

- the average beneficiaries' age taken as 74 considers retirement benefits beneficiaries only but ignores beneficiaries of disability and survivor benefits

- any measurement of average ages should be weighted by applicable amounts (earnings or benefits).

APPENDIX E

Pierre Treuil's note on

FUND DEVELOPMENT OF AN EARNINGS-RELATED SOCIAL INSURANCE PLAN UNDER STABILIZED CONDITIONS

taken from Volume XXXIII of the TSA

FUND DEVELOPMENT OF AN EARNINGS-RELATED SOCIAL INSURANCE PLAN UNDER STABILIZED CONDITIONS

PIERRE TREUIL

ABSTRACT

It has been well established that, under stabilized conditions, the full fund for an earnings-related social insurance plan increases at the rate of growth in total earnings and that, as a consequence, the current cost (pay-as-you-go) contribution rate will be greater than, equal to, or less than, the full cost rate, depending upon whether the rate of interest is greater than, equal to, or less than the rate of growth in total earnings, and vice versa. This is briefly summarized in Section IV. The OASDI in the United States, and the Canada and Quebec Pension Plans in Canada, are examples of plans that, with minor modifications, would be strictly subject to this theory.

The purpose of this paper is to extend this theory further and to examine how an actual fund, for any given contribution rate, would develop as a proportion of the full fund. This leads to the key equation (10) developed in Section VI, some of the implications of which are discussed in the remainder of the paper.

I. INTRODUCTION

DETAILED cost studies of earnings-related social insurance plans often consider periods of up to seventy-five years; however, few, if any, serious studies consider very long-term prospects, such as those after one hundred years. The reasons are fairly obvious: studies are expensive and time-consuming; conditions that may prevail at such a distant time are extremely uncertain, not only as to appropriate actuarial assumptions but even as to the nature of the plan let alone the form of social organization that may then exist; and there is less interest in such dim horizons than in the nearer-term future. Nevertheless, this does not mean that such remote periods should be ignored entirely. What is needed is a set of analytical methods that can be quickly and inexpensively applied and that, despite all the uncertainties involved, do provide some real insight into

the possibilities that may arise. This paper was designed to develop some such methods.

Section II defines all the key variables used in the paper, except those used in a purely local context.Section III explains what is meant by "stabilized conditions," the basic assumption underlying the subsequent analyses. Section IV develops a simple formula for the growth of the full fund of an earnings-related social insurance plan, and also develops a fundamental relationship between the size of the full cost rate and the current cost (pay-as-you-go) rate of the plan. Sections V–IX are concerned with how the actual fund will evolve as a proportion of the full fund—that is, with how the funding ratio will change. Section V proves that the funding ratio may be kept constant by the charging of a specific contribution rate, which is defined as the equilibrium contribution rate and for which a suitable formula is developed. Section VI derives the key formula of the paper, which shows how the funding ratio will evolve for any contribution rate. Sections VII and VIII analyze some of the qualitative implications of this formula, and Section IX illustrates some of its quantitative implications. Section X develops some additional relationships that may have useful analytical value, such as (*a*) how to convert the estimated funding ratios into ratios of the actual fund to contributory earnings and (*b*) a formula to calculate the number of years' expenditures that will be covered by any estimated actual fund assuming no further contributions. Section XI briefly recapitulates the purpose for which the paper was written.

II. DEFINITIONS OF VARIABLES

FF = Full fund = Total liability, at any moment in time;

AF = Actual fund at any moment in time;

FR = Funding ratio = AF/FF;

C = Contributory earnings during a one-year period accumulated with interest to the end of that period;

CE = Instantaneous contributory earnings on a per annum basis;

ER = Equilibrium contribution rate = Contribution rate required to maintain FR constant;

t = Time t; may be used as a subscript attached to any of the above variables to indicate the value of the variable at time t (e.g., FF_t = Full fund at time t, and C_t = Contributory earnings between t and $t + 1$, accumulated with interest to $t + 1$);

FC = Full cost contribution rate = Contribution rate that must be charged in connection with a full fund to maintain the fund at the FF level;

PG = Current cost contribution rate = Pay-as-you-go (referred to hereinafter as pay-go) contribution rate;

CR = Actual contribution rate;
n = $(CR - PG)/(FC - PG)$;
i = Rate of interest;
p = Rate of growth in population;
s = Economic (nonpromotional) rate of growth in individual earnings;

$$r = \frac{1 + i}{(1 + p)(1 + s)}.$$

III. STABILIZED CONDITIONS

Generally speaking, the term "stabilized conditions" means not only that plan benefits are assumed to have matured but also that economic, demographic, and other similar variables are assumed to have become constant.

In particular, it is assumed that the rate of interest i, the economic rate of growth in individual earnings s, and other similar economic variables, such as the rate of growth in the CPI, will be constant at current levels indefinitely into the future.

It is also assumed that the rates of fertility, mortality, and immigration will be constant indefinitely into the future. It is not assumed that the population will be constant (stationary), but it is assumed that the percentage distribution of the population by age and sex will be constant. Thus, the rate of growth in the population, p, which is assumed to be constant in the future, is applicable not only to the population as a whole but also to each of its components, such as the aged population, the working-age population, and so on.

All other factors that affect costs, such as participation rates, earnings distributions, disability rates, proportions married, and so on, are also assumed to remain constant at current levels indefinitely into the future.

It follows from these assumptions that both the full cost contribution rate FC under many full-funding methods, and the pay-go contribution rate PG, are assumed to remain constant at current levels indefinitely into the future (as are i, p, s, and therefore r, as indicated above).

It is obvious that such assumptions represent a highly idealized and simplified set of circumstances, which will never be realized, and probably will never be even closely approximated, at any time in the future. It might be argued that the analysis that follows, which is based on such assumptions, is of more theoretical than practical interest. On the other hand, a thorough grasp of this simplified theoretical model may yield a number of valuable insights that will facilitate the understanding of more complicated real-world situations, and, at least in that sense, the analysis may have a definite practical value.

It should be noted that the full-funding method on which *FF* and *FC* are based is not defined. The reasoning in this paper is applicable in connection with any full-funding method, provided that, under stabilized conditions, the method produces a positive full fund *FF*, and the contribution rate *FC* associated with that method is, or can be expressed as, a level proportion of contributory earnings.

