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SOCIAL SECURITY: ADEQUACY, EQUITY AND PROGRESSIVENESS

A REVIEW OF CRITERIA

BASED ON EXPERIENCE IN CANADA AND THE UNITED STATES

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Abstract

This paper reviews and compares the Canadian and U.S. Social Security systems as to their adequacy, actuarial equity and progressiveness. It concludes that the Canadian system(s) provide larger minimum benefits and, thus, greater adequacy than the U. S.. On the other hand, the analysis indicates more emphasis on actuarial equity in the U.S. system (in total) than in Canada. Finally, both systems are shown to be highly progressive in that lower-wage earners get larger benefits per dollar of contribution than do higher-wage earners.

The paper concludes by noting that while the systems in these two countries have remarkably different actuarial formulae for determining benefits, and remarkably different structures, that the benefits that result from the two systems are surprisingly similar.

I INTRODUCTION

The design of social security systems as to the balance between and among adequacy, equity and progressiveness has been the subject of discussions in governments and among actuaries and economists for many years. The main purpose of this paper is to compare, on the basis of the criteria of adequacy, equity and progressiveness, the retirement benefits provided by the Canadian and the U.S. social security systems. The paper starts with a brief introduction to the current (1998) social security systems in Canada and the U.S.. The paper follows with a comparison of the two systems according to defined criteria for a national retirement income system. It concludes with a summary of its findings.

II SOCIAL SECURITY IN CANADA

Under the Canadian social security system, the retirement benefits consist of three main components -- Old Age Security (OAS), the Guaranteed Income Supplement (GIS) and the Canada and Quebec Pension Plans (C/QPP). OAS provides monthly benefits to all people who reach age 65 and meet residency requirements. The OAS monthly benefit was $407.15 as of January 1st, 1998. The amount is taxable and fully indexed quarterly to the cost of living as measured by the Consumer Price Index. In 1989, a clawback was imposed on OAS benefits by the federal government. Since then, each OAS recipient has had to pay back 15 cents of the OAS benefit for every dollar that net income exceeded a threshold ($53,215 in 1998). The threshold is indexed to inflation less 3 percent, so applies to more Canadians each year.

The GIS also provides monthly benefits to OAS recipients, but subject to an income test. The maximum monthly benefit as of January 1st, 1998 was $483.86 for single OAS pensioners and $315.17 for each spouse of a married couple where both spouses are OAS recipients.

A Spouse Allowance (SA) is payable to OAS/GIS recipients' spouses, widows and widowers who are between 60 and 64 years of age. Eligibility for SA is also subject to an income test. As of January 1st, 1998, the maximum monthly SA benefit was $722.32 for spouses and $797.45 for widows and widowers.

For a single pensioner, the GIS benefit is reduced by one dollar for each two dollars of monthly income (other than OAS benefit). For other GIS recipients, the benefit is reduced by a dollar for each four dollars of combined monthly income (other than OAS benefit). GIS benefits are nontaxable. Both OAS and GIS benefits are financed by general tax revenues.

OAS and GIS will be replaced by the new Seniors Benefit (SB) in 2001. Under the new SB, the maximum yearly benefit is $11,420 for a single pensioner and $18,440 for a couple in 2001. This maximum benefit is reduced by fifty cents for each dollar of other income until the benefit is down to $5,160 ($10,320 for a couple). Then, after a period of no clawback, the benefit is further reduced by twenty cents for each dollar of other income in excess of $25,912. The SB is nontaxable income and is fully indexed to inflation.

The third component, C/QPP, provides other forms of benefits besides just a retirement pension. These include disability benefits, survivor benefits and death benefits. These benefits are financed by contributions from employers and

employees. The contributions are a fixed percentage of earnings between the Year's Basic Exemption (YBE) and the Year's Maximum Pensionable Earnings (YMPE). The paper reviews only the retirement pension. To calculate the retirement pension, the pensioner's actual contributory earnings in each year are adjusted by the ratio of the average YMPE for the three years ending with the year in which the pension commences, to the YMPE for the work year in question. The pension itself is equal to 25% of the average of the adjusted yearly earnings. C/QPP benefits are taxable income.

III SOCIAL SECURITY IN THE UNITED STATES

In the U.S., public retirement benefits come from two main sources -- Old-Age, Survivors, and Disability Insurance (OASDI) and Supplemental Security Income (SSI). Like the C/QPP of Canada, survivor benefits and disability benefits are also provided by OASDI besides the retirement benefits. As to retirement benefits, for a worker retired at the normal retirement age (currently age 65), the OASDI pays monthly benefits in an amount referred to as the Primary Insurance Amount (PIA). Before calculating the PIA, one must determine the worker's Average Indexed Monthly Earnings (AIME). First, earnings in each year (up to a maximum amount allowed for the year) are indexed by the ratio of the average earnings in the indexing year to the average earnings in the valuation year. The indexing year is the second year before the year in which the worker attains age 62. Incomes earned during and after the indexing year are not adjusted. The AIME is the quotient found by dividing the sum of the adjusted and unadjusted earnings in the 35 highest years of earnings by the total number of months over which such earnings were credited. For the cohort attaining age 62 in 1998, the PIA is equal to the sum of 90% of the first

$477 of AIME, 32% of the next $2398 of AIME and 15% of the AIME above $2875. The monthly benefits are indexed yearly according to increases in the Consumer Price Index.

The OASDI program is financed by a payroll tax, interest income on the trust fund investments and revenues derived from the taxation of part of the OASDI benefits (Rejda, 1994, p.121). The taxation of the OASDI benefits is as follows:

> *"Beginning in 1984, OASDI benefits have, for high-income persons, been subject to income tax. The proceeds are transferred to the trust fund which paid the benefits on which income taxes were levied. If the sum of (1) Adjusted Gross Income (as customarily determined for income-tax purposes), (2) interest on tax-exempt bonds, (3) certain foreign-source income, and (4) 50% of OASDI benefits exceeds the basic threshold amount ($25,000 for single persons, $32,000 for married persons filing a joint return, and zero for married persons filing separate returns who lived together at some time in the year), then 50% of the 'excess' -- but not more than 50% of the OASDI benefits -- is added to the AGI in computing income-tax liability. Note that the threshold amounts are not indexed for future years.*
>
> *Beginning in 1994, a second threshold ($34,000 for single persons and $44,000 for married persons filing a joint return) is established; when the foregoing 'excess' carries beyond the second threshold, then 85% of the 'excess' beyond such threshold (as well as 50% of the difference between the thresholds) is added to the AGI in computing income-tax liability -- but not more than 85% of the OASDI benefits can be so added (with equitable transition provisions for those who are just above the second threshold). The additional tax proceeds are transferred to the Hospital Insurance Trust Fund.* (Myers, 1997, p.19)

The OASDI payroll tax contribution is a percentage of the portion of a pensioner's earnings that is below a maximum taxable and creditable earning base. The amount is matched by an identical contributions from the employer.

Unlike OASDI, benefits from SSI are not related to recipients' past earnings. Seniors aged 65 or over who meet a needs test are eligible for SSI benefits. The maximum monthly benefit was $494 as of January 1998 ($791 for a couple if both members are eligible). The SSI benefit is reduced by a dollar for each dollar of the recipient's other monthly income excluding the following: the first $20 in OASDI benefits or other earned or unearned income each month; the first $65 of monthly earnings and one-half of any monthly earnings above $65 (Social Security Bulletin). The $20 and $65 thresholds are not indexed in the future. SSI benefits are indexed yearly according to increases in the Consumer Price Index. SSI benefits are financed by general tax revenues.

IV ADEQUACY, EQUITY AND PROGRESSIVENESS

In a recent paper, Knox and Cornish (1997) established the following four criteria for a national retirement income system:

1. An adequate minimum income should be provided for all retirees;
2. Outputs should be related to inputs (i.e. more contributions should lead to more benefits);
3. Redistribution should be progressive;
4. Similar benefits should be provided to individuals in similar circumstances.

The paper will review the Canadian and U.S. systems based on the first three criteria. The last one is deemed to have been met by these systems as defined.

In the model used for analysis, a worker is assumed to have worked for 40 years from age 25 to 64 and then retires at age 65 in 1998. To simplify the calculations, a worker is also assumed to earn constant wages, measured in 1998 dollars, for each year during his/her 40 years in the work force. The target income replacement ratio after retirement is 70% for all workers. If retirement benefits from the national social security system are not enough to provide the 70% replacement ratio, the difference is assumed to be provided by the worker from other sources of private income (e.g. savings or private pension plans). Based on these assumptions, the amount of each type of retirement benefit for workers with yearly earnings from $1,000 to $100,000, under the social security systems in Canada and the U.S., is calculated. The results are tabulated in Appendix A. Table 1A and 1B show the benefits under the current and future Canadian system (i.e. when the Seniors Benefit becomes effective in 2001). Table 2 shows the benefits under the U.S. system. With these data, the actual comparison of the two national systems can be carried out.

Adequacy of Protection

To compare the adequacy of protection provided for retirees under the two national social security systems, graphs plotting total retirement benefits against yearly pre-retirement income levels are shown in Appendix B. Figures 1 to 4 graph the current Canadian system, followed by graphs for the Canadian system in 2001 when the Seniors Benefit becomes effective (Figures 5 and 6) and for the current U.S. System (Figure 7).

In the current Canadian system, there are three local minimum points of total benefits: $10,692.12 at income levels between $1,000 and $3,000; $10,885.80 at income level $23,000; and $10,861.22 at income level $100,000. These points, in the order shown, occur where there is no CPP benefit, where the GIS benefit is reduced to almost zero and where the OAS benefit is at its minimum. Note that the amount of total benefits of $10,692.12 from OAS and GIS in 1998, with inflation, would be $11,300 in 2001, or $120 less than the corresponding benefits for the same income levels under the new Seniors Benefit program.

In the Canadian system in 2001, the three local minimum points are: $11,420 at income levels between $1,000 and $3,000; $11,590 at income level $25,000; and $8,841.67 at income levels greater than or equal to $74,000. These points, in the order shown, occur where there is no CPP benefit, where the Seniors Benefit is at its local minimum when it is reduced to $5,160 and where the Seniors Benefit is zero. Note that the amounts of the C/QPP retirement benefits shown in Figure 5 are the same as those in 1998. This is because the YBE and YMPE used in the calculation are those in 1998. In a recent amendment to the C/QPP, the YBE is legislated to remain static at $3,500. Thus, the YBE amount is appropriate. However, the YMPE in 2001 will be larger than the one used in the calculation. So, the minimum total benefits provided by the 2001 system will be greater than $8,841.67 (in 2001 dollars).

Hence, under both Canadian systems, local minimum points of total retirement benefits occur at local minimum points of the components (OAS/GIS/CPP or SB/CPP) of the systems.

In the U.S. system, the minimum total benefit is $6,168 (approximately CAD$8,635)[1] at income levels between $1,000 and $9,000. These are also the points where SSI benefits exist.

It is obvious that the current Canadian system provides greater minimum protection for retirees than the U.S. system, since the minimum total benefits under the Canadian system (CAD$10,692) are much greater than under the U.S. system (CAD$8,635). On the other hand, with low inflation rates in recent years, the U.S. system seems to provide an amount of minimum total benefits that is similar to the 2001 Canadian system (CAD$8,841.67). However, the minimum amount in the 2001 Canadian system occurs at high income levels where the need for retirement benefits from social security system is smaller since pensioners at these income levels are able to provide for their own retirements. Ignoring this minimum amount of $8,841.67, the 2001 Canadian system has minimum total benefits of $11,420 at income levels between $1,000 and $3,500. From this point of view, the new Canadian system also provides much greater minimum protection than the U.S. system. Moreover, the Canadian systems provide a minimum amount of total benefits of approximately $11,000 and this minimum occurs at the lowest end of the range of income levels while the U.S. system has a minimum of $6,168 (CAD$8,635) also at the lowest income levels. Therefore, the Canadian systems provide greater protection (a ratio of 11,000/8,635 or 1.27) than the U.S. system for people with low incomes and, hence, with the greatest need for retirement benefits from the government.

[1] assuming an exchange rate of U.S.$1 to CAD$1.4

In addition, as shown by Figure 7, the total retirement benefits paid by the U.S. system to workers with income levels between $1,000 and $9,000 are constant. This results from the fact that SSI is reduced by a dollar for each dollar of monthly OASDI benefit that exceeds a threshold ($20 in 1998). Thus, over this interval of income levels, any extra benefits paid to retirees from the OASDI are taken away by the SSI. These constant benefits for income levels below $9,000 also mean that there is little incentive for low-income workers to work unless they can get wages large enough to get them beyond SSI eligibility. For low-income workers in Canada, this lack of incentive is not as great since only workers with income levels less than or equal to $3,500 receive the same total retirement benefits. This is because these Canadian workers do not qualify for C/QPP since their incomes are less than the YBE. Also, under the Canadian system, it is not the case that benefits from one social security program are taken away 100% by another.

An alternate way to determine the adequacy of protection provided by a social security system is to look at the income replacement ratios provided. Figures 10, 12 and 14 show the income replacement ratios plotted against pre-retirement income levels between $1,000 and $10,000 under the current and the 2001 Canadian system and the U.S. system respectively. Figures 11, 13 and 15 show the income replacement ratios at income levels between $11,000 and $100,000 under the three corresponding systems. Since people with low income are the ones with greatest need for assistance, the comparison of the national security systems in this part of the paper will focus on income levels below $36,900. This is the YMPE of the C/QPP in 1998, which is approximately the average wage in Canada. The average earnings in the U.S. in 1997 were U.S. $26,732 or CAD $37,424.80 (at an exchange rate of 1.4).

