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FINANCIAL CONSISTENCY IN LONGITUDINAL MICROSIMULATION: HOMEMAKER PENSIONS RE-EXAMINED

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Transfer programs, including public pension plans, do not generate wealth. In this paper methods of distributional analysis that lack budget constraints and are prone to illusions of wealth creation are criticized. A microsimulation analysis reported in "Homemaker Pension and Lifetime Redistribution" (Wolfson, 1988) is repeated using a conceptual framework that imposes a balance between the positive and negative impacts of transfer programs. This alternate analytical perspective reverses the distributional conclusions of the earlier study conducted using the same model.

INTRODUCTION

Wealth creation illusions, financial inconsistency, and "social security wealth" are by no means new problems in the field of pension policy analysis. Many microsimulation efforts in this area have been flawed by a lack of discipline in the financial framework. Critiques of Pesando and Rea (1977) by Asimakopulos (1980), and of Rea (1981) by Éthier (1985), indicate that technically brilliant simulation efforts can be rendered irrelevant by financial consistency problems. Without financial consistency a distributional analysis presents the hypothetical distribution of an unrealizable set of net benefits.

The article "Homemaker Pensions and Lifetime Redistribution" by Michael Wolfson (1988) makes a major contribution to the policy and methodological debates surrounding public pension policy in Canada. With respect to financial consistency, however, its distributional analysis follows in the tradition of the studies cited above.

Wolfson knew, and noted, that the proposal he was assessing was underfinanced. In his distributional analysis he chose to be true to the proposal as advanced rather than to strive for a consistent set of impacts. In this paper the author re-examines the homemaker pension proposal using the same models, but opting in the other direction. He takes the position that faced with an inconsistent proposal, it is better to make heroic assumptions about where the taxes will fall, than to omit the burden of program financing. Tax rates are modified to provide adequate funding for proposed benefits, and an analytical framework is imposed that maintains a balance between positive and negative impacts. With these analytical changes, the homemaker pension proposal looks less progressive and less sex-neutral, than it did in Wolfson (1988).

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A Refresher

The Canada Pension Plan (CPP) is one of several large programs that make up the Canadian public pension system. It is an earnings-related contributory pension plan financed out of involuntary "contributions" (a payroll tax). The CPP is a quasi "pay-as-you-go" pension plan. The CPP contribution rate is now managed to keep current contribution revenues approximately in line with current benefit expenditures. There is an outstanding debt by provincial governments to the CPP that is called the "Canada Pension Plan Investment Fund", but it is of little significance to either the operation or the security of the CPP.

The "homemaker pension" proposal was advanced by the 1983 Parliamentary Task Force on Pension Reform. It would reform the CPP as it applied to "homemakers" (any adult caring for a child under the age of 18, for a spouse, or for a dependent and infirm relative living in the same house). In computing earnings-related CPP benefits, homemakers who earned less than half the average wage would be deemed to have made half the average wage. "Contributions" on these deemed earnings would be payable in full only if there is a spouse present with earnings above the average wage. The proposal also involves "credit splitting" (which averages earned entitlements between spouses) and changes to the CPP's complex "dropout provisions" (which raise benefits by eliminating certain low-earnings years from the benefits computation). The proposal has not been enacted, but it still has the avowed support of the Prime Minister.

Wolfson's analysis employed a microsimulation model (DEMOGEN) to generate life histories for a synthetic cohort of individuals. Transition probabilities and propensities observable in the early 1980s were held constant over time to generate this cohort. It is consequently a cohort from a steady-state scenario defined by those transition probabilities. Since the experience of each cohort in a steady-state scenario is the same, the cohort used is demographically representative of all cohorts in the scenario.

Taxes and "contributions" paid and pension benefits received were computed for each individual in the synthetic cohort using another model, the Lifetime Income Pension Policy Simulator (LIPPS). Policy experiments were performed by comparing income statistics between a "status quo" simulation run, and runs in which the pension algorithms were modified to reflect various elements of the homemaker pension proposal.

