Pensions and Longevity Differences.

Differentiating the Retirement Age or the Replacement Rate?

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Consider a world where lifespan varies significantly across individuals $L_i, i = 1...N$ and in a way that is correlated with observable socio-demographic categories $X_{i,k}$, including lifetime income $W_{i,k}$. Consider the problem of equalising the ratio of their lifetime pensions benefits to their lifetime pensions contributions (i.e. equalising the pension rate of return). Abstracting for the issue of education and career length differences, the ratio writes

$$rr_i = \frac{L_i - RA_i}{RA_i} \times \mu_i \tag{1}$$

with RA the retirement age and μ the ratio of pension benefits to pension contributions (which is functionally equivalent to a replacement rate). If L varies across individuals i, the only way to equalise lifetime rates of return across individuals is to individualise either the retirement age RA_i, or the benefit to contribution ratio μ_i.[1]

Imagine a Bismarkian pension system where benefits are strictly proportional to contributions i.e. $\mu_i = \mu$, then equality requires that retirement age should rise proportionally with lifespan

[1]Or by resorting to a mix of these policies.

$$RA_i = \frac{L_i \times \mu}{rr + \mu} \tag{2}$$

Imagine now a pension system where retirement age is uniform i.e $RA_i = RA$, then equalisation requires the replacement rate to be reduced when lifespan rises following

$$\mu_i = \frac{rr \times RA}{L_i - RA} \tag{3}$$

Note that the relationship is monotone but not linear. In particular when $L_i - RA$ tends to zero (when time in retirement becomes very small), the equalising replacement rate goes to $+\infty$.

The point is that, in order to achieve equalisation, both policies (retirement age differentiation and replacement rate differentiation) are dependant on the planner knowing the full distribution of lifespan across individuals $f(L)$. If, as seems inevitably, he/she can only use proxies $X_{i,k}$ (i.e. categories k that are correlated to lifespan) to differentiate treatment and if unaccounted/residual/within variance in terms of L is important, then both policies will prove relatively ineffective at achieving ex-post equality. And this is fundamentally due to the same lack of predictive power of $X_{i,k}$ implying that $\hat{L}_i(X_{i,k})$ deviates from the true longevity L_i. The magnitude of that problem can be studied via simulations by considering both policy scenarios (i.e. retirement age differentiation or replacement rate differentiation), and the computation of "gap" indices. Typically, the building block of the "retirement age gap index" would be

$$G_i^{RA} = RA_i - \tilde{RA}_i = \frac{L_i \times \mu}{rr + \mu} - \frac{\hat{L}_i(X_{i,k}) \times \mu}{rr + \mu} \tag{4}$$

where $\hat{L}_i(X_{i,k})$ is the expected longevity given our knowledge of $X_{i,k}$ A similar expression can be written for the "replacement rate gap index".

$$G_i^{\mu} = \mu_i - \tilde{\mu}_i = \frac{rr \times RA}{L_i - RA} - \frac{rr \times RA}{\hat{L}_i(X_{i,k}) - RA} \tag{5}$$

The only nuance, is that the retirement age differentiation scenario seems more tractable and palatable: a "retirement age equity gap index" is easier to apprehend and manipulate algebraically than a "replacement rate equity gap index".