At income levels between $1,000 and $10,000, the two Canadian systems out-perform the U.S. system. Table 3 (p. B16) shows the income replacement ratios of the U.S. system to income replacement ratios of the current Canadian system at these income levels. Table 4 (p. B17) shows the corresponding ratios of the U.S. system and the 2001 Canadian system at these income levels. The U.S. system produces income replacement ratios that are consistently about one half those under the Canadian systems. On the other hand, the two Canadian systems provide similar replacement ratios, with the ratios under the 2001 system being about 8% greater than the current system (Table 5 on p. B18).

At income levels between $11,000 and $29,000, the U.S. system still provides income replacement ratios smaller than those of the two Canadian systems. The difference in the replacement ratios between the Canadian and the U.S. systems gradually decreases as income levels increase. The current Canadian system and the U.S. system provide almost the same income replacement ratio at income level $29,000.

In conclusion, the two Canadian systems provide greater minimum protection for retirees than the U.S. system, especially for those with low incomes. This is true regardless of whether the comparison is based on the amount of minimum total benefits or on income replacement ratios.

Actuarial Equity

The second criteria of equity states that benefits should be related to contributions in the sense that more contributions should lead to more benefits. Before comparing the two national systems, the individual components of the two systems are analyzed.

In the current Canadian system, OAS is financed by general tax revenues. To the extent that these revenues are from income taxes, people with higher incomes contribute relatively more to the program. However, before the OAS clawback was introduced in 1989, OAS provided universal benefits to all eligible seniors. Under the current system, the amount of the OAS benefits received by pensioners is still the same at pre-retirement income levels between $1,000 and $76,000 (the maximum benefit of $4,885.80). The clawback comes into effect when pre-retirement income is greater than $76,021 (i.e. post-retirement income > $53,215). At these income levels, the amount of OAS benefit decreases as income levels increase because of the clawback. This is because the target income replacement ratio is set at 70% and pensioners with high pre-retirement income are modeled as having private income in addition to government benefits in order to achieve the 70% ratio (so $76,021 pre-retirement income leads to a post-retirement income of $53,215). These findings can be seen in Figure 2. Therefore, people who contribute more to OAS do not receive more OAS benefits. In fact, with the clawback in effect, people who contribute more receive less in OAS benefits.

The situation with GIS is very similar to that for OAS. The GIS is also financed by general tax revenues. Hence, using the same reasoning as for OAS,

people with higher incomes contribute relatively more to the program. Recall that, for a single pensioner, the GIS benefit is reduced by a dollar for each two dollars of monthly income (other than the OAS benefit). Therefore, the GIS benefit decreases as income levels increase since, even without considering other sources of private income, the amount of C/QPP retirement benefit increases as income levels increase. This is seen in Figure 3. Also, by comparing the graph of OAS benefits (Figure 2) with that of the GIS benefits (Figure 3), one can see that the GIS benefit decreases much faster than the OAS benefit as income levels increase. The GIS benefit is already zero at an income level of $24,000, while the OAS clawback only starts to come into effect at a post-retirement income of $53,215. This is because the GIS benefit is reduced by a dollar for each two dollars of monthly income (other than OAS), while the OAS clawback is only 15% and only comes into effect when net income is in excess of $53,215. In conclusion, the GIS benefit does not increase with contributions, similar to the OAS program.

For the C/QPP, the contributions are a fixed percentage of earnings between the YBE and the YMPE. Thus, contributions again increase as income levels increase (up to the YMPE). The C/QPP retirement benefits at income levels between $1,000 and $100,000 are shown in Figure 4. People with income levels less than or equal to $3,500 do not receive C/QPP retirement benefits because their earnings are less than the YBE ($3,500 in 1998). Starting at an income of $3,500, the C/QPP benefit increases as income levels increase. The C/QPP benefit then stops increasing when it reaches $8,841.67 or an income level of $36,900 since the YMPE was $36,900 in 1998. From Figure 4, it is clear that the C/QPP retirement benefit increases as contributions increase.

Under the new Canadian system in 2001, there will only be two types of retirement benefits: C/QPP and the Seniors Benefit. The C/QPP, under the 2001 system, is modeled using the same formulae as the current C/QPP program to calculate contributions and retirement benefits. Therefore, the C/QPP retirement benefits under the 2001 system also increase as contributions increase.

The Seniors Benefit (SB), similar to the total of the OAS and the GIS, is also financed by general tax revenues. Thus, contributions from a pensioner toward the program increase with the pensioner's income level. Figure 6 shows the benefits from the SB at income levels between $1,000 and $100,000. As a replacement of both OAS and the GIS, the SB behaves in a similar manner to the other two programs in the sense that benefits decrease as income levels increase. This can also be seen from the formula used to calculate SB benefits. The maximum benefit of $11,420 is reduced by fifty cents for each dollar of outside income, until the benefit falls to $5,160. After a period where there is no marginal clawback, the benefit is further reduced by twenty cents for each dollar of outside income in excess of $25,912 (see Figure 5). Under the model used, only pensioners with income less than or equal to $3,500 receive full benefits since the YBE of C/QPP used is $3,500 (i.e. these pensioners do not qualify for the C/QPP). The SB starts decreasing at income levels above $3,500, where there is a positive amount of C/QPP benefits, and is down to zero when the income level reaches $73,888.

Aggregating the retirement benefits from individual components, the behaviour of the two Canadian systems is shown in Figures 1 and 5 respectively. At income levels between $1,000 and $44,000, the total retirement benefits offered by the two Canadian systems are almost the same. The graph of the 2001 system

is a slight upward shift of the graph of the current system at these income levels. However, the amount of total benefits under the 2001 system starts its second decline at an income level of $45,000, while the corresponding decline under the current system does not begin until income levels reach $76,021 (or $53,215 of post-retirement income). In general, total retirement benefits under both Canadian systems do not increase as contributions (which are directly related to income) increase. In fact, as pointed out above, total benefits decrease as the income level increases for income levels exceeding a certain threshold ($45,000 for the 2001 system and $76,021 for current system). Furthermore, this decrease continues until the C/QPP retirement benefit is the only component of the total benefit (i.e. until pre-retirement income level reaches $73,888 and $114,948 for the 2001 and the current systems respectively).

Switching to the U.S. system, SSI benefits are financed by general tax revenues. Thus, tax 'contributions' by a pensioner toward the SSI program increase as the pensioner's income increases. Figure 8 shows that the SSI benefit decreases as income increases. This decrease is very rapid as the monthly SSI benefit is reduced by a dollar for each dollar of the recipient's other monthly income excluding the following: the first $20 in OASDI benefits or other earned or unearned income each month; the first $65 of earnings each month, and one-half of any earnings above $65 each month. The $20 and $65 are not indexed in the future. With a maximum monthly benefit of $494 (single) in 1998, the SSI benefit is zero at a yearly pre-retirement income level of $10,000.

The OASDI program is financed by a payroll tax, interest income on the trust fund investments and revenues derived from the taxation of part of the OASDI benefits. Hence, people with higher earnings contribute more to the

program as they pay more in total taxes. Unlike SSI, the OASDI benefit does increase as income increases. This is shown in Figure 9. From this graph, it is obvious that actuarial equity plays an important role in the derivation of OASDI benefits.

The U.S. system in total also appears to emphasize actuarial equity. This is because the SSI only plays a very minor role in the U.S. system, in that most of the total retirement benefits are from OASDI. In fact, at pre-retirement income levels greater than or equal to $10,000, the OASDI benefit is the only retirement benefit. Thus, in general, total retirement benefits in the U.S. system increase as income and contributions increase.

In conclusion, a pensioner's retirement benefits under the two Canadian systems do not increase as contributions to the total system increase, while the opposite is generally true in the U.S.. Even though OAS, the GIS and the SB under the Canadian systems violate the second criteria of equity, this may be justifiable. The OAS and the GIS combined (or the SB) were designed to provide minimum protection for all retirees. Hence, it is reasonable for these benefits to decrease as income increases since people with higher earnings don't need the government-sponsored benefits as much. On the other hand, the U.S. system could have emphasized minimum protection more by redistributing more money to the poor. So, the criteria that benefits should be positively correlated to contributions may not be essential in a social security system.

Progressiveness

The third criteria for a national social security system states that redistribution should be progressive. A social security system is progressive if workers with lower income pay less per dollar of actual benefit than workers with higher income.

Under the current Canadian system, benefits from OAS and the GIS are not paid to high-income Canadians. Assuming a 70% replacement ratio, people with pre-retirement income greater than or equal to $24,000 do not receive GIS benefits while people with pre-retirement income greater than or equal to $114,948 do not receive any OAS benefits. In addition, the formula used to calculate the benefit is highly progressive. The GIS benefit is reduced by fifty cents for every dollar of monthly income (other than OAS). The OAS benefit is taxable income plus it has a highly progressive 15% clawback.

Looking at the financing of the programs, both OAS and GIS are financed by general tax revenues. This means a worker's contributions to the programs increase with his/her income level while benefits actually decline. In total, therefore both OAS and the GIS are highly progressive.

Similar comments can be made about the Seniors Benefit of 2001. People with earnings greater than or equal to $73,888 do not receive any benefits from the SB program. Moreover, the SB benefit is reduced by fifty cents for each dollar of outside income until the benefit reaches $5,160. Then the benefit is further reduced by twenty cents for each dollar of other income in excess of $25,912. Like

OAS and the GIS, the SB is financed by general tax revenues, which are also progressive. Thus, the SB is also highly progressive.

In fact the SB may be too progressive. The following table shows the marginal clawback rate and the marginal tax rate of the SB (Brown, 1997, p.130):

Projected Total Marginal Clawback and Tax Rates for Single Seniors:

Other Income ($)	Clawback Rate (%)	Tax Rate (%)	Total Marginal Rate (%)
0 - 6,500	50	0	50
6,500 - 12,520	50	27	77
12,520 - 25,912	0	27	27
25,912 - 36,000	20	27	47
36,000 - 51,721	20	40	60
51,721 - 54,000	0	40	40
54,000+	0	50	50

(Brown, 1997, p130)

As can be seen, many retirees will lose between 47% and 77% of every dollar of post-65 income (from all sources other than the SB). The result is that many Canadians will attempt to avoid taxes by cutting back on savings or by cashing their savings prior to age 65. Hence, the new system may have a perverse result in creating disincentives to save for retirement. Such incentives (or disincentives) should be a criterion in the design of any social security system. It is worthy of note that while the skewed OASDI/PIA formula has a similar impact on benefits as the SB clawback, it does not result in any perverse incentives with respect to saving for retirement. This is because the skewed PIA of OASDI is applied to career earnings while the SB clawback is applied to post-retirement personal income.

The C/QPP retirement benefits are very much the same for the current Canadian system and the one in 2001. The following discussion is based on the C/QPP under the current Canadian system. Since the C/QPP contributions from workers are a fixed percentage of earnings between the YBE and the YMPE, while the C/QPP retirement benefits are a fixed percentage of the contributory earnings, the C/QPP could be regressive if one accounts for the positive correlation between income and life expectancy. This contention is based on the fact that high-income workers live longer and, thus, receive lifetime benefits that are worth more.

In a recent paper, Brown (1998), analyzed the progressiveness of the C/QPP. In that paper, C/QPP retirement beneficiaries were stratified into four groups: those receiving 0 to 25 percent of a full benefit, those receiving 25 to 50 percent of a full benefit, those receiving 50 to 75 percent of a full benefit, and those receiving 75 to 100 percent of a full benefit. Using C/QPP records that show both the ages at death and levels of retirement income of beneficiaries over the period between 1988 and 1994, it was shown that a positive correlation between the C/QPP retirement benefit and life expectancy does exist. The maximum differential found in life expectancy at age 60, for men, was 1.15 for those with 75 to 100 percent of a full benefit versus those with 0 to 25 percent of a full benefit. The differentials were shown to be much smaller for women. However, Brown also presented the following arguments to show that the C/QPP program is still progressive even if only retirement benefits are considered.

C/QPP contributions are a fixed percentage of earnings between the YBE and the YMPE. In 1997, the YBE and the YMPE were $3,500 and $35,800 respectively (this is the scheme analyzed by Brown (1998)). This means that a worker with full retirement benefit credit (i.e. $35,800 contributory earnings) contributes on $32,300 of his/her income while a worker with 25% of a full retirement credit (i.e. $8,950 contributory earnings) contributes on $5,450 of income. The benefit credit of the high-income worker is four times that of the low-income worker. However, the contribution of the high-income worker is 5.93 (32,300/5,450) times that of the low-income worker. Hence, there is a 48% advantage to the 25-percent-YMPE worker in the benefit/contribution formula (ibid., p.16). Since the life expectancy advantage of the 100-percent-YMPE worker is only 15%, the C/QPP in 1997 is still progressive. Similar comparisons were made between the other groups with different percentages of a full benefit credit. It was shown that the C/QPP is always progressive except for males aged 60 with average earnings between 50 and 75 percent of YMPE. For them, the benefit-to-contribution advantage is exactly offset by their life expectancy disadvantage. Still, the C/QPP, as a whole, is progressive.

