Second-best public debt with human capital externalities

Jie Zhang[a,b,]*

[a]*National University of Singapore, Singapore*
[b]*University of Queensland, Australia*

Abstract

This paper studies optimal public debt in a dynastic model with human capital externalities that cause human capital investment (fertility) to be below (above) its socially optimal level. By reducing fertility and raising human capital investment, the optimal debt can exceed 10% of output for plausible parameterizations.
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1. Introduction

This paper studies optimal public debt in a dynastic model with externalities in the form of positive spillovers from average human capital in the education sector. The spillovers lower the private rate of return to education from the social rate, and thus education investment is too low. At the same time, through the trade-off between the number and quality of children, fertility is too high. This combination of low

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*Department of Economics, National University of Singapore, AS2 level 6, ARts Link, Singapore, Singapore. Tel.: +65 6874 6010; fax: +65 6775 2646.

E-mail address: ecszj@nus.edu.sg.

education investment and high fertility is commonly observed in early development stages across nations. One obvious policy instrument to tackle this problem is to subsidize education. The education subsidy can be partly financed by debt to improve welfare from a competitive equilibrium, as shown in Zhang (2003). In the real world, however, many countries issue debt to finance many types of government expenditures. It is thus important to see whether public debt can improve on the competitive solution with human capital externalities in the absence of education subsidies.

Intuitively, higher public debt leads to higher future tax liabilities, inducing current altruistic parents to leave more private intergenerational transfers per child in the form of bequests. The increased bequest cost of having a child tends to reduce fertility and increase human capital investment per child. As a consequence, public debt can reduce the efficiency loss originating from the externalities. If the externalities are strong enough, the optimal debt-output ratio can exceed 10% in this model.

Our study differs from a large body of literature on public debt. The traditional justification of public debt is based on the Ricardian equivalence hypothesis, whereby any mix of public debt and a lump-sum tax to finance government lump-sum transfers has no real effect as demonstrated in Barro (1974). Ever since the seminal work by Barro, some realistic factors have been suggested to invalidate the debt neutrality.[1] But little attention has been paid to the welfare implication of public debt and its optimal level, particularly in the presence of human capital externalities. A recent exception is Aiyagari and McGrattan (1998), who find that the optimum quantity of public debt is close to the current US level using precautionary saving motives and borrowing constraints.

The remainder of the paper is organized as follows. The next section introduces the model. Section 3 characterizes the competitive equilibrium and optimal public debt. The last section concludes. Proofs of the results are relegated to appendices.

2. The model

This model has an infinite number of periods and overlapping-generations of identical agents who live for two periods. Old agents work and choose the number of children and the allocations of time and income. Each old agent has one unit of time endowment. Rearing a child needs v fixed units of time and hence the number of children or fertility, n_t, is bounded above by $1/v$. Each working generation has a size $L_t = \bar{n}_{t-1} L_{t-1}$ and each agent takes average or aggregate variables as given. To distinguish an individual quantity of a variable x from its average quantity per worker, we use $\bar{x}$ for the latter (e.g. $\bar{n}$), while we denote aggregate quantities for the

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[1]These factors include, e.g., finite horizon (Diamond, 1965), non-altruistic or inoperative bequests (Bernheim et al., 1985; Kotlikoff