In Wolfson's steady-state scenario, all programs maintain a constant share of aggregate income. There is no inflation, no earnings growth, and no discounting. (Or alternately all figures are in 1987 dollars, all programs are indexed to earnings, and future flows are discounted at a rate equal to the rate of real growth in aggregate earnings.) The distributional "impacts" in the analysis are based on changes in disposable income, and the principal distributional conclusions are that the homemaker pension proposal is progressive, and virtually neutral with respect to redistribution by sex.

Imposing Consistency

Since longitudinal microsimulation works with a cohort rather than an entire population, there can be problems in imposing financial consistency (or financial

closure). At each point in time, most of the taxpayers are not represented. A comment by Henry Aaron (1985), however, suggests a means of imposing financial constraints on cohort model providing that the scenario being analyzed is one of steady-state growth, and that one is willing to use a discount rate equal to the rate of real growth in aggregate earnings. Under these conditions Aaron points out that, for any cohort, the discounted net benefits of a public pension program will be zero. Consistency can therefore be imposed by balancing discounted taxes and discounted benefits within the cohort.

Restriction of the discount rate to equal the earnings growth rate is not a high price to pay for financial consistency. A quick review of six microanalytic pension policy studies (Pesando and Rea, 1977; Rea, 1981; Wolfson, 1988; Hain and Helberger, 1986; Hurd and Shoven, 1985; and Nelissen, 1987) reveals differences between growth and discount rates that range from 0 to 1 percent.[1]

Maintaining Consistency

Following the strategy outlined above, one can adjust a proposal's tax or benefit rates in order to construct a scenario that is internally consistent. Having done so, the immediate product of a microsimulation experiment is a set of individual histories of changes in disposable income over time. When considering how to aggregate this microdata into a report, care must be taken if one wishes to maintain in the impact accounts the financial discipline that has been achieved in the scenario.

The most difficult question that arises is how to distribute income (and impacts) within family units. In computing impacts, Wolfson (1988) uses a family-based income concept that equates an individual's income with the total income of his or her family.[2] One dollar transferred to a married couple produces a positive impact of one dollar when looking at the husband and the same positive impact when looking at the wife. Cash flows are not preserved creating potential for fiscal illusions whereby transfer programs appear to generate (or consume) wealth.

A cash-flow preserving, family-based income concept can be achieved by considering the income of a married individual to be half of the combined income of the couple (total family income divided by the number of adults in the family). A dollar transferred to a couple then increases the income of each partner by 50 cents. The advantage of this is that when the impacts of a financially consistent transfer program representation are aggregated, positive and negative impacts will balance so long as all adult family members are included in the aggregates.[3] Moreover, it may be argued that this family income concept gives a better indicator of the relative welfare of individuals than does the approach equating family-based

[1]Among these studies only Hain and Helberger (1986) employs the discounted taxes equals discounted benefits restriction.

[2]An Equivalent Adult Units [EAU] adjusted, family-based income concept is also used, but only for computing replacement ratios. An individual perspective on income is provided as well, but it is less meaningful. As Wolfson notes (1988, p. 239) the non-earning spouse of an individual with high earnings would not normally be considered poor.

[3]DEMOGEN cohorts are not defined strictly by year of birth. Regardless of age difference, spouses (by first marriage) of all cohort members are also members of the cohort.

individual income with family income. Using that income concept, when two individuals with equal incomes marry, their family-based individual incomes both double.

To preserve a balance in impacts, changes in disposable income must be aggregated across all ages and across all individuals in the cohort. The distributional analysis in Wolfson (1988) focuses on changes in post-retirement (age 65+) disposable income. This measure is not comprehensive enough to preserve accounting balances, and it does not conform to a lifecycle perspective. The major rationale for using a lifecycle model when assessing pension policies is that it enables one to incorporate both taxes and benefits into some sort of net effect, even when the taxes and benefits apply over different phases of the lifecycle. An "impact" based on the 65+ age range fails to exploit this potential.[4]