In conclusion, since all the components of the 1997 and 2001 Canadian systems are progressive, both Canadian systems provide progressive income redistribution.

In the same paper, Brown (1998) presented a similar discussion about the OASDI program in the U.S.. The following is a summary of the findings.

In 1989, the Office of Actuary carried out a study about the correlation between mortality rates and OASDI benefit. OASDI recipients were stratified

into four groups according to their PIA. The groups are people with PIAs less than $400; between $400 and $599; between $600 and $799; and greater than or equal to $800. The maximum mortality differentials were found to be about 1.5 to 1. Applying this differential to all ages and using the 1979-81 U.S. Life Table as a base, the highest-income workers have a life expectancy advantage of 6.4% over the lowest-income workers.

Despite this life expectancy advantage of people with relatively high incomes, OASDI is still progressive even if only retirement benefits are considered.

The formula used to calculate OASDI benefits leads to a highly progressive income redistribution. Consider a worker reaching age 62 as of January 1st, 1997 and retiring with 35 years of earnings at the nationwide average wage. The Average Indexed Monthly Earnings (AIME) for this worker would be $2,061. The corresponding PIA would be $923.40. The OASDI monthly retirement benefit would be 80% of PIA or $738. For a similar worker with 35 years of earnings at exactly one-half of the nationwide average, the monthly retirement benefit would be $474. The benefit ratio is 1.56 to 1 while the contribution ratio is 2 to 1, which leads to a 28.2% (2/1.56) advantage to the low-income worker. Similar calculations comparing other wage strata also show that the benefit-to-contribution advantage to the relatively low income worker exceeds the life expectancy advantage to the relatively high income worker. Therefore, one can argue that the OASDI program is highly progressive.

The progressiveness of OASDI was also supported by a paper by Duggan, Gillingham and Greenless (1995). The correlation between survivorship and

income was found again in this study. The authors calculated the internal rate of return such that the present value of expected benefits was equal to the present value of expected contributions. This included spousal survivor benefits. They did the calculations first by assuming equal mortality across all income classes. Then they calculated the values again using the actual mortality observed for each income class. The results are shown in the following table (ibid., p.14):

Social Security Real Rates of Return (%)

By Income Class and Gender:

Gender	Income Class	Unadjusted for Mortality	Adjusted for Mortality
Men	Low	6.23	6.17
	Medium	5.59	5.58
	High	4.99	5.04
Women	Low	9.24	9.19
	Medium	7.66	7.70
	High	6.02	6.12

(ibid, p. 14)

It is clear from the results that the OASDI program is progressive even when the 'high-income' mortality advantage is taken into account.

The other component of the U.S. system is SSI. Like OAS and GIS in Canada, SSI benefits are not paid to high-income workers. People with yearly income greater than or equal to $10,000 do not receive any SSI benefit. Furthermore, the monthly SSI benefit is reduced first by a dollar for each dollar of monthly OASDI benefit that exceeds a threshold ($20). Then the SSI benefit is

reduced again by fifty cents for each dollar of monthly earnings that exceeds a second threshold ($65). Thus, the benefit formula is highly progressive. Also, the SSI is financed by general tax revenues. This means workers' contributions to the program are directly related to their income levels. Thus, SSI is highly progressive. So progressive that, as mentioned earlier, it may discourage employment, a perverse incentive indeed.

In conclusion, both components of the U.S. social security system are progressive.

V SUMMARY AND CONCLUSION

From the comparisons of the retirement benefits provided by the Canadian and the U.S. social security systems presented above, the following conclusions can be drawn. In general, the 1998 and 2001 Canadian systems provide greater minimum retirement protection than the U.S. system. On the other hand, the benefits and the contributions under the U.S. system are more directly related than those of the Canadian system. Thus, one could conclude that the U.S. system puts relatively more emphasis on equity than adequacy when compared to Canada. Finally, however, all three systems provide progressive income distribution.

Going back to the criteria presented by Knox and Cornish, it has already been pointed out that the equity criteria as defined (i.e. benefits must increase with contributions), may not be an essential criterion for a national social security system.

On the other hand, from the discussion of the progressiveness of the Seniors Benefit, it seems appropriate to have a criterion that states that a social security system should not provide disincentives for people to save for their retirement or to continue to work.

Of course, these criteria are only a general guide towards the design of a social security system. The relative emphasis that should be placed on the individual criterion depends on the political, economic and demographic context of the given country.

VI EPILOGUE

The purpose of this paper was to review issues around adequacy, equity and progressivenss of social security using the United States and Canada as living examples. While that was of interest, another aspect arose in the study.

It became a point of fascination to this researcher that while the actuarial designs of the social security systems in these two countries are remarkably different, the end-result benefits to the participants bear remarkable similarities. For example, for workers consistently earning the Average National Wage, the two systems provide almost identical replacement ratios.

In Canada, adequacy is assured through a flat benefit that is income tested and income dependent. Equity is (somewhat) achieved by adding to this base benefit an earnings-related C/QPP. The purpose of each part of this dual-benefit structure is fairly clear and can be understood by many, if not most, of the participants in the system.

On the other hand, if you accept that the SSI program in the United States is a minimalist scheme, then in a single program, OASDI, the architects of social security in the U. S. attempted to satisfy both adequacy and equity with the skewed PIA formula. Very few people (including very few actuaries) have a total comprehension of the inner workings of the PIA, and, as one example, cannot appreciate the effective marginal tax equivalents on an extra dollar of private source income post-retirement of this skewed formula. Thus, the system is anything but transparent or clear.

Historically, I had often thought that this characteristic (i.e. transparency and, hence, understandability) was a strength of the Canadian system and a weakness of the system in the U.S.. Now, I am not so sure. I would submit to the reader that it is extremely difficult, if not impossible, to design an affordable social security system that provides adequate enough benefits to the poor, and equitable enough benefits to the wealthy, which does not result in effective marginal tax rates that then create perverse impacts (e.g. a disincentive to save for retirement). However, if you design a system that no-one can comprehend, then you can have all three of these attributes in a single system. I would submit to you that OASDI is one such system.

I say this not as a criticism, but as a point of congratulations, to the original architects of the OASDI system, and hope that by contributing to the discussion to this paper, they can shed some light on whether this result came from good management or good luck.

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Appendix A

Table 1A

Pre-Retire Inc.	OAS	OAS Clawbk	Net OAS ratio	CPP	CPP ratio	GIS	GIS ratio	Total Benefits	Total Ben. ratio	Other Income
1000	4885.8	0.00	4.8858	0.00	0.0000	5806.32	5.8063	10692.12	10.6921	0
2000	4885.8	0.00	2.4429	0.00	0.0000	5806.32	2.9032	10692.12	5.3461	0
3000	4885.8	0.00	1.6286	0.00	0.0000	5806.32	1.9354	10692.12	3.5640	0
4000	4885.8	0.00	1.2215	1000.00	0.2500	5306.32	1.3266	11192.12	2.7980	0
5000	4885.8	0.00	0.9772	1250.00	0.2500	5181.32	1.0363	11317.12	2.2634	0
6000	4885.8	0.00	0.8143	1500.00	0.2500	5056.32	0.8427	11442.12	1.9070	0
7000	4885.8	0.00	0.6980	1750.00	0.2500	4931.32	0.7045	11567.12	1.6524	0
8000	4885.8	0.00	0.6107	2000.00	0.2500	4806.32	0.6008	11692.12	1.4615	0
9000	4885.8	0.00	0.5429	2250.00	0.2500	4681.32	0.5201	11817.12	1.3130	0
10000	4885.8	0.00	0.4886	2500.00	0.2500	4556.32	0.4556	11942.12	1.1942	0
11000	4885.8	0.00	0.4442	2750.00	0.2500	4431.32	0.4028	12067.12	1.0970	0
12000	4885.8	0.00	0.4072	3000.00	0.2500	4306.32	0.3589	12192.12	1.0160	0
13000	4885.8	0.00	0.3758	3250.00	0.2500	4181.32	0.3216	12317.12	0.9475	0
14000	4885.8	0.00	0.3490	3500.00	0.2500	4056.32	0.2897	12442.12	0.8887	0
15000	4885.8	0.00	0.3257	3750.00	0.2500	3931.32	0.2621	12567.12	0.8378	0
16000	4885.8	0.00	0.3054	4000.00	0.2500	3806.32	0.2379	12692.12	0.7933	0
17000	4885.8	0.00	0.2874	4250.00	0.2500	3681.32	0.2165	12817.12	0.7539	0
18000	4885.8	0.00	0.2714	4500.00	0.2500	3556.32	0.1976	12942.12	0.7190	0
19000	4885.8	0.00	0.2571	4750.00	0.2500	3198.44	0.1683	12834.24	0.6755	465.76
20000	4885.8	0.00	0.2443	5000.00	0.2500	2498.44	0.1249	12384.24	0.6192	1615.76
21000	4885.8	0.00	0.2327	5250.00	0.2500	1798.44	0.0856	11934.24	0.5683	2765.76
22000	4885.8	0.00	0.2221	5500.00	0.2500	1098.44	0.0499	11484.24	0.5220	3915.76
23000	4885.8	0.00	0.2124	5750.00	0.2500	398.44	0.0173	11034.24	0.4797	5065.76
24000	4885.8	0.00	0.2036	6000.00	0.2500	0	0.0000	10885.80	0.4536	5914.2
25000	4885.8	0.00	0.1954	6250.00	0.2500	0	0.0000	11135.80	0.4454	6364.2
26000	4885.8	0.00	0.1879	6500.00	0.2500	0	0.0000	11385.80	0.4379	6814.2

Table 1A (Con't)

Pre-Retire Inc.	OAS	OAS Clawbk	Net OAS ratio	CPP	CPP ratio	GIS	GIS ratio	Total Benefits	Total Ben. ratio	Other Income
27000	4885.8	0.00	0.1810	6750.00	0.2500	0.00	0.0000	11635.80	0.4310	7264.2
28000	4885.8	0.00	0.1745	7000.00	0.2500	0.00	0.0000	11885.80	0.4245	7714.2
29000	4885.8	0.00	0.1685	7250.00	0.2500	0.00	0.0000	12135.80	0.4185	8164.2
30000	4885.8	0.00	0.1629	7500.00	0.2500	0.00	0.0000	12385.80	0.4129	8614.2
31000	4885.8	0.00	0.1576	7750.00	0.2500	0.00	0.0000	12635.80	0.4076	9064.2
32000	4885.8	0.00	0.1527	8000.00	0.2500	0.00	0.0000	12885.80	0.4027	9514.2
33000	4885.8	0.00	0.1481	8250.00	0.2500	0.00	0.0000	13135.80	0.3981	9964.2
34000	4885.8	0.00	0.1437	8500.00	0.2500	0.00	0.0000	13385.80	0.3937	10414.2
35000	4885.8	0.00	0.1396	8750.00	0.2500	0.00	0.0000	13635.80	0.3896	10864.2
36000	4885.8	0.00	0.1357	8937.48	0.2483	0.00	0.0000	13823.28	0.3840	11376.72
37000	4885.8	0.00	0.1320	8937.48	0.2416	0.00	0.0000	13823.28	0.3736	12076.72
38000	4885.8	0.00	0.1286	8937.48	0.2352	0.00	0.0000	13823.28	0.3638	12776.72
39000	4885.8	0.00	0.1253	8937.48	0.2292	0.00	0.0000	13823.28	0.3544	13476.72
40000	4885.8	0.00	0.1221	8937.48	0.2234	0.00	0.0000	13823.28	0.3456	14176.72
41000	4885.8	0.00	0.1192	8937.48	0.2180	0.00	0.0000	13823.28	0.3372	14876.72
42000	4885.8	0.00	0.1163	8937.48	0.2128	0.00	0.0000	13823.28	0.3291	15576.72
43000	4885.8	0.00	0.1136	8937.48	0.2078	0.00	0.0000	13823.28	0.3215	16276.72
44000	4885.8	0.00	0.1110	8937.48	0.2031	0.00	0.0000	13823.28	0.3142	16976.72
45000	4885.8	0.00	0.1086	8937.48	0.1986	0.00	0.0000	13823.28	0.3072	17676.72
46000	4885.8	0.00	0.1062	8937.48	0.1943	0.00	0.0000	13823.28	0.3005	18376.72
47000	4885.8	0.00	0.1040	8937.48	0.1902	0.00	0.0000	13823.28	0.2941	19076.72
48000	4885.8	0.00	0.1018	8937.48	0.1862	0.00	0.0000	13823.28	0.2880	19776.72
49000	4885.8	0.00	0.0997	8937.48	0.1824	0.00	0.0000	13823.28	0.2821	20476.72
50000	4885.8	0.00	0.0977	8937.48	0.1787	0.00	0.0000	13823.28	0.2765	21176.72
51000	4885.8	0.00	0.0958	8937.48	0.1752	0.00	0.0000	13823.28	0.2710	21876.72
52000	4885.8	0.00	0.0940	8937.48	0.1719	0.00	0.0000	13823.28	0.2658	22576.72

Table 1A (Con't)

