

**PAYGO FUNDING STABILITY AND
INTERGENERATIONAL EQUITY**

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ABSTRACT

The paper reviews the demographic shifts, including improved life expectancy and the baby-boom/baby-bust cycle, of the past half-century and discusses their impact on the funding of pay-as-you-go (paygo) social security systems.

The paper draws an analogy between the funding of private pension plans and paygo schemes and discusses the fundamental security of both mechanisms. The paper argues that the true security underlying either funding mechanism is the ability of the economy to transfer wealth. Advantages and disadvantages of both systems are also presented.

The paper then discusses the consequences for social security if the system were based on a defined-contribution approach instead of on a defined-benefit approach. This analysis argues that today's large baby-boom cohort is making relatively small social security contributions and, under a defined-contribution approach, should then expect to receive commensurately small benefits.

The paper shows that the most rapidly aging of the western populations exists in Canada. Hence, Canadian data are used to attempt to formulate a model that brings intergenerational equity to the funding of social security.

The paper argues that by raising the age of eligibility for social security retirement income benefits, only slightly, from age 65 today to age 69 by 2030, intergenerational equity and an acceptable wealth transfer index can be achieved. A series of logical arguments to support that model politically are also presented.

1. INTRODUCTION

Most western industrialized nations have in place plans providing significant social security benefits, and virtually all these plans are funded on a pay-as-you-go (paygo) or quasi-paygo basis. At the same time, all these nations have populations that are aging, partly because of enhanced life expectancy, but more importantly because of the decline in birth rates since their peaks in the late 1950s.

As will be shown, social security paygo schemes are sensitive to demographic shifts, and an aging population gives rise to pressures for increased social security contribution rates as the ratio of retirees (beneficiaries) to workers (contributors) increases (most sharply after 2015). This pressure in turn raises doubts in the minds of citizens and public-policy-makers about the continued viability of these paygo schemes. Can they survive? Will the next, smaller generation of workers pay the requisite contributions?

This paper explores the true economic security of paygo schemes and, based on that analysis, presents a model for funding stability. The paper argues that this model is also one that creates and provides intergenerational equity and hence will succeed in guaranteeing the future viability of paygo schemes.

2. PAYGO VERSUS INDIVIDUAL ACTUARIAL FUNDING

If an individual wishes to retire at age 65 with an annual income of one unit payable continuously, then an actuary can determine the required level contributions by setting the present value of all contributions equal to the present value of all retirement income benefits at a defined age. Thus, assuming that contributions start at age 20, the formula would be

$$C \int_0^{45} e^{-\delta t} \frac{l_{20+t}}{l_{20}} dt = e^{-45\delta} \frac{l_{65}}{l_{20}} \int_0^{\infty} e^{-\delta t} \frac{l_{65+t}}{l_{65}} dt$$

which solves for

$$\begin{aligned} C &= e^{-45\delta} \frac{\int_0^{\infty} e^{-\delta t} l_{65+t} dt}{\int_0^{45} e^{-\delta t} l_{20+t} dt} \\ &= \frac{\int_{65}^{\infty} e^{-\delta x} l_x dx}{\int_{20}^{65} e^{-\delta x} l_x dx} \end{aligned}$$

The plan is funded by contributions made between ages 20 and 65, contingent on survival; benefits are paid for ages 65 and beyond, also contingent upon survival. Total expected contributions are not as large as total expected benefits because of the discounting effect of the rate of investment return, δ .

For paygo funding, assume a paygo plan wishes to pay an annual income of one unit payable continuously to all citizens alive aged 65 and over. Contributions will be made by all citizens aged 20 to 64 inclusive. Because, in a paygo system, contribution income is immediately distributed as benefit

outgo, there is no discounting for investment income. Thus, in a stationary population, the level contribution formula is simply

$$C(T_{20} - T_{65}) = T_{65},$$

or

$$C = \frac{T_{65}}{T_{20} - T_{65}}.$$

For more general applicability, assume the population is stable (rather than stationary) with intrinsic rate of increase, r . Assume it is now time z , and the rate of live births is now $B(z)$. Those now alive aged x were born at time $z-x$ in a birth cohort of size

$$B(z-x) = B(z)e^{-rx}.$$

Thus the paygo funding formula is

$$C \int_{20}^{65} B(z)e^{-rx} s(x)dx = \int_{65}^{\infty} B(z)e^{-rx} s(x)dx,$$

or

$$\begin{aligned} C &= \frac{\int_{65}^{\infty} B(z)e^{-rx} s(x)dx}{\int_{20}^{65} B(z)e^{-rx} s(x)dx} \\ &= \frac{\int_{65}^{\infty} e^{-rx} l_x dx}{\int_{20}^{65} e^{-rx} l_x dx}. \end{aligned}$$

Hence the formula used to determine the required contribution rate for a paygo social security scheme is analogous to the formula used to determine the required contribution for an individual prefunded retirement scheme. Further, the ability to have total expected paygo benefits that exceed total expected paygo contributions depends on the "discount" rate, r . As presented, this means that the paygo discount rate is the intrinsic growth rate, r , for the stable population.

The funding of social security is normally dependent only on active workers, however. Thus, we need to analyze the intrinsic rate of increase, r , not of the general population, but rather of the active labor force. For example, increasing the labor force participation rate of females, or increasing net immigration of qualified workers, is as helpful to the funding requirements of a paygo system as an increase in the birth rate.

Thus the required contribution rate for a paygo scheme is dependent upon the ratio of beneficiaries to workers. This ratio is dependent upon all the following demographic variables: mortality, fertility, migration, and labor force participation rates. Further, most paygo schemes have a contribution formula such that total contributions increase at the same rate as average wages, whereas benefits after retirement increase at the same rate as inflation. Thus, to the extent that there is real productivity growth (net of inflation), this real productivity growth, as a rate per annum, can be added to the labor force intrinsic growth rate to determine the total paygo discount rate (call it r') for the period between the average contribution date and the average benefit payment date.*

Hence the "discount" rate, r' , for the paygo social security system is the total of the growth rate of the labor force and the growth rate of its productivity. In other words, r' is the growth rate in wealth production for society as a whole.

3. DEMOGRAPHIC CONTEXT

As stated earlier, all western industrialized nations currently have aging populations. Population aging here means "growth over time of the proportion of old persons according to some chronological age (usually 65), in the total population" [5].

There are two causes of this population aging. One is enhanced life expectancy; the other is a recent drop in the rate of live births. Statistics for Canada (the choice of Canada as a benchmark is explained later in this section) indicate significant improvement in life expectancy over the past 70 years. Canada has also experienced a falling fertility rate since 1959, as seen in Figure 1.

More important to the analysis of the funding of a paygo scheme is the actual number of live births. Again, Canada experienced a significant drop in the number of live births in the period from 1959 to 1972, as seen in Figure 2.

The U.S. Department of Commerce [21] presented data on the trend in aging for several countries based on medium-variant data generated by the United Nations population division in 1984. Highlights are shown in Table 2. As the publication notes:

*It is often argued that retirement benefits should be indexed to average wages versus the cost of living. In this way, retirees would share in the enhanced standard of living produced by the workers. This particular side issue is not explored further in this paper.

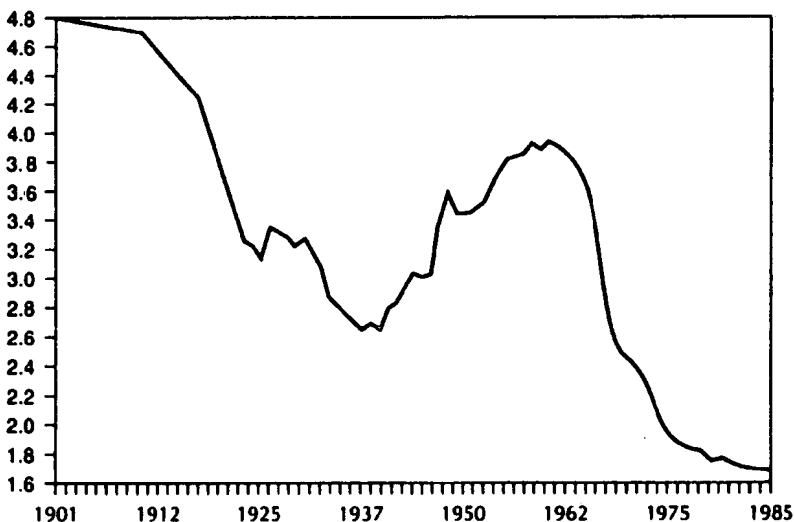
For most countries listed, there will be modest increases in the size of the elderly population relative to the size of the working-age population over the first 20 years, but sharp increases from 2005 to 2025.

The statistics underlying Table 2 can also be used to calculate the projected percentage increase in the population aged 65 and over, over the period 1985 to 2025, as in Table 3.

TABLE 1
LIFE EXPECTANCY [20]

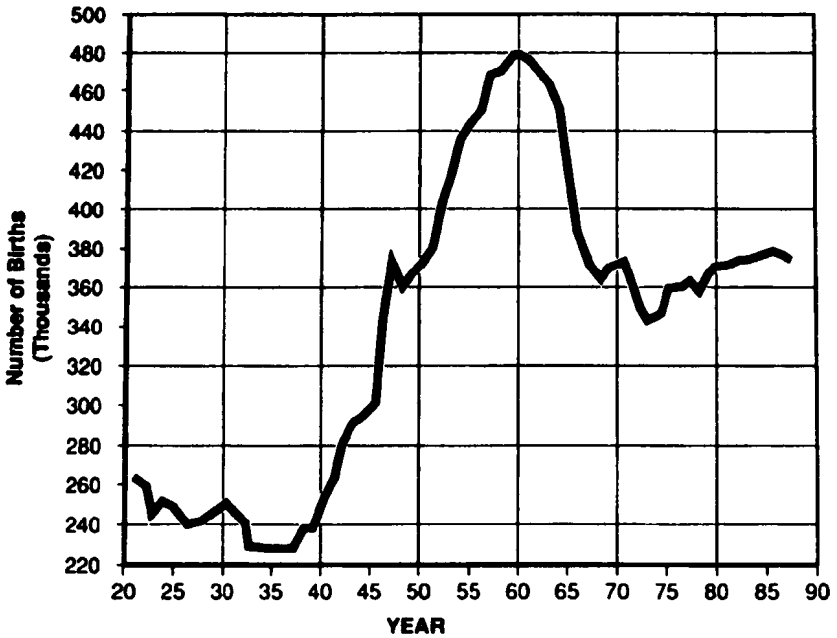
Year	At Birth		At Age 65		At Age 75	
	Male	Female	Male	Female	Male	Female
1921	58.8	60.6	13.0	13.6	7.6	8.0
1941	63.0	66.3	12.8	14.1	7.5	8.2
1961	68.4	74.2	13.5	16.1	8.2	9.5
1981	71.9	79.0	14.6	18.9	9.0	11.9
1991	74.6	80.9	15.7	19.9	9.6	12.5

FIGURE 1
FERTILITY RATES (CANADA)*



*From STATISTICS CANADA, "Current Demographic Analysis, Fertility in Canada." *Catalogue 91-524E*, 121-122. Ottawa, Ont.: 1984.

FIGURE 2
NUMBER OF LIVE BIRTHS (CANADA)*



*From Brown, R.L. *Introduction to the Mathematics of Demography*. 2nd ed. Winsted, Conn.: Actex Publications, 1993. Copyright © 1993, Actex Publications. Reprinted with permission.

The shift in the ratio of expected retiree-beneficiaries to expected worker-contributors is the chief concern about the future viability of western paygo schemes. The shift is caused by both the enhanced life expectancy of the elderly and the declining number of live births (both included in these projections).

Of all the western industrialized nations, Canada displays the largest shift in its funding ratio. Although India, China, and Hong Kong face more rapidly aging populations, their social security promises are modest when compared to those of the rest of the countries listed in Table 3. Thus, for the remainder of this paper, Canadian statistics are used to analyze the public policy alternatives for the western paygo social security schemes. The assumption is

TABLE 2
AGED POPULATION RATIOS AS PERCENTAGE OF TOTAL POPULATION [20]

Country	1985			2005			2025		
	65+	75+	85+	65+	75+	85+	65+	75+	85+
France	12.4%	6.2%	3.2%	14.8%	6.4%	3.1%	19.3%	7.9%	3.8%
W. Germany	14.5	6.8	3.2	18.9	7.5	3.8	22.5	9.5	5.3
Italy	13.0	5.5	2.5	16.9	7.0	3.4	19.6	8.6	4.3
U.K.	15.1	6.3	3.1	15.3	6.9	3.8	18.7	8.1	4.0
Sweden	16.9	7.2	3.5	17.2	8.2	4.7	22.2	10.5	5.2
U.S.	12.0	4.9	2.6	13.1	6.7	4.1	19.5	8.5	4.8
Canada	10.4	4.0	2.0	12.5	5.6	3.0	18.8	7.5	3.7
Australia	10.1	3.7	1.7	11.4	4.8	2.4	15.9	6.2	2.9
Japan	10.0	3.7	1.7	16.5	6.4	3.0	20.3	10.0	4.9
China	5.1	1.4	0.5	7.4	2.4	1.0	12.8	4.1	1.8
Hong Kong	7.6	2.4	1.0	10.3	4.3	2.1	17.5	5.8	2.6
India	4.3	1.1	0.4	6.1	1.8	0.7	9.7	3.1	1.3
Israel	8.9	3.6	1.5	8.3	3.5	1.8	11.9	4.7	2.1

TABLE 3
PROJECTED PERCENTAGE INCREASE
IN NUMBER AGED 65+ 1985 TO 2025

Country	Percentage Increase
India	264%
China	238
Hong Kong	219
Canada	135
Australia	125
Japan	121
Israel	116
U.S.	105
France	67
Italy	51
W. Germany	36
U.K.	23
Sweden	21

that if a solution can be found that is workable for Canada, it should prove to be acceptable for all the countries listed below Canada in Table 3.