The Simulation Experiment

The DEMOGEN and LIPPS models are evolving continuously, and consequently the versions used for this analysis are not identical to those used in Wolfson (1988). Fertility rates have been re-estimated using more recent data (and reduced slightly to total fertility rate = 1.68) and they have been associated with marital status. Earnings have been generally reduced (correcting a coding error). A sensitivity analysis (reported in Kennedy, 1989) indicates that the conclusions of Wolfson's analysis are not sensitive to these changes.[5]

Changes have also been made to the policy environment that distinguish the reference run in this simulation from the "status quo" run in Wolfson (1988). Representation of a typical provincial top-up pension (GAINS Ontario) has been added to LIPPS, and the CPP contribution rate has been raised to make the CPP financially consistent in the reference case.[6]

In the policy experiment, the homemaker pension proposal is implemented exactly as in Wolfson (1988). Several runs of LIPPS were required to apply the financial consistency constraint. The first run simulated the proposed changes without any offsetting tax changes. In the next step CPP payroll taxes were increased by 6.1 percent to offset new CPP benefits and restore financial consistency to the CPP. Finally personal income taxes were decreased by 1 percent of total earnings (distributed in proportion to initial tax liabilities) to offset changes in general revenue caused by tax implications and interactions between

[4]Two other elements of Wolfson's analysis must be avoided if one is seeking balanced impact accounts that reflect the "zero sum" character of transfer programs. These are the annualization of impacts (which divides flows by different denominators depending on the age at death of the contributor or recipient), and exclusion from the impact accounts of those who died before age 65.

[5]This sensitivity analysis also indicates that the conclusions in Wolfson (1988) are not sensitive to reasonable variation of the female labour force participation rates in DEMOGEN.

[6]The full-cost, steady-state, pay-as-you-go rate for current CPP benefits is implemented at 14.8 percent. Wolfson estimated this rate to be 13.5 percent, but simulated using the 3.6 percent rate that was in force in 1987. (In the official projections; Department of Insurance, 1986; it is optimistically predicted that the contribution rate for current benefits will reach 11.7 percent by 2030.) Income tax rates in the reference run also had to be increased so as to maintain the reference run's level of tax revenue in the face of increased deductions for CPP contributions. Aggregate income taxes were increased by 2.8 percent (from 18.6 percent to 21.4 percent of total earnings) and these taxes were distributed in proportion to income taxes paid prior to the increase.

TABLE 1

OVERVIEW OF COMPONENTS OF INCOME

Income, Tax, or Transfer Item	Mean Lifetime Flow, All Core Adults ($000s, 1987)	
	Reference Run	Homemaker Pension Run
Total Earnings	554.1	554.1
Contributory Earnings (CPP)	349.4	349.4
Old Age Security	49.7	49.7
Guaranteed Income Supplement (GIS)	31.9	21.7
GAINS	1.5	0.8
CPP Benefits	51.8	74.6
CPP Contributions	−51.8	−74.6
Income Tax	−118.5	−107.6
Disposable Income	514.5	514.5

pension programs. The end result is a simulation in which the synthetic steady-state cohort, as a whole gets, no discounted net benefit out of a change in public pension arrangements. Some overall simulation results for comparison with Wolfson's Table 4 is provided in Table 1.

RE-EXAMINING HOMEMAKER PENSIONS

Impacts of the homemaker pension proposal by lifetime earnings decile and by sex are presented in Figure 1. Plotted vertically are mean values of changes in "lifetime" (age 18 to death) disposable income, using the family perspective on income described above. As in Wolfson's analysis, flows have effectively been discounted to age 18 at an unspecified rate equal to the real earnings growth rate. (Operationally there is no discounting and no real earnings growth.)

The cohort is disaggregated twice along the horizontal axis. The cohort is sorted first into ten deciles of lifetime earnings and then into two groups by sex. The sort variable for the first distribution is lifetime earnings, from a family perspective, discounted as described above. There are 200 simulated individuals in each of these decile groups and 1,000 in each of the groups by sex. (Each earnings decile is associated with the percentile that marks the upper boundary of the group. i.e. "10" indicates the lowest earnings decile.)