Pre-Retire Inc.	OAS	OAS Clawbk	Net OAS ratio	CPP	CPP ratio	GIS	GIS ratio	Total Benefits	Total Ben. ratio	Other Income
53000	4885.8	0.00	0.0922	8937.48	0.1686	0.00	0.0000	13823.28	0.2608	23276.72
54000	4885.8	0.00	0.0905	8937.48	0.1655	0.00	0.0000	13823.28	0.2560	23976.72
55000	4885.8	0.00	0.0888	8937.48	0.1625	0.00	0.0000	13823.28	0.2513	24676.72
56000	4885.8	0.00	0.0872	8937.48	0.1596	0.00	0.0000	13823.28	0.2468	25376.72
57000	4885.8	0.00	0.0857	8937.48	0.1568	0.00	0.0000	13823.28	0.2425	26076.72
58000	4885.8	0.00	0.0842	8937.48	0.1541	0.00	0.0000	13823.28	0.2383	26776.72
59000	4885.8	0.00	0.0828	8937.48	0.1515	0.00	0.0000	13823.28	0.2343	27476.72
60000	4885.8	0.00	0.0814	8937.48	0.1490	0.00	0.0000	13823.28	0.2304	28176.72
61000	4885.8	0.00	0.0801	8937.48	0.1465	0.00	0.0000	13823.28	0.2266	28876.72
62000	4885.8	0.00	0.0788	8937.48	0.1442	0.00	0.0000	13823.28	0.2230	29576.72
63000	4885.8	0.00	0.0776	8937.48	0.1419	0.00	0.0000	13823.28	0.2194	30276.72
64000	4885.8	0.00	0.0763	8937.48	0.1396	0.00	0.0000	13823.28	0.2160	30976.72
65000	4885.8	0.00	0.0752	8937.48	0.1375	0.00	0.0000	13823.28	0.2127	31676.72
66000	4885.8	0.00	0.0740	8937.48	0.1354	0.00	0.0000	13823.28	0.2094	32376.72
67000	4885.8	0.00	0.0729	8937.48	0.1334	0.00	0.0000	13823.28	0.2063	33076.72
68000	4885.8	0.00	0.0719	8937.48	0.1314	0.00	0.0000	13823.28	0.2033	33776.72
69000	4885.8	0.00	0.0708	8937.48	0.1295	0.00	0.0000	13823.28	0.2003	34476.72
70000	4885.8	0.00	0.0698	8937.48	0.1277	0.00	0.0000	13823.28	0.1975	35176.72
71000	4885.8	0.00	0.0688	8937.48	0.1259	0.00	0.0000	13823.28	0.1947	35876.72
72000	4885.8	0.00	0.0679	8937.48	0.1241	0.00	0.0000	13823.28	0.1920	36576.72
73000	4885.8	0.00	0.0669	8937.48	0.1224	0.00	0.0000	13823.28	0.1894	37276.72
74000	4885.8	0.00	0.0660	8937.48	0.1208	0.00	0.0000	13823.28	0.1868	37976.72
75000	4885.8	0.00	0.0651	8937.48	0.1192	0.00	0.0000	13823.28	0.1843	38676.72
76000	4885.8	0.00	0.0643	8937.48	0.1176	0.00	0.0000	13823.28	0.1819	39376.72
77000	4885.8	120.88	0.0619	8937.48	0.1161	0.00	0.0000	13702.40	0.1780	40197.6
78000	4885.8	244.41	0.0595	8937.48	0.1146	0.00	0.0000	13578.87	0.1741	41021.13

Table 1A (Con't)

Pre-Retire Inc.	OAS	OAS Clawbk	Net OAS ratio	CPP	CPP ratio	GIS	GIS ratio	Total Benefits	Total Ben. ratio	Other Income
79000	4885.8	367.94	0.0572	8937.48	0.1131	0.00	0.0000	13455.34	0.1703	41844.66
80000	4885.8	491.47	0.0549	8937.48	0.1117	0.00	0.0000	13331.81	0.1666	42668.19
81000	4885.8	615.00	0.0527	8937.48	0.1103	0.00	0.0000	13208.28	0.1631	43491.72
82000	4885.8	738.53	0.0506	8937.48	0.1090	0.00	0.0000	13084.75	0.1596	44315.25
83000	4885.8	862.06	0.0485	8937.48	0.1077	0.00	0.0000	12961.22	0.1562	45138.78
84000	4885.8	985.59	0.0464	8937.48	0.1064	0.00	0.0000	12837.69	0.1528	45962.31
85000	4885.8	1109.12	0.0444	8937.48	0.1051	0.00	0.0000	12714.16	0.1496	46785.84
86000	4885.8	1232.65	0.0425	8937.48	0.1039	0.00	0.0000	12590.63	0.1464	47609.37
87000	4885.8	1356.18	0.0406	8937.48	0.1027	0.00	0.0000	12467.10	0.1433	48432.9
88000	4885.8	1479.71	0.0387	8937.48	0.1016	0.00	0.0000	12343.57	0.1403	49256.43
89000	4885.8	1603.24	0.0369	8937.48	0.1004	0.00	0.0000	12220.04	0.1373	50079.96
90000	4885.8	1726.76	0.0351	8937.48	0.0993	0.00	0.0000	12096.52	0.1344	50903.48
91000	4885.8	1850.29	0.0334	8937.48	0.0982	0.00	0.0000	11972.99	0.1316	51727.01
92000	4885.8	1973.82	0.0317	8937.48	0.0971	0.00	0.0000	11849.46	0.1288	52550.54
93000	4885.8	2097.35	0.0300	8937.48	0.0961	0.00	0.0000	11725.93	0.1261	53374.07
94000	4885.8	2220.88	0.0284	8937.48	0.0951	0.00	0.0000	11602.40	0.1234	54197.6
95000	4885.8	2344.41	0.0268	8937.48	0.0941	0.00	0.0000	11478.87	0.1208	55021.13
96000	4885.8	2467.94	0.0252	8937.48	0.0931	0.00	0.0000	11355.34	0.1183	55844.66
97000	4885.8	2591.47	0.0237	8937.48	0.0921	0.00	0.0000	11231.81	0.1158	56668.19
98000	4885.8	2715.00	0.0222	8937.48	0.0912	0.00	0.0000	11108.28	0.1133	57491.72
99000	4885.8	2838.53	0.0207	8937.48	0.0903	0.00	0.0000	10984.75	0.1110	58315.25
100000	4885.8	2962.06	0.0192	8937.48	0.0894	0.00	0.0000	10861.22	0.1086	59138.78

Table 1B

Pre-Retire Inc.	Seniors Benefit	SB ratio	CPP	CPP ratio	Total Benefits	Total Ben. ratio	Other Income
1000	11420.00	11.4200	0.00	0.0000	11420.00	11.4200	0.00
2000	11420.00	5.7100	0.00	0.0000	11420.00	5.7100	0.00
3000	11420.00	3.8067	0.00	0.0000	11420.00	3.8067	0.00
4000	10920.00	2.7300	1000.00	0.2500	11920.00	2.9800	0.00
5000	10795.00	2.1590	1250.00	0.2500	12045.00	2.4090	0.00
6000	10670.00	1.7783	1500.00	0.2500	12170.00	2.0283	0.00
7000	10545.00	1.5064	1750.00	0.2500	12295.00	1.7564	0.00
8000	10420.00	1.3025	2000.00	0.2500	12420.00	1.5525	0.00
9000	10295.00	1.1439	2250.00	0.2500	12545.00	1.3939	0.00
10000	10170.00	1.0170	2500.00	0.2500	12670.00	1.2670	0.00
11000	10045.00	0.9132	2750.00	0.2500	12795.00	1.1632	0.00
12000	9920.00	0.8267	3000.00	0.2500	12920.00	1.0767	0.00
13000	9795.00	0.7535	3250.00	0.2500	13045.00	1.0035	0.00
14000	9670.00	0.6907	3500.00	0.2500	13170.00	0.9407	0.00
15000	9545.00	0.6363	3750.00	0.2500	13295.00	0.8863	0.00
16000	9420.00	0.5888	4000.00	0.2500	13420.00	0.8388	0.00
17000	9295.00	0.5468	4250.00	0.2500	13545.00	0.7968	0.00
18000	9170.00	0.5094	4500.00	0.2500	13670.00	0.7594	0.00
19000	9045.00	0.4761	4750.00	0.2500	13795.00	0.7261	0.00
20000	8840.00	0.4420	5000.00	0.2500	13840.00	0.6920	160.00
21000	8140.00	0.3876	5250.00	0.2500	13390.00	0.6376	1310.00
22000	7440.00	0.3382	5500.00	0.2500	12940.00	0.5882	2460.00
23000	6740.00	0.2930	5750.00	0.2500	12490.00	0.5430	3610.00
24000	6040.00	0.2517	6000.00	0.2500	12040.00	0.5017	4760.00
25000	5340.00	0.2136	6250.00	0.2500	11590.00	0.4636	5910.00
26000	5160.00	0.1985	6500.00	0.2500	11660.00	0.4485	6540.00

Table 1B (Con't)

Pre-Retire Inc.	Seniors Benefit	SB ratio	CPP	CPP ratio	Total Benefits	Total Ben. ratio	Other Income
27000	5160.00	0.1911	6750.00	0.2500	11910.00	0.4411	6990.00
28000	5160.00	0.1843	7000.00	0.2500	12160.00	0.4343	7440.00
29000	5160.00	0.1779	7250.00	0.2500	12410.00	0.4279	7890.00
30000	5160.00	0.1720	7500.00	0.2500	12660.00	0.4220	8340.00
31000	5160.00	0.1665	7750.00	0.2500	12910.00	0.4165	8790.00
32000	5160.00	0.1613	8000.00	0.2500	13160.00	0.4113	9240.00
33000	5160.00	0.1564	8250.00	0.2500	13410.00	0.4064	9690.00
34000	5160.00	0.1518	8500.00	0.2500	13660.00	0.4018	10140.00
35000	5160.00	0.1474	8750.00	0.2500	13910.00	0.3974	10590.00
36000	5160.00	0.1433	8841.67	0.2456	14001.67	0.3889	11198.33
37000	5160.00	0.1395	8841.67	0.2390	14001.67	0.3784	11898.33
38000	5160.00	0.1358	8841.67	0.2327	14001.67	0.3685	12598.33
39000	5160.00	0.1323	8841.67	0.2267	14001.67	0.3590	13298.33
40000	5160.00	0.1290	8841.67	0.2210	14001.67	0.3500	13998.33
41000	5160.00	0.1259	8841.67	0.2157	14001.67	0.3415	14698.33
42000	5160.00	0.1229	8841.67	0.2105	14001.67	0.3334	15398.33
43000	5160.00	0.1200	8841.67	0.2056	14001.67	0.3256	16098.33
44000	5160.00	0.1173	8841.67	0.2009	14001.67	0.3182	16798.33
45000	5055.25	0.1123	8841.67	0.1965	13896.92	0.3088	17603.08
46000	4880.25	0.1061	8841.67	0.1922	13721.92	0.2983	18478.08
47000	4705.25	0.1001	8841.67	0.1881	13546.92	0.2882	19353.08
48000	4530.25	0.0944	8841.67	0.1842	13371.92	0.2786	20228.08
49000	4355.25	0.0889	8841.67	0.1804	13196.92	0.2693	21103.08
50000	4180.25	0.0836	8841.67	0.1768	13021.92	0.2604	21978.08
51000	4005.25	0.0785	8841.67	0.1734	12846.92	0.2519	22853.08
52000	3830.25	0.0737	8841.67	0.1700	12671.92	0.2437	23728.08

Table 1B (Con't)

Pre-Retire Inc.	Seniors Benefit	SB ratio	CPP	CPP ratio	Total Benefits	Total Ben. ratio	Other Income
53000	3655.25	0.0690	8841.67	0.1668	12496.92	0.2358	24603.08
54000	3480.25	0.0644	8841.67	0.1637	12321.92	0.2282	25478.08
55000	3305.25	0.0601	8841.67	0.1608	12146.92	0.2209	26353.08
56000	3130.25	0.0559	8841.67	0.1579	11971.92	0.2138	27228.08
57000	2955.25	0.0518	8841.67	0.1551	11796.92	0.2070	28103.08
58000	2780.25	0.0479	8841.67	0.1524	11621.92	0.2004	28978.08
59000	2605.25	0.0442	8841.67	0.1499	11446.92	0.1940	29853.08
60000	2430.25	0.0405	8841.67	0.1474	11271.92	0.1879	30728.08
61000	2255.25	0.0370	8841.67	0.1449	11096.92	0.1819	31603.08
62000	2080.25	0.0336	8841.67	0.1426	10921.92	0.1762	32478.08
63000	1905.25	0.0302	8841.67	0.1403	10746.92	0.1706	33353.08
64000	1730.25	0.0270	8841.67	0.1382	10571.92	0.1652	34228.08
65000	1555.25	0.0239	8841.67	0.1360	10396.92	0.1600	35103.08
66000	1380.25	0.0209	8841.67	0.1340	10221.92	0.1549	35978.08
67000	1205.25	0.0180	8841.67	0.1320	10046.92	0.1500	36853.08
68000	1030.25	0.0152	8841.67	0.1300	9871.92	0.1452	37728.08
69000	855.25	0.0124	8841.67	0.1281	9696.92	0.1405	38603.08
70000	680.25	0.0097	8841.67	0.1263	9521.92	0.1360	39478.08
71000	505.25	0.0071	8841.67	0.1245	9346.92	0.1316	40353.08
72000	330.25	0.0046	8841.67	0.1228	9171.92	0.1274	41228.08
73000	155.25	0.0021	8841.67	0.1211	8996.92	0.1232	42103.08
74000	0.00	0.0000	8841.67	0.1195	8841.67	0.1195	42958.33
75000	0.00	0.0000	8841.67	0.1179	8841.67	0.1179	43658.33
76000	0.00	0.0000	8841.67	0.1163	8841.67	0.1163	44358.33
77000	0.00	0.0000	8841.67	0.1148	8841.67	0.1148	45058.33
78000	0.00	0.0000	8841.67	0.1134	8841.67	0.1134	45758.33

