

## **Aging, Pension Reform, and Capital Flows: A Multi-Country Simulation Model**

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In the vast majority of countries, populations are aging. The extent and timing of population aging, however, differs substantially across countries. For example, many European countries and some Asian countries have experienced more significant population aging earlier than the United States. The populations of Latin America and Africa, on the other hand, are much younger today, and are likely to see population aging continue much further into the future. The United States is nearer the middle of a long-term demographic transition with a very large working age population today and very significant population aging still projected going forward. So while population aging is happening globally, the pattern and character and timing of the aging process varies widely from one country to another.

Within each country, demographic change alters the time path of aggregate saving. A country with a larger working age population may save more in anticipation of retirement, and less once they reach retirement; and this pattern may be amplified by pension reforms that encompass pre-funding. Thus in a world of closed economies, differences across countries in the timing and extent of population aging would generate differences in saving rates, investment, and rates of return on assets. In a world of global capital markets, however, financial assets can move freely and rapidly across countries. So if the demographics of one country lead to more saving by residents of that country, those savings can be invested anywhere in the world. And if demographics result in the residents of another country saving less, or withdrawing assets previously saved, those withdrawals may come from anywhere in the world, and they may be replaced by relatively higher saving by others. Thus aging, saving and global capital flows may be highly related. The goal of this project is to model those relationships, and to estimate the extent to which global capital flows moderate the effects of country-specific demographics on asset returns.

The first step in this work is to develop a stylized multi-country overlapping generations (OLG) model. The model is then used to project macroeconomic aggregates such as international capital flows over a 70-year horizon, using long-term demographic projections for different sets of countries and regions. A number of improvements have been made to past models of demographics and international capital flows, and a good part of our work has been directed to model development. For example, we incorporate pay-as-you-go pension schemes in the model and, consequently, address the important issue of pension reform with its associated changes in saving patterns which in turn have implications on international capital flows. We also incorporate more detailed demographic projections that model the various dimensions of demographic change, and we carefully distinguish between the effects of population aging and population shrinkage. The model has three basic building blocks: a demographic projection, a stylized pension system, and a macroeconomic overlapping generations model which generates the general equilibrium of the internationally linked economies.

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Although all countries and regions are modeled symmetrically as large open economies, our presentation focuses on continental Europe as one of the world regions most severely affected by aging. At the same time, the pension systems in continental Europe are dominated by generous pay-as-you-go financing mechanisms. We explicitly take three single European countries (France, Germany, and Italy) as examples for countries that are differently affected by population aging within Europe. France is aging much less than Germany and Italy. Accordingly, we not only analyze capital flows from Europe to the rest of the world, but also the resulting intra-European capital flows. Furthermore, we account for differences in the generosity of pension systems and simulate the impact of a stylized pension reform in the regions of our model.

Our simulations predict substantial capital flows due to population aging. Population aging results in decreases of saving rates when the baby boomers decumulate their assets. International capital flows follow this trend. The countries most affected by aging such as the European Union will initially be capital exporters, while countries less affected by aging like the United States and other OECD regions will import capital. However, since older households decumulate their assets, capital exports from these fast aging countries to the rest of the world decrease and therefore fast aging countries are projected to become capital import countries around the year 2020. Pension reforms with higher degrees of pre-funding are likely to induce more capital exports. They also increase labor supply considerably, while the effects on the rate of return to capital are small. While the rate of return on assets is projected to decline in response to population aging, the model predicts no devastating “asset market meltdown”.

A final result of our paper is the important interplay between saving and labor supply adjustments in response to population aging. Saving rates, rates of return and international capital flows react substantially less to demographic change once households absorb some part of the demographic shock by working more.

The full working paper is available on our website, [www.nber.org/programs/ag/rrc/books&papers.html](http://www.nber.org/programs/ag/rrc/books&papers.html) as paper NB05-04 and as NBER Working Paper #11850.

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