IV. EVOLUTION OF *FF*, AND RELATIONSHIP BETWEEN *FC* AND *PG*

Under the assumptions outlined in Section III, any basic monetary element of a plan for any year (such as contributory earnings of 43-year-old males, or widows' pensions payable to 81-year-old females), is equal to the corresponding element for the preceding year multiplied by the factor $(1 + p)(1 + s)$, which is equal to 1 plus the rate of growth in total earnings. Under such circumstances, it can be shown that the full fund, *FF*, increases each year by the same factor; that is,

$$FF_{t+1} = (1 + p)(1 + s)FF_t \,. \tag{1}$$

Another method of calculating FF_{t+1}, which would yield identical results, is given by the formula

$$FF_{t+1} = (1 + i)FF_t + (FC - PG)C_t \,. \tag{2}$$

In this formula $PG\ C_t$ represents the value of benefits accumulated to the end of the year. *FC* is the contribution rate underlying both formulas. An examination of the two formulas indicates that $PG = FC$ implies $(1 + i) = (1 + p)(1 + s)$, that is, $r = 1$. Similarly, $PG > FC$ implies $r > 1$, and $PG < FC$ implies $r < 1$. Since the logic also operates in the opposite direction, we have

$$PG \gtrless FC \Leftrightarrow r \gtrless 1 \,. \tag{3}$$

Throughout the balance of this paper it is assumed that $r \neq 1$. Virtually all of the following reasoning would be incorrect if $r = 1$, usually because, in one way or another, it would involve division by zero.

V. CIRCUMSTANCES UNDER WHICH THE FUNDING RATIO, *FR*, WILL REMAIN CONSTANT—THE EQUILIBRIUM CONTRIBUTION RATE *ER*

In Section IV, we analyzed the progress of the full fund, *FF*, and relationships between the full cost contribution rate, *FC*, and the pay-go rate, *PG*. As a practical matter, when a plan is mature, the actual fund, *AF*,

probably will be only a fraction of the full fund, *FF*, although theoretically it might exceed it, and, unless the plan is being financed on a fairly strict pay-go basis with no real concern for fund levels, legislators will be considering a range of possible contribution rates, probably lying between the full cost rate *FC* and the pay-go rate *PG*, but quite possibly extending beyond this range. Not only at the time of plan maturity, but well in advance of it, planners will be interested in developing an appreciation of how the actual fund *AF* might progress under various circumstances. They may be concerned with such questions as (1) how the funding ratio will change over various specified periods of time for any given contribution rate *CR*; (2) whether a particular *CR* will be sufficient to maintain the solvency of the fund indefinitely, and, if not indefinitely, for how long; (3) what *CR* would be required to meet a specific funding objective over a specified period of time; and so on. Relatively simple procedures for evaluating answers to most such questions, assuming stabilized conditions, are developed later on in this paper, but in this section we shall confine ourselves to the problem of developing the conditions that must be imposed on the actual contribution rate *CR*, given an actual fund *AF*, to ensure that the fund increases at the same rate as the full fund *FF*, that is, to ensure that the funding ratio *FR* remains constant.

We may write

$$AF_{t+1} = AF_t(1 + i) + (CR - PG)C_t ,$$

or

$$\begin{aligned}(CR - PG)C_t &= AF_{t+1} - AF_t(1 + i) \\ &= FR_{t+1}FF_{t+1} - FR_tFF_t(1 + i) .\end{aligned}$$

Formula (2) in Section IV may be rewritten as

$$(FC - PG)C_t = FF_{t+1} - FF_t(1 + i) ,$$

whence

$$\frac{(CR - PG)C_t}{(FC - PG)C_t} = \frac{CR - PG}{FC - PG} = \frac{FR_{t+1}FF_{t+1} - FR_tFF_t(1 + i)}{FF_{t+1} - FF_t(1 + i)} .$$

If the funding ratio remains constant, that is, if $FR_{t+1} = FR_t = FR$, the preceding formula reduces to

$$\frac{CR - PG}{FC - PG} = FR ;$$

therefore, the contribution rate required to keep the funding ratio constant and equal to FR is

$$CR = FR\,FC + (1 - FR)PG = ER\,. \tag{4}$$

Relationship (4) states that for the actual fund AF to develop at the same rate as the full fund FF, that is, for the funding ratio FR to remain constant, the necessary and sufficient condition is that the contribution rate CR for the actual fund AF be set equal to the equilibrium contribution rate ER. This equilibrium contribution rate is a weighted average of the full cost contribution rate FC and the pay-go contribution rate PG, where the weight assigned to FC is the funding ratio FR, and the weight assigned to PG is $(1 - FR)$.

Relationship (4) may also be developed from general reasoning. Let us assume that we have a partial fund equal to, say, 30 percent of the full fund. We could consider the plan as consisting of two portions, a 30 percent portion that is fully funded and a 70 percent portion that is completely unfunded. If we charged the full cost rate FC for the first 30 percent, that portion would remain fully funded, while if we charged the pay-go rate PG for the remaining 70 percent, that portion would remain unfunded. Recombining the two portions would give a composite contribution rate equal to $0.3FC + (1 - 0.3)PG$, and the combined fund as it developed would clearly remain at 30 percent of the fully funded level. If, throughout the above discussion, we replace the 0.3 and 30 percent terms with FR, we obtain relationship (4).

VI. EVOLUTION OF THE FUNDING RATIO FR, IF THE CONTRIBUTION RATE CR IS NOT SET EQUAL TO THE EQUILIBRIUM CONTRIBUTION RATE ER

It should be obvious that, if CR is set higher than ER, FR should increase, while if CR is set lower, FR should decrease. The purpose of this section is to determine the extent of the increase or decrease.

From the definition of n in Section II, it follows that

$$CR = n\,FC + (1 - n)PG\,. \tag{5}$$

It is clear from a comparison of this formula with relationship (4) that $CR = ER$ implies $n = FR$, and vice versa. In this section we shall examine what happens when $CR \neq ER$, that is, $n \neq FR$.

Let us assume that the current time (at some future date, under stabilized conditions) is zero, so that the value of the current actual fund is AF_0, the

current full fund is FF_0, the current funding ratio is $FR_0 = AF_0/FF_0$, and so forth. Since $n \neq FR_0$, the contribution rate CR is not the equilibrium contribution rate for the actual fund AF_0. It should be clear from equations (4) and (5), however, that CR is the equilibrium contribution rate for a hypothetical actual fund HF_0 set equal to $n\ FF_0$. Let D represent the difference between HF and AF, for example, $D_0 = HF_0 - AF_0$. Since AF_0 and CR are known quantities, and, presumably, n and FF_0 can be estimated, it follows that FR_0, HF_0, and D_0 can be calculated. The contribution rate for the full fund FF is FC, while the contribution rate for the HF and AF funds is CR. After t years, these funds will become FF_t, HF_t, and AF_t, respectively.