The impacts in Figure 1 incorporate the contribution rate increase required to re-balance the CPP, and the personal income tax decrease required to make the proposal revenue neutral. The latter change primarily offsets the effect on general revenue of a reduction in expenditures on income-tested public pensions due to increased CPP benefits. While the benefits from the homemaker proposal are progressively distributed (as Wolfson reports, p. 243), on the financial side the burden of CPP expansion falls on the rather regressive CPP payroll tax, and some of the existing burden of supporting the elderly is effectively shifted from the more progressive personal income tax to the CPP payroll tax. The comprehensive impacts by level of earnings could be described as U-shaped. When the financial implications of the proposal are taken into account, the proposal is not "unequivocally progressive".

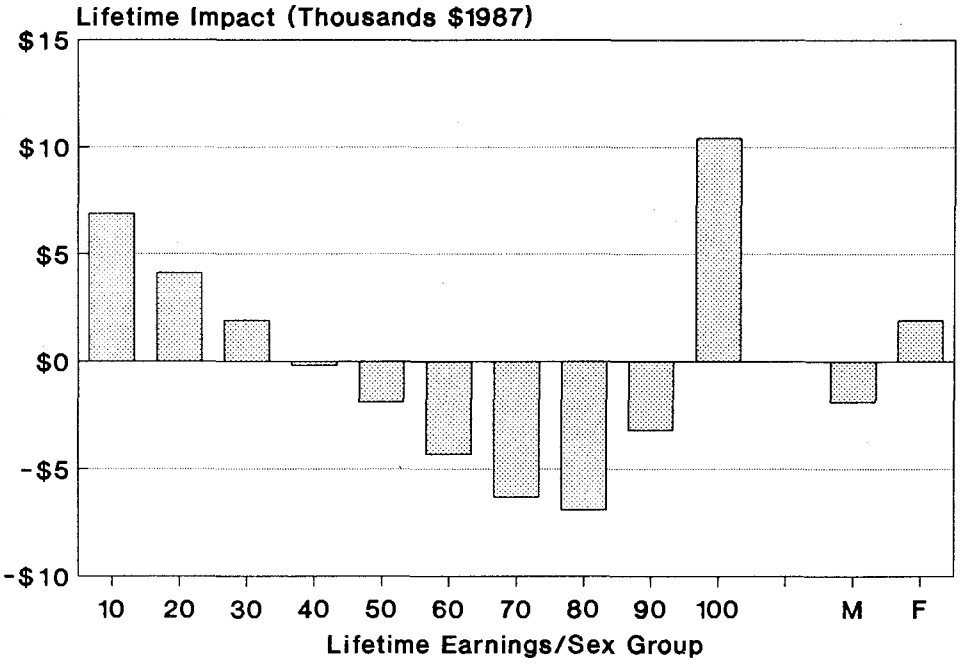

Figure 1. Impacts of the Homemaker Pension Proposal

Focusing on post-retirement impacts, Wolfson found the proposal to be neutral with respect to redistribution by sex (1988, p. 238). However, when the lifecycle financial implications are included, the proposal does shift consumption from males to females (see Figure 1). It would appear that both males and the upper earnings groups tend to benefit from an expansion of the public pension system that is financed out of the CPP payroll tax, and shifts some of the burden for supporting the elderly off of personal income taxes.[7]

Conclusions

The distributional results in Wolfson (1988) reflect a different analytical perspective than the one used in this paper. The two papers demonstrate, that the conclusions of microsimulation studies can be at least as sensitive to analytical framework issues as they are to simulation issues. Questions of how impacts are defined and aggregated, what family income concept is used, and how financial inconsistencies are dealt with, deserve as much attention as the estimation of participation rates, and the presence or absence of behavioral responses.

