The Macroeconomics of PAYG Pension Schemes in an Aging Society

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- The Belgian population, as in all developed and most developing countries, is ageing ...

- ... because the fertility rate has been decreasing and life expectancy has increased steadily.

- In Belgium, the number of children per woman has decreased from 2.54 in 1960 to 1.76 in 2013.

- In Belgium, life expectancy has increased from 66 years in 1950 to 80 years in 2011.

- In Belgium, the demographic old-age dependency ratio has increased from 18.1 in 1950 to 31.7 in 2015 and is expected to increase to 50.5 in 2050.

- In Belgium, the employment rate of workers aged 55-59 is 60% (around 70% in France and 80% in Germany).

- In Belgium, the expected years of retirement is 25.8 years for women and 21.1 for men (27.2 and 23 in France; 22.8 and 19.4 in Germany).

- In Belgium, the incomes of people aged over 65 represent 77.2% of the population incomes (100.4% in France and 86.9% in Germany).

- Impact of population ageing on the sustainability of pension systems in Belgium? Which solutions? Which reforms?

- Impact of population ageing and of pension reforms on welfare in Belgium?

- Will the pension system be more sustainable if pensions are decreased, the retirement age increased and the employment rate higher?

- And what about the welfare of all (workers and pensioners)?

- Theoretical approach: clarify the effects of population ageing on the unfunded and funded pension schemes on income per capita and welfare, rank the pension schemes and explain why some are better than others when population ages.

- Quantitative approach: macroeconomic model with pension schemes, heterogenous agents and imperfect labor market calibrated on Belgian data.

- Empirical approach: identify causes of low unemployment among older workers in Belgium by using a Random Utility and Random Opportunity model of job choice.

- Bart Crépeau (KUL) and Andr Decoster (KUL) "Random utility and random opportunity models as a tool to assess the contribution of preferences and limited availability of suitable jobs in explaining observed job choice behaviour."

- Willem Devriendt (UGent) and Freddy Heylen (UGent) "A computable OLG-model to study effects of demographic change and pension reform in Belgium".

- Lionel Artige (ULG) "The Macroeconomics of PAYG Pension Schemes in an Aging Society".

- Lars Ludolph (CEPS) "Outlook and global drivers of interest rates: implications for ageing in Belgium".

Pension systems are very diverse across countries. They are either unfunded, funded or a mix of the two. Which pension scheme is the least harmful to average income per capita?

- Which pension scheme is the least harmful to average income per capita?

- Which pension scheme is the least harmful to average welfare over the life-cycle?

- And why?

1. A general macroeconomic analysis of ageing (decrease in fertility and rise in longevity) with different pension systems.

2. Determine which PAYG pension system should be preferred in an OLG model when population ages.

3. Study welfare effect of change in pension system.

- Overlapping-generations; two periods.

- Perfect competition in all markets.

- Fertility is exogenous.

- Longevity is exogenous.

- Age retirement is fixed.

- Pensions are either financed by tax (PAYG) or by personal saving (Fully-funded system).

4 pension systems:

- Fully-funded scheme (FF): pensions are personal saving.

- Defined-Contribution PAYG scheme (DC): the tax is fixed and the pension depends on fertility.

- Defined-Benefit PAYG scheme (DB): the pension is fixed and the tax depends on fertility.

- Defined-Annuity PAYG scheme (DA): the annual pension is fixed but the number of annuities depends on longevity while the tax depends on fertility.

- Young: they work, earn a labor wage, save and/or pay a tax to finance pensions.

- Old: they retire, consume their accumulated savings and/or pension.

- Utility: $\qquad U_t = u(c_t) + \beta l u(d_{t+1})$

- Constraints: $\qquad c_t + s_t = w_t - \tau(n)$

$$d_{t+1} = \frac{p(n) + (1 + r_{t+1})s_t}{l}$$

   where c_t: consumption when young; d_{t+1}: consumption when retired; s_t: saving; τ: tax financing pension; l: longevity

- Production technology: $Y_t = AF(K_t, L_t)$

   where K_t: physical capital; L_t: labor.

- Constant fertility rate: age structure (old-age dependency ratio) is constant over time. We study permanent changes in fertility, and hence, permanent changes in the age structure.

- Fixed age retirement: simplifies the analysis but extensions are possible (see Dedry, Onder and Pestieau (2015)).

- Exogenous longevity implies deterministic model and no accidental bequests.

- Investment in physical capital only. The tax is not distortionary so adding a new asset (human capital for instance) would not change the analysis.

- The decline in fertility increases income in the economy with a DC pension system while it is ambiguous in the economy with a DB system.

- The macroeconomic performance (income per capita) is better in the DC than in the DB pension system when fertility declines.

- The "capital dilution" effect and the marginal pension benefit are proportional to n while the marginal pension cost $\frac{d\tau(n)}{dn}$ is convex in n. But in the DC system, the marginal pension cost does not depend on fertility.

- When fertility declines, the DC pension system is superior to the DB system. When fertility increases, it is the opposite.

- Welfare analysis is complicated in OLG models. In the literature, welfare analysis is done at the steady state leaving unanswered the question of welfare gain or loss for the generations along the transition path.

- A recent paper by Kühle (2014) proposes a method to analyze welfare along the transition path to the steady state.

- We use this method to do the welfare analysis.

2 situations:

- The change in fertility cannot be anticipated by the first old cohort (ex: unexpected inflow or outflow of migrants). Demographic change is external to the domestic population.

- The change in fertility is anticipated by the first old cohort who are the parents of the newborn generation with a modified size. This is the internal natural demographic change.

- When the change is unanticipated, it is necessary to distinguish the first old-cohort (who can anticipate the change) and the following ones.

- For the first old cohort, the effect of an outflow of young people (unanticipated decline in population growth) on welfare is negative in the DC system while it is positive in all other pension systems

- For the following cohorts, the effect on welfare is negative in the FF and the DC system while it is ambiguous in the other two (DB and DA)

- This work proposes a general analysis of ageing in a macroeconomic model with pensions.

- Ranking of pension systems. The DC system is superior to the DB or DA system when fertility declines.

- Policy implications: transition to a DC system when population ages.

- Complete analysis with a change in longevity.

- Analysis with uncertain lifetime.

- Analysis with changes in age retirement.

- Analysis with heterogenous workers when they are imperfect substitutes.