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Pay-as-you-go or funded social security? A general equilibrium comparison

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ABSTRACT

This paper demonstrates that the analysis of fiscal sustainability of social security must include the education funding dimension of public policy, which affects the productivity of future workers. This fact is true under both social security regimes: pay-as-you-go (PAYG) and fully funded (FF). We consider an OLG economy where the government, in addition to running social security, also funds education via a dedicated tax. The education tax rates are chosen, in each period, by a majoritarian rule. We demonstrate, contrary to conjectures in the literature, that the FF social security system produces political support for a relatively higher (compared to PAYG) education funding, and hence generates higher rates of human capital accumulation, physical capital accumulation, and economic growth, Furthermore, it also results in a comparatively lower degree of income inequality.

1. Introduction

Social security systems exist in all developed economies and, moreover, represent in most of them the largest public program. The demographic trends in all these economies lead to a decreasing dependency ratio and are viewed as a sign of a looming crisis of public pension systems, raising doubts about future solvency of the existing programs and bringing the social security reform proposals on the public policy agenda. This public policy debate has stimulated empirical and theoretical analyses that evaluate the prospects of sustainability of pay-as-you-go (PAYG) social security programs compared to some fully or partially funded alternatives, as well as their implications for economic growth (see, e.g., Diamond, 1999; Feldstein, 2005).

While this literature focuses on the trend of the dependency ratio for its predictions, a large part of it treats the dynamics of future productivity as exogenously given. Many other papers, e.g., Diamond and Orszag (2005), Hines and Taylor (2005), and Sinn (2000), while unequivocal about the looming insolvency, also observe that the dynamics of future productivity is negatively affected by the growth of social security obligations due to its depressing effect on private saving. The impact of PAYG social security on savings and welfare has been widely discussed in the literature starting with Feldstein (1974).[1] Most of this literature, however, overlooked the fact that social security system may also affect the

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[1] Karni and Zilcha (1989) analyzed this problem within general equilibrium OLG framework.

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future productivity through the channel of human capital accumulation. A notable exception, in direct response to Feldstein (1974), is the paper by Pogue and Sgontz (1977). They conjectured that PAYG social security system creates incentives (both individual and collective) for investment in younger generation's education. Moreover, they argued that "the introduction of [PAYG] social security has led to a substitution of human for physical capital" and pointed out that the post-1938 trends are consistent with this claim. Becker and Murphy (1988) have also argued that PAYG social security strengthens the political support among the current workers for public investment in the education of the future workforce; furthermore, they have pointed out that this incentive is stronger for the middle and lower income populations.

Our intended contribution in this paper is to provide a rigorous theoretical analysis of the above conjecture in a general equilibrium framework. Moreover, we intend to explore the comparative effects of the alternative social security systems on human capital accumulation and through it on labor productivity and economic growth. We note that the incentives to enhance productivity of future workforce exists not only under PAYG system, where benefits are directly dependent on the payroll taxes paid by future workers, but also in the case of a fully funded social security where the rate of return on pension funds' investment depends on the future labor productivity. Thus the human capital dimension is essential for a comparative analysis of these social security systems.

The role of both public and private investment in education in the relationship between PAYG social security funding and economic growth was analyzed by Kaganovich and Zilcha (1999), Glomm and Kaganovich (2003). Zhang and Zhang (1998) and Pecchenino and Utendorf (1999) studied the impact of PAYG social security on incentives for private investment in education. Docquier and Paddison (2003) and Lambrecht et al. (2005) compared such incentives under PAYG and fully funded pension systems. A branch of literature including Konrad (1995), Bellettini and Ceroni (1999), Kemnitz (2000), Boldrin and Montes (2005), and Poutvaara (2006) examined the relationship between public education and PAYG pensions as an issue of political economy of an implicit intergenerational contract. A contribution, which is conceptually closest to ours, is by Soares (2006). He studies the effect of PAYG social security on political support for public education funding in a calibrated OLG model with a realistic age structure of the otherwise homogeneous electorate. For the closed economy version of the model, Soares finds that the introduction of a PAYG system results in a political equilibrium with lower funding of public education than in the absence of social security, because under the PAYG scheme the voters' incentive to enhance the productivity of future workers is outweighed by the general equilibrium effects on factor prices, which reduce the present value of the pension benefits.

The present paper offers a theoretical analysis in a dynamic general equilibrium framework, the first to our knowledge, focusing on the comparison of PAYG and fully funded social security systems in terms of the incentives they generate for political support of public funding of education. We consider a closed OLG economy where individuals differ in the attained levels of human capital. We assume that while public funding of education is provided uniformly to all young agents, inequality of attainment arises due to unequal innate abilities and parental inputs. Public funds are budgeted through a dedicated education tax on working adults. We further assume that the education tax rate is determined in each period through a majoritarian political mechanism. Contrary to the Pogue and Sgontz (1977) conjecture, we demonstrate analytically within a dynamic political equilibrium, that under some meaningful conditions the fully funded regime dominates the PAYG with the same level of social security tax, in terms of human capital accumulation. Specifically, we show in our Theorem 1 that under the fully funded regime the lower and middle income workers will support higher education tax rates.

The argument is based on the general equilibrium analysis of the factor price effect of the education tax under alternative social security regimes on individual returns. The intuition can be derived from the two motives driving each agent's choice of the education tax level: (i) its effect on the rate of return (in terms of future benefits) on social security contributions and (ii) its effect on the interest rate. Under the fully funded system, future pensions of current workers are financed by the returns on investment of the social security trust fund formed by these workers' payroll taxes. Therefore, the two motives are entirely consistent: the positive effect of education funding on the interest rate will enhance both the returns on private savings and social security benefits. In contrast, under the PAYG system, while an increased investment in educating future workers will raise the nominal value of social security benefits, there will be a stronger positive effect on the interest rate, so that the present value of social security benefits will actually decrease. As a result, we show that the combined effect of the two motives will be weaker under PAYG than under the fully funded regime for all agents except those in the upper tail of income distribution.

We combine thus established dominance of the fully funded system in terms of the political support for education funding with its well known advantage in physical capital accumulation and show (Theorem 2) that under plausible conditions the fully funded regime indeed generates consistently higher levels of aggregate physical and human capital, than the PAYG regime, hence higher output along the dynamic political equilibrium path. We then compare the social security regimes in terms of their impact on agents' lifetime income distributions and find (Theorem 3) that under some conditions (that appear plausible for developed economies) a fully funded system will result in a lower degree of income inequality along the dynamic political equilibrium program.

2. The model

We study an overlapping generations economy populated by heterogeneous family dynasties indexed by family name $\omega \in \Omega$. The only sources of heterogeneity are the differences of human capital levels of the members of the initial generation in period $t=0$ and the (random) innate ability. Each generation consists of agents whose adult life has two