Wolfson (p. 236) offers two reasons for not adjusting tax rates in his analysis to make the proposal he was assessing consistent. (1) Raising taxes would have little effect on his results. This is true, only because his "impacts" are restricted

[7]The personal income tax rates used in this analysis and in Wolfson (1988) are those that were in effect prior to the latest round of tax reform in Canada (the so-called "phase one" reforms). Under current conditions with fewer income brackets and lower marginal rates for the higher income earners, the effect of this shift would be slightly less dramatic.

to the 65+ age range, and consequently do not pick up changes in the CPP payroll tax. (2) It would not be feasible to balance the general revenue account in the simulation. This is also true, but it is only a problem if one is interested in trying to determine the distributional impact of current public expenditure. For analyzing incremental proposals, all that is necessary is that incremental flows to and from the general revenue account be balanced.

It is conceded that the use, in this analysis, of proportional changes in personal income taxes to compensate for changes in general revenue, constitutes an arbitrary assumption concerning the incidence of future sources of revenue. (CPP shortfalls on the other hand must, by statute, come from the CPP payroll tax.) Ideally, a flexible "balancing tax" could be provided in the LIPPS model. Its incidence could be adjusted to reflect the analyst's perception of the incidence of unfunded government liabilities, and this abstract "tax" could then be used to modify an under-funded proposal before assessing its impacts.

The impacts reported in Wolfson (1988) are difficult to interpret. They pertain to a representative cohort drawn from a steady-state, discount rate = earnings growth rate, scenario. The cohort impacts, however, cannot be representative. Indeed, the inter-cohort transfer suggested by the cohort's gain in disposable income is not possible within the scenario. Analysis of an inconsistent proposal has generated inconsistent results.

The impacts presented above, in Figure 1, can be interpreted as pure intra-cohort transfers. These are the non-traisient, long-term, distributional effects of a public pension proposal, and they are an appropriate focus for public debate over pension policy. The framework used to generate them imposes a very sobering perspective on program expansions. It forces analysts to acknowledge the full long-run cost of a proposal before committing to its inherent long-run obligations.

References

Aaron, Henry, Comment, in Wise, D. A. ed., *Pensions, Labor and Individual Choice*, pp. 215-221, National Bureau of Economic Research, Chicago, 1986.

Asimakopulos, A., *The Nature of Public Pension Plans: Intergenerational Equity, Funding and Saving*, p. 41, Economic Council of Canada, Ottawa, 1980.

Department of Insurance (Canada), *Canada Pension Plan Statutory Actuarial Report # 10*, p. 9, Supply and Services, Ottawa, 1986.

Éthier, Mireille, Survey of Pension Issues, in Vaillancourt, François, ed., *Income Distribution and Economic Security in Canada*, pp. 228-229, The Royal Commission on the Economic Union and Development Prospects for Canada and University of Toronto Press, Toronto, 1985.

Hain, Winfried and Helberger, Christof, Longitudinal Microsimulation of Life Income, in Orcutt, Merz and Quinke, eds., *Microanalytic Simulation Models to Support Social and Financial Policy*, pp. 251-270, North-Holland, Amsterdam, 1986.

Hurd, M. D. and Shoven, John B., The Distributional Impact of Social Security, in Wise, D. A., ed., *Pensions, Labor and Individual Choice*, University of Chicago Press, Chicago, 1985.

Kennedy, Bruce, Intra-Cohort Redistribution using Longitudinal Microsimulation: The Impact of Potential Changes to Canada's Public Pension System, Ph.D. dissertation, School of Public Administration, University of Victoria, Victoria B.C., 1989.

Nelissen, Jan, The Redistributive Impact of the General Old Age Pensions Act on Lifetime Income in the Netherlands, *European Economic Review*, 31, 1419-1441, 1987.

Pesando, J. E. and Rae, S. A. Jr., *Public and Private Pensions in Canada: An Economic Analysis*, Ontario Economic Council, Toronto, 1977.

Rae, S. A. Jr., *Redistributive Effects of Canada's Public Pension Programs*, Economic Council of Canada, Ottawa, 1981.

Wolfson, Michael, Homemaker Pensions and Lifetime Redistribution, *Review of Income and Wealth*, 34, 221-250, 1988.