**Topic and Motivation**

The sustainability of public pension systems is increasingly challenged by demographic shifts, particularly declining fertility rates. Finland has witnessed a dramatic drop in its total fertility rate (TFR), reaching a historic low of 1.26 in 2023. This trend, if persistent, threatens the balance of the earnings-related pension system, which operates on a pay-as-you-go basis. In such systems, the working-age population finances the pensions of retirees, making demographic stability crucial.

This report investigates how different fertility trajectories could affect the long-term financing of Finland's earnings-related pensions. It introduces two plausible fertility scenarios and applies stochastic modeling to simulate their impact on pension contribution rates up to the year 2090.

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**Theoretical Focus**

The study is grounded in demographic-economic modeling, combining population projections with pension system dynamics. It builds on the theory that fertility trends influence the age structure of the population, which in turn affects the ratio of contributors to beneficiaries in pension systems. The stochastic approach allows for uncertainty in demographic developments, offering a probabilistic view of future outcomes rather than deterministic forecasts.

The analysis also draws on comparative fertility behavior in Nordic countries, particularly the phenomenon of postponed childbearing, which may lead to a delayed recovery in fertility rates.

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**Data and Assumptions**

The simulations rely on a combination of historical demographic data, national forecasts, and economic assumptions. Key inputs include:

- Fertility rates (based on Statistics Finland and Nordic trends)
- Employment rates (targeting 73–74%)
- Net migration (15,000 annually)
- Mortality projections (Statistics Finland 2021 forecast)
- Real return on pension assets (2.5% until 2031, then 3.5%)
- Real wage growth (1.2% annually)
- Inflation (2.0% annually)

These assumptions are consistent across both scenarios to isolate the effect of fertility changes.

Foreign-born individuals are assumed to be employed and their income level is assumed to be the same as it was in 2023. Age, gender, and length of stay in the country have been taken into account when assessing employment and income level.

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**Methods**

Two fertility scenarios are modeled:

1. **Scenario P (Permanent Decline)**: Assumes fertility remains at the 2023 level (TFR 1.26) with no recovery.
2. **Scenario L (Postponement Reversal)**: Assumes fertility gradually increases to TFR 1.45 by 2050 due to delayed childbearing.

Each scenario is simulated 5,000 times using stochastic techniques. The results are presented as medians and confidence intervals (50% and 90%) for key indicators, primarily the Employees Pensions Act (TyEL) contribution rate.

The stochastic model accounts for variability in demographic outcomes and provides a range of possible futures rather than a single forecast. This approach enhances the robustness of policy analysis and planning.

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**Findings and Implications**

The simulations reveal that fertility trends have a substantial impact on pension financing:

- In **Scenario P**, TyEL contribution rates rise to 24.9–26.4% of the wage sum by the end of the projection period. In order for TyEL contribution rates to be maintained at its current level of 24.4 percent of the payroll in the long term, net immigration would need to be 27 000-42 000 per year.
- In **Scenario L**, the contribution pressure is reduced by approximately 0.5 percentage points. Net immigration would need to be 24 000-40 000 per year to maintain current contribution rate.

While the difference may seem modest, it reflects significant financial implications over decades. A higher contribution rate implies increased costs for employers and employees, potentially affecting labor market dynamics and economic growth.
The findings underscore the importance of realistic demographic forecasting in pension policy. They also highlight the need for adaptive strategies, such as adjusting contribution rates, retirement ages, or benefit levels, to maintain system sustainability under varying demographic conditions.

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**Conclusion**

This report provides a rigorous, data-driven analysis of how fertility developments influence the long-term viability of Finland's pension system. By incorporating stochastic modeling and demographically grounded scenarios, it offers valuable insights for policymakers, actuaries, and economists. The results emphasize that even modest changes in fertility assumptions can have meaningful effects on pension financing, reinforcing the need for continuous monitoring and flexible policy design.