Table 1B (Con't)

Pre-Retire Inc.	Seniors Benefit	SB ratio	CPP	CPP ratio	Total Benefits	Total Ben. ratio	Other Income
79000	0.00	0.0000	8841.67	0.1119	8841.67	0.1119	46458.33
80000	0.00	0.0000	8841.67	0.1105	8841.67	0.1105	47158.33
81000	0.00	0.0000	8841.67	0.1092	8841.67	0.1092	47858.33
82000	0.00	0.0000	8841.67	0.1078	8841.67	0.1078	48558.33
83000	0.00	0.0000	8841.67	0.1065	8841.67	0.1065	49258.33
84000	0.00	0.0000	8841.67	0.1053	8841.67	0.1053	49958.33
85000	0.00	0.0000	8841.67	0.1040	8841.67	0.1040	50658.33
86000	0.00	0.0000	8841.67	0.1028	8841.67	0.1028	51358.33
87000	0.00	0.0000	8841.67	0.1016	8841.67	0.1016	52058.33
88000	0.00	0.0000	8841.67	0.1005	8841.67	0.1005	52758.33
89000	0.00	0.0000	8841.67	0.0993	8841.67	0.0993	53458.33
90000	0.00	0.0000	8841.67	0.0982	8841.67	0.0982	54158.33
91000	0.00	0.0000	8841.67	0.0972	8841.67	0.0972	54858.33
92000	0.00	0.0000	8841.67	0.0961	8841.67	0.0961	55558.33
93000	0.00	0.0000	8841.67	0.0951	8841.67	0.0951	56258.33
94000	0.00	0.0000	8841.67	0.0941	8841.67	0.0941	56958.33
95000	0.00	0.0000	8841.67	0.0931	8841.67	0.0931	57658.33
96000	0.00	0.0000	8841.67	0.0921	8841.67	0.0921	58358.33
97000	0.00	0.0000	8841.67	0.0912	8841.67	0.0912	59058.33
98000	0.00	0.0000	8841.67	0.0902	8841.67	0.0902	59758.33
99000	0.00	0.0000	8841.67	0.0893	8841.67	0.0893	60458.33
100000	0.00	0.0000	8841.67	0.0884	8841.67	0.0884	61158.33

Table 2

Pre-Retire Income	OASDI	OASDI ratio	SSI	SSI ratio	Total Benefits	Total Ben. ratio	Other Income
1000	900	0.9000	5268	5.2680	6168.00	6.1680	0
2000	1800	0.9000	4368	2.1840	6168.00	3.0840	0
3000	2700	0.9000	3468	1.1560	6168.00	2.0560	0
4000	3600	0.9000	2568	0.6420	6168.00	1.5420	0
5000	4500	0.9000	1668	0.3336	6168.00	1.2336	0
6000	5239.92	0.8733	928.08	0.1547	6168.00	1.0280	0
7000	5559.92	0.7943	608.08	0.0869	6168.00	0.8811	0
8000	5879.92	0.7350	288.08	0.0360	6168.00	0.7710	0
9000	6199.92	0.6889	0	0.0000	6199.92	0.6889	100.08
10000	6519.92	0.6520	0	0.0000	6519.92	0.6520	480.08
11000	6839.92	0.6218	0	0.0000	6839.92	0.6218	860.08
12000	7159.92	0.5967	0	0.0000	7159.92	0.5967	1240.08
13000	7479.92	0.5754	0	0.0000	7479.92	0.5754	1620.08
14000	7799.92	0.5571	0	0.0000	7799.92	0.5571	2000.08
15000	8119.92	0.5413	0	0.0000	8119.92	0.5413	2380.08
16000	8439.92	0.5275	0	0.0000	8439.92	0.5275	2760.08
17000	8759.92	0.5153	0	0.0000	8759.92	0.5153	3140.08
18000	9079.92	0.5044	0	0.0000	9079.92	0.5044	3520.08
19000	9399.92	0.4947	0	0.0000	9399.92	0.4947	3900.08
20000	9719.92	0.4860	0	0.0000	9719.92	0.4860	4280.08
21000	10039.92	0.4781	0	0.0000	10039.92	0.4781	4660.08
22000	10359.92	0.4709	0	0.0000	10359.92	0.4709	5040.08
23000	10679.92	0.4643	0	0.0000	10679.92	0.4643	5420.08
24000	10999.92	0.4583	0	0.0000	10999.92	0.4583	5800.08
25000	11319.92	0.4528	0	0.0000	11319.92	0.4528	6180.08
26000	11639.92	0.4477	0	0.0000	11639.92	0.4477	6560.08

Table 2 (Con't)

Pre-Retire Income	OASDI	OASDI ratio	SSI	SSI ratio	Total Benefits	Total Ben. ratio	Other Income
53000	17134.92	0.3233	0.00	0.0000	17134.92	0.3233	19965.08
54000	17284.92	0.3201	0.00	0.0000	17284.92	0.3201	20515.08
55000	17434.92	0.3170	0.00	0.0000	17434.92	0.3170	21065.08
56000	17584.92	0.3140	0.00	0.0000	17584.92	0.3140	21615.08
57000	17734.92	0.3111	0.00	0.0000	17734.92	0.3111	22165.08
58000	17884.92	0.3084	0.00	0.0000	17884.92	0.3084	22715.08
59000	18034.92	0.3057	0.00	0.0000	18034.92	0.3057	23265.08
60000	18184.92	0.3031	0.00	0.0000	18184.92	0.3031	23815.08
61000	18334.92	0.3006	0.00	0.0000	18334.92	0.3006	24365.08
62000	18484.92	0.2981	0.00	0.0000	18484.92	0.2981	24915.08
63000	18634.92	0.2958	0.00	0.0000	18634.92	0.2958	25465.08
64000	18784.92	0.2935	0.00	0.0000	18784.92	0.2935	26015.08
65000	18934.92	0.2913	0.00	0.0000	18934.92	0.2913	26565.08
66000	19084.92	0.2892	0.00	0.0000	19084.92	0.2892	27115.08
67000	19234.92	0.2871	0.00	0.0000	19234.92	0.2871	27665.08
68000	19384.92	0.2851	0.00	0.0000	19384.92	0.2851	28215.08
69000	19444.92	0.2818	0.00	0.0000	19444.92	0.2818	28855.08
70000	19444.92	0.2778	0.00	0.0000	19444.92	0.2778	29555.08
71000	19444.92	0.2739	0.00	0.0000	19444.92	0.2739	30255.08
72000	19444.92	0.2701	0.00	0.0000	19444.92	0.2701	30955.08
73000	19444.92	0.2664	0.00	0.0000	19444.92	0.2664	31655.08
74000	19444.92	0.2628	0.00	0.0000	19444.92	0.2628	32355.08
75000	19444.92	0.2593	0.00	0.0000	19444.92	0.2593	33055.08
76000	19444.92	0.2559	0.00	0.0000	19444.92	0.2559	33755.08
77000	19444.92	0.2525	0.00	0.0000	19444.92	0.2525	34455.08
78000	19444.92	0.2493	0.00	0.0000	19444.92	0.2493	35155.08

Figure 2

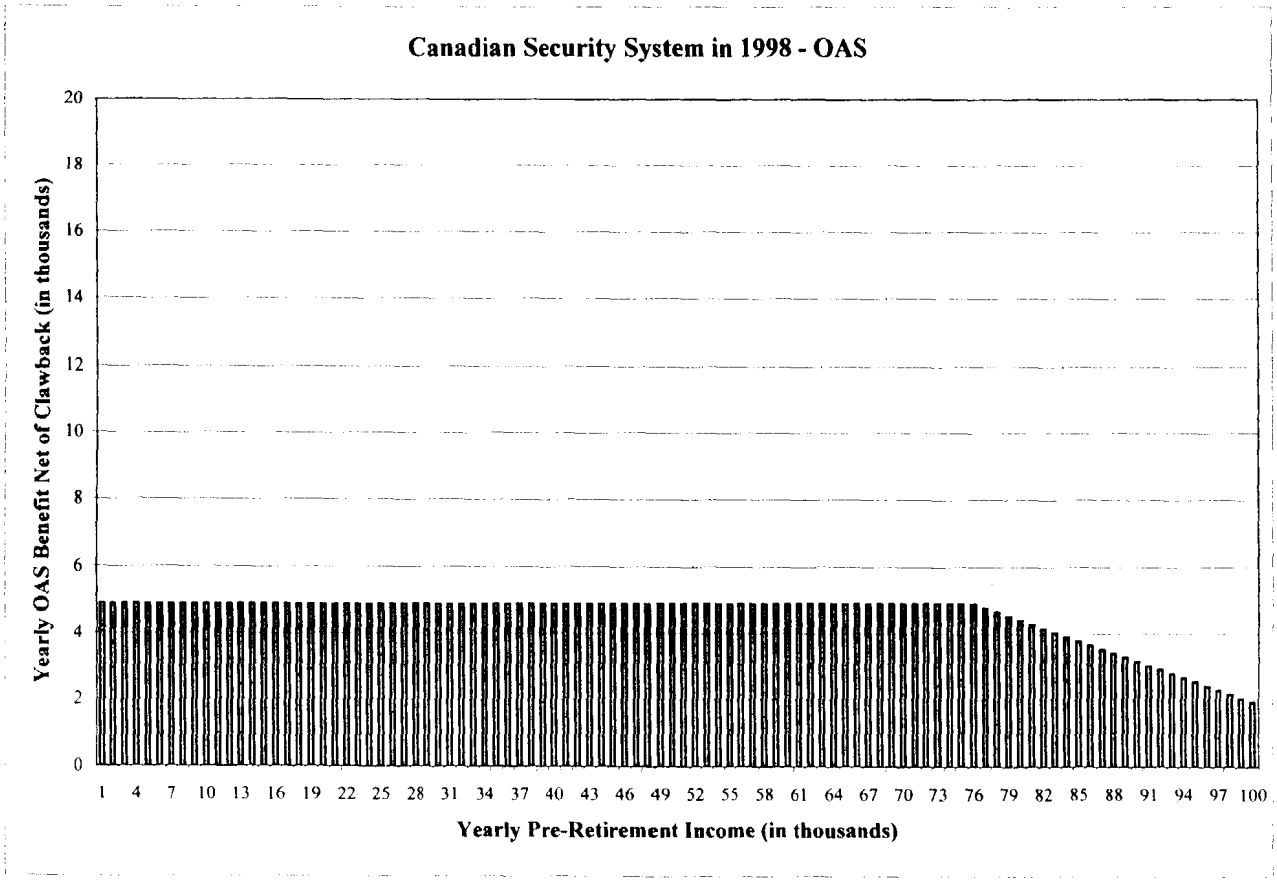
Canadian Security System in 1998 - OAS
Yearly OAS Benefit Net of Clawback (in thousands)
0
2
4
6
8
10
12
14
16
18
20
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85 88 91 94 97 100
Yearly Pre-Retirement Income (in thousands)

Figure 3

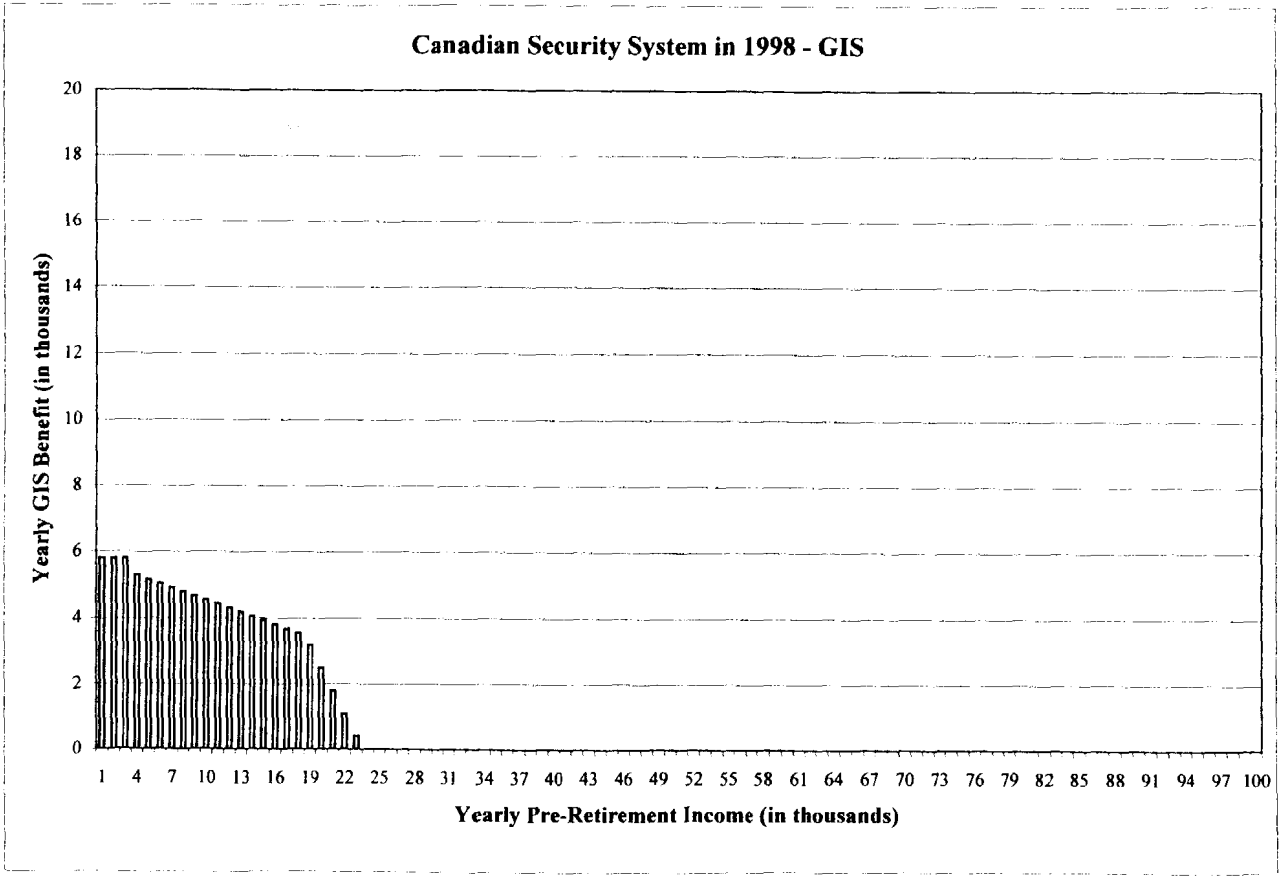
Canadian Security System in 1998 - GIS
Yearly GIS Benefit (in thousands)
0
2
4
6
8
10
12
14
16
18
20
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85 88 91 94 97 100
Yearly Pre-Retirement Income (in thousands)

