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Propagation and Risk Spreading in Alternative Social Security Systems

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While a primary function of pension systems is to provide resources to elderly retirees, pensions can satisfy other government functions as well. One such function is the allocation of economic and demographic shocks among different generations. While many government policies have intergenerational consequences (e.g., national debt management, infrastructure investment, and expenditures on public education), the size and variety of public pension schemes makes them a natural focus when considering the intergenerational effects of policy.

Funded defined-contribution pension schemes result in one particular allocation of economic and demographic shocks among generations. For example, a larger age cohort would be expected to experience lower lifetime wages (because of its high labor supply) and lower rates of return on its retirement saving (because of its high demand for retirement assets). But public pension systems take many other forms, varying in the extent of funding, or asset accumulation, as well as the formulas for contributions and benefits, and how they may be adjusted in response to economic and demographic pressures.

In two earlier papers, we studied a variety of existing and hypothetical unfunded arrangements, some adhering strictly to a PAYG approach and others allowing small fluctuations in trust fund balances. Our findings suggested that the methods of spreading shocks across generations can have significant effects on welfare. But questions remain about the channels through which these effects operate. In this paper, we develop a methodology for isolating the effects of different types of shocks on the welfare of different generations, looking in particular at the extent to which such shocks are efficiently spread across cohorts.

Our simulation models are used to evaluate how different public pension structures spread the effects of macro shocks across leading and trailing generations. We focus on three public pension system designs that maintain their financial stability in different ways: (1) a "benefit-adjust" system, in which the payroll tax is fixed and all adjustments occur to benefits, (2) a "tax-adjust" system, in which the replacement rate is fixed and all adjustments occur to payroll taxes, and (3) the German system, which incorporates adjustments to both taxes and benefits in any given year. The three systems are compared with a "no-system" scenario.

The general equilibrium approach provides new insights about the effects of shocks filtered through different pension structures, which affect the way that shocks alter the saving and labor supply behavior of generations. For example, following a mortality shock, older working age generations have less need to save for retirement (life expectancy is shorter and annuity rates of return are higher, reflecting higher old age mortality), so capital per worker is reduced and wages fall, while the rate of return earned by the elderly on their assets rises. But these general equilibrium effects are modified in different ways by the

pension structures. Under a tax adjust system, for example, the mortality shock reduces the number of elder retirees leading to a lower tax rate for workers, offsetting the reduction in wages. Following a fertility shock, once the incremental births enter the labor force, wages fall and interest rates rise. The higher interest rates benefit the elderly retirees, while their benefit levels respond in opposite directions under tax and benefit-adjustment programs.

It appears that the pension systems we consider are effective to some degree in spreading risk across generations, since the simulations with no social security system show greater intergenerational variation in wealth equivalents in response to mortality and fertility shocks. However, for a productivity shock, although the response was similar in all cases, the no-system simulations had very slightly less intergenerational variability. Our conclusions will be revisited in future work, as we continue to improve our model design.

The full working paper is available on our website www.nber.org/programs/ag/rrc/books&papers.html as paper NB09-19.

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