Extension of formula (1) in Section IV indicates that

$$FF_t = (1 + p)^t(1 + s)^t FF_0 . \tag{6}$$

Since the HF fund is subject to its equilibrium contribution rate CR, its funding ratio n does not change with time; therefore,

$$HF_t = n\ FF_t . \tag{7}$$

We may also write, as a matter of definition,

$$D_t = HF_t - AF_t . \tag{8}$$

Any fund at time t can be considered as equal to the initial fund at time 0 accumulated with interest to time t, plus contributions less expenditures accumulated with interest. When considering the two funds HF and AF, it should be noted that, since they have the same contributions, expenditures, and interest rate, the difference between the two at time t, namely, D_t, is simply equal to the difference between their initial amounts, accumulated with interest. Hence, we may write

$$D_t = (1 + i)^t D_0 . \tag{9}$$

From these relationships it follows that

$$\begin{aligned} FR_t &= \frac{AF_t}{FF_t} = \frac{HF_t - D_t}{FF_t} = n - \frac{D_t}{FF_t} \\ &= n - \frac{(1 + i)^t D_0}{(1 + p)^t(1 + s)^t FF_0} = n - r^t \frac{D_0}{FF_0} \\ &= n - r^t \frac{HF_0 - AF_0}{FF_0} = n - r^t(n - FR_0) . \end{aligned}$$

Hence,

$$FR_t = n - r^t(n - FR_0) \ . \tag{10}$$

VII. IMPLICATIONS IF $PG < FC$

The possibility that $PG < FC$ is traditionally regarded as unlikely, presumably on the grounds that viable economic conditions more or less require that the rate of interest exceed the rate of growth in total earnings in the long run. However, since most of us are strongly antipathetic to the notion that the pay-go rate might be less than the full cost rate indefinitely, this possibility may be more likely than we are inclined to admit.

Relationship (3) states that, if $PG < FC$, then $r < 1$. It follows that $r^t \longrightarrow 0$ as $t \longrightarrow \infty$, and, consequently, from equation (10),

$$\text{If } PG < FC \ , \quad \text{then } FR_t \longrightarrow n \text{ as } t \longrightarrow \infty \ . \tag{11}$$

It can be seen from equation (5) that the actual contribution rate, CR, can be considered as a weighted average of the full cost rate, FC, and the pay-go rate, PG, with n being the weight assigned to FC and $(1 - n)$ the weight assigned to PG.

Relationship (11) states that, provided that PG is less than FC, the funding ratio will tend to n, the weight assigned to FC in calculating CR, and this is true regardless of the initial level of the actual fund, AF_0, or the initial level of the funding ratio, FR_0.

For example, if CR is set at 25 percent of the full cost rate FC and 75 percent of the pay-go rate PG, the fund will tend toward 25 percent of the full fund, regardless of whether it started as 5, 30, or 70 percent, or any other percentage of the full fund.

As long as CR is set somewhere between PG and FC, n will have a value somewhere between 0 and 1, and the fund will tend to some positive fraction of the full fund. This will not be the case, however, if CR is set outside these limits. If CR is set below the pay-go rate, PG, then n is negative and the fund eventually will become negative no matter how large its initial amount. If CR is set above the full cost rate, FC, then $n > 1$ and the fund eventually will exceed the full fund, no matter how small its initial amount. In the special case where CR is set equal to PG, the funding ratio will tend toward zero (but never reach it), no matter how large the initial fund, and in the special case where CR is set equal to FC, the funding ratio will tend toward 1 (but never reach it), no matter how small the initial fund.

VIII. IMPLICATIONS IF $PG > FC$

The situation $PG > FC$ may be of more practical interest than that analyzed in Section VII, because of the prevailing belief that, in the long run, it is more likely that PG will exceed FC than the reverse.

Relationship (3) states that $PG > FC$ implies $r > 1$, and that therefore $r^t \longrightarrow +\infty$ *as* $t \longrightarrow \infty$. It follows from equation (10) that

$$\text{If } PG > FC \text{ and } n < FR_0 \text{ (i.e., } CR > ER_0\text{)}, \quad \text{then } FR_t \longrightarrow +\infty \text{ as } t \longrightarrow \infty; \tag{12}$$

and

$$\text{If } PG > FC \text{ and } n > FR_0 \text{ (i.e., } CR < ER_0\text{)}, \quad \text{then } FR_t \longrightarrow -\infty \text{ as } t \longrightarrow \infty. \tag{13}$$

In contrast to the situation where $PG < FC$, analyzed in Section VII (which revealed that the funding ratio, whatever its initial value FR_0, tended to converge to n), in the situation where $PG > FC$ the funding ratio diverges from n. If the initial funding ratio, FR_0, is greater than n, the funding ratio moves away from n in the direction of $+\infty$, while if FR_0 is less than n, the funding ratio moves away from n in the direction of $-\infty$. Only if the contribution ratio CR is set equal to the equilibrium contribution rate ER_0, in which case the funding ratio will remain constant and equal to n, do we have an inherently stable situation for a constant CR. Otherwise, the fund will be set on a course such that eventually it will exceed the full fund and, in fact, become indefinitely large relative to the full fund, or it will be set on a course that eventually will lead to its disappearance. Furthermore, while in the case $PG < FC$ the absolute rate of change in FR decreases with the passage of time, and eventually becomes insignificant as FR approaches n, in the case where $PG > FC$ the absolute rate of change in FR increases with the passage of time and eventually becomes indefinitely large.

Two special cases may be worth noting when $PG > FC$. If CR is set equal to the full cost rate FC, the fund eventually will become negative, no matter how large its initial value, provided that the initial value is less than the full fund. If CR is set equal to the pay-go rate PG, the fund eventually will exceed the full fund and, in fact, will become indefinitely large relative to the full fund, no matter how small its initial value, provided that it is positive.

IX. SOME NUMERICAL EXAMPLES

Sections VII and VIII discussed trends that tend to occur under certain circumstances, some favorable, some unfavorable, but no attempt was made

to measure the time horizons involved in these trends. Obviously, such time horizons can be important in assessing the timing and magnitude of any critical decisions. Equation (10), together with some of the other equations, permits us to make a number of helpful quantitative estimates in this regard, depending on the nature of the problem.

For illustrative purposes, let us suppose that $PG = 0.09$, $FC = 0.08$, and $r = 1.004$. Incidentally, these assumptions are very roughly consistent with the long-range hypotheses and conclusions of *Statutory Actuarial Report No. 6* on the Canada Pension Plan. Let us further assume that $FR_0 = 0.2$. From relationship (4), we know that the equilibrium contribution rate $ER_0 = 0.088$.

