Reforming EU Pension Systems: Equity and Sustainability in Conflict

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Abstract

As the heterogeneity in life expectancy by socioeconomic status increases, many pension systems imply a wealth transfer from short- to long-lived individuals. Various pension reforms aim to reduce inequalities that are caused by ex–ante differences in life expectancy. However, these pension reforms may themselves induce redistribution effects. We have implemented a dynamic General Equilibrium-OLG model populated by heterogeneous individuals that differ by gender, education, family size, labor supply, health status, and life expectancy. Life expectancy at the individual level is therefore determined by life cycle events that are heterogenous across the population. In addition we also allow for exogenous individual specific health and labor market shocks. Within this framework, we study various pension reforms across different socioeconomic groups taking into account that pension reforms themselves induce individual level reactions. We analyse pension reforms across various dimensions (at the macro and micro level) and discuss the results for different socioeconomic groups, especially by gender and skill level. Our model is calibrated to four EU countries (Austria, Germany, Italy and Poland). These countries capture different pension systems (DB vs. DC systems) and different pension generosity.

1. Motivation

Europe is facing significant population ageing with an increasing share of dependent elderly to be supported by a declining share of the working age population. This demographic development will put pressure on social security systems, such as the public pension systems. These systems are built on intergenerational links and prevailing economic developments.

Several reforms of the pension systems have been proposed to alleviate the pressure of ageing on fiscal sustainability of these systems. However, these reforms will affect distributional fairness across income levels, genders and generations. Pension reforms will also determine life cycle decisions including education, consumption, savings and the age at which to retire. These behavioural reactions to pension reforms are further exposed to idiosyncratic risks related to unemployment, health and mortality whereby gender and the number of children are important characteristics shaping those risks.

Hence, pension reforms have to be implemented taking the balance between sustainability and equity into account and at the same time maintaining incentives for education, labor force participation and savings. Our paper aims to consider the fiscal impact of pension reforms together with repercussions of the pension reforms on life cycle decisions and the long-term distributional consequences across multiple dimensions (gender, skill, income quintile, birth cohort).

2. Methodology and Data

We set up a household model that accounts for individual-level heterogeneity in gender, education and number of children. Based on these characteristics we allow for idiosyncratic risks in unemployment, health and mortality which determine employment histories, savings, and pension entitlements. We then integrate our household model into a general equilibrium model of households, firms and the government.

We calibrate our model to four European countries (Austria, Germany, Italy and Poland) which differ in their demographics and pension systems. Simulation results are presented for cohorts born between 1942 and 2050 for each country. Demographic data, economic data, and projections for the four countries, along with all country-specific transition rates by birth cohort, number of children, gender, and skill group—are derived from publicly available data from Eurostat (EUROPOP2023), ILO, OECD, and the Wittgenstein Centre Human Capital Data Explorer.

For each country, the model is calibrated to target retirement ages and educational attainment by gender. We use age profiles derived from publicly available data from Eurostat, OECD, and the AGENTA data explorer to match the existing labor income profiles observed for each gender, skill group and country. The dynamic overlapping generations model has been built using the Julia Programming Language v1.11.4, which is a general purpose open-source programming language.

We consider four reform scenarios, in addition to the currently prevailing pension system in each country. Our first two reforms, including a sustainability factor and alternatively delayed retirement, mainly target the fiscal sustainability of pensions. Our third and fourth reform scenarios, a minimum pension benefit or alternatively progressive pension benefits, are targeted towards redistribution. We evaluate our pension reforms for each of the four countries along various dimensions.

3. The model

The model consists of three types of agents: households, a representative neoclassical firm, and a government. Households are heterogeneous, each comprising a household head and dependent children. The number of dependent children in a household varies based on the age of the household head, taking into consideration that children leave their parents home at the age of 18.

Household heads differ initially by their gender, year of birth, earning ability, and educational effort. Household heads face during their lifetime idiosyncratic risks related to unemployment, health, and mortality, which are specific to their initial characteristics, and an initial one-time shock related to the total number of children they will have along their lives. Based on their initial characteristics together with their employment and health histories, household heads make endogenous decisions about education, household consumption and savings.