Figure 4

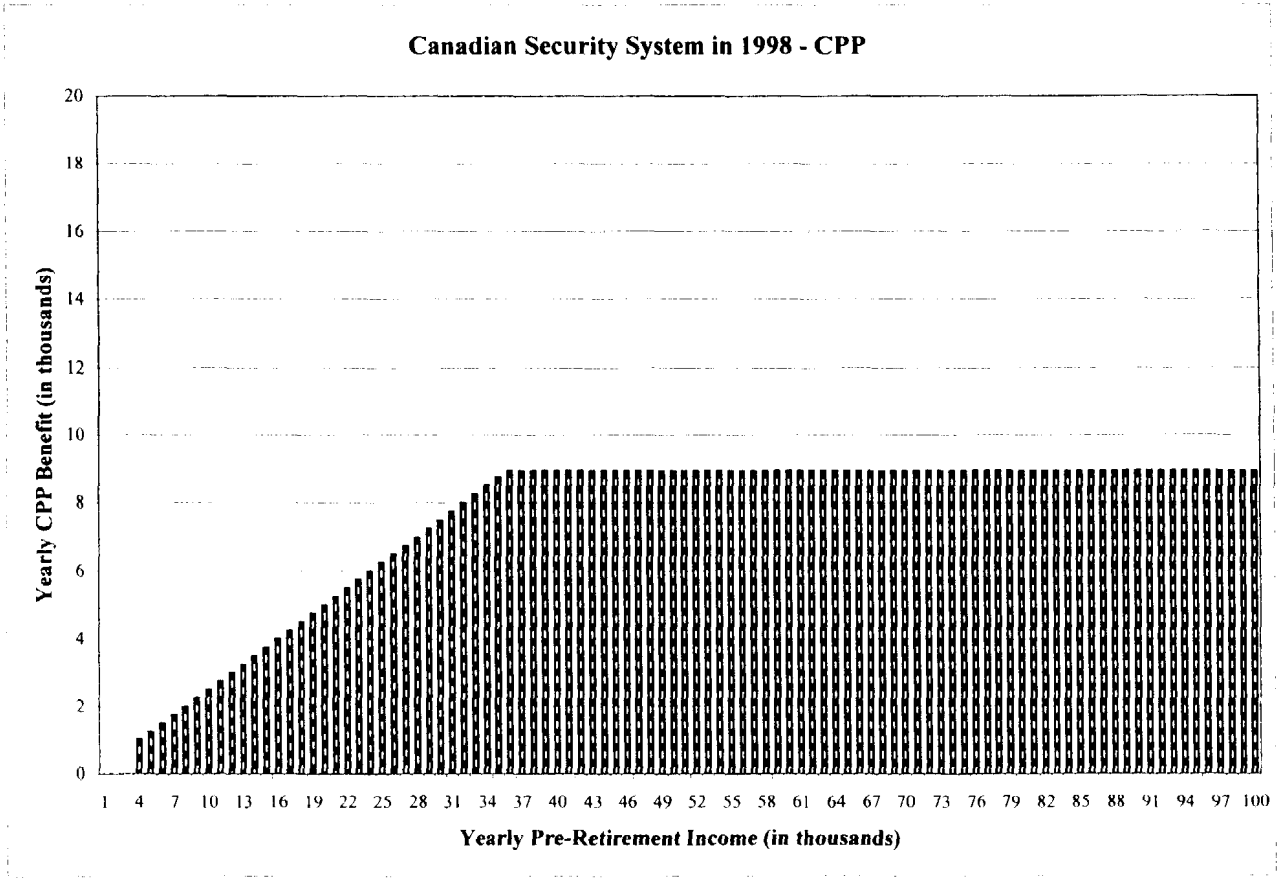
Canadian Security System in 1998 - CPP
Yearly CPP Benefit (in thousands)
0
2
4
6
8
10
12
14
16
18
20
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85 88 91 94 97 100
Yearly Pre-Retirement Income (in thousands)

Figure 5

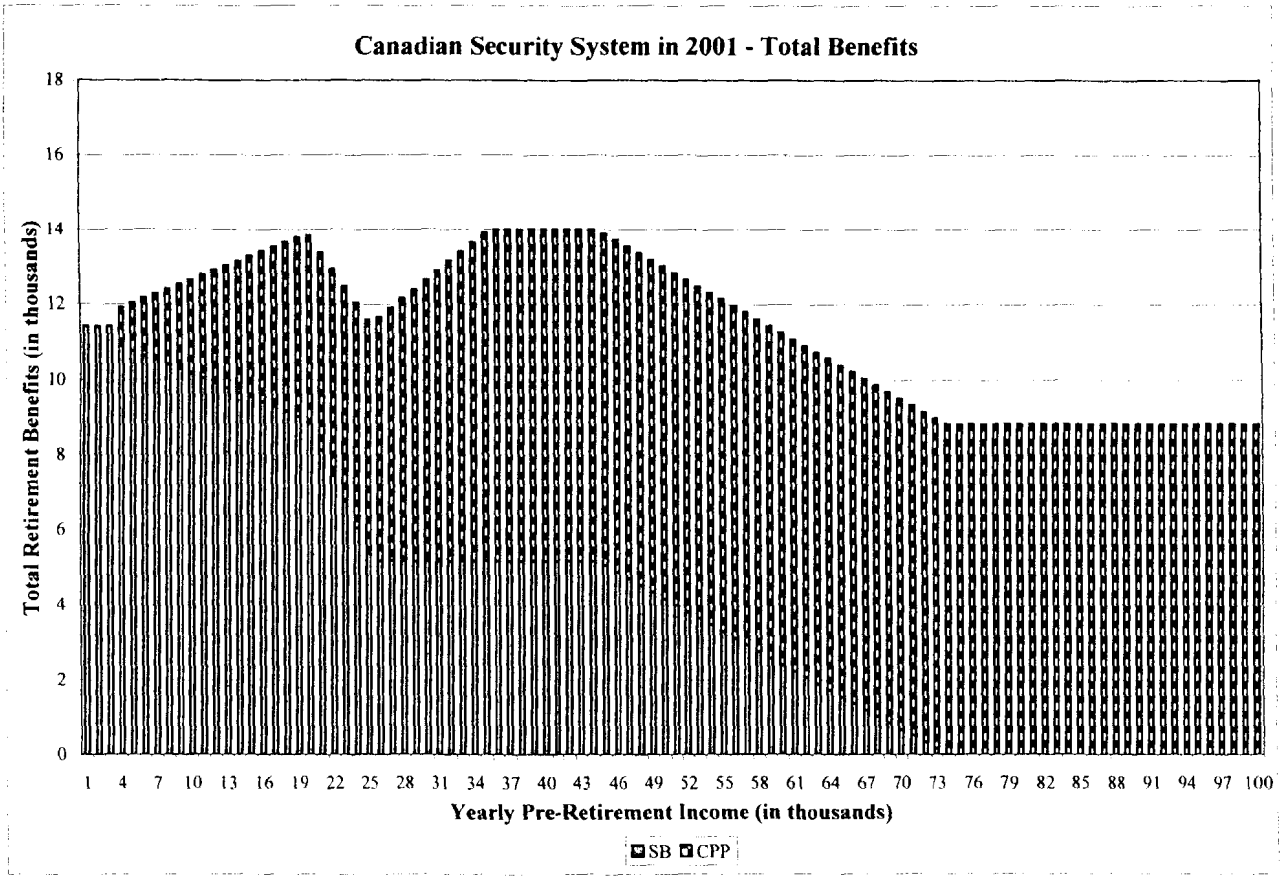
Canadian Security System in 2001 - Total Benefits
Total Retirement Benefits (in thousands)
0
2
4
6
8
10
12
14
16
18
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85 88 91 94 97 100
Yearly Pre-Retirement Income (in thousands)
SB
CPP

Figure 6

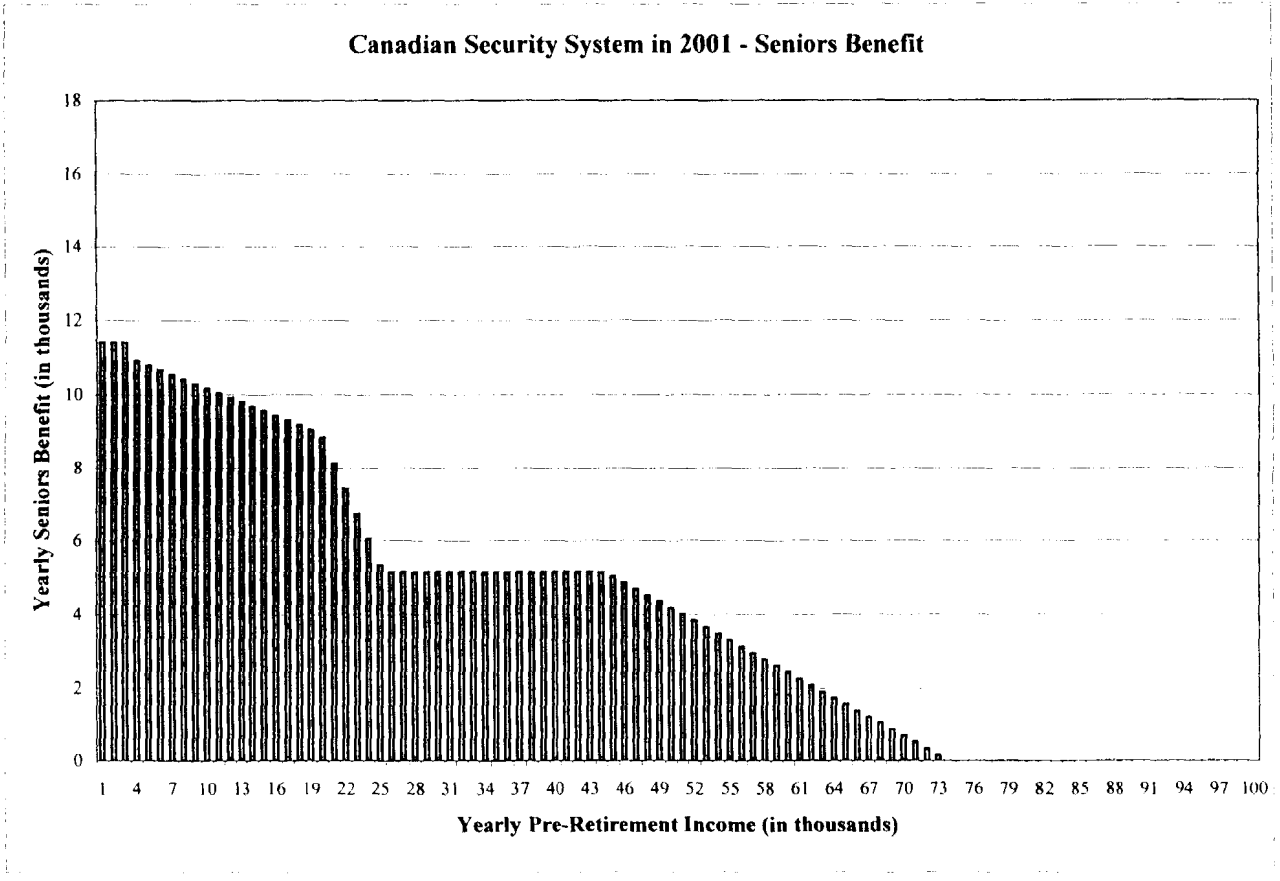
Canadian Security System in 2001 - Seniors Benefit
Yearly Seniors Benefit (in thousands)
18
16
14
12
10
8
6
4
2
0
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85 88 91 94 97 100
Yearly Pre-Retirement Income (in thousands)

