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Funded pensions and intergenerational and international risk sharing in general equilibrium

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A B S T R A C T

We explore intergenerational and international risk sharing in a general equilibrium multiple-country model with two-tier pensions systems. The exact design of the pension system is key for the way in which risks are shared over generations. The laissez-faire market solution fails to provide an optimal allocation because the young cannot share in the financial risks. However, the existence of wage-indexed bonds combined with a pension system with a fully funded second tier that pays defined wage-indexed benefits can reproduce the first best. If wage-indexed bonds are not available, mimicking the first best is not possible, except under special circumstances. We also explore whether national pension funds want to deviate from the first best by increasing domestic equity holdings. With wage-indexed bonds this incentive is absent, while there is indeed such an incentive when wage-indexed bonds do not exist.

1. Introduction

This paper explores intergenerational and international risk sharing in a general equilibrium multiple-country model with two-tier pensions systems. The first tier is a pay-as-you-go (PAYG) pillar that consists of a lump-sum component and a part that is linked to the wage of the young generation. The second tier

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involves a fully funded pillar that also pays a benefit indexed to the wage of the young generation. Our analysis is of interest from the perspectives of institutional design and of policy making. Given the ageing of their populations, many countries are reforming their pension systems by introducing a funded pension pillar.[2] Also the World Bank see e.g. Holzmann and Hinz (2005) has recommended pension funding to complement traditional public PAYG pension arrangements. The design of the funded component is of crucial importance for the way in which risks are shared over various generations.

Our model features a productivity shock and a depreciation shock (a financial shock) in each country. The laissez-faire market solution fails to provide an optimal allocation, because the young are born after the shocks have materialized and so cannot trade these risks. Introduction of a pension fund with benefits defined in wage-indexed terms allows for optimal intergenerational risk sharing within each country.[3] Essential in this regard is that the pension fund features a (ex post) mismatch between its assets and liabilities. For example, if pension benefits are defined in wage-indexed terms, any equity investment by the pension fund is effectively owned by the young generation and, in this way, the young share in the equity risks. Specific investment portfolios of the pension fund allow for the optimal allocation of the fundamental economic shocks between the young and old generations so that intergenerational risk sharing becomes optimal.

While intergenerational risk sharing within each country may be optimal for given national resources, allocations can still be suboptimal when viewed from the perspective of an international planner. In the presence of multiple countries that are each characterised by their own shocks, replication of the international planner's optimum (the 'first best') is possible only if pension funds have access to wage-indexed bonds of all countries.[4] In particular, we show that in the presence of these wage-indexed bonds, a properly designed pension system with a fully funded second tier that pays a defined wage-indexed benefit reproduces the first best. If these wage-indexed bonds are not available, mimicking the first best is impossible, except under special circumstances. The analysis in this paper thus assigns an important role to the *combination* of a proper design of a two-tier pension system and the degree to which asset markets are complete.

Having identified the circumstances under which the first best can be replicated, we explore whether the national pension funds (or their designers) have an *incentive* to invest in accordance with the first-best allocation. The answer to this question depends on the incentive of pension funds to increase domestic equity investments and thereby again on the presence of wage-indexed bonds. With such bonds, the consequences for the factor returns of equity shifts in pension portfolios are spread evenly throughout the world, because countries' investment portfolios are sufficiently diversified in terms of both wages and equity. This is not the case, however, if wage-indexed bonds are absent. An increase in domestic equity holdings lowers the return on domestic equity but raises the domestic wage rate. This benefits the old generation to the extent that they have internationally diversified their equity investments but have a large stake in domestic wages through the pension system (via the wage-linked component of the first tier or the wage-indexed benefit they may receive via the second tier) that they cannot diversify by selling wage-indexed bonds to foreigners. The lower return on the domestic equity position of the pension fund causes only limited harm to the young as residual claimants of the defined-benefit pension fund, because they hold only a limited amount of domestic equity while the rest is held abroad. At the same time, they benefit substantially from the higher domestic wage (and more so if the wage-linked first- or second-tier pension payments to the old are smaller) if the lack of wage-indexed bonds prevents them from sharing domestic wage risks internationally.

In order to not unduly complicate the analysis, we make a number of simplifying assumptions. In particular, we assume that participation by the young in the pension system is mandatory. Hence, the

[2] For the European Union (EU), Economic Policy Committee and European Commission (2006, pp. 28–31) provide an overview of recent and current reforms. Over the past decade, the volume of assets managed by pension funds in the OECD has grown much faster than GDP (see Boeri et al., 2006).

[3] Also a pension fund with benefits defined in real terms is able to produce optimal intergenerational risk sharing within each country – see also Beetsma and Bovenberg (2009). However, with endogenous labour supply, the defined wage-indexed system becomes strictly preferable – see Beetsma et al. (2008).

[4] All our results would go through in the presence of any two country-specific assets that are linearly independent combinations of equities and wage-linked bonds issued by that country.