In that regard, the main element of Canada's retirement income paygo system is the Canada/Quebec Pension Plan (C/QPP). As is generally true for most western paygo schemes, C/QPP contributions increase with wages, and retirement benefits increase with inflation. No contributions are made on wages up to 10% of the average industrial wage (AIW). Benefits are a function of the total indexed career wage credits over 40 years on wages up to the AIW.

There are two other smaller sources of government-sponsored retirement income for the elderly in Canada. The first is the Guaranteed Income Supplement (GIS), which is paid only to the poorer elderly based on an income test (assets are ignored). The second is a scheme called Old Age Security (OAS). Until 1989, monthly OAS benefits were paid to all Canadians aged 65 and over who satisfied a residency requirement. Under new legislation however, a special "clawback" has been imposed on these pensions. Individuals with net incomes exceeding a threshold (\$53,215 in 1993) must repay 15% of net income over the threshold up to the full OAS pension (this point was achieved at a net income level of \$83,800 in 1993). Because the OAS clawback is indexed to inflation less 3%, the OAS scheme will slowly (but surely) degenerate into a second-tier GIS benefit based on need. OAS and GIS benefits are paid from general tax revenues. These plans are not directly analyzed in the remainder of the paper, because they are not true paygo-funded schemes.

The current C/QPP paygo contribution rate is 7.8%. The actual 1994 contribution rate is 5.4% paid 50/50 by employers and workers on wages between 10% of the AIW and the AIW [16]. The C/QPP was initiated in 1966 with the first full retirement pension not paid until 1976 retirements. Thus it was easy to have early contribution rates that were very low and still develop significant C/QPP assets. In fact, from 1966 to 1986, the contribution rate was 3.6% (1.8+1.8). As the C/QPP matures, as the population ages, and as the C/QPP early assets are depleted, these contribution rates must increase. There is already an agreed-upon schedule that will gradually take the combined contribution rate to 10.1% in 2016. However, C/QPP actuarial projections show that the combined contribution rate will have to increase to 14.4% by 2035 [16]. The rate is projected to stabilize thereafter at that level depending, of course, on the realization of the projection assumptions.

These contributions bring a retirement income benefit at age 65 equal to 25% of career earnings over the best 40 years, adjusted for changes in the AIW. Special dropout provisions are allowed for years of disability and for years at home caring for a child under age 7. The C/QPP also pays disability income benefits, death benefits, and benefits to survivors and orphans. The retirement benefit can be taken from age 60 to 70 with an actuarial adjustment (up or down) of 1/2% per month (which is very close to being actuarially neutral, especially for early retirement [14]).

For a Canadian who consistently earns the AIW, government-sponsored social security will guarantee a 40% replacement ratio at age 65: 25% from

the C/QPP, 14% from OAS, and a small payment from GIS. Poorer workers achieve higher replacement ratios from government sources (since OAS is a level dollar benefit and they receive a larger net GIS benefit), and wealthier workers receive lower and lower replacement ratios from government sources as incomes increase.

For example, someone consistently earning three times the AIW will retire and receive no OAS, no GIS, and a C/QPP benefit that provides an 8.3% replacement ratio.

Many commentators in Canada (for example, the Canadian Institute of Actuaries [6]) have raised concerns about whether or not the next generation of workers will agree to contribute 14.4% of their wages up to the AIW to fund the C/QPP retirement benefits now being promised. The Canadian government has now initiated a more formal discussion of this matter. Similar concerns about paygo funding requirements exist in most other western industrialized nations.

4. THE ADVANTAGES OF PAYGO FUNDING

Paygo schemes are under heavy public scrutiny and criticism. It therefore seems worthwhile that, prior to presenting methods that can be used to "save" paygo schemes, we outline reasons why they are worth having.

In general, the following are advantages of government-sponsored paygo schemes:

1. The entire working population can be covered relatively easily.
2. Benefits can be immediately vested and are fully portable, important features for the mobile work force of today.
3. Because contribution income immediately becomes benefit payout, no problem exists with indexation of benefits to wages. A source of "actuarial discounting" for years with real productivity gains exists if benefits are indexed to cost of living and contributions rise with average wages (the norm). On the other hand, negative labor force growth rates will mitigate against this "actuarial discount" factor.
4. Administrative costs are usually very low per unit of cash flow.

Governments can instead sponsor fully funded schemes as opposed to paygo schemes, with several disadvantages, including the following:

1. Fully funded schemes are susceptible to erosion by inflation. This destroyed several fully funded schemes in Europe earlier in the century and is probably the main reason that virtually all government-sponsored social security schemes are funded on a pure or quasi-paygo basis.

2. Government control of the large amounts of capital accumulating under a fully funded scheme is a concern. If this money is "invested" in government bonds, then it provides an easy source of deficit financing and provides an incentive for deficit spending. If invested in the private sector, any fully funded social security scheme would have assets capable of controlling the country's entire available supply of equities. This "backdoor" government control may not be generally supported.
3. Who will decide how to invest this capital and at what administrative expense? How does one avoid political influence?
4. With the large accumulation of assets, continuous pressure will exist to enhance benefits.
5. In any transition from paygo financing to full funding, one generation of workers will have to pay almost double contributions, both to prefund their own benefits and to pay for the paygo benefits not previously funded (equal to the present paygo actuarial liability). This would not likely prove acceptable, making it difficult, now, to switch to a fully funded basis.

Despite this, a switch to full funding of social security has its supporters, including many actuaries, who believe that the method would truly improve security of plan benefits to participants. But is real security enhanced?

5. IS A FULLY FUNDED SCHEME MORE SECURE?

If the assets backing a fully funded social security system are government bonds, then future social security benefits will be financed by a combination of worker contributions, payment of interest on the bonds, and liquidation of bonds as needed. All these funds flow from productive workers. It should make no difference to these workers, in total, whether they pay increased benefits to retirees through increased contributions to a paygo system, or through a combination of contributions, bond interest, and bond liquidation in a "fully funded" scheme. Investing in private sector bonds or other private assets does not change this reality.

The real issue is the balance between production of goods and consumption demands. In his book *The Economics of the Welfare State*, Barr [2] states

The widely held (but false) view that funded schemes are inherently 'safer' than PAYGO is an example of the fallacy of composition.^a For *individuals* the economic function of a pension scheme is to transfer consumption over time. But (ruling out the case where current output is stored in holes

in people's gardens) this is not possible for society as a whole; the consumption of pensioners as a group is produced by the next generation of workers. From an *aggregate* viewpoint, the economic function of pension schemes is to divide total production between workers and pensioners, i.e. to reduce the consumption of workers so that sufficient output remains for pensioners. Once this point is understood it becomes clear why PAYGO and funded schemes, which are both simply ways of dividing output between workers and pensioners, should not fare very differently in the face of demographic change.

*It is a fallacy of composition to assume that because something is true for an individual it will necessarily be true on aggregate. For instance, if I stand on my seat in the theatre I will get a better view, but if everybody does so, nobody will get a better view.

Social security pensions, whether funded on a paygo or fully funded basis, are a means of transferring wealth from workers to retirees. The crucial variable is therefore creation of wealth. The only way that a fully funded social security scheme would enhance the true security of benefits is if two effects were to result. First, there would have to be an overall increase in gross national savings. Second, assuming increased savings, such an increase would have to raise total output or total wealth. While there is extensive literature on this matter (for example, see Barr [2] or Aaron [1]), no conclusive evidence exists to support any enhanced real security by the full funding of social security schemes. In fact, according to Rosa [19, p. 212], the experiences of Sweden and Japan in running state funded schemes:

... offer powerful evidence that this option may only invite squandering capital funds in wasteful, low-yield investments [which] should give pause to anyone proposing similar accumulations elsewhere.

Thus actuarial full funding of social security schemes will not add to their inherent security, even their security in an environment of significant demographic shifts.

The critical factor facing society is the impending shift in the ratio of retiree-consumers to worker-producers. How will we produce enough wealth to supply the consumption demand? This production/consumption equilibrium is the focus of the remainder of the paper.

6. DEFINED-BENEFIT VERSUS DEFINED-CONTRIBUTION PLANS

Although the paper has rejected actuarial full funding as a private pension plan solution to government-funded paygo social security schemes, an

analysis of other aspects of private pension funding alternatives does prove to be useful.

Clearly, private pensions can be, and are, formulated on either a defined-benefit or a defined-contribution basis. Government-sponsored paygo social security is almost always formulated on a defined-benefit basis. (This does not include government-mandated employer-sponsored schemes such as in Chile and Australia.) The benefits are defined, and the contributions become the variable. As the population ages, the contribution rates required to fund today's promised defined benefits must increase.

But what would happen if social security schemes were redesigned as defined-contribution plans? That is, each year every worker could make some defined contribution (for example, some percent per dollar of wage). This would create cash flow that would then be divided among the nation's retirees of the day. Note that no fund accrues. The play is purely paygo. The defined contributions from today's workers are immediately divided among today's retirees.

Assume that a transition from defined benefit to defined contribution were to take place today. By definition, for a pure paygo scheme, no change in benefits or contributions would be immediately necessary. As the population ages (that is, as life expectancy improves and as the baby boomers retire), however, the defined paygo contributions would fund smaller and smaller paygo benefits. Is this equitable?

If one studies populations in which birth rates rise and fall cyclically, the following conclusions emerge. A large cohort, in a defined-benefit paygo scheme, will make relatively smaller contributions, but will expect full benefits from the scheme despite these smaller contributions. On the other hand, a small cohort will be forced to make larger contributions with no gain in benefits.

In a defined-contribution paygo scheme, the opposite pattern emerges. Small cohorts make their defined contributions, but then receive retirement benefits well in excess of the actuarial value of their contributions. Similarly, large cohorts make the same defined contribution but receive retirement benefits less than the actuarial value of their contributions.

Neither achieves actuarial equity. Can actuarial equity be achieved? The answer is that it *must* be achieved. Remember that the ability to pay social security benefits has little to do with the funding mechanism. Rather, the ability to pay social security benefits is exactly the ability to transfer wealth from the productive workers to the retirees. The ability to transfer wealth

does not rise and fall with the external roller coaster of shifting demographics. In general, it rises slowly in line with real gains in worker productivity, but that is all.

The actuarially equitable solution to the paygo roller coaster is to level off the hills and valleys. In real terms, this means that cohorts of average size will pay "expected" (mean) paygo contributions for "expected" (mean) paygo benefits. Large cohorts can pay below-average contributions but will, in turn, receive below-average benefits. Finally, small cohorts pay above-average contributions but will receive above-average benefits. Thus we achieve actuarial equity. Those who pay average contributions get average benefits. Those who pay below-average contributions receive below-average benefits. And those who pay above-average contributions receive above-average benefits. They are told this; they agree to this; and their expectations are achieved. Add to this the expectation that there will be real worker productivity gains and that all citizens can expect to receive benefits whose expected (nondiscounted) value exceeds the expected value of their contributions.

Having arrived at an actuarially sound process for achieving intergenerational solidarity, can we market the process successfully? One answer is that the citizenry has no choice; there is only so much wealth that can be transferred. To attempt otherwise would create inflation that would achieve the required economic equilibrium by deflating the purchasing power of the benefits.

It should not be difficult to expect average cohorts to accept average benefits for average contributions. Nor should it be difficult to convince large cohorts to make below-average contributions and small cohorts to accept above-average benefits. The problem arises when a large cohort must be convinced to accept below-average benefits or a small cohort to make above-average contributions. But that is exactly the situation today!

Most of the western industrialized nations are now faced with a large birth cohort born in the 1950s and early 1960s that is now approaching normal retirement age. This larger-than-average cohort is currently funding the retirement benefits on a paygo basis of a smaller-than-average cohort (the depression cohort) with smaller-than-average contributions. Unfortunately, what follows the large baby-boom cohort is the smaller-than-average baby-bust cohort.

Thus, the western paygo systems face the following limited alternatives: (a) convince the baby-boom cohort that because they made below-average

contributions, they should be happy to receive actuarially equivalent below-average benefits; or (b) convince the baby-bust cohort to make above-average contributions (that is, forego their wealth consumption) so that the baby-boom retirees can receive the full average paygo benefit they have been promised. In return, the baby-bust generation can be promised the expectation of above-average benefits when they retire, if the next generation is larger.