1. For one reason or another, there may be pressure to establish CR at a somewhat lower level than the equilibrium contribution rate, perhaps equal to the full cost rate, 0.08. In that event, n would equal 1. There may be interest in finding out how much this would affect the funding ratio over a twenty-year period. Substituting $n = 1$, $r = 1.004$, $t = 20$, and $FR_0 = 0.2$ in equation (10), we would estimate $FR_{20} = 0.134$ as the funding ratio after twenty years.
2. Although the fund is still positive after twenty years, relationship (13) indicates that, under the circumstances postulated, it will eventually disappear. To determine when this will happen, we first transform equation (10) as follows:

$$t = \frac{\ln(|n - FR_t|) - \ln(|n - FR_0|)}{\ln r}. \tag{14}$$

   The fund will disappear when FR_t equals zero. Substituting $n = 1$, $FR_t = 0$, $FR_0 = 0.2$, and $r = 1.004$ in equation (14) yields $t = 55.9$ as the estimated number of years for which the fund will survive.
3. The problem may, of course, be quite different. For example, it may be desired to fully fund the plan over a period such as fifty years, and the problem may consist of determining the contribution rate that would be required. Another simple transformation of equation (10) gives

$$n = \frac{r^t FR_0 - FR_t}{r^t - 1}. \tag{15}$$

   Substituting $r = 1.004$, $t = 50$, $FR_0 = 0.2$, and $FR_t = 1$ in this equation yields $n = -3.421$. Then substituting $n = -3.421$, $FC = 0.08$, and $PG = 0.09$ in equation (5) yields $CR = 0.12421$.
4. Heretofore, we have assumed that CR remains constant throughout the period covered by our calculations. It is possible, however, to determine the effect of varying CR from time to time by determining the status at the end of the first stage for which CR is held constant, and using this as a starting position for determining the effect of a new CR for the second stage, and so on. For example, as a result

of the estimates in items 1 and 2 above, it might be thought desirable to consider the feasibility of holding CR constant at 0.08 for twenty years, increasing it to 0.083 for the next twenty years, to 0.086 for the next twenty years, and to the equilibrium contribution rate thereafter. Three successive applications of equation (10) reveal that the fund will remain positive under such circumstances, the funding ratio decreasing to 0.060 after sixty years, and that this ratio will remain constant thereafter if CR is set equal to the equilibrium contribution rate of 0.0894 applicable at that time.

Some problems may require working backward instead of forward in time, but they will not be considered here, the required modifications being fairly obvious.

X. SOME ADDITIONAL RELATIONSHIPS

A. *Full Fund Expressed as a Proportion of Contributory Earnings*

While C_t represents contributory earnings during the year t to $t + 1$, accumulated with interest to $t + 1$, CE_t represents annualized contributory earnings at the moment t. We may write

$$\begin{aligned} C_t &= \int_0^1 CE_t(1 + p)^x(1 + s)^x(1 + i)^{1-x}dx \\ &= \int_0^1 \frac{CE_t(1 + i)}{r^x}\, dx \\ &= \frac{CE_t(1 + i)(r - 1)}{r \ln r}\,. \end{aligned}$$

Hence, formula (2) may be rewritten

$$FF_{t+1} = (1 + i)FF_t + \frac{(FC - PG)CE_t(1 + i)(r - 1)}{r \ln r}\,.$$

Dividing expression (2) in this form by expression (1), we obtain

$$1 = r + \frac{(FC - PG)CE_t(r - 1)}{FF_t \ln r}\,,$$

or

$$\frac{FF_t}{CE_t} = \frac{PG - FC}{\ln r}\,. \tag{16}$$

Formula (16) states that the ratio of the full fund to contributory earnings is equal to the excess of the pay-go rate over the full cost rate, divided by the natural logarithm of r. It is independent of the duration t, since both the

full fund and contributory earnings increase at the rate of increase in total earnings.

B. *Actual Fund Expressed as a Proportion of Contributory Earnings*

Some may feel that ratios of the actual fund to the full fund, as developed in prior sections of this paper, are of limited interest on the grounds that the hypothetical full fund of a social insurance plan is not particularly significant, and would prefer to relate the actual fund to some more meaningful economic variable. They may wish to convert these funding ratios into ratios of the actual fund to contributory earnings, by multiplication by the ratio given in formula (16), that is,

$$\frac{AF_t}{CE_t} = FR_t \frac{PG - FC}{\ln r} . \tag{17}$$

Actually, a neat, compact expression for the ratio of the actual fund to contributory earnings that does not explicitly involve FR_t may be developed as follows:

$$\begin{aligned} \frac{AF_t}{CE_t} &= \frac{FR_t(PG - FC)}{\ln r} \\ &= \frac{PG - PG + FR_tPG - FR_tFC}{\ln r} \\ &= \frac{PG - [FR_tFC + (1 - FR_t)PG]}{\ln r} , \end{aligned}$$

or

$$\frac{AF_t}{CE_t} = \frac{PG - ER_t}{\ln r} . \tag{18}$$

This formula, while slightly more compact than formula (17), normally may not be as easy to apply in practice, since it requires calculating ER_t.

If desired, the ratio of any fund, full or actual, to contributory earnings may be converted into a ratio of the fund to (*a*) annualized expenditures—by dividing by PG—or (*b*) annualized contributions—by dividing by the contribution rate (FC or CR, as the case may be).

C. *Number of Years' Expenditures Covered by a Fund, Assuming No Further Contributions*

Another criterion sometimes used in social insurance to evaluate the strength of a fund, AF_t, is to estimate the number of years' expenditures,