We assume that having children imposes labor income penalties on women. First, the presence of a newborn increases the risk of job separation. Second, the job separation rate further increases with the number of children under the age of six. As a result, these two effects reduce the employment rate and labor income of women with children, which later on translates into lower pension rights.

To compensate for women's lower income we assume that men transfer a portion of their labor income to women until the per capita consumption profiles of both genders are equalized. In the

model, this transfer declines over time, reflecting the projected increase in the share of women with tertiary education.

We assume a representative firm that produces a final good by combining capital and effective labor under constant returns to scale, using a Cobb-Douglas production function. The effective labor in each year is calculated as the sum, across age, gender, and education level, of the productivity of all employed individuals. The final good can either be consumed by households or saved. The rate of growth of the labor-augmenting technological progress is assumed to be constant at 1.5 percent per year throughout the entire period analyzed. The representative firm maximizes its net cash flow by renting capital and hiring labor from households in competitive markets. The firm operates in an open economy, where both the interest rate and the wage per effective unit of labor are fixed and determined in international markets.

The government runs a social security system that provides pension benefits and other social transfers. To finance both transfers, the government levies social contributions on workers' income. To better understand the impact of demography on the economic evolution and sustainability of the social security system, we assume no government debt. Consequently, contribution rates are adjusted annually to cover all benefits claimed. In notional defined contribution (NDC) pension systems, we distinguish between the fixed contribution rate used to accumulate pension rights and the additional contributions required to cover the total cost of the system. We implement this distinction, since in an NDC pension system it is not a priori guaranteed that a fixed contribution rate can finance all benefits claimed when the population is not stable.

4. Preliminary Results

Figure 1 presents simulation results on the impact of various pension reform scenarios—baseline, raising minimum pension benefits (MinPB), progressive pension benefits (PPB), delayed retirement (DR) and sustainability factor (SF)—on retirement ages, pension-income ratios, and contribution rates across Austria, Germany, Italy, and Poland from 2020 to 2070.

The panels in the first row show how the average retirement age evolves under different pension reforms across countries. In the baseline scenario of all countries the retirement age increases, with Germany and Italy having higher average ages than Austria and Poland. This pattern reflects past reforms in Germany and Italy that gradually increased the statutory retirement age from 65 to 70. Austria and Poland also show increases in the retirement age when a delayed retirement (DR) reform is introduced (red lines). In contrast, reforms that increase the minimum pension benefit (MinPB, orange lines) or make the pension formula more progressive (PPB, green lines) keep the retirement age similar to the baseline. This is because these two reforms reduce the link between contributions and benefits, increasing the marginal cost of continuing to work and incentivizing earlier retirement.

The second row illustrate the pension-income ratio, defined as the ratio of the average pension benefit received by retirees to the average labor income of workers. Our simulations show an initial decline that stabilizes after all baby boomers retire. Only in Poland the ratio declines due to the internal adjustment of the replacement rate by life expectancy. Two reforms lead to declines in the pension-income ratio: the sustainability factor (SF) and the progressive pension benefit (PPB). For the sustainability factor (SF) reform, the decline in the pension-income ratio in later years is due to the overall declines in pension benefits. The MinPB reform and the delayed retirement (DR) increase the pension-income ratio.

The panels in the third row show the share of labor income required each year to fully fund all pension claims. In defined benefit systems, this is equivalent to the social contribution rate necessary to pay all pension benefits. In notional defined contribution (NDC) systems, we add an

