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Optimal social security in a dynastic model with investment externalities and endogenous fertility

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Abstract

This paper studies optimal pay-as-you-go social security with investment externalities, positive bequests and endogenous fertility. With an investment externality, a competitive solution without social security suffers from under-investment in capital and over-reproduction of population. We show the existence of time-consistent optimal social security that improves welfare by reducing fertility and increasing capital intensity. We also illustrate numerically that a small degree of this externality can justify the observed high ratios of social security spending to GDP.

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1. Introduction

Pay-as-you-go social security (PAYG) has been practiced in many countries in the last several decades. In industrial nations, for example, payroll tax rates for social

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security range from 10% to 20% or higher; see the United States Department of Health and Human Services (1999). At the same time, PAYG social security has attracted a great deal of attention in the literature. While most studies of social security have focused on how it affects capital accumulation, much less attention has been paid to how it affects social welfare.

Existing studies of the welfare consequence of social security differ between models with or without altruistic bequests. Without such bequests, social security reduces life-cycle saving and its welfare implication hinges on some form of market failure or on the fact that the competitive solution in the life-cycle model with overlapping generations is typically second-best.¹ In the life-cycle model, social security can improve welfare by mitigating the problem of over-accumulation of capital (e.g. Diamond, 1965), or it can emerge from a political equilibrium among different age groups with conflicting interests (e.g. Cooley and Soares, 1999).

In a dynastic-family model, by contrast, social security is well known to be neutral concerning households' consumption–saving decision (Barro, 1974), because a rise in social security transfers from workers to the elderly can be fully offset by increasing bequests from parents to children.² Moreover, when fertility is endogenously chosen by parents, the rise in the bequest cost of having a child caused by social security reduces fertility and hence raises capital per worker (e.g. Becker and Barro, 1988; Zhang, 1995). However, the welfare implication of such changes caused by social security remains unclear. In this situation, social security can increase the level, or the growth rate, of per capita output by reducing fertility. Indeed, there is empirical evidence in Zhang and Zhang (2004) and others indicating that social security has a negative effect on fertility and a positive effect on the growth rate of per capita income.³ It is therefore relevant and interesting to explore whether PAYG social security can be justified in terms of welfare when altruistic bequests are operative and fertility is endogenous.

In this paper, we examine the welfare implication of PAYG social security with altruistic bequests and endogenous fertility in a dynastic model of capital accumulation. As in the literature, scaling up PAYG social security has no effect on the saving rate in a dynastic model when altruistic parents respond by leaving more bequests to their children to offset the resultant increase in the future tax burden. However, a rise in the tax rate for social security has opposing effects on fertility. On the one hand, by increasing the bequest cost of having a child, the tax rise tends to reduce fertility. On the other hand, by reducing the after-tax wage rate,

¹See, e.g. Samuelson (1958), Diamond (1965), Aaron (1966), Eckstein and Wolpin (1985), Hubbard and Judd (1987), Hansson and Stuart (1989), Cooley and Soares (1999), Kaganovich and Zilcha (1999), and Corneo and Marquardt (2000).

²Though there is little doubt about the existence of bequests in the literature, there is no consensus with regard to what motivates bequests; see, e.g. Kotlikoff and Summers (1981), Laitner and Thomas (1996), and Altonji et al. (1997).

³To focus on the welfare analysis of social security, we will keep the model simple by ignoring sustainable growth in the long run. The conditions under which social security has a positive growth effect in the long run were given in Zhang (1995) in a dynastic family model with reproducible human capital and physical capital.

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