I believe that either sale will prove difficult politically. However, while convincing the baby-boom generation to take smaller benefits will be difficult, the ability to convince the baby-bust generation to dramatically increase their contributions on the basis of a nebulous benefit promise 50 years hence approaches the impossible.

Is there a politically acceptable approach to convincing the baby-boom generation to accept less in real wealth transfer than they are now being promised? I believe that there is.

7. PAYGO STABILITY: AN AGE-OF-ELIGIBILITY MODEL

As stated earlier, the cost per worker of a set of benefits funded on a paygo system is a direct function of the ratio of retiree-beneficiaries to worker-contributors. In turn, this ratio depends upon several demographic variables, including fertility, mortality, immigration, and labor force participation rates. Finally, if contributions are indexed to wages and benefits are indexed to cost of living (that is, inflation), then annual labor force productivity growth can be added to the paygo "discount" factor.

To what extent can the government control or influence these variables in a manner that would prove beneficial to the paygo funding ratios?

7.1 Fertility

Higher fertility rates have a long-term favorable impact on paygo funding ratios. As stated by Myers [15, p. 3]:

If all other demographic elements are constant, higher fertility rates will have a favorable effect on social insurance systems providing old-age retirement benefits. As long as fertility is above the replacement rate (or the actual fertility plus the effect of net immigration achieves this result), there will be a steadily growing covered work force to provide the contributions necessary to support the retired population. This type of chain-letter effect will show relatively low costs for the social insurance program, although eventually the chain must break (because population size

cannot increase forever), and the cost of the program will become significantly higher.

So while attempts to increase fertility may prove to be marginally beneficial in the short run, in the long run it is a fool's game.

Further, there is no evidence that government can influence fertility rates to any significant extent, if at all. Evidence from countries that have attempted such influence through financial incentives suggests little effect (see, for example, Hohn [11, p. 461]). For example, West Germany offered cash incentives for women to have children and extended mothers' holidays and child-care facilities, but the fertility rate continued to slide. In fact, historically, the countries that have the largest family allowances also have the lowest birth rates [22, p. 21].

Finally, raising fertility rates has a short-term negative impact on the ability to transfer wealth to the elderly, because the increased number of children now compete for some of that wealth transfer.

7.2 Mortality

No government is going to admit to promoting policies that decrease life expectancies. Hence any public policy alternatives must assume continued improvements in life expectancy.

7.3 Immigration

As stated previously by Myers, increased net immigration has the same impact on paygo funding as increased fertility. In terms of wealth-transfer capabilities, immigration may be preferable if workers arrive educated and prepared to join a productive work force. Increased immigration today is not desirable, however. For most western nations, immigrants over age 28 today only add to the baby-boom cohort, thus exacerbating the paygo funding problem.

In a publication entitled *One in Three*, the Economic Council of Canada states that significant increases in immigration are not desirable until after 2020 and that [8, p. 32]:

We noted earlier that the retirement income programs would reach just over 7% of GNP by 2031, assuming moderate population growth and maintenance of the present age of eligibility and income-replacement ratio. To reduce this share by only 1 percentage point would necessitate an additional 2.8 million workers in the labour force and no extra retirees by 2031. To accomplish this would require an increase in net immigration in

the decade prior to 2031 from 80,000 to 640,000, assuming, as is now the case, that only half the immigrants would be of workforce ages.

Further, any country presuming to use immigration as a partial solution to the paygo funding problems must prepare the population for the social impact of this significant influx.

7.4 Economic Growth

As stated previously, if paygo contributions are a function of wages, but benefits move only with inflation, then the real productivity gains of the workers can be added to the paygo actuarial discount factor for the time between the average contribution date and the average benefit payment date.

Such real productivity gains are already a part of the actuarial projections calculated for most western paygo systems, and still these projections anticipate significant contribution rate increases over the next 40 years.

For example, for the CPP, the actuarial projections assume an annual 1.0% real productivity growth rate [16]. Despite this, today's total contribution rate of 5.4% (2.7+2.7) is projected to increase 14.4% by 2035.

In a recent publication, the Canadian Institute of Actuaries [6] questioned the acceptability of such a high contribution rate to the next generation of workers, especially given the fact that the actuarial cost of the C/QPP benefits on a fully funded basis is 10.5% based on a real rate of return of 2.5%. Thus, any contribution rate higher than 10.5% corresponds to a real rate of return lower than 2.5%.

However, for the baby-boom generation, because its C/QPP contribution rates to date have been less than 5.4%, a reduction in retirement benefits would not mean a real rate of overall return less than 2.5%. In fact, the CPP Fifteenth Actuarial Report states that someone born in 1948 who starts to contribute to the CPP in 1966, even with the projected contribution rate increases, will realize an internal rate of return of 9.0%, and someone born in 1968 who starts to contribute in 1986 will realize 6.4% per annum. Given that the actuarial projections assume inflation of 3.5% per annum, the corresponding real rates of return are 2.9% and 5.5%, respectively, which are very high net rates of return given the level of security in a government-sponsored system. Thus, benefits to this cohort can be reduced without their experiencing a "bad" deal.

Even assuming that these are convincing arguments to actuaries, the real crux of the matter is still to find a way to decrease the paygo benefits of

the baby-boom cohort in a manner that will prove acceptable to *them*. This paper presents an age-of-entitlement formula that satisfies that need.

7.5 Age of Entitlement

Several countries are now reviewing a possible increase in the age of entitlement for social security benefits [12]. For many countries, the first step in this direction is simply bringing the age of entitlement for women up to the same age as that for men. However, some countries have announced the intention to raise the overall age of entitlement to paygo retirement benefits to lessen the projected increase in required contribution rates.

In the U.S., for example, the normal retirement age for OASDI retirement income benefits will be raised gradually from age 65 (the present level) starting in 2003 to age 66 by 2009 and then gradually to age 67 in 2027. By announcing this change in 1983, U.S. public-policy-makers have provided sufficient time for workers and employer-plan-sponsors to modify the retirement planning systems already in place. Such early warning should be a requirement of any such shift in the age of entitlement.

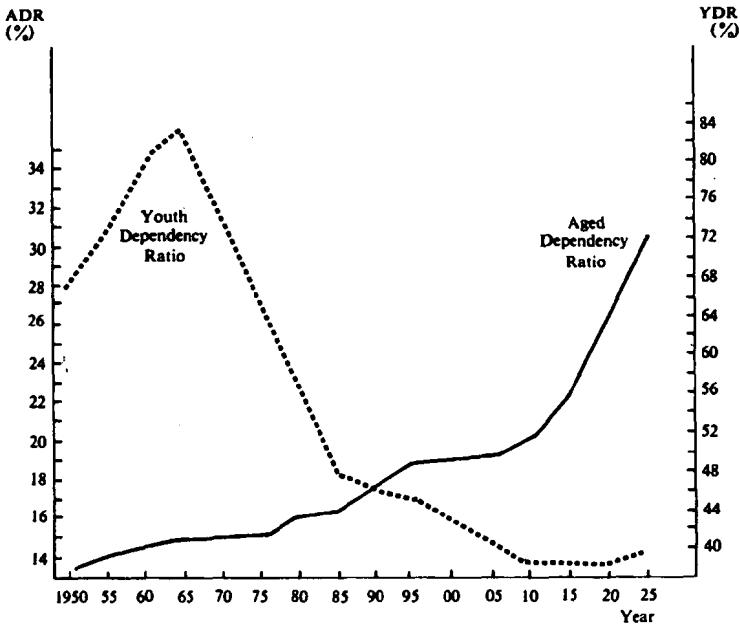
In a recent review of Canada's social security system, the Canadian Institute of Actuaries [6] analyzed a possible shift in the normal retirement age for C/QPP benefits from its present level at age 65 to age 70, over a 20- or 30-year period (both options were presented). The analysis showed that such an increase in the normal retirement age would mean that instead of the ultimate C/QPP contribution rate peaking at 14.4%, it would level out at 11.0% instead.

This analysis assumes that the entire C/QPP funding "problem" must be solved by effectively reducing benefits to the next generation of retirees. However, by remembering that the real issue is not the method of financing but rather the ability to transfer wealth, we can then use the same factors that have created these paygo funding problems to provide a partial solution.

The decline in live births in the 1970s also resulted in a decline in the transfer of wealth required to provide education and health care to the dependent young. Thus, while the number of dependent elderly is increasing, the number of dependent young is decreasing, as indicated in Figure 3, based on Canadian data.

The youth dependency ratio presented is simply the number in the population aged 0 to 17 divided by the population aged 18 to 64. Similarly the aged dependency ratio is the number aged 65 and over to the number aged 18 to 64.

FIGURE 3
YOUTH AND AGED DEPENDENCY RATIOS [18]



*From "Issues in Pension Policy: Demographic and Economic Aspects of Canada's Ageing Population," *Ontario Treasury Studies 16*. Toronto, Ontario: Ministry of Treasury and Economics, Taxation and Fiscal Policy Branch, October 1979.

If the transfer of wealth required to educate and provide health care to the young were equal to the transfer of wealth required for health care and retirement income security for the elderly, then no problem would exist, since the total dependency ratio (youth plus aged) is no higher in 2025 than it was in 1960.

That is not the case, however.

Analysis for Canada [10] has shown that government expenditures on the elderly are 2.5 times those for the young (per capita). Therefore, any analysis that attempts to derive a shift in the age of entitlement for retirement income security should include the lower demands for wealth by the youth sector and also include the differing transfer factors for the young versus the elderly.

Such an analysis has been done on Canadian data [3]. The authors developed a statistic called the labor force expenditure dependency ratio (LFEDR), which is defined as

$$LFEDR_t = \frac{(1.7 \times Y_t) + (1 \times U_t) + (4.244 \times A_t)}{LF_t}$$

where

Y = youth, 0–19

U = those collecting unemployment benefits

A = aged, 65 and over

LF = the projected labor force.

The weights of 1.7, 1, and 4.244 were derived by Foot [10, p. 17] and depict relative wealth transfer weights for the young, the unemployed, and the elderly. Statistics Canada population projections were used for the model's projected input variables. The labor force was projected to include trends of increasing female labor force participation, but assumed that male labor force participation rates would remain stationary.

The statistic referred to as $LFEDR_t$, could also be called a wealth transfer index. It is a single statistical indicator of the supply of (denominator) and demand for (numerator) wealth. As shown in Figure 4, this wealth transfer index does not change very much until 2006.

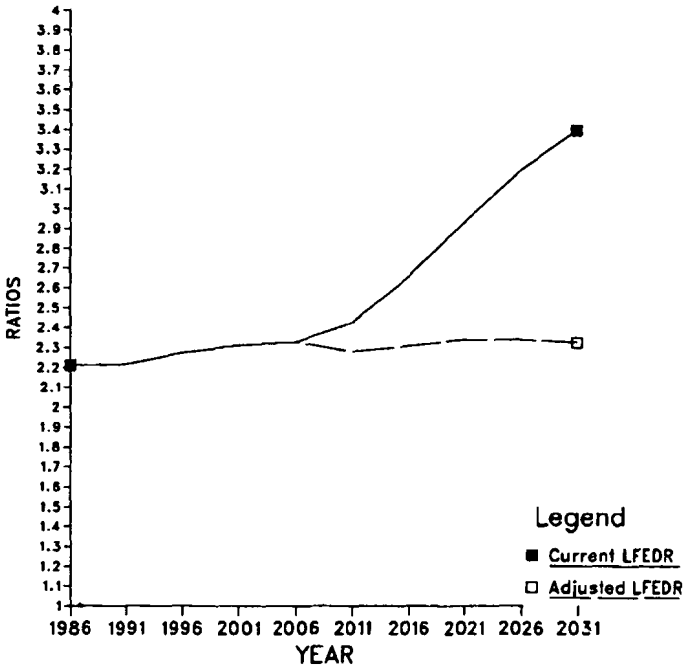
After 2006, it increases rapidly as the population ages and, in particular, as the baby-boom generation retires and the labor force turns to the baby-bust generation for wealth creation. Brown and Iglesias determined an increase in the age of entitlement for wealth transfer to the elderly that would keep the wealth transfer index constant at its 2006 level, as indicated in Figure 4.

This shift in the age of entitlement can be determined by finding K such that

$$LFEDR(2006) = \frac{(1.7 \times Y) + (1 \times U) + (4.244 \times A_{65+K})}{LF_{65+K}}$$

This model has two assumptions that are not obvious. First, as the age of entitlement increases, the elderly who lose some of their social security retirement income benefits are expected to remain in the labor force, with the same participation rates as those now aged 60 to 64. Second, it is assumed that there will be a slight improvement in health for those aged 65 to 69.