Y_t, that would be covered by the fund if no further contributions were collected. Under stabilized conditions, the present value of future expenditures over a period of y years is given by

$$\int_0^y \frac{PG\ CE_t(1 + p)^x(1 + s)^x}{(1 + i)^x}\, dx = PG\ CE_t \int_0^y r^{-x} dx$$

$$= \frac{PG\ CE_t(r^y - 1)}{r^y \ln r}\ .$$

Setting this expression equal to AF_t, dividing both sides by CE_t, and using expression (18), we obtain

$$\frac{PG - ER_t}{\ln r} = \frac{PG(r^y - 1)}{r^y \ln r}\ ,$$

or

$$1 - \frac{ER_t}{PG} = 1 - r^{-y}\ .$$

Substituting Y_t for y, we obtain

$$Y_t = \frac{\ln PG - \ln ER_t}{\ln r}\ . \tag{19}$$

Formula (19) means that the actual fund is exactly sufficient, without further contributions, to cover expenditures for a period of years, Y_t, equal to the excess of the logarithm of the pay-go rate over the logarithm of the equilibrium contribution rate, divided by the logarithm of r. In the special case of a full fund, formula (19) becomes

$$Y_t = \frac{\ln PG - \ln FC}{\ln r}\ .$$

D. *A Relationship between Full Funds and Full Cost Rates*

For a given plan structure and given actuarial assumptions, CE, PG, and r are independent of the full-funding method, but FF and FC are not. If we let ${}_1FF_t$ and ${}_1FC$ refer to the full fund and full cost rate under full-funding method 1, and ${}_2FF_t$ and ${}_2FC$ refer to the same functions under full-funding method 2, then, from formula (16),

$$\frac{{}_1FF_t}{{}_2FF_t} = \frac{PG - {}_1FC}{PG - {}_2FC}\ . \tag{20}$$

It is well known that those full-funding methods involving the lowest mature full cost rates normally produce the highest full funds. Formula (20) not only supports this proposition provided that $r > 1$ (the reverse would be true if $r < 1$), but also provides a mathematical relationship under stabilized conditions between the factors involved—a relationship that may be of more interest in private pension plan analysis than in social insurance analysis. For example, it enables one to determine the relative sizes of the ultimate funds involved under different full-funding methods knowing only the associated full cost rates and the pay-go rate, without the necessity of making any fund projections.

E. *Independence of the Equilibrium Contribution Rate from the Full-funding Method*

The equilibrium contribution rate, ER_t, is the contribution rate that will cause the actual fund, AF_t, to increase at the rate of increase in total earnings if all actuarial assumptions are met. Viewed as such, ER_t is clearly independent of the full-funding method used as a comparison basis. At the same time, relationship (4), which expresses ER_t as a function of FR_t and FC, both of which depend upon the full-funding method used as a comparison basis, seems to imply the opposite. That this is an illusion may be demonstrated by means of formula (20) in the following manner (where prefixed subscripts 1 and 2 pertain to full-funding methods 1 and 2, respectively):

$$
\begin{aligned}
{}_1ER_t &= {}_1FR_t\,{}_1FC + (1 - {}_1FR_t)PG \\
&= AF_t\left(\frac{{}_1FC - PG}{{}_1FF_t}\right) + PG \\
&= AF_t\left(\frac{{}_2FC - PG}{{}_2FF_t}\right) + PG \\
&= {}_2ER_t\,.
\end{aligned}
$$

F. *A Direct Formula for Projecting the Equilibrium Contribution Rate*

Normally, ER_t would be calculated by first estimating n, using the definition in Section II, then calculating FR_t using formula (10), and, finally, calculating ER_t using relationship (4). However, considering the potential importance of ER_t, not only in its own right but as a possible working variable in formulas such as (18) and (19), it may be useful to develop a

more direct expression for it. Bearing in mind that $FR_t = n - r^t(n - FR_0)$ and $n = (CR - PG)/(FC - PG)$, we have

$$\begin{aligned} ER_t &= FR_t\, FC + (1 - FR_t)PG \\ &= [n - r^t(n - FR_0)](FC - PG) + PG \\ &= (1 - r^t)(CR - PG) + r^t(FR_0)(FC - PG) + PG \\ &= CR(1 - r^t) + r^t[FR_0\, FC + (1 - FR_0)PG] \\ &= CR(1 - r^t) + r^t \mathrm{ER}_0\ ; \end{aligned}$$

whence

$$ER_t = CR - r^t(CR - ER_0)\ . \tag{21}$$

The similarity to formula (10) is striking.

It should be noted that, if AF_0 and CE_0 are known, formula (18) may be used to calculate ER_0, formula (21) to project ER_t, and formula (18) to calculate AF_t/CE_t and, for that matter, AF_t itself, since $CE_t = (1 + p)^t (1 + s)^t CE_0$. This procedure has the advantage, when compared with that based on formula (10), of permitting the projection of AF_t without making any assumption as to a full-funding method to be used as a comparison basis, and without requiring the calculation of FF_0 *or* FC. It has the disadvantage, however, that it does not seem to yield such valuable insights into the mechanics of the funding process as those that can be obtained from formula (10).

XI. CONCLUSIONS

For many earnings-related social insurance plans, such as OASDI and the Canada and Quebec Pension Plans, detailed long-range cost estimates are made by official and unofficial agencies for up to seventy-five years in the future. They cover periods during which plan costs are expected to change dramatically as a result of more or less predictable economic, demographic, and other trends; and perhaps the major purpose of such studies is to assess the scope of such changes. Clearly, the techniques outlined in this paper are unsuitable for analyzing such periods.

However, toward the end of the periods covered by such studies, not only do prognostications become more and more uncertain, but presently discernible trends tend to disappear as well. In effect, a time is being approached when, for all practical present purposes, an assumption of stabilized conditions seems to be as appropriate as any other. The main purpose

of this paper is to provide an analytical method to sharpen our perceptions, both of a qualitative and of a quantitative nature, of what may or may not be feasible at such a time.

A word of caution is called for. While many fascinating calculations can easily be made using the techniques outlined in this paper, the various assumptions underlying such calculations must be chosen with care in order to ensure their mutual compatibility. The long-range hypotheses and findings of the detailed cost estimates referred to in the first paragraph of this section may serve as a useful guide in this respect.

If an earnings-related social insurance plan should actually approach stabilized conditions to the extent that analyses of the relatively short-range future conducted by the methods outlined in this paper would approximate fairly closely the findings of much more detailed cost studies, there should be a quickening interest in this approach. It would not supplant the need for detailed investigation of any concrete proposals that might be implemented, but it could be used (*a*) to analyze a tremendous number of possibilities and, from them, to select those worthy of more detailed examination; (b) to explain, in readily intelligible terms, trends inherent in various proposals that might be difficult to detect or isolate from more elaborate inquiries; and (*c*) to permit actuaries, and perhaps others, lacking ready access to detailed cost-study systems, to satisfy themselves that all reasonable possibilities have received due consideration and fair appraisal.

APPENDIX F

THE SIMTAB MODEL

SIMTAB is a cross-sectional, static, microsimulation model developed at Human Resources Development Canada, and used both there and in the Department of Finance. It serves these departments as one of the major policy tools for investigating the quantitative dollar and person impacts of policy proposals involving changes in tax and benefit programs.

As the first half of its name suggests, SIMTAB simulates, using a representative sample of Canadian families, income taxes and all of the major benefits that provide income to Canadians. The year-specific database represents approximately forty thousand census families, and includes considerable information about the socio-demographic characteristics of the individual private sector income sources, *e.g.* paid employment income, and the details of the family structures.