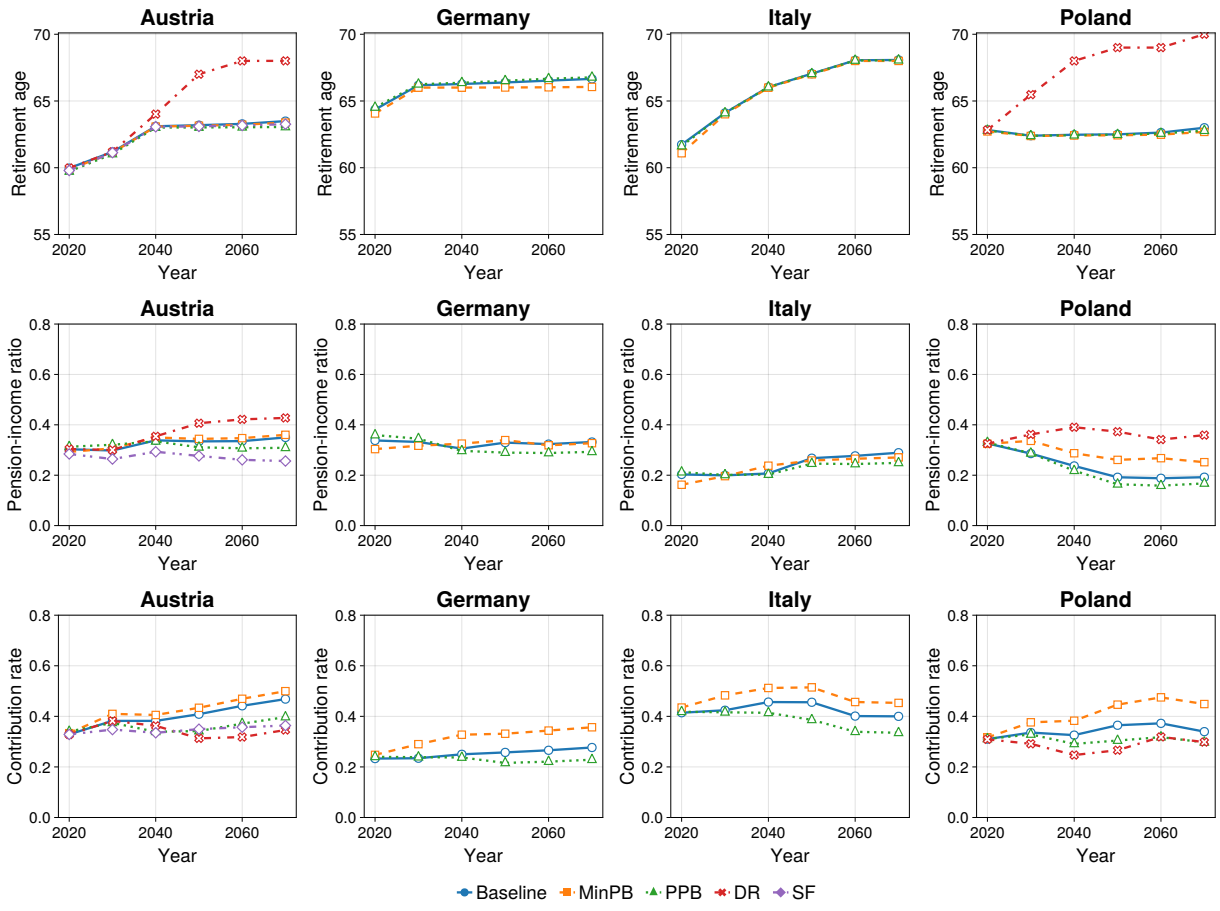

Figure 1: Fiscal and Social Benefit Outcomes

extra contribution rate, on top of the fixed rate used to calculate pension entitlements, to reflect the total funding needed. Across countries, current contribution rates vary from 20% to 40% of total labor income, with Italy having the highest rate, followed by Austria, Poland, and Germany. Future contribution needs differ significantly by country and reform scenario. Two reforms have a particularly clear impact on contribution rates. First, delaying the retirement age (DR) lowers overall pension costs by increasing the number of contributors and reducing the number of retirees. Second, increasing the minimum pension benefit (MinPB) raises the costs of the pension system, requiring a higher contribution rate. Reforms that make the benefit formula more progressive (PPB) also help to reduce long-term costs to levels similar to those seen in the 2020s.

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