FIGURE 4
WEALTH TRANSFER INDEX*

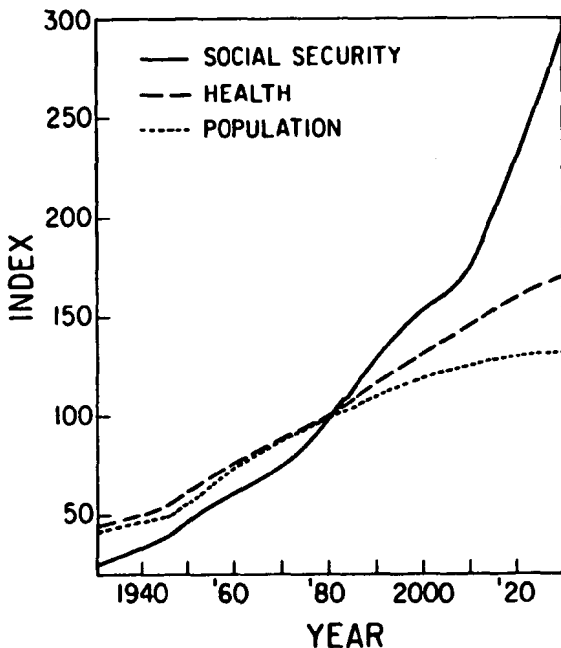


*From BROWN, ROBERT L., AND IGLESIAS, FERDINAND AG. "Social Security Funding Stability: An Age of Eligibility Model," *Research Report 89-01*. Waterloo, Ontario: Institute of Insurance and Pension Research, February 1989. Copyright 1989 by Robert L. Brown and Ferdinand Ag Iglesias. Reprinted with permission.

This latter assumption is not as dramatic as it seems, for several reasons. First, improvement in the health profile of Canadians has occurred with the improvement in life expectancy [22]. Second, the most significant increase in health care costs arises after age 69 [13, p. 555]. Finally, the impact on total wealth transfer from retirement income security is much greater than the impact from health care delivery.

Denton and Spencer [7, p. 14] have shown that between 1980 and 2030 health care costs will rise 69.8%, while social security costs will be three times their 1980 level in 2030 (see Figure 5), solely because of population aging.

FIGURE 5
 INDEX OF SOCIAL SECURITY COSTS* (1981 = 100)



*From DENTON, F.T., AND SPENCER, B.G. "Prospective Changes in the Population and Their Implications for Government Expenditure," *QSEP Research Report No. 98 (June)*, McMaster University: Program for Quantitative Studies in Economics and Population, 1984.

Given these assumptions, the model developed by Brown and Iglesias shows that the wealth transfer index will remain level at its 2006 value if the age of entitlement shifts upward from 65 in 2006 by two months each year (starting in 2007), until it reaches age 69 in 2030. No further adjustment is necessary.

This is a remarkable result. As indicated earlier in Table 3, Canada will have the most rapidly aging population of all western industrialized nations over the period 1985 to 2025. Thus, if a shift in the age of entitlement from 65 to 69 creates a constant wealth transfer index for Canada, then a smaller shift would do the same for all other western industrialized nations. Further,

the Brown and Iglesias model does not include the effects of real productivity gains (that is, real growth in wealth creation). Such gains, if not fully transferred to the elderly in their retirement income benefits, could be used to reduce further the age shift indicated.

The other powerful advantage of the age-of-entitlement alternative is its flexibility. Having determined an acceptable wealth transfer index, public-policy-makers are assured that there will be an age-of-entitlement shift that will exactly match that index requirement. Such an index could vary from time to time and place to place.

Raising the age of entitlement to government-sponsored retirement income does not mean that the only option is for workers to wait to retire. They can continue to retire whenever they wish. It just means there will be an extra need for private responsibility for the provision of retirement income prior to the new age of entitlement (that is, higher personal savings rates).

In this regard, it bears repeating that the announcement of any shift in the age of entitlement should be made well in advance of its occurrence to allow time for workers and employers to respond appropriately.

Clearly, if the baby-bust generation does not agree to significantly higher contribution rates for social security (that is, higher rates of foregone consumption), then the baby-boom generation must be convinced to take reduced benefits (but only in line with the actuarial value of the relatively small contributions they are making today).

The following question remains: will a shift in the age of entitlement prove to be a palatable solution to achieving an acceptable wealth transfer equilibrium? There are many reasons to believe that the answer is yes.

For the past 20 years, both government (for example, more flexible retirement within social security) and the private sector have provided incentives for workers to take early retirement. One reason for this was to assist in reducing the high levels of youth unemployment created when the baby boom entered the labor force. Twenty years from now, however, the baby boom will start to retire, and by 2030, the labor force will be dependent on the baby-bust generation for its supply of workers to create wealth. Today's incentives for early retirement will become tomorrow's incentives for later retirement.

Thus an increase in the age of entitlement for social security retirement income will exactly match the goals of all employers (private and public), reason no. 1 that should make it acceptable.

Second, no economy can accommodate a sudden switch of all members of the baby boom (who will reach age 65 between 2015 and 2030) from

productive members of the labor force to passive retired consumers. Total production plus imports must equal total consumption plus exports.

A sudden drop in production with no change in consumption would require increased imports, thus eroding the nation's balance of trade. Also, prices for domestic goods would increase. While the productive labor force may be able to achieve wage increases to offset the resulting inflation, the passive retirees will not, and they will see the value of their assets, and their ability to consume, erode, until a new economic equilibrium is achieved. It would be preferable to have some of the baby boomers remain productive members of the labor force for a longer period, to achieve a consumption-production equilibrium without inflation. One cannot avoid the reality that wealth must be created before it can be transferred.

There are also sociological reasons for accepting an increase in the age of entitlement. Many workers today are being forced to retire and would rather be working, at least part time. It is both illogical and unfair to relegate the experience and expertise of capable older workers to empty role structures merely because they have attained a certain chronological age [13, p. 196], [17, p. 65].

There are individual economic reasons to expect a rising age of entitlement to be palatable. While the cohort born between 1946 and 1955 was 30% wealthier than their fathers by age 30, the cohort born between 1956 and 1965 was 10% less well-off than their fathers by age 30 [4]. A great deal of the personal wealth that allows workers today to retire early exists because of the significant real increase in the value of housing that took place in the 1970s and 1980s as the baby boomers bought their first homes. However, that windfall is now history, and there is no reason to expect the real value of housing will rise faster than the GNP for the next 40 years. In fact, if the baby boomers all try to downsize their choice of housing at the time of retirement, capital losses could be expected to occur. Thus, the workers born after 1955 may not be able to accumulate enough wealth to retire early. This is especially true given their enhanced life expectancy. Instead of creating enough wealth to pay for 10 years of retirement income, they may well have to accumulate enough for 20 years.

In fact, it is this improvement in life expectancy that will prove to be the cornerstone in the campaign to sell the concept of a rising age of entitlement.

The cause of the wealth transfer dilemma is the aging population. But the cause of population aging is twofold: first, shifting demographics as the baby bust follows the baby boom, and second, enhanced life expectancy. As life expectancy has continued to improve, each retirement cohort has been the

recipient of ever larger wealth transfers from social security (given a constant normal retirement age).

The Canadian data support this contention. The C/QPP was introduced in 1966 with a normal retirement age of 65. Had the criterion for the normal age at retirement for C/QPP been established as the 1966 life expectancy at age 65, then the equivalent ages of retirement, shown in Table 4, would result.

TABLE 4
EQUIVALENT AGE
AT RETIREMENT (CANADA)

Year	Age
1966	65.00
1981	67.30
1991	68.36
2001	69.36
2011	69.86
2021	70.28
2031	70.72

Table 4 shows that, by 2031, a normal retirement age of almost 71 would equate to a 1966 normal retirement age of 65. Remember that the Brown and Iglesias model projects a rise in the age of entitlement from 65 in 2006 to 69 in 2030, without accounting for the productivity gains of workers in that period (because some social security schemes cannot achieve that gain). Thus, a shift in the age of entitlement only slightly more than the equivalent improvement in life expectancy will result in a level wealth transfer index for the country with the fastest aging population. This should be an acceptable alternative for Canadians. All other western nations will experience an easier sales job than that needed in Canada.

Pressure is already mounting in the U.S. for further changes to the OASDI normal retirement age. One example is the Pickle Bill, which would raise the normal retirement age to 70.

More recently, in the U.S., then House Ways and Means Committee Chairman Dan Rostenkowski proposed an acceleration of the shift in the age of entitlement for OASDI benefits from age 65 to age 67, as presented earlier in this paper. The following is part of the editorial reaction carried in *USA Today*, Monday, April 25, 1994:

Speeding up that process saves billions while bowing to the reality that as people live longer—about six years longer than at Social Security's birth—they must work longer too....

And it's fair.

Current beneficiaries get two to three times more from Social Security than they contributed; future generations can't even get their contributions back.

8. BEWARE DEMANDS TO EXPAND PAYGO SOCIAL SECURITY

It may be surprising that there could be a demand for an expanded paygo system at a time when the present viability of these schemes is being questioned. However, this is possible given the realities of the initial years of any paygo system, when it is possible to have all workers contribute immediately, but it could take more than a generation before all retirees draw full benefits. Hence, early paygo contributions can be far less than the contributions required to fund the mature paygo scheme.

Any new extended layer of benefits can be designed with the same properties (that is, contributions that, actuarially, are much smaller in value than the new benefits that are promised to be paid in the future). In this way, the *total* contributions for the combined new system could appear to be acceptable.

It is now apparent that paygo systems have two perverse characteristics. First, once a paygo system is accepted, it is almost impossible to return to a fully funded system because one generation would have to make double contributions to pay off the actuarial liability of the paygo system while also prefunding the fully funded system. Second, one apparent short-term solution to the funding problem with a paygo scheme is an expansion of that scheme!

However, there exists only a short-term appearance of equity, with the new expanded cost being added to the chain-letter commitment of the next generation.

9. CONCLUSION

A paygo security scheme derives much of its apparent security from an assurance of its permanence. This paper has presented a politically acceptable solution to the funding problems now facing most social security systems in the western industrialized nations that can guarantee that permanence. Having determined that the real issue is not the method of funding

such systems (that is, paygo versus fully funded), the paper analyzes the ability of these western nations to find an acceptable wealth transfer equilibrium given their aging populations. Because Canada has the most rapidly aging population among these western nations, Canadian data were used in the analysis.

The paper presents an age-of-entitlement model that can be used to achieve *any* acceptable wealth transfer ratio. The Canadian data show that the maximum age shift that would be required to solve the problems projected over the next half-century is a shift in the normal retirement age from 65 to only 69 (a proposed graded shift starting in 2007 and being finally achieved in 2030). No western nation should require a shift more dramatic than that.

I hope that this model will prove helpful in the public policy analysis that all western industrialized nations will pursue in the quest for a new wealth transfer equilibrium and for intergenerational solidarity.

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DISCUSSION OF PRECEDING PAPER

G.N. WATSON:

This discussion is written from the standpoint of a Canadian who participated in the consultation process at the inception of the Canada Pension Plan (CPP) and is one of only a few actuaries who did so. No position was taken or opinion expressed by the Canadian Institute of Actuaries, and the plan was completely opposed by the life insurance industry, not because it was a pay-as-you-go plan, but because it was not self-supporting based on the contribution rate required at the outset. It was generally assumed that because it was supported by an actuarial report and was certified as sound by the Government Actuary of the day, it was therefore fully supported by the contributions required.

Now, 30 years later, we read in the newspapers that we have a very serious problem, which most actuaries and pension specialists knew all along.

This problem did not arise because it was a pay-as-you-go plan but primarily because there was a built-in deficiency at the start. This was largely due to granting to those residents over 55 the right to start full benefits after making only 10 years of contributions. Other major enhancements were made later without changing the original contribution rate, which was, in total, originally 3.6% and stood unchanged for more than 20 years. There were several enhancements during this period, the most important being the introduction of full CPI indexation for members already retired and the removal of the requirement for complete retirement from the work force for benefits to be payable from ages 65 to 70.

Buried in the original actuarial report was the statement (then seemingly ignored by most writers and speakers on the subject) that, based on the original actuarial assumptions, contribution rates should be increased from the original 3.6% to 5.5%, starting in 1985. This increase was to pay for the considerable gift involved at the inception giving full benefits after 10 years of contributions had been made, as already stated.

In this paper, the author shows that if contributions are made to a pay-as-you-go plan over the full working lifetime, a funded plan contribution rate is the same as the rate for a pay-as-you-go plan, provided that there is a sufficient increase in the active members and in the average wage rate. But no mention is made of what is generally called the past-service benefit, which a funded plan would certainly have to make provision for. It was

estimated that the fund required at the inception of the CPP to cover this item was approximately \$20 billion dollars.

Thus, there was in this plan a substantial deficit at the outset, which was one of the chief causes for the substantial increase actually required in 1985. No increase was made in 1985 as originally projected, but in 1986 a continuous annual increase in the contribution rate was commenced, to soften the blow. This increase was less than originally projected, whereas conditions and the level of benefit payments had, in the meantime, changed. As a result, a much larger increase was in fact needed. Now, 11 years later, the matter has become a matter of public concern.