Where appropriate, adjustments are made to the database so that the various income and demographic aggregates conform to externally specified totals and distributions. The model's tax and transfer simulations are performed at the level of the relevant administrative units (individuals or families), using calculations that closely mirror the forms and formulae used to administer the programs themselves. The programs simulated, or represented in the data, include federal and provincial income taxes in some detail, social insurance (CPP, QPP and UI) contributions and benefits, and all of the major benefits and credit programs (CPP, OAS, GIS, SPA, and social assistance). For some of these benefits, the simulation takes place in the generation of the underlying database, while for others the benefits and contributions are simulated as part of the model runs themselves. Where program participation is optional, take-up factors based on actual experience are used.

For most analyses, two tax/benefit systems are simulated in parallel, one of them corresponding to the existing system, and one to the hypothetical or option system. This dual system approach makes it possible to obtain not only the aggregate and distributional impacts of the hypothetical system, but also an identification of the winners and losers, the sizes of their gains and losses in disposable income, and the characteristics of the winner and loser units.

As the second half of the name suggests, one of the major features of SIMTAB is the flexible tabulation of the simulation results by means of the full range of tabulation facilities available in the SPSS package. Since all of the variables (unit characteristics at different levels of units of administration or analysis, and amounts of taxes, benefits, base vs. option differences, etc.) are available at the individual and/or family level, cross-tabulations with appropriate case selection can conveniently supply most of the tables that policy makers wish to see. SIMTAB automatically provides a considerable selection of built-in variables for various possible categories for use as row or column control

variables, and many more as candidates for the tabulated variables--dollars, individuals, families, and averages, and further offers the analyst the capacity to develop other customized variables by category or tabulation as required. Documentation in the form of variable labels and value labels are an integral part of the SIMTAB database and outputs.

SIMTAB can thus provide distributional information on either an individual or a family basis. The tabulations used in this paper identified nine family types, Where the head of the family was under age sixty-five, the families were grouped into (i) singles not eligible for the SPA for widows and widowers, (ii) couples with no dependents, (iii) two parent families, and (iv) one parent families. Where the head was age sixty five or older, the categories were: (i) singles, (ii) with a spouse at least age sixty-five, (iii) with a spouse age at least sixty, but not sixty-five (and so eligible by reason of age for SPA benefits), (iv) with a spouse under age sixty (and so not eligible for SPA benefits), and (v) a surviving spouse at least age sixty, but under age sixty-five (and so eligible by reason of age for SPA benefits for widows and widowers). This last category could have been included with those were the head was under sixty-five, but the units were included here because they were potentially eligible for SPA benefits, and we wished to take SPA benefits for widows and widowers into account.

Total family incomes were tabulated in bands of $5,000 up to $50,000, in bands of $10,000 from $50,000 up to $100,000 and in two final bands of $100,000 to $125,000, and $125,000 and over. Actual incomes were used to obtain the totals for each band.

For this paper we generated figures for Canada as a whole, and for Canada excluding Québec; the latter were used.

Individual SIMTAB models also include basic data aging facilities so that reasonable projections can be made for a few years into the future. The primary limitation of SIMTAB is its static nature, *i.e.* its assumption that behaviour in such areas as labour force participation, earnings levels, family structures, program participation, etc. will not be affected by the policy being modelled, *e.g.* that earners will continue to work a given amount and achieve a given level of earnings, regardless of work incentives and tax levels. As well, a SIMTAB model applies to only a single year's taxes and benefits. Thus it is not suitable for analyses in which a family or individual will see different impacts in successive years, and in which there is a need to roll up all of these varying impacts into a summary measure.

The reader who wishes more information on SIMTAB is referred to Chapter Three of *Microsimulation for Tax-Transfer Analysis* published in 1989 by The Urban Institute Press in Washington. The relevant chapter is entitled *Microsimulation as a Policy Input: Experience at Health and Welfare Canada*, and was written by Richard J. Morrison, who participated in the preparation of this paper.

GLOSSARY

Some of the definitions in this **Glossary** are adapted from the **Glossary of Actuarial Terms** developed by the **Actuarial Standards Board** in the United States, and I acknowledge my debt to them.

account Usually, the CPP account, which is the fund projected to be built up over the years from the valuation date; it is the accumulated excess of contributions and investment earnings over expenditures, which include all benefits paid and expenses. In defined contribution plans, the account established for each member. The context should make the usage clear.

accrued benefit The amount of an individual's benefit as of a specified date in accordance with the terms of a pension plan, and based on compensation (if applicable) and service or participation to that date.

accrued benefit cost method A method under which the benefits of each individual included in an actuarial valuation are allocated by a consistent formula to valuation years. Usually the cost of the benefit earned in a year is allocated to that year. Sometimes called the unit benefit cost method.

actuarial accrued benefit liability The actuarial present value of benefits attributed by a pension benefit formula to member service rendered before a specified date and based on service and compensation (if applicable) prior to that date.

actuarial assumption The value of a parameter, or other choice, having an impact on an estimate of a future cost or other actuarial item under a valuation. Sometimes called a valuation assumption.

actuarial calculations Calculations that make use of actuarial assumptions and actuarial methods.

actuarial cost method A procedure for determining the actuarial present value of pension plan benefits and expenses and for developing an actuarially equivalent allocation of such value to time periods, usually in the form of a normal cost and an actuarial accrued benefit liability. Sometimes called a funding method.

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actuarial gain or loss A measure of the difference between actual experience and that expected based upon a set of actuarial assumptions during the period between two actuarial valuation dates, as determined in accordance with a particular actuarial cost method; sometimes called an experience gain or loss.

actuarially equivalent Producing equal actuarial present values determined as of a given date with each value based on the same set of actuarial assumptions

actuarial method A procedure by which data are analyzed and actuarial assumptions are used to estimate a future cost or other actuarial item.

actuarial present value The value of an amount or series of amounts payable or receivable at various times, determined as of a given date by the application of a particular set of actuarial assumptions.

actuarial report A document, or other presentation, prepared as a formal means of conveying an actuary's professional conclusions and recommendations; recording and communicating the methods, procedures, and assumptions; and ensuring that the parties addressed are aware of the significance of an actuary's opinion of findings.

actuarial valuation With respect to a pension plan, the determination as of a valuation date of the normal cost, actuarial accrued liability, actuarial value of assets, and related actuarial present values; actuarial valuations can be made for other purposes, and in such cases the items determined may be different.