Figure 8

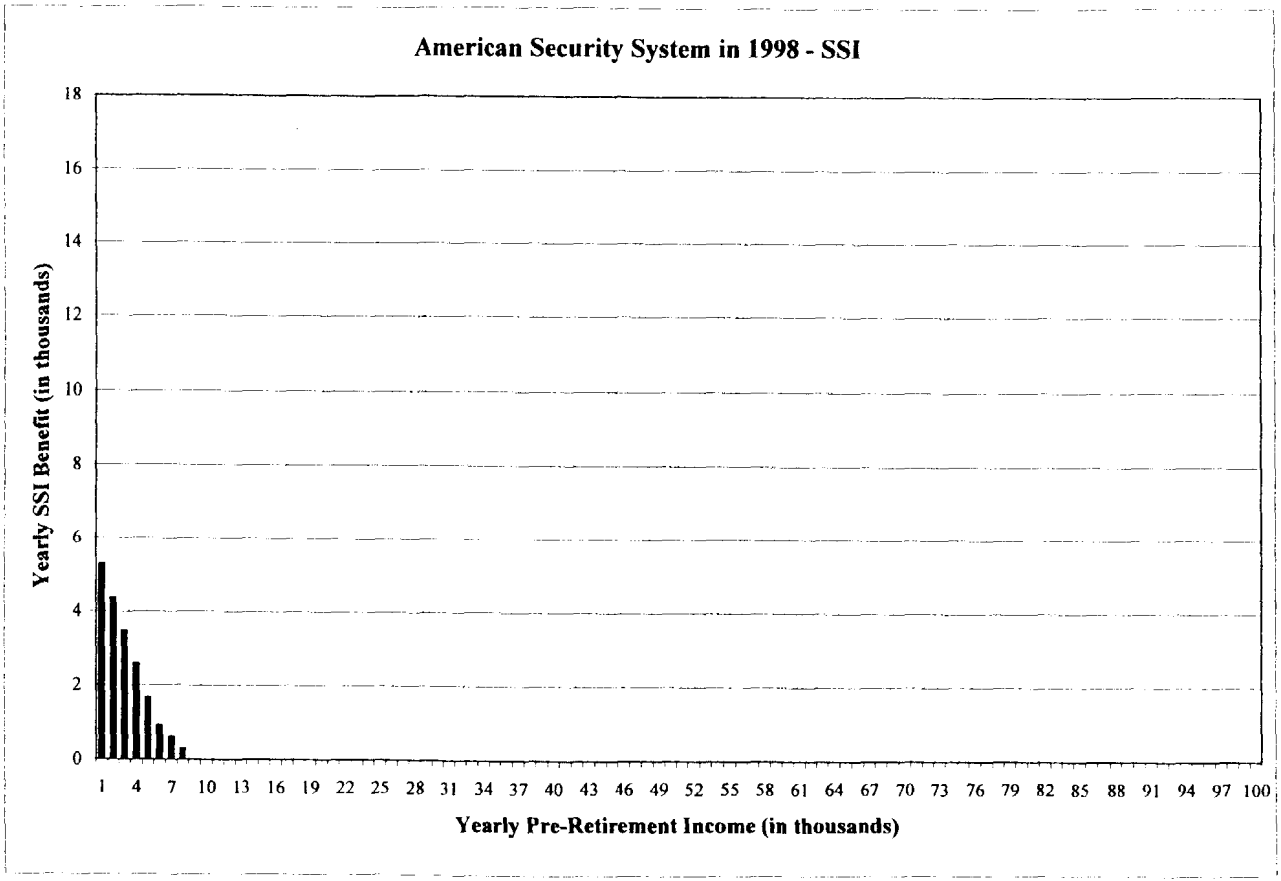
American Security System in 1998 - SSI
Yearly SSI Benefit (in thousands)
18
16
14
12
10
8
6
4
2
0
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85 88 91 94 97 100
Yearly Pre-Retirement Income (in thousands)

Figure 9

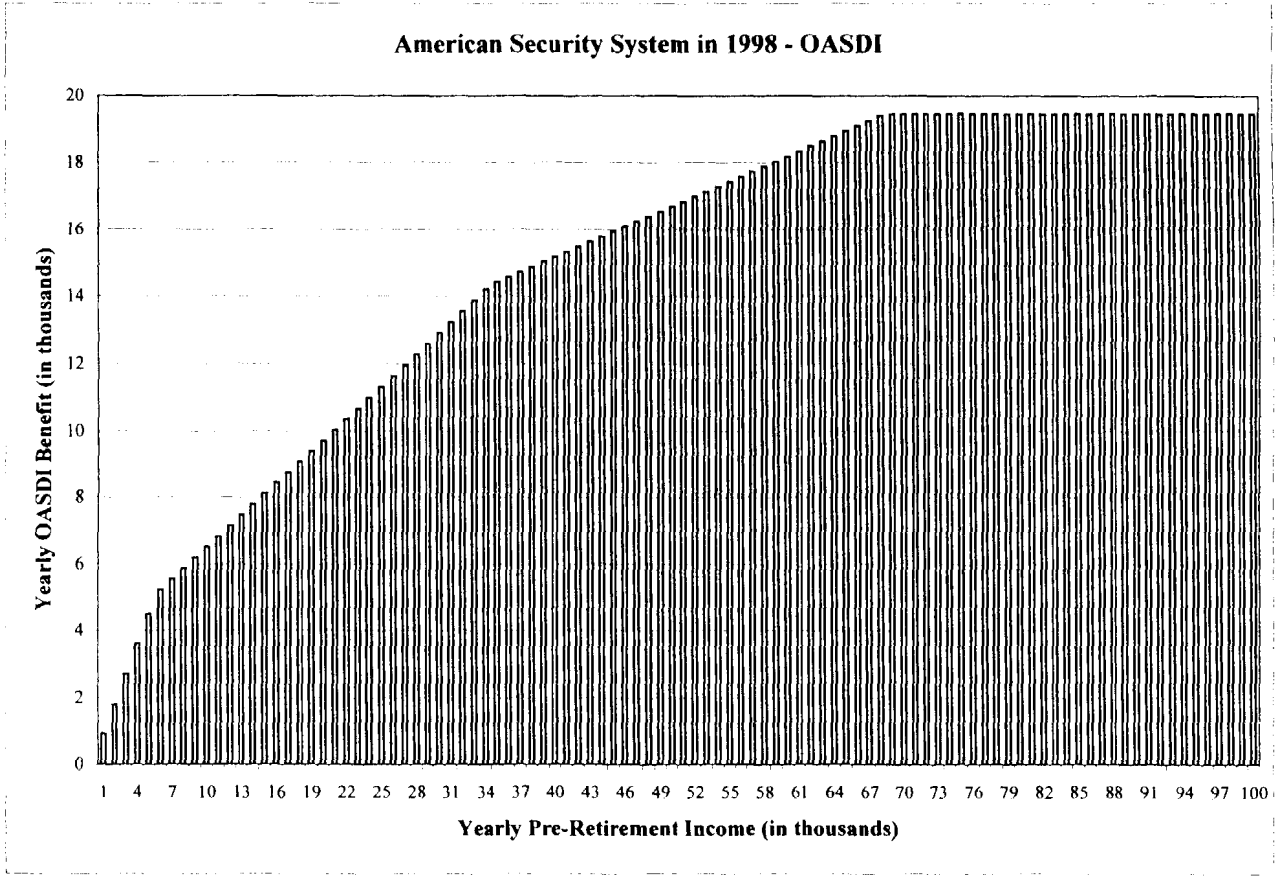
American Security System in 1998 - OASDI
Yearly OASDI Benefit (in thousands)
0
2
4
6
8
10
12
14
16
18
20
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85 88 91 94 97 100
Yearly Pre-Retirement Income (in thousands)

Figure 10

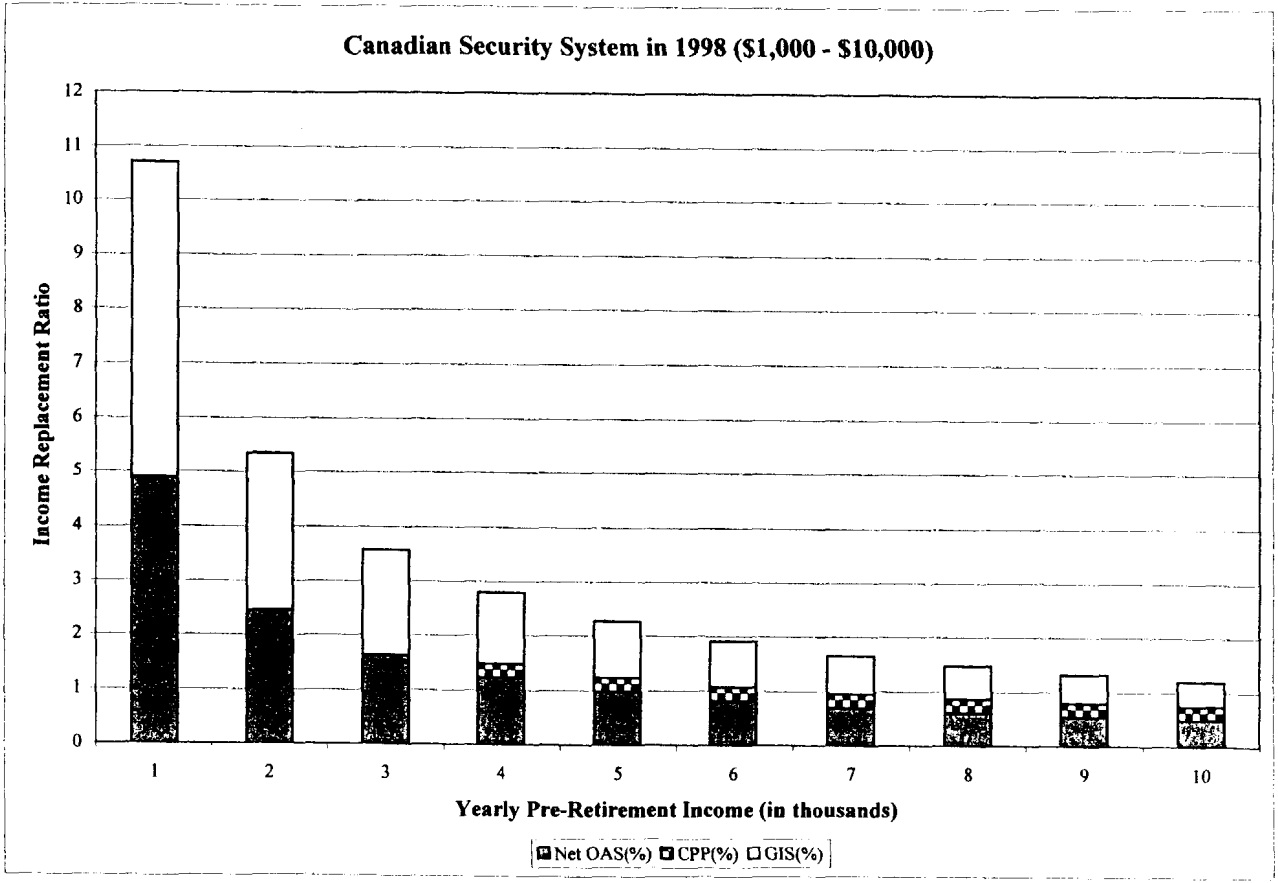
Canadian Security System in 1998 ($1,000 - $10,000)
Income Replacement Ratio
0
1
2
3
4
5
6
7
8
9
10
11
12
1
2
3
4
5
6
7
8
9
10
Yearly Pre-Retirement Income (in thousands)
Net OAS(%)
CPP(%)
GIS(%)