This discussion is written to avoid the pitfall of assuming that the CPP and other social security plans in the western world have a problem merely because of a changing birth rate and an aging population. If that was all it was, I agree with the author: there are various solutions that come to mind. The Canadian Institute of Actuaries has listed these, and the authorities understand such alternatives. The magnitude of the problem 30 years later has been caused chiefly by neglect not by demography.

Therefore, let us as actuaries not delude ourselves and, because of our expertise, give comfort to those who must now bear responsibility for the sins and the unsupported promises of the past.

This is a very valuable paper because it analyzes how a pay-as-you-go plan can be self-supporting and shows how it can be compared to a fully funded plan and particularly how the growth rate of contributions compares to the earned interest rate of the fund of the latter. That is an important point because it does indicate certain necessary assumptions implicit in the valuation. This discussion is intended to go further and to point out that there must be in all of this certain additional assumptions if the pay-as-you-go plan is to survive, as follows:

- (1) The liability for past employment existing at the inception of the plan must be taken into account in setting the initial contribution rate.
- (2) If the terms of the plan are changed, the contribution rates must be changed accordingly.
- (3) If there are demographic changes, these must be examined at intervals of five to ten years and changes recommended by the Government Actuary in the required contribution rates and acted on as a matter of law.
- (4) To the extent that the plan accumulates a fund because of (1), these funds should be invested at a rate of interest sufficient to meet the valuation assumptions, but not necessarily invested only in government

bonds. Bank stocks should be a good secure investment because of the considerable support banks receive from the federal government. This type of investment would give comfort to the average citizen (and all members of the NDP party), who would rejoice to read of the profits earned by the banks that would, under these circumstances, be used, in part, to pay for his/her pension.

- (5) Whenever the administration rules are relaxed so as to increase the rate of claim for benefits, this must be accompanied by a change in the required rate of contribution.

My submission to the special committee that was appointed to consider and report on the proposed CPP, consisting of Senators and Members of Parliament, was made January 13, 1965 in Ottawa. At one point I stated (quoting exactly from the printed record),

... it would seem to me that the pension plan should be self-supporting and I deplore the fact that the rate of contribution specified in the Act will not provide a plan which is self-supporting. In fact, from 1985 and on, it will require a higher rate of contribution if we are to rely on the estimates of the chief actuary.

I went on to say,

... I would like to see a plan, if this is the action that will be taken, that will stand on its own feet, considering the present population as a group.

That was my principal recommendation. At the conclusion, they smiled, asked questions, and complimented me on the charts and illustrations I had shown them. One member even suggested they should be published in the *Ottawa Citizen*, but otherwise in their report they ignored everything I had to say. Later, the Government Actuary told me privately that he did not agree with the point I was making.

Now, 30 years later, we have a problem that any actuary can perceive, but let us not sugarcoat it. The government of the day ignored the actuarial imperatives and will again unless we clearly tell the truth of the matter. The problem is not pay-as-you-go versus fully funded. It is rather a matter of adhering to proper valuation standards, which all actuaries are required to do, except when it is really a matter of national importance.

Forgive me for writing of the past at such length, but those others who know the truth of what I have said are for the most part dead or suffering from one dread disease or another. The members of the committee who were

charged to report on the matter to Parliament are also no longer with us; only the written record survives.

Those younger actuaries who must now advise government may benefit in some small way by reading this discussion, to better understand how we Canadians managed to get in this position and what must now be done to cure it and, further, to prevent recurrence.

BERNARD DUSSAULT:

I commend Rob Brown on a profoundly professional and scientifically rigorous treatment of the economic, social, and political aspects of the issues stemming from social retirement programs run on a pay-as-you go basis in a demographic environment of an aging population. The paper should prove to be a useful reference to aid in the understanding of the complex factors affecting the administration of social insurance and pension programs. I do, however, question one aspect of the solution proposed in the paper for resolving the intergenerational equity issue brought about with the population aging process, and I also submit a comment on the discussion of financing approaches.

Increasing the Normal Retirement Age

Raising the normal retirement age would be consistent with that part of the aging process caused by improved longevity. However, I question whether its permanent implementation would and/or could resolve the intergenerational inequity caused by that part of the aging process resulting from the sustained shift to lower fertility since the mid-1960s. I suggest that increasing the normal retirement age would achieve financial equilibrium temporarily for baby boomers, who would thereby receive reduced benefits consistent with the lower contribution rates resulting from the pay-as-you go approach for relatively larger cohorts of contributors. However,

- If implemented permanently, would the increased retirement age not exacerbate rather than resolve the inequity issue for subsequent “buster” generations, because they would be expected to contribute at higher rates than boomer generations for equivalent benefit amounts?
- Consistent with the sensible, suggested, actuarially equitable solution to the paygo roller coaster whereby smaller cohorts (for example, the buster generations following the boomer generations) paying above-average contributions should receive about-average benefits, would the normal retirement age not have to be accordingly set back to age 65 (or even

below) for the subsequent buster generations, which are projected to contribute at rates higher than any previous generations?

In this context, it is not surprising that the model developed by Brown and Iglesias shows that the wealth transfer index will remain level until 2030 at its 2006 value if the retirement age is gradually shifted from 65 to 69. As stated in the paper, this is a remarkable result. But the paper is silent on what this model would produce from 2030 and later. Maintaining the retirement age at its increased level of 69 after 2030 should cause the wealth transfer index to start decreasing after 2030 as dramatically as it increases, as shown in Figure 4 of the paper for 2006 to 2030 under a no-retirement-age-increase scenario.

Discussion of Financing Approaches

My comments here deal with the discussion of the relative merits of paygo and full funding as financing approaches for social retirement programs. Although the paper states that the full-funding approach, as compared to the pay-as-you-go approach, does not add to the inherent security of promised benefits, it fails to disclose the following two important attributes of full funding:

- (a) It is generally recognized as the most cost-equitable self-adjusting approach.
- (b) It produces lower costs than the paygo approach if and when investment rates of return are higher than increases in total employment earnings. For example, assuming a long-term real rate of return of 2.5% (consistent with the existing CPP investment policy), the CPP full cost contribution rate would, at 10.5%, be about 25% less than the ultimate pay-as-you-go rate of about 14.3% for 2030 and later years projected using an internal rate of return of about 1.5%, as assumed in the fifteenth actuarial report on the CPP. Assuming a real rate of return of 4% (which would normally be considered appropriate for a diversified portfolio investment policy like that applying for the Québec Pension Plan), the CPP full-cost contribution rate would, at about 6.75%, be about 50% less than the above ultimate pay-as-you-go rate.

KENNETH A. STEINER:

In his paper, Mr. Brown develops a wealth transfer index model “for funding stability.” According to Mr. Brown, this model “creates and provides intergenerational equity and hence will succeed in guaranteeing the

future viability of paygo schemes.” I question whether application of Mr. Brown’s model would, in fact, achieve either funding stability or intergenerational equity in Canada or elsewhere. Further, I take issue with Mr. Brown’s preference for paygo financing over actuarial advance funding of social security benefits.

Funding Stability

According to Mr. Brown, “the actual 1994 contribution rate [for C/QPP] is 5.4% paid 50/50 by employers and workers. . . .” This rate is projected by C/QPP actuaries to be 14.4% by 2035. Presumably, this expected increase in contribution rates is the problem Mr. Brown wishes to address with his model. However, the increases in the normal retirement age he proposes would still result in an ultimate contribution for C/QPP in excess of 11%, or more than double the current rate. It seems to me that future generations of taxpayers may still have much the same reluctance to contribute in excess of 11% as they might with a 14.4% rate. A doubling of the contribution rate and possible reluctance of future taxpayers to make required contributions does not seem to reflect a stable funding environment.

Mr. Brown does not specify how his model will work if actual experience deviates from projected experience, if actuarial assumptions for future projections are changed or if C/QPP benefit provisions are changed. Will there be some mechanism in Mr. Brown’s model that automatically adjusts the normal retirement age for these changes? It seems somewhat unrealistic that the Canadian government will entrust the provisions of its national retirement program to one or more actuaries and their somewhat arbitrary “LFEDR” calculations. Again, it is difficult to see how funding stability would be achieved under the proposed model.

Intergenerational Equity

Despite Mr. Brown’s arguments, I remain unconvinced that the LFEDR model will “create” or even “provide” intergenerational equity. I do not find the ratio to be a particularly good measure of intergenerational equity for several reasons, including the following:

- Because the support of the nation’s youth is not borne solely by the working population (at least in the U.S.), it should be eliminated from the numerator.
- The use of the labor force in the denominator favors those generations that did not (or do not) participate as fully in the labor force.

- The numerator fails to reflect transfer of wealth related to other government-sponsored programs such as national defense, servicing of the national debt, and so on.

I agree with Mr. Brown that intergenerational equity can be achieved through actuarial equity. However, I believe that most taxpayers look to “money’s-worth” comparisons as the best measure of individual or intergenerational equity (that is, this generation can expect to receive benefits of $x\%$ of accumulated contributions paid versus $y\%$ expected by the preceding generation and $z\%$ expected from the following generation). Under most money’s-worth analyses that I have seen, Mr. Brown’s solution might introduce more equity between baby-boom and baby-bust generations, but it would doubtless provide less equity between these two generations and preceding generations.

Paygo versus Actuarial Advance Funding

I was disappointed that Mr. Brown felt obligated to attack the “actuarial full funding” straw man that he created. I believe the real question is not whether one approach provides more security than another, but whether actuarial advance funding (note: this is not the same as “full funding”) can better accomplish a reasonable funding objective (such as keeping the tax rate nearly level in the future when measured as a percentage of taxable payroll or as a percentage of gross national product or as a percentage of some other reasonable measure). I believe the answer is, “Yes, it can.”

Certainly, there are some advantages of paygo financing: initial program costs are usually lower and there is no need to worry about how program assets are to be invested. The advantages of actuarial advance funding for social security programs include the opportunity to level out the tax rate and impose financial discipline in the form of automatic adjustment of gains and losses, changes in assumptions, changes in plan provisions, and so on.

Many individuals favor paygo financing, and many individuals would like to see some type of advance funding of baby-boomer social security retirement benefits with assets either invested by the government or privately invested. If our policymakers choose to finance baby-boomer benefits on a paygo basis, then Mr. Brown’s approach is as reasonable an approach as any for determining possible future benefit reductions. If advance funding is desired by our policymakers, we should offer actuarial solutions to ensure that the desired levels of asset accumulations are accomplished. In either event, we should help our policymakers by substituting facts for appearances

and demonstrations for impressions. I believe those facts and demonstrations should include graphs of expected future tax rates and individual money's worth comparisons for the various alternatives considered.

JOHN C. MAYNARD:

The Canada Pension Plan faces immediate and critical decisions in financing and structure. The finding of solutions to the underlying problems will be of actuarial and general interest in Canada and in other countries in which similar problems are looming. I thank Robert Brown for writing the paper.

In the following discussion, issue is taken with several of the author's opinions. His suggested method of financing is then examined. Finally, an alternative method of financing is described and recommended.

The advantages of present-day government paygo schemes are important: nearly universal coverage, immediate vesting, and low administrative costs. These advantages will still be there if the government scheme has some funding. In the paper the disadvantages of government-funded schemes are much overstated, and their advantages in relation to paygo are not brought out clearly. The door is therefore open for considering as the best alternative a continuation of the present plan with the injection of some funding.

The destruction of several government fully funded pension schemes in the early part of the century is attributed to inflation. However, in recent times there have been public service plans and some private plans, with benefits indexed to cost-of-living, and they have come through the inflation of 1960 to 1990 very well. My TSA paper¹ bears on the funding of private plans with indexed benefits.

In the paper serious doubts are expressed that the assets of a government-funded scheme can be held securely and invested properly. Rosa, writing in 1982, goes so far as to warn that an attempt to do this "invites squandering capital funds in wasteful low yield investments." These opinions do not allow for the many changes that have occurred in investment systems in the past 15 years or so.

In fact the worldwide demand for capital has expanded enormously, and widening markets have brought buyers and sellers together. Thanks to much improved communications these markets are now international in scope and activity. Along with this growth has come the required knowledge, the skills,

¹MAYNARD, J.C. "Financing Defined-Benefit Pension Plans with Indexed Benefits." *TSA* XLIV (1992): 193-246.

and the definition of responsibilities required by a professional person, the investment manager.

Speaking of pension fund investments, Keith Ambachstsheer states in a recent article²

The motivations of pension fund managers proceed logically from understanding that it is in the common interest of employers and employees to create pension funds. Such funds secure pension promises and, by earning superior returns, also help create the wealth needed to make the promises economically viable. Legislation supports these arrangements, providing tax deferrals and requiring fund managers to act as fiduciaries solely in the best interests of the beneficiaries.

These remarks apply to public service pension funds as well as private pension funds. In Ontario about six years ago, two new investment systems were set up for two public service pension funds: the Ontario Teachers' Fund and the Ontario Pension Board. The purpose of these changes was to diversify from investments of the Ontario government to a broader range of investments, thereby improving both security and rate of return. The last few years have been kind to investors, and these two funds and others like them have been doing well.