actuarial value of assets The value of cash, investments, and other property belonging to a pension plan, as used by the actuary for the purpose of an actuarial valuation.

affordability The ability to be purchased without the necessity of doing without essentials; alternatively, having a reasonable price considering what is provided. A number of other definitions of affordability are given in Chapter I.

after-tax Pertaining to the amount of money an individual has left after paying income tax.

ancillary benefit A benefit or coverage that is subsidiary to the major function of a program; examples are the disability and survivors' benefits under the CPP.

annuity A contract with an insurance company under which it pays a series of periodic payments commencing at a specified date in return for payment of a premium (or premiums) to the company before that date. Payments may be for life only, for life with a minimum guaranteed period, for life with the continuation in whole or in part to a designated beneficiary, usually the spouse, or for a period certain only.

beneficiary-oriented Allocating benefits to the cohort to which the recipient belongs; used in connection with rate of return calculations.

cash flow projection The process of projecting and timing the amounts of contributions to be received, investment earnings to be received, and benefit payments to be made after the valuation date. There is also usually a projection of what the fund will be.

census The enumeration of a population by age and sex, and the tabulation of various characteristics of that population. Usually refers to the entire population of a country, but can apply to sub-populations.

CIA In actuarial literature, the Canadian Institute of Actuaries, the research, accreditation, and membership organization for actuaries in Canada.

cohort A group of individuals with certain common characteristics; typically, and in this paper, all those born in the same calendar year.

constant dollar amount An amount of money so adjusted that, in the year for which it is determined, it has the same purchasing power as a given nominal amount in some base year; thus the effect of inflation is removed.

contribution rate The rate at which a member and/or the employer contribute to a pension plan. For this paper it almost invariably means the specified contribution rate paid to the CPP by employees and employers combined on contributory earnings.

contributor-oriented Allocating benefits to the cohort to which the contributor belongs; used in connection with rate of return calculations.

contributory earnings The amount of earnings on which contributions to a pension plan are made. There may be a first tranche of earnings on which no contributions are made, and an upper limit above which no contributions are made. For the CPP contributions are made on earnings between the YBE and the YMPE.

contributory period The period of time during which contributions can be made to a pension plan; *e.g.* from age 18 to 65; sometimes the period during which a contributor actually made contributions; the context should make the meaning clear.

CPI The Consumer Price Index.

CPP The Canada Pension Plan, an earnings-related contributory pension plan covering the vast majority of employees and self-employed persons in Canada, with the exception of those in Québec.

CPP Actuarial Model The model constructed in the office of the Chief Actuary of OSFI and used for the actuarial valuation of the CPP, the estimation of the costs of any proposed changes, and the determination of characteristics of contributors and beneficiaries. A description of this model appears in Appendix B of the statutory actuarial reports on the CPP.

cross-subsidy The payment to one individual cohort, or group of individuals, of monies contributed by another such unit.

death benefit Usually the lump sum amount paid on death, but in some cases broadened to include pensions paid to survivors, *e.g.* surviving spouses and children.

defined benefit plan A pension plan under which benefits are determined by a formula with regard to compensation and/or service, and in which contributions *per se* do not affect the pension.

defined contribution plan A pension plan that provides for an individual account for each member, and for benefits based solely on amounts contributed to the member's account, and any investment income or other items allocated to the accounts.

de-indexation The procedure under which limits for various items, such as tax brackets, increase at a slower rate than the amount of inflation, which is usually measured by the increase in the CPI; sometimes referred to as partial indexation, or partial de-indexation.

demogrant An amount paid to all residents that is not dependent upon income, earnings or work history, *e.g.* the OAS program before the introduction of the claw-back tax.

disability benefit Benefits paid under the CPP if the beneficiary meets the definition of disability contained in the CPP, and has met the eligibility requirements.

disposable income Income after the payment of income taxes and required social security contributions.

Drop-out A provision by which a certain number of years may be excluded from the contributor's CPP contributory period, thus resulting in higher average earnings and thus higher benefit amounts.

earnings-related A benefit or contribution whose amount depends upon the level or history of employment earnings of the member.

eligibility The conditions that must be met in order to receive a benefit.

employment earnings Earnings arising from employment, including self-employment. Income sources as investments and pensions are not included.

entry-age normal actuarial cost method A method under which the actuarial present value of all benefits, both accrued and to be earned in the future, of each individual included in an actuarial valuation is allocated on a level basis between entry age and the assumed exit age(s); in the CPP, the exit age is the retirement age.

experience The statistics on items such as actual contributions made and actual benefits paid; from these can be determined actual rates of mortality, fertility, early retirement, etc., which may result in revisions in the actuarial assumptions for the future.

fertility rate The number of children each female will bear, on average, over her reproductive years.

fifteen-year formula The formula used for determining CPP contribution rates which aims at the end of the fifteen-year period that the CPP Account be equal to two years of benefit payments.

financing method The method used to pay for a pension plan. While this may be an actuarial cost method, it is not necessarily, *e.g.* pay-as-you-go.

flat-rate An amount that does not depend upon earnings, and is the same for all beneficiaries, regardless of earnings.

fully funded Having the actuarial value of the assets at least equal to the actuarial accrued benefit liability

fund The cash, investments, and other property belonging to a pension plan. Different values may be assigned to these items than in the actuarial value of the assets, so it is not necessarily the same. For the CPP the fund is called the **Account**, and the **CPP Fund** corresponds to that part of the Account lent to the Provinces.

funding method The same as actuarial cost method.

GIS The Guaranteed Income Supplement, an income-tested benefit under the OAS Act.

HRD Human Resources Development Canada, a ministry of the federal government that administers the CPP. Prior to a reorganization in 1993, the CPP was administered by Health and Welfare Canada.

immigration For purposes of the CPP valuation, the excess of immigrants to Canada over emigrants from Canada. Sometimes called “net” immigration for greater clarity.

income-tested A benefit that is calculated as a function of a recipient’s income. Usually a full benefit is paid if income is below a certain specified level, declining as income increases, and becoming zero when income exceeds a certain specified level.

indexed benefit A benefit which increases in proportion to an outside index, such as the increases in prices or wages, *e.g.* the CPI.

inflation Price changes over the whole of the economy, usually measured by increases in the CPI.

interaction The effect that a change in one set of benefits or program has upon another set of benefits or program.

interest rate While usually this refers to the rate of interest on debt instruments, for purposes of an actuarial valuation, it is the rate of investment return, actually earned or expected to be earned, inclusive of capital gains whether realized or unrealized.

