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Review of Economic Dynamics 8 (2005) 178–194
Review of Economic Dynamics
www.elsevier.com/locate/red

Social security as Markov equilibrium in OLG models

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Received 26 December 2000; revised 1 September 2004

Available online 13 December 2004

Abstract

This paper studies the characteristics of intergenerational transfers in a standard overlapping generations model with short lived governments that care about the welfare of young generations only. A number of authors have shown that simple intergenerational games, in which in each period the current young generation plays as a dictator, are able to deliver political equilibria with social security even if the underlying competitive equilibrium is not dynamically inefficient. These authors have either derived pure steady state results or have relied on subgame-perfectness. This paper extends these results deriving Markov subgame perfect equilibria (i.e. that depend only upon the period t state variable, which is the stock of capital).

Non-Markov subgame perfect equilibria assume agents know all the past history of the game; they cannot predict when the social security system will emerge and whether or not it will eventually emerge; they prescribe that generations that never deviated may be punished. Markov equilibria, placing more restrictions on the structure of the game, are able to deliver solutions that do not suffer from these drawbacks. As the paper shows, however, Markov strategies may produce unstable dynamics.

JEL classification: C72; H55

Keywords: Social security; Overlapping generations models; Markov equilibria

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1094-2025/$ – see front matter
doi:10.1016/j.red.2004.10.003

1. Introduction

Intergenerational redistribution is a very important issue in the political debate: on the one hand pension systems can be manipulated for political purposes; on the other, it is not clear how a transfer scheme should be designed to be optimal and thus more secure from political pressures, considering that it should be flexible enough to adjust to exogenous (such as population or technological) shocks.

In this context, it is very important to understand the widespread role of intergenerational transfers and why pay-as-you-go (PAYGO) social security systems developed and became stable institutions of modern societies. In particular, the existence of PAYGO schemes seems puzzling, given that successive generations cannot subscribe any commitment to pay old age benefits to older generations. There are many explanations in the literature of why PAYGO social security have been introduced and then expanded. Some relate to the incompleteness of private annuity markets and adverse selection, others to the fact that PAYGO systems can help to overcome inefficient intergenerational credit markets. The classical solution to the puzzle is that, if the economy is on a dynamically inefficient path (such that the interest rate falls below the economy's growth rate), then the introduction of a PAYGO social security scheme is Pareto improving since it reduces the capital deepening. However, even in this case, a PAYGO social security scheme is a dynamically inconsistent agreement between successive generations. Young generations would be better off discontinuing the PAYGO scheme and setting up a new one. Hence the question arises of why PAYGO schemes survive.

Recently a growing literature has analyzed the role of PAYGO pension schemes in the context of majority voting in overlapping generations models. Azariadis and Galasso (1997), Galasso (1998), Cooley and Soares (1998) show that equilibria exist in which social security emerges through a majority voting mechanism. Boldrin and Rustichini (2000) show that "a PAYGO public pension plan is a subgame perfect equilibrium of a majority voting game in an OLG model with production and capital accumulation when the growth rate of total labor productivity and the initial stock of capital satisfy a certain set of restrictions."

These contributions show that a PAYGO system can be supported by a strategy which stipulates that a punishment, in the form of no old age transfer, must be inflicted to all generations that in the past have modified its rules. That is, a generation which votes to deviate from the prescribed level of social security payroll tax would be punished and would not receive any old age benefit. A generation which decides not to inflict the punishment would not receive any old age benefit as well (in this case, it would contribute to the system but would not receive any benefit back).

These equilibria have some limitations. In the first place, both steady states (Cooley and Soares, 1998) and dynamic (Boldrin and Rustichini, 2000) subgame perfect equilibria (SPE) assume agents know the complete past history of the game and use this information when deciding their actions. Secondly, they have not sharp implications: as Boldrin and Rustichini (2000) show, although the social security system can be sustained in equilibrium, the model cannot predict when it will emerge and whether or not it will eventually emerge. Third, they prescribe that the PAYGO is never started again if one generation de-