It is estimated that the Public Sector Pension Funds in Canada amount to \$225,000,000, while the fund for a partially funded Canada Pension Plan is estimated to have an average of about this amount in the next 25 years.

Is a fully funded scheme more secure than paygo? Authority Barr replies "No," because in both cases it is the transfer of consumption from workers to pensioners that counts and the two methods of funding should not fare very differently. But this reasoning does not allow for differences in timing. Under paygo the current contributions are paid directly to pensioners. Under full funding the contributions are saved up for a generation and then with investment income are paid to pensioners. At any one time the pension payments are supported by the fund and by current contributions, not by current contributions alone. Suppose we had a prolonged economic depression in which incomes were reduced and contributions were much reduced or cut off. Under full funding, earned pensions could continue unabated without a strain on other resources. Under paygo this could not happen. Other examples can be given. Surely it can be accepted that funding, even partial funding, is more secure than paygo.

²"In defence of pension funds," *Toronto Globe and Mail*, March 6, 1996.

Paygo funding is subject to an inherent instability, and the history and experience of the Canada Pension Plan reveal this. In the early 1960s the federal government of the day asked Dr. Robert M. Clark to study and report on the field of government schemes. His report stated the need for a universal federal scheme with contributions and benefits based on earned income. The government was influenced by schemes of this kind that were in operation in the U.S. and Sweden and decided to proceed. The contribution rates were set to provide for a small fund and for benefits as they fell due. The rates were thus low but above paygo rates, which were initially very low. The actuarial literature of the time is full of warnings that under this system the contribution rates were bound to increase and this would be unfair to future contributors. However, the actual experience has been worse than expected. Projections, which were made every few years, always confirmed that contribution rates had to increase, but the contribution rate for a given year was always going to be higher than the rate for that year in the previous projection. It is not surprising that contributors are disturbed, fearing that contribution rates will increase indefinitely and without limit, and that the Canada Pension Plan is headed for cancellation or major change. As this discussion is being written, press reports appear monthly in favor of cancellation.

The main cause of increasing contribution rates is clearly stated in the paper. It is a characteristic of paygo schemes that when a benefit is introduced "all workers contribute immediately, but it could take more than a generation before all retirees draw full benefits." This characteristic not only explains why rates increase in a paygo system, but also guarantees that this will happen. This characteristic is therefore an inherent flaw.

But there is another flaw. If paygo continues, there is the need each year to balance the equation between cash contributions from current workers and cash payments to current retirees. This is difficult if the ratio of worker population to retiree population varies because birth rates have varied down and up and down in the last 60 years, or for any other reason. Author Brown attempts to bring stability to the "paygo roller coaster" by defining a change in contribution rates, but finds this unsatisfactory. He then attempts to define a change in benefits, concluding that an increase might be made in the retirement age because of improved and improving mortality. This is understandable. But then he requires a further increase in the retirement age for the baby-boom cohort, to be followed presumably by a reduction in retirement age for the following cohort. This amounts to gradual changes in retirement age up and down according to year of birth. In the opinion

of this writer the public would not understand or support changes of this kind.

There has been another weakness in the present system. In the past four years the cost of disability claims in the CPP has doubled, while there has been no change in the definition of disability. This situation certainly calls for investigation and correction.

The experience of the first 30 years under CPP/QPP has shown that paygo funding leads to contribution rates that increase unpredictably and that vary according to year of birth and economic factors. On the other hand, there are advocates of full funding, that is, a system in which contributions from individuals provide for their own benefits in retirement. These contributions are made in advance of payments and lead to a large fund that needs to be invested and managed well.

A move from paygo to full funding can be made, but if earned benefits for existing retired persons are to be continued, the contributions will be heavy for a generation of contributors. These contributors will have to pay for the benefits of the retired while paying for their own benefits in advance.

Is there any method of funding other than paygo or a move to full funding? Yes, there is a family of partial funding methods. This is the family for which contribution rates are expected to remain level for a period. This is a good family because if a level contribution rate can be determined and accepted, confidence in the plan will be restored.

For a given year of commencement, the determination of the level contribution rate will depend on: the benefits, the assumptions about the future, the initial fund, the period, and the fund at the end of the period. The technique for determining present and future contribution rates has been highly developed by the Chief Actuary in the last few years and uses the facility for making projections of the fund for many years. In other contexts this process would be risky, even foolhardy. In the present situation the fund is anchored to an aging and well-known population. The economic factors may well differ from the assumptions, but their differences are likely to be offsetting in the projections. The projections are credible and useful, particularly for the shorter periods.

A period of 35 years from 1996 is long enough to include most of the benefit payments to the baby-boom cohort. For this period and with present benefits and an interest rate assumption of 7%, the level annual contribution rate is estimated at 11%. All contribution rates apply to only a portion of earned income. The comparison with paygo is as follows:

Year	Paygo Rate	Estimated Level Rate
1997	8.00%	11.0%
2001	8.36	11.0
2011	10.08	11.0
2021	12.53	11.0
2030	14.22	11.0

With this level rate the fund account is expected to grow at \$15 billion per year, reaching \$400 billion (five to six times annual benefit payments) in 2016 to 2021. In the following years the growth rate of the fund account is expected to reduce to a level that equals two times annual benefit payments in 2030. This level is large but comparable to the level of public sector funds in Canada and low in relation to the growing level of the world market for capital.

In time there will be periodic reviews of experience, assumptions, benefits, and expected level contribution rates. The original projections will serve as the initial objective for fund assets. If assets exceed the initial objective, as will happen if the actual rate of return exceeds the assumed rate of interest, it would be proper to make a refund of contributions, perhaps over the following five year period. Conversely, if assets are lower than the objective, there should be an increase in contribution rate.

If there is a reduction in benefits, there should be a new calculation of the expected level contribution rate, which should be lower than the current rate. Normally this should be adopted immediately. A possible increase in retirement age is an important example of reduction in benefits.

If there is an increase in benefits or any liberalization in the administration of disability or other claims, there should be a new calculation of the expected level contribution rate at the new level of benefits. The new and higher contribution rate should be adopted on the effective date of the new level of benefits.

The CPP/QPP is a plan in which the benefits and contributions are based on earned income. It has the advantages of universality, portability, low expense. Together with OAS, GIS (the public plans with flat rate benefits), and private savings, the CPP/QPP makes up the three-way structure for the provision of retirement income in Canada.

In public the CPP/QPP has been criticized for continuously increasing contributions and consequent lack of stability. In this discussion, in answer to these criticisms, a practical and stable funding method has been outlined

that depends on contribution rates that are expected to be level or non-increasing for 35 years.

The method outlined requires a jump in contribution rates to a level higher than current paygo. Will the baby-boom generation who makes the contributions be agreeable to this?

Several inducements will help to make them feel agreeable:

1. They will be providing additional security for members of their own generation.
2. Interest rates today are historically high.
3. They get tax credit for the increase in contributions, and investment income is sheltered from tax.

The funding method will require some basic changes in the operation of CPP/QPP:

1. A new structure will be needed for investment management, so that investment policy is left to professionally trained persons. Periodically, public statements on the fund should be available, permitting comparisons with other funds.
2. A board and staff will be responsible for administration of payments, expenses, claims, and decisions on funding based on a commitment to maintain level contribution rates.

KRZYSZTOF M. OSTASZEWSKI:

The issue of stability of pay-as-you-go social insurance systems has gained worldwide attention recently. The book *Averting the Old Age Crisis* [4] illustrates that the security of social security systems has become a central public policy issue throughout the world. The publication of Mr. Brown's work is a welcome addition to this important debate.

There are several important points that should be raised in relation to Mr. Brown's paper.

1. "Pay-As-You-Go" Is Not Properly Defined by Its Name, as the So-called "Funded Plans" Also Pay as They Go

The most fascinating aspect of social security systems is the pretense of those systems of being something completely new in their respective national economies. Social security schemes are presented as transferring cash from the working to the nonworking (for example, retired, disabled, and so on). Alas, if the nonworking group holds a portfolio of claims to cash flows of firms employing the working group, the same kind of transfer is ensured.

When the nonworking want to consume, they collect their interest, dividends, and possibly capital from their portfolio, and cash flows from the working to the nonworking. Then (or actually simultaneously) the cash flows in the opposite direction to ensure the more important transfer of goods and services. Interestingly enough, as much cash flows out of the firms to the nonworking as then flows into purchases of goods and services, and the system pays as it goes.

The above illustrates one purpose of capital markets. We tend to think of modern, efficient markets with numerous intermediaries facilitating the flow. This is beneficial but not necessary for the function described here. Inefficient, monopolistic markets that existed in the nineteenth century, and dominated the economic scene before that, were capital markets nevertheless and allowed for imperfect accumulation of capital assets. We in fact believe that paygo schemes are simply an extension of nineteenth-century government perpetuities used for retirement. Capital assets are merely claims to future cash flows of enterprises, and they are generally prioritized into the following groups:

- Claims to riskless cash flows generated by taxing power (government securities)
- Claims to cash flows guaranteed by an enterprise's existence (bonds)
- Claims to discretionary cash flows generated by an enterprise (stocks).

A paygo scheme is a sophisticated method to hide the true nature of social insurance schemes. What is the true nature? To answer that, let us now engage in a reverse of the exercise presented above. If private markets for retirement (and disability) indeed function on a pay-as-you-go basis, private financial security systems look like social security. Is the opposite true—are social security schemes just like capital markets? Are rights accrued within social security systems a security? One might be tempted to say “no” because the legislature can change them at any session. Alas, the value of a marketable security, even in an efficient market, can be changed by any session of the legislature by a simple twist of the tax code. In fact, participation in a social or private pension scheme is a security, because it is a claim to future cash flows. If the future cash flows become more uncertain, they are discounted at a higher rate and valued less.

Where is that security hiding in social security systems? Social security systems are equivalent to:

- Initial-beneficiaries generation receiving welfare transfer payments
- Government issuing special private placement bonds in return for payroll tax contributions

- Benefits termed “contributions plus interest”
- Special tax/transfer payment instituted for beneficiaries to achieve the prescribed benefit levels.

This is fully described, and presented in an appropriate mathematical model, by Kotlikoff in the “social security” entry in *The New Palgrave Dictionary of Money and Finance* [3]. It is quite common to perceive the social insurance payroll premium as either tax or an insurance premium. If it a premium, it is much closer to an annuity premium—the participants expect a return of it. If it is a tax, we should recall one of the most fascinating claims of classical economics, recently revived by the rational expectations school (represented by last year’s Nobel Prize winner, Robert Lucas, or Robert Barro, and numerous others): the Ricardian equivalence. In its simplest form, it proclaims that how government finances itself—taxes or bonds—does not matter, because all of it will become taxes one day anyway. Yes, this is a debatable proposition, especially in view of the Keynesian and supply-side schools of thought, but it deserves attention. Let us observe that one of the heated debates about social security systems is their effect on the savings rate. Many critics of social insurance proclaim that it hampers savings. Ricardian equivalence holds that social security cannot have any effect on the savings rate. In my opinion, however, the main problem with social security systems lies in an entirely different area.

2. Demographics Is Not the Problem, but Centralized Demographical Models Are

There is now nearly a “call to arms” among public-policy scholars about the state of the pay-as-you-go systems in relation to the coming “tsunami” of baby-boomer retirements. If the retirement systems were in the private sector (as they properly should be), we would instead talk of a secular (although precedented) bull ride in the financial markets (which should be followed by a secular bear market, sometime after 2020). In the mixed North American economies, we are blessed with the opportunity to talk about both. Mr. Brown’s paper gives demographic projections that imply the issues facing paygo systems. Yet the problem is not demographics, but the concentration of the response to demographics in the hands of government actuaries and the legislature. Are private capital markets efficient enough to price the demographic tsunami into the interest rates? All scholarly work in modern finance indicates that the answer is “Yes.” Anecdotal evidence often points

to a "no." We must honestly ask: What is the more efficient way to price capital assets?

The problem is that over the next several decades there is going to be an increasing demand for the social insurance benefits paid to the elderly, while the supply of such benefits may not rise to the level demanded. If the benefits were demanded in a private market, price would undoubtedly rise. Alas, they are provided by the government and the price is already set, and even if it is not set yet, it will be set by the government. The actuaries will perform all necessary calculations and arrive at the level of funding that is needed. This will translate into the appropriate payroll tax level, be it 60% or 70% (no, we do not believe we will get to that level, but we do need to get your attention), and then the system will return to equilibrium. There may be temporary shortages and there may be some rationing, but speculators will be punished by law, and the needs of the population will be met.

The production of shoes in the command economy was guided by similar principles. Projected demand for shoes was carefully evaluated by a team of government experts. Then the national economy's capacity to produce and import shoes was analyzed in view of current social priorities. The results of such expert analysis were then brought to the executive of the ruling party. The party then brought the resolution adopted to the legislature, which voted upon it and thus provided for relief from acute shortages of shoes that developed in the marketplace. However, despite repeated efforts of the experts, the party, and the legislature, the acute shortages of shoes persisted and even deepened.