internal rate of return The rate of investment return earned from a series of financial transactions consisting of the actual contributions received and benefits paid, and taking into account the amounts and timing of these cash flows. The internal rate of return for a series of flows is the rate at which the present value of the series is zero. In this paper shortened to "rate of return" as it is not being contrasted with some other rate such as the time-weighted rate of return.

inter-valuation period The period between two actuarial valuations.

life expectancy The average number of years an individual is expected to live. This figure almost invariably varies by age, sex, and calendar year, and may also vary with other characteristics.

material Something which will change the results significantly. For the CPP a change is considered material if the change in costs that it causes ultimately exceeds 0.1% of contributory earnings in a year.

means-tested A benefit is means-tested if an individual's assets, sometimes broadened to include family assets, must be below a certain level in order to receive a benefit. This differs from income-tested because it looks at the value of non-income producing assets, such as the family home. No federal benefit programs are means-tested today.

methodology The technical, scientific, and actuarial methods and procedures used in producing the results in an actuarial valuation.

mortality improvements Decreases in the rates of mortality that have occurred or are expected to occur in the future.

nominal Rates or amounts not adjusted for the effect of inflation.

normal cost That portion of the actuarial present value of pension plan benefits and expenses that is allocated to a given year by the actuarial cost method used, excluding any payment in respect of an unfunded liability

OAS The Old Age Security Pension, a taxable benefit, originally a demogrant, that is based on the period of Canadian residence. It is indirectly, through the claw-back process as part of income tax, also income-tested at a relatively high level of income. OAS may also refer to the Act which includes the three programs of OAS, GIS, and SPA.

OASDI The Old Age and Survivors Insurance and Disability Insurance program in the United States; also known as Social Security.

orphans' benefit The benefit paid to a child of a deceased contributor under the CPP. Similar amounts are paid to the children of those contributors in receipt of a CPP disability benefit.

OSFI The Office of the Superintendent of Financial Institutions, the branch of the federal Department of Finance that is responsible, *inter alia*, for actuarial work on the CPP, OAS, and PSSA. What used to be the Department of Insurance is now part of OSFI.

participation rate The ratio of those participating under a program to all those who theoretically could participate. For the CPP, this ratio corresponds to the proportion of contributors out of the relevant population.

pay-as-you-go A method of financing a pension plan under which the contributions are generally made at about the same time, and in about the same amount, as the benefits and expenses become payable.

pay-as-you-go rate The theoretical contribution rate shown in the CPP Actuarial report required to finance the CPP on a pay-as-you-basis were there no Account producing investment income. These differ from the CPP contribution rates, which are determined for twenty-five years by the fifteen-year formula, and are subject to federal and provincial agreement.

pensionable earnings Earnings used for determining benefits. They are not necessarily the same as contributory earnings. For the CPP pensionable earnings are employment earnings to the level of the YMPE, provided earnings are at least equal to the YBE.

projected benefits Pension plan benefit amounts that are expected to be paid at various future times under a particular set of actuarial assumptions

PSSA The Public Service Superannuation Act; also, the pension plan established by this Act.

QPP The Québec Pension Plan, which is essentially similar to the CPP, but covers residents of Québec.

quinquennial review The actuarial federal-provincial ministerial review required under the CPP Act every five years for setting a schedule of contribution rates for the next twenty-five years.

rate of return See internal rate of return.

real Rates or amounts adjusted to remove the effect of inflation.

retirement benefits Benefits paid on the retirement of a plan member, usually in the form of a series of payments for life. Most pension plans guarantee either a specified minimum number of payments, or a continuation to a surviving spouse for his or her life. In the CPP retirement benefits cease on death, but other provisions of the plan provide for benefits to eligible survivors.

scenario A set of economic and operating assumptions on the basis of which projections are made.

select and ultimate assumptions Assumptions which vary over a period of time, after which period they do not vary any more. Those in the period during which they vary are called select, and after that period, ultimate.

select period The period during which assumptions vary with time.

SIMTAB A model developed by HRD for ascertaining the impacts of various policy options on income tax and social insurance programs. See Appendix F.

simulation A modelling, usually financial, of the consequences of a given scenario.

Society of Actuaries An international research, education, and membership organization for actuaries in the life and health insurance, employee benefits, and pension fields. While it is located in the United States, virtually all Canadian actuaries are members, and many take an active role in it.

SPA Spouses' Allowance. An income-tested benefit, under the OAS Act, payable to spouses, or surviving spouses, of GIS recipients; such spouses must at least 60, but under 65, and so not eligible by virtue of their age for GIS benefits. See also Widowed Spouses' Allowance.

surplus The excess of the actuarial value of the assets over the actuarial accrued benefit liability.

survivors' benefits The periodic amounts payable for life to the surviving spouse of a contributor, or pensioner, but sometimes broadened to include benefits to orphans and the lump sum death benefit.

time value of money The principle that an amount of money available at an earlier point in time has different usefulness and value than the same amount at a later point in time, over and above an adjustment for the erosion of value resulting from inflation.

tranche An amount between specified limits; in the vernacular, sometimes called a "slice", "band", or "portion."

triennial review The actuarial review of the CPP every three years for monitoring purposes required under the CPP legislation.

UI Unemployment Insurance.

ultimate assumptions The constant assumptions that apply after the end of the select period.

ultimate period The period of time after the end of the select period, and during which the assumptions no longer vary over time.

unemployment The state of being in the labour force, but not being remuneratively employed.

unfunded liability The excess, if any, of the actuarial accrued benefit liability over the actuarial value of the assets.

unit benefit cost method See accrued benefit cost method.

validation The process by which the previously projected results of an actuarial valuation are reconciled with the actual experience.

valuation The determination of the value of assets or liabilities, and the cost, of a pension plan.

Widowed Spouses' Allowance An income tested benefit, under the OAS Act, payable to widows and widowers aged 60 to 64, broadly similar to the Spouses' Allowance that is paid to those 60 t0 64 who are not surviving spouses. Frequently in this paper, and elsewhere, included in the term SPA, and not mentioned separately.

YBE Years' Basic Exemption. The initial tranche of earnings under the CPP on which no contributions are made, but on which benefits may be earned.

YMPE Years' Maximum Pensionable Earnings. The maximum level of earnings under the CPP, above which no contributions are made or benefits earned.

BIBLIOGRAPHY

The following is a list of the major publications either consulted by the author, or that relate to some aspects of the paper. Not all were used in preparing this monograph, in some cases because of their recent publication date, but they are all suggested to the reader who wishes more information. In addition there was considerable unpublished material in HRD and OSFI that I was able to consult.

OSFI, (and its predecessor, the Department of Insurance)

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