Figure 12

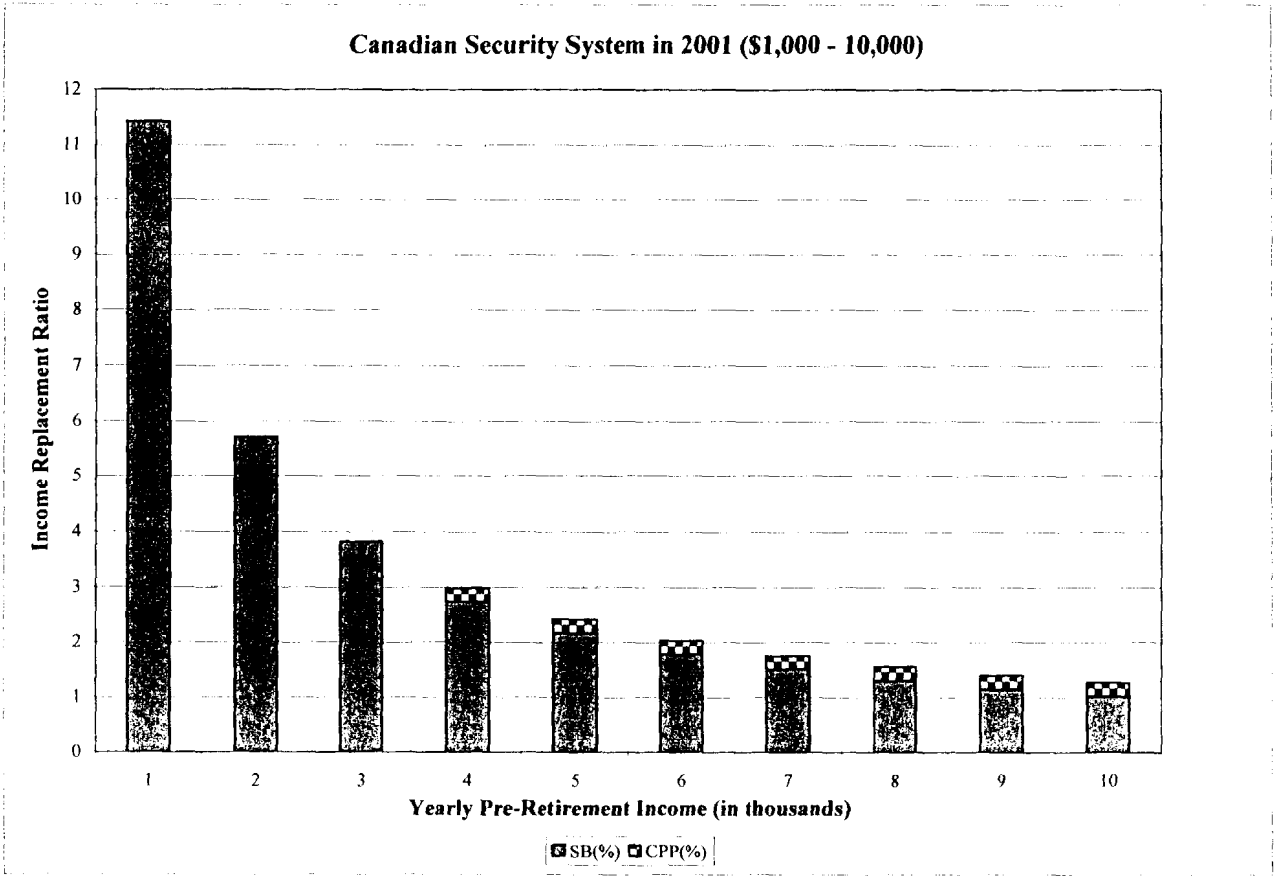
Canadian Security System in 2001 ($1,000 - 10,000)
Income Replacement Ratio
0
1
2
3
4
5
6
7
8
9
10
11
12
1
2
3
4
5
6
7
8
9
10
Yearly Pre-Retirement Income (in thousands)
SB(%)
CPP(%)

Figure 14

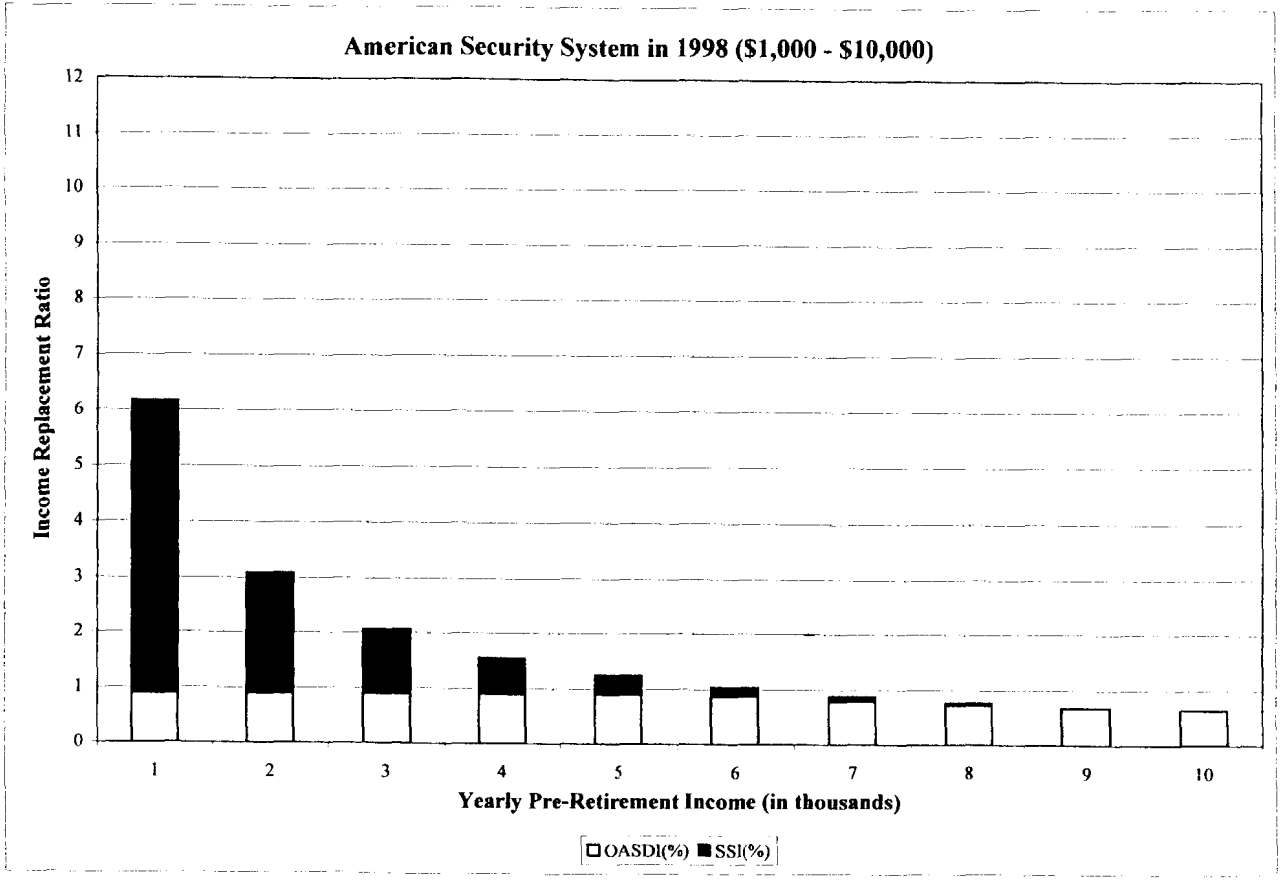
American Security System in 1998 ($1,000 - $10,000)
Income Replacement Ratio
0
1
2
3
4
5
6
7
8
9
10
11
12
1
2
3
4
5
6
7
8
9
10
Yearly Pre-Retirement Income (in thousands)
OASDI(%)
SSI(%)

Table 3

Ratios of "Income Replacement Ratio of the American System in 1998" to "Income Replace Ratio of the Canadian system in 1998"

Pre-Retirement Income	Ratio	Pre-Retirement Income	Ratio	Pre-Retirement Income	Ratio	Pre-Retirement Income	Ratio	Pre-Retirement Income	Ratio
1000	0.57687	25000	1.01653	49000	1.19616	73000	1.40668	97000	1.73124
2000	0.57687	26000	1.02232	50000	1.20702	74000	1.40668	98000	1.75049
3000	0.57687	27000	1.02786	51000	1.21787	75000	1.40668	99000	1.77017
4000	0.55110	28000	1.03316	52000	1.22872	76000	1.40668	100000	1.79031
5000	0.54501	29000	1.03824	53000	1.23957	77000	1.41909		
6000	0.53906	30000	1.04312	54000	1.25042	78000	1.43200		
7000	0.53324	31000	1.04781	55000	1.26127	79000	1.44515		
8000	0.52753	32000	1.05231	56000	1.27212	80000	1.45854		
9000	0.52466	33000	1.05665	57000	1.28297	81000	1.47218		
10000	0.54596	34000	1.06082	58000	1.29383	82000	1.48608		
11000	0.56682	35000	1.05860	59000	1.30468	83000	1.50024		
12000	0.58726	36000	1.05510	60000	1.31553	84000	1.51467		
13000	0.60728	37000	1.06595	61000	1.32638	85000	1.52939		
14000	0.62690	38000	1.07680	62000	1.33723	86000	1.54440		
15000	0.64612	39000	1.08765	63000	1.34808	87000	1.55970		
16000	0.66497	40000	1.09850	64000	1.35893	88000	1.57531		
17000	0.68345	41000	1.10935	65000	1.36978	89000	1.59123		
18000	0.70158	42000	1.12021	66000	1.38064	90000	1.60748		
19000	0.73241	43000	1.13106	67000	1.39149	91000	1.62407		
20000	0.78486	44000	1.14191	68000	1.40234	92000	1.64100		
21000	0.84127	45000	1.15276	69000	1.40668	93000	1.65828		
22000	0.90210	46000	1.16361	70000	1.40668	94000	1.67594		
23000	0.96789	47000	1.17446	71000	1.40668	95000	1.69398		
24000	1.01048	48000	1.18531	72000	1.40668	96000	1.71240		

Table 4

Ratios of "Income Replacement Ratio of the American System in 1998" to "Income Replace Ratio of the Canadian system in 2001"

Pre-Retirement Income	Ratio	Pre-Retirement Income	Ratio	Pre-Retirement Income	Ratio	Pre-Retirement Income	Ratio	Pre-Retirement Income	Ratio
1000	0.54011	25000	0.97669715	49000	1.25294	73000	2.16129	97000	2.19924
2000	0.54011	26000	0.99827787	50000	1.28129	74000	2.19924	98000	2.19924
3000	0.54011	27000	1.00419144	51000	1.31042	75000	2.19924	99000	2.19924
4000	0.51745	28000	1.00986184	52000	1.34036	76000	2.19924	100000	2.19924
5000	0.51208	29000	1.01530379	53000	1.37113	77000	2.19924		
6000	0.50682	30000	1.02053081	54000	1.40278	78000	2.19924		
7000	0.50167	31000	1.02555538	55000	1.43534	79000	2.19924		
8000	0.49662	32000	1.03038906	56000	1.46885	80000	2.19924		
9000	0.49421	33000	1.03504251	57000	1.50335	81000	2.19924		
10000	0.51460	34000	1.03952562	58000	1.53890	82000	2.19924		
11000	0.53458	35000	1.03773688	59000	1.57553	83000	2.19924		
12000	0.55417	36000	1.04165575	60000	1.61329	84000	2.19924		
13000	0.57339	37000	1.05236875	61000	1.65225	85000	2.19924		
14000	0.59225	38000	1.06308176	62000	1.69246	86000	2.19924		
15000	0.61075	39000	1.07379477	63000	1.73398	87000	2.19924		
16000	0.62891	40000	1.08450778	64000	1.77687	88000	2.19924		
17000	0.64673	41000	1.09522078	65000	1.82120	89000	2.19924		
18000	0.66422	42000	1.10593379	66000	1.86706	90000	2.19924		
19000	0.68140	43000	1.1166468	67000	1.91451	91000	2.19924		
20000	0.70231	44000	1.12735981	68000	1.96364	92000	2.19924		
21000	0.74981	45000	1.1466512	69000	2.00527	93000	2.19924		
22000	0.80061	46000	1.17220622	70000	2.04212	94000	2.19924		
23000	0.85508	47000	1.19842149	71000	2.08036	95000	2.19924		
24000	0.91361	48000	1.22532292	72000	2.12005	96000	2.19924		

Table 5

Ratios of "Income Replacement Ratio of the Canadian System in 2001" to "Income Replace Ratio of the Canadian system in 1998"

Pre-Retirement Income	Ratio	Pre-Retirement Income	Ratio	Pre-Retirement Income	Ratio	Pre-Retirement Income	Ratio	Pre-Retirement Income	Ratio
1000	1.06808	25000	1.04079	49000	0.95469	73000	0.65085	97000	0.78720
2000	1.06808	26000	1.02408	50000	0.94203	74000	0.63962	98000	0.79595
3000	1.06808	27000	1.02357	51000	0.92937	75000	0.63962	99000	0.80490
4000	1.06504	28000	1.02307	52000	0.91671	76000	0.63962	100000	0.81406
5000	1.06432	29000	1.02259	53000	0.90405	77000	0.64526		
6000	1.06361	30000	1.02214	54000	0.89139	78000	0.65113		
7000	1.06293	31000	1.02170	55000	0.87873	79000	0.65711		
8000	1.06225	32000	1.02128	56000	0.86607	80000	0.66320		
9000	1.06160	33000	1.02087	57000	0.85341	81000	0.66940		
10000	1.06095	34000	1.02048	58000	0.84075	82000	0.67572		
11000	1.06032	35000	1.02011	59000	0.82809	83000	0.68216		
12000	1.05970	36000	1.01291	60000	0.81543	84000	0.68873		
13000	1.05909	37000	1.01291	61000	0.80277	85000	0.69542		
14000	1.05850	38000	1.01291	62000	0.79011	86000	0.70224		
15000	1.05792	39000	1.01291	63000	0.77745	87000	0.70920		
16000	1.05735	40000	1.01291	64000	0.76479	88000	0.71630		
17000	1.05679	41000	1.01291	65000	0.75213	89000	0.72354		
18000	1.05624	42000	1.01291	66000	0.73947	90000	0.73093		
19000	1.07486	43000	1.01291	67000	0.72681	91000	0.73847		
20000	1.11755	44000	1.01291	68000	0.71415	92000	0.74617		
21000	1.12198	45000	1.00533	69000	0.70149	93000	0.75403		
22000	1.12676	46000	0.99267	70000	0.68883	94000	0.76206		
23000	1.13193	47000	0.98001	71000	0.67617	95000	0.77026		
24000	1.10603	48000	0.96735	72000	0.66351	96000	0.77864		