Let us then recall what happened when price controls on consumer goods were removed on January 1, 1990 in Poland. It took less than a week to fill the stores. Yes, there were complaints about prices, but what we need to ask is which of the two sets of prices was the real one: the prices set by the government experts, or the prices set by private speculators hassling refrigerators across the German border. In the U.S., the wealthiest quintile now saves less than an average Korean or an average German. If the purpose of retirement insurance is to provide income replacement, shock therapy may be necessary for such behavior.

I am convinced that the baby boomers will respond to the real incentives soon, and we will see a savings rate of more than 20% in the U.S. economy within a decade, as well as a price/earnings ratio of 50 in the U.S. stock markets.

But the problem is not demographics; the problem is that centralized demographic models of social security systems hide true incentives from

economic decision-makers. In a rational economy, prices must be real. This means that demographic projections should be decentralized, and many competing private firms should be struggling with the problem of income replacement for the retired baby boomers. For example, How serious would the overpopulation problem be if every person had the capacity and the commitment to “pay for his/her own space”?

The intergenerational equity issue raised by Mr. Brown is addressed in depth in the recent works on intergenerational accounting, such as Kotlikoff, [2], and we believe that Mr. Brown’s analysis would be enhanced by incorporation of that framework.

3. Asset/Liability Management Matters

The entire demographic section assumes static analysis, ignoring the value of embedded options. Yet as the experience of Medicare in the U.S. indicates, the option value for Medicare between 1965 and 1990 turned out to be 900% of the value of the static contract (1990 expenditures were ten times the 1965 projections for 1990 expenditures; this does include Congress’ option to raise benefits, but at least 300% is due to participants and providers skillfully adjusting their behavior to maximize cash flows from the system). All proposed ratios in Mr. Brown’s analysis depend on the design of the system itself and will self-adjust as the system evolves. The static model assumes that there are no negative feedbacks in the system, an assumption that is a reasonable approximation for small tax levels but that becomes very inaccurate for large tax levels, as the experience of other countries clearly indicates. Thus long-term projections must be considered as standard asset/liability management projects, assuming intricate interactions of the factors.

What interactions would those be? Let us begin with the discount rate. Clearly, there is no single discount rate for premiums and benefits, as Mr. Brown’s paper assumes. Benefits generally grow with an index of consumer prices, while contributions grow with wages. The spread of the two was precisely the reason why legislators for the longest time felt unrestrained in increasing benefits levels. If the Ricardian equivalence is incorrect, this is precisely where it may fail—increasing levels of explicit and implicit government debt cause returns to financial capital to rise on a relative basis and cause returns to human capital (that is, labor) to fall on a relative basis. As a result, the taxable wage base for social insurance does not grow as expected, thus forcing an even greater increase in implicit government debt.

The economy is, again, similar to a patient after a morphine shot—no pain is felt (that is, no signals are given to economic decision-makers). But there is no greater disease that needs to be cured to justify the morphine shot. In fact, this addiction to economic painkillers may be the disease that hinders economic growth. If we can get just an additional 3% of growth over the next generation's work life, we will more than double the final gross domestic product.

The labor force expenditure dependency ratio model is particularly troubling. It is simply impossible that the factors of youth and elderly dependency will remain constant at their proposed levels of 1.7 and 4.244, respectively. What Mr. Brown calculates is merely a first-order approximation—it is undoubtedly useful but cannot and should not be used as a basis for public policy. Further study is needed.

Finally, there are incentives. Paygo participants face amazingly twisted incentives. They are often penalized for working while in retirement. They benefit from a relatively short work life with high earnings (it makes even more sense to obtain a professional degree in a country with a paygo system). Social support structures are needed less. Family structure is needed less. Incentives to save and to control one's one destiny are lessened.

4. The Specter of Privatization and the False Dichotomies

Mr. Brown's paper contains an extensive list of disadvantages of privatization and advantages of paygo schemes. This intricate reasoning is, however, built on a central false premise: that there is a dichotomy between fully funding and paygo. As we have stated above, such dichotomy is mythical. The defining characteristic of a paygo scheme is: *Paygo is a nationalized enterprise involved in the retirement and disability provision business.* Privatization, among others, does not involve prefunding because paygo is prefunded—with implicit (off balance sheet) private placement government bonds, backed by government's ability to collect future payroll taxes. Neither is any "fallacious composition" proposed in privatization. The main claim of privatization is not that fully funded schemes are more secure; it is rather that efficient delivery of price signals in a private system ensures more robust economic growth. No more, no less. Mr. Brown debates an illusory opponent.

The list of advantages of paygo is flawed. Let us discuss that:

- “The entire working population can be covered relatively easily.” A mandatory private system ensures just that. Clearly, universal coverage is a major public policy issue, but this does not justify nationalization.
- “Benefits can be immediately vested and are fully portable.” This problem of private systems actually indicates lack of imagination on the part of legislatures and public-policy scholars. Most certainly, personal defined-contribution schemes have this property, and to extend it to defined-benefit plans requires just that—innovative scholarly and legislative work. Alas, high government debt levels have caused returns to labor to fall so much that we are too busy making ends meet instead of thinking our way out of the box.
- “Administrative costs are usually very low per unit of cash flow.” They are in the same range as private defined-benefit plans in Canada (as claimed by Ken Ambachsteer at the recent Fraser Institute conference). In addition, government-run system costs are low because governments do not count costs that private institutions must count, such as:
 - Management costs, which are bundled into the costs of legislature work, elections, and related items
 - Advertisement costs, which are bundled into various government programs, public policy debate, and same as management
 - Marketing costs, which are transferred onto employers and judicial system.

The question of whether these costs are higher than the opportunity lost because of capital misallocation is of course a different story. Finally, the burden of increasing implicit government debt created by paygo is passed onto labor, resulting in the current “economically anxious society.”

- “Fully funded schemes are susceptible to erosion by inflation.” This is an amazing argument: you should entrust the provision of retirement to the government because if you use the private sector, the government may confiscate your benefits. Inflation is not a random phenomenon, but entirely a product of irresponsible monetary policy. Are we really to believe that a government that promotes irresponsible monetary policy will be responsible when running a paygo scheme? The experience of Latin American countries clearly indicates the opposite. On the other hand, capital markets *must* deliver long-term returns above inflation; they really do not have a choice in that matter.
- “Government control of the large amounts of capital accumulating under a fully funded scheme is a concern.” Naturally it is. This is why

government moves that capital off balance sheet in a paygo scheme. This is not an argument against privatization but for it.

- “Who will decide how to invest this capital?” Who decides how a private defined-benefit plan invests its capital? Who decides how mutual funds invest their capital?
- “With a large accumulation of assets, continuous pressure will exist to enhance benefits.” Not in a private system. Mr. Brown apparently envisions something that simply does not exist and should never exist—a government-run national “pension plan” valued on a closed-group basis. This has nothing to do with privatization, is highly recessionary, and should be firmly opposed (as Mr. Brown rightfully does). Again, the position of Mr. Brown’s opponents is misrepresented.
- “In any transition from paygo financing to full funding, one generation of workers will have to pay almost double contributions. . . .” This is the most persistent myth among proponents of paygo; it is entirely false. The liabilities are already issued (off balance sheet). Thus privatization cannot add to their cost; it merely reallocates capital. Nobody is asking one generation to both prefund its benefits in full and also pay, for example, the \$550 billion C/QPP unfunded liability. The only time a double payment happens is at the onset of paygo. In the investment terminology, Mr. Brown confuses earnings with cash flows. In privatization, one cash flow (savings of the working group) will achieve both purposes: funding of the future retirement of the current working group and financing of the current retirees. Or are we to believe that a mutual fund receiving contributions from its shareholders puts the money in a vault instead of using it for its current cash flows? Are banks warehouses of cash? Are pension plans warehouses of cash?

5. Conclusions

As much as I find disagreement with Mr. Brown’s analysis, I do find myself in strong agreement with some of his conclusions. He says: “Beware demands to expand paygo social security.” As I have indicated above, the paygo scheme is an analogue of price controls in capital markets. Let us examine the consequences of price controls. If the government decides that the price of oil is not allowed to exceed \$25 per barrel, such control would probably have very little effect on our lives. If, however, this was followed by an event similar to the 1990 Iraqi invasion of Kuwait and prices rising to \$40 per barrel in the open market, our ability to transport people and

goods would diminish very rapidly, and the whole country might be brought to a serious recession—without any real reason for that to happen! All we would need would be a removal of price controls, or at least raising of the ceiling to \$50. The last thing we would need would be an expansion of price controls!

Similarly, the economy is expected to deliver large amounts of benefits to future retired baby boomers. But those baby boomers do not think that they need to save appropriate amounts of capital to be used in funding productive capacities that will deliver goods and services in the future to them. In other words, baby boomers want to buy oil for \$10 a barrel when the market price is \$15, and if they can't, the government must help them! This is a dream world and it cannot last. Mr. Brown says we should tell the boomers to retire later. Of course this is a good idea, but what if they vote against it? Precisely because retirement provision is partly nationalized, they can. What they should be doing instead is projecting returns on their retirement portfolios in the range of 3%–5% annually, then really worrying, driving their BMWs for at least ten years, and saving.

We do believe they eventually will. But the longer we wait before delivering true economic signals to them, the more likely that they will need shock therapy.

By the way, Mr. Brown's claim that "once paygo is introduced, it is almost impossible to return to a funded scheme" (I presume this means private enterprise system) is not true. This was easily accomplished in one day: May 1, 1981, in Chile.

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DAVID J. MERKEL:

Mr. Brown's paper succinctly answers a tough problem: how to fund social security when the baby boomers retire. He highlights two often ignored factors:

- (1) Retired people are always supported by people who are working. How to get the money from the workers to the retirees, the funding mechanism, is a secondary question. On that question, paygo funding has a few advantages, ably pointed out in the article, and some disadvantages.
- (2) The most politically feasible way of funding retirement benefits in a world with fewer workers and more retirees is to correct the imbalance by raising the retirement age. It's common sense. No matter what the leadership of the AARP and their confederates in other nations may say, we all know that we are living longer, so working longer makes sense.

By ranging beyond the usual grazing grounds of actuaries into the field of politics, Mr. Brown has made a significant contribution. He needs to be even more adventuresome and chew on the meaning of "equitable" and the role of families in intergenerational support.

A basic purpose of families for centuries was to care for their aged members. Parents raised children in the expectation that their children would support them in their old age. Over the past 100 years support of children for their parents has been socialized and nationalized, in private pension programs, in group health insurance, and in social security plans. The price for collective security has been weakened families, held together today only by affective ties. Parents have no economic incentive to bear children. Children are national economic assets, but they are family economic liabilities. Families making rational economic decisions have fewer and fewer children, so funding for social security becomes a problem. In fact, only if families continue to act in ways that are economically irrational will there continue to be workers to support retirees. Social security is on a collision course with itself.

Collective safety nets, including social security, weaken families in a second way. They reduce the rational economic incentive for marriage and thus contribute to the increase in one-parent families. Children, however, need two parents to thrive. Our society has a growing number of children so neglected at home that the schools can do little with them. Unskilled and unmotivated workers will not support retirees. Social security is on a collision course with itself.

Now the issue of "equitable." Does any generation in aggregate have an intergenerational equity right? Why should parents who took the time and trouble and expense to raise children share the fruits of their (children's) labor with other old people who had no children of their own? Without grounding in a general system of ethics, the notion of "equity" is a manipulable quantity. What a temptation for politicians to use the idea of "equity" to garner votes from a huge baby-boomer voting block when the time comes, to demand "equal" support to what a previous generation got.

Consideration of the need to give parents the economic incentive to marry and bear children and of the slippery nature of "equity" in collective and intergenerational matters suggests that more serious attention should be given to individualizing retirement plans. Any new plan must satisfy three constraints. First, it must be a system that can work in good and bad economic times. Second, it must recognize and encourage the abiding importance of families to society. Third, the transition to the new system must be slow.

Because any aggregate social insurance system ruins familial economic incentives, thus harming society and ultimately the social insurance systems, the ideal social insurance system is entirely private. Beyond eliminating government social programs, this also would involve eliminating distortions in the tax code encouraging employer-sponsored health and pension plans.

In this new system, the elderly would live off their savings, pensions, and continued labor. To the extent that those are inadequate, their children, churches, and private charities would care for them. Laws would have to be placed on the books entitling parents to a reasonable share of the productivity of their children, if they needed it. This would be an incentive for parents to help their children become productive. Some people, due to negative providence or lack of planning will not fare well under such a system. It is not possible for any social system to be perfect; some people fall through the cracks in any system. This system leads to healthier families and therefore a better long-term economy than any other; that should be enough to urge its adoption.

A system like this takes time to implement. One cannot spring it overnight on unprepared people. Old promises must be kept, while phasing in the ability to keep new ones. It would have to be graded in over time. Here is an example, admittedly oversimplified, of how a transition might work:

From the time the new system is adopted, children born would be exempt from paying taxes into the system. Taxes would continue on all others. The new system would look like the old system for the first 35 years because

tax losses would be small. During the second 35 years, taxes would cover those who had not had children in the first 35 years, while those who had children would gain residual support from them. As taxes waned in the second period, benefits would be focused on those who are poor, with no children. Most of those who were children when the system was changed would have children to aid them. The rest would have saved the money they would have spent on children, if they were provident. After 70 years, the system would effectively be private.¹ This could terminate a paygo system without any additional cost.

Finally, we have to confront the fact that total economic security is not achievable. As people have lost their faith in God, they have placed it in the largest entity that they can envision for their support: the government. As the Eastern bloc and Latin America have learned, the ability of the state to provide a safety net is no better than the economies of their nations (which, in turn, depend upon God and His blessing). Various nations in the West are now staring the same problem in the face. The question is, "Will we learn from their collectivist mistakes?" In the short term, we can if we use the smaller institutions of our society—families, churches, and private charities—to a fuller extent. In the long term, I believe we can only if we as a society return to faith in God.²

GREGORY SAVORD:

I commend the author on such an intriguing paper on the funding of social security pensions. This topic is of intense interest to the general public. We need intelligent discussion and public education. This paper is a fine addition to this discussion.

The author has made clear that the pensions of retirees are a transfer of income from current workers—even if the system is fully funded. Pension benefits of retirees are only as secure as the creation of economic wealth and increasing economic output. As frightening as it may be, this also applies to private pensions. The public must be educated on this fact so that public debate on social security and pensions addresses the fundamental problem. If a large portion of the population is retired and the remaining workers do not substantially increase their real economic output, the

¹As an innovative alternative to this system, I would recommend John S. Agatston's paper, "A Promising Future; A Proposal for Avoiding the Coming Crisis in Social Security," 1988, available from him at his *Directory* address.

²To avoid ambiguity, by "God" I mean the God described by the Bible—the Father, the Son, and the Holy Spirit.

economy cannot support the expected standard of living for both retirees and workers. Even if the fundamental issue is not addressed, symptoms of the problem will continue to appear. Actuaries should be on the forefront in the public analysis and discussion of this issue.

The author states that, currently, a relatively large number of workers are supporting a relatively small number of retirees. Consequently, the workers make a modest contribution to provide generous pension benefits. When the number of retirees becomes relatively larger, the workers would need to make larger contributions or the retirees would receive lower benefits. The author proposes to have workers, who make a modest contribution supporting a small number of retirees, receive a smaller pension benefit when they are supported by a smaller number of workers. The smaller pension benefits would be consistent with the actual contributions made by these retirees when they were working. The smaller number of future workers would contribute more to support the large cohort of retirees, but in turn these future workers would receive larger pension benefits in return for their greater contributions. This suggests that the work force would have to expand to support these distant-future retirees. The author's proposal implies that the population distributions will continue to be cyclic. However, if the population distribution continues to decline into the distant future, as many expect it will, this proposal will fail. Readers should thus be aware that this proposal is not guaranteed to work.

The author correctly states that we are beginning to see the implementation of his proposal in the political arena. The pension benefits of future retirees are being reduced, notably by delaying the retirement age. We will continue to see this adjustment activity, even if the author's proposal is never formally adopted or even recognized.

Again, I congratulate the author on his fine addition to the actuarial literature.

ROBERT J. MYERS:

Mr. Brown has contributed a monumental paper to the field of social-insurance-financing literature. One reason that I say this is that I agree so thoroughly that paygo funding is, by far, the best route for social insurance programs. I also agree that the solution to any long-range financing problems that are due to demographic causes (aging of the population and increasing longevity) should be solved by demographic means (raising the minimum age at which unreduced benefits are first payable). Yet another reason for

paygo funding is that any problems on how to invest properly the mammoth sums developing under partial or full funding are thereby avoided.

In Figure 3, Mr. Brown shows the aged dependency ratios for Canada over the years on the basis of the ratio of the population aged 65 and over to that aged 18–64. It would be interesting—and perhaps even more significant—to present such ratios on a dynamic basis, as well as on a static basis, for the minimum retirement age, that is, to use for each future year the equivalent age at retirement as shown in Table 4 (or, alternatively, that from the age-at-entitlement model described in the Conclusions) as the “border” instead of age 65 in all years.

(AUTHOR’S REVIEW OF DISCUSSIONS)

ROBERT L. BROWN:

I am very pleased with the extent of the response to my paygo paper, both in terms of the number of discussants and in terms of the wide variety of content of their discussions.

Any student of social security who thought that this was a dull or straightforward area of study would know better after reading the diversity of responses. Issues surrounding the funding of social security are subtle and extremely difficult to grasp. Further, because any social security system is economically massive by nature, any proposed modifications have to be analyzed allowing for behavioural response (or the rational expectation school of Nobel Prize-winner Robert Lucas). This is extremely difficult, especially, I believe, for actuaries.

That being said, there are some fundamental truths that can be used as building blocks.

Social security is a means to transfer wealth from workers to retirees (ignoring ancillary benefits for the disabled, orphans, and so on). The wealth that is transferred must be created by someone (that is, workers) and it must be created (with very few exceptions) just prior to consumption.

Thus, whether called pay-as-you-go or fully funded or anything in between, *any* social security plan is dependent on the wealth that the economy creates at the time the system wishes to divide up that wealth.

Therefore, the whole discussion about the advantages and disadvantages of funding is often inappropriate. Funded systems are no more stable or

unstable than paygo (which would you rather predict: interest rates, fertility rates, or growth in productivity rates?).

Funded systems are not demographically immune. They will suffer from shifting demographics as much as paygo plans.

Finally, it is inappropriate to say: "Right now we have high real interest rates and low productivity growth rates, so paygo looks bad while funding looks wise. So let's create social security funds of some several trillions of dollars, invest them wisely, and live happily ever after."

Why is this inappropriate?

If you truly create several trillions of dollars of new national savings and invest the money prudently, two things must inevitably result. First, real rates of return will fall, and second, productivity growth rates will rise. By the end of the process, you could easily be arguing for paygo funding once again.

Now to answer some specific points raised in the discussion.

George Watson gives us his personal view of the implementation of the Canada/Quebec Pension Plans in 1966. While there was a significant gift to Mr. Watson's generation by the government of the day in granting full pensions after only 10 years, there was nothing inherently wrong with the adoption of paygo financing. In fact, the rates of growth of the labor force and productivity versus the real rates of interest of the day made it a clear winner versus prefunding. I do not believe that the C/QPP has suffered from neglect. It has suffered from severe and unpredictable changes in fertility rates and productivity growth rates. I agree that we must control the cost of the disability income benefits, and there is early evidence of some success on that front. I would also add that the work done by the valuation actuary is of the highest quality and has always provided us with indications of problems at least 25 years in advance.

Next is Bernard Dussault, who is that high-quality CPP valuation actuary. The funding ratios for paygo plans result from fertility, mortality and productivity. If life expectancy improves, there are ways to get funding stability—increased contributions or an increased retirement age. Sweden has now made its social security system immune to life expectancy by saying that the social security dollar benefits will (rise and) fall exactly with life expectancy.

Were that provision to exist in the CPP, then the normal retirement age from my model would rise for the baby boomers and fall for the baby busters. The fact that the age of eligibility is not expected to fall very much

(if at all) for the baby busters is because of their enhanced life expectancy. That is fair.

Mr. Dussault goes on to say that a funded system is recognized as the "most cost-equitable self-adjusting approach." By whom? Why? He further states that a funded CPP would cost less than a paygo CPP. But that is only if his other static assumptions (for example, 4% real return and low productivity growth) hold constant. As I have said, that assumption is virtually impossible.

Kenneth Steiner proposes that the best way to achieve intergenerational equity is to make sure every generation gets the same rate of return on contributions. That may appear a laudable goal. However, social security is not a bank account; it is a wealth transfer scheme. What must be stabilized therefore is the ratio of wealth created and wealth transferred. My model does exactly that.

Finally Mr. Steiner says that I "felt obligated to attack the actuarial full funding straw man that I created." At first I thought that Mr. Steiner referred to funding as a straw man because he realized that funding does not avoid the demographic problems facing social security at all. But no, that is not the case. Mr. Steiner says advance funding can be used to level out the tax rate. Why would this happen? Wouldn't shifting the normal retirement age appropriately in a fully mature social security system (which the CPP is not) level out tax rates more effectively than advance funding? There is no explanation for Mr. Steiner's claim.

Finally, if prefunding of social security is just a straw man of my creation, why is it on the public policy agenda in both Washington and Ottawa?

Jock Maynard makes similar unsupported claims that advance funding, in and of itself, will lead to more stable contribution rates. Of course, anyone could jack up the C/QPP contribution rate well above the necessary paygo rate and then keep that higher rate constant for an extended period. That forced stability of high contribution rates results in advance funding. However, advance funding does not create stable contribution rates. These rates vary with real interest rates, which can be as variable as fertility and/or productivity.

Mr. Maynard claims that if there were a prolonged economic depression in which incomes were reduced (lowering contributions to social security), a fully funded social security pension could continue unabated without strain on other resources. That is just not true. Whether funded or not, social security is a transfer of national product—today's national product. If there is no national product, there will be no social security benefits (whether

funded or paygo). If there is a healthy economy, there will be healthy social security benefits (whether funded or paygo). Social security is not a large private pension scheme. Advance funded social security is no more secure from demographic changes than is a paygo plan. Nor is it inherently any more stable, as discussed previously. In social security, individuals do not provide for their own benefits. That is impossible unless we can find a way to store restaurant meals and similar services for several decades.

Krzysztof Ostaszewski has again challenged me with his capital-market arguments. At least we agree that there is little fundamental difference between paygo and funded plans, even if our reasons are different. Krzys (and Laurence Kotlikoff to whom Krzys refers) argues that capital markets would have priced the actuarial liability of social security into interest rates on the day of its enactment. However, between 1958 and 1967 Canada enacted universal health care, the Canada/Quebec Pension Plans, the Guaranteed Income Supplement, the Spousal Pension Allowance, the significant increases to the Old Age Security without a tick of a change in interest rates. How is that explained?

Krzys is correct that there will be a behavioral response to any public policy initiative and that many of the ratios that I hold constant cannot be assumed to stay constant. I acknowledge that, but I do not have a way to do it better. If I wish to see the impact of a change in variable x , I am prone to do the analysis holding everything else constant, even though I know that cannot be true. However, I will stand by my one-variable analysis any day if compared to the "57"-variable economic models that are often created in an attempt to solve this very real stochastic problem.

In closing, Krzys states that Chile's social security system was privatized on one day, May 1, 1981. I disagree. Chilean retirees are still dependent on the taxpayer/worker for the unfunded actuarial liability of social security as at May 1, 1981 which is a significant percentage of their benefit cash flow. Second, more than one-third of the new "privatized" system is "invested" in government bonds. So more than one-third of the new system is not private at all, but dependent on the worker/taxpayer as surely as before. It will take several decades before Chile's system can be called private, if ever.

David Merkel tells us that social security has harmed society through weakened families who now have fewer children. How do the lower birth rates of the pre-social-security 1930s fit into this thesis?

Mr. Merkel says people should be totally dependent on what they make by themselves (including children) and charity. Some will suffer, but so be it.

My personal religious beliefs do not coincide with a wealthy society that does not share. I like a little collectivism, if it means that everyone can be fed, housed, clothed, and educated. A caring society is also a peaceful society, as Canadian and Scandinavian experience indicates to me. So I will continue to support the collectivism inherent in social security.

Gregory Savord says that if fertility rates continue to drop, the baby-bust generation will never see the larger benefits my model promises them. He is correct. However, we cannot continue forever with fertility rates below replacement ratios. Either through a turnaround in fertility (already apparent in the U.S.) or immigration or increased worker productivity, I believe the baby-bust generation can expect a fair deal from social security. Unfortunately, Mr. Savord and I will probably not live long enough to know the final outcome.

I greatly appreciated the kind words of Bob Myers, one of the actuarial architects of OASDI. Mr. Myers has been a supportive ally in much of my work.

He suggests redoing the aged dependency ratios of Figure 3 by using my suggested age-of-entitlement model. I believe the result is highly predictable. The important matter to me is that wealth transfer remain constant. I derived my future age of entitlement by determining the age that produced a constant wealth transfer. In the population models, for years beyond 2006, the fertility variable and the unemployment variable are held constant. Thus, I would predict a new "aged" dependency ratio that would be very nearly flat as its 2006 level. Of course "aged" would not be defined by age 65, but by the new age of entitlement. If time permits I will attempt this analysis for Mr. Myers, but that is what I would expect.

As I stated at the outset, the study of social security funding is complex and subtle. Large-pension-plan truths are often social-security-plan fallacies. I have been studying these matters for 25 years now and am still on the upward slope of the learning curve. The discussion from the eight authors has greatly enhanced my knowledge as I hope it has yours. I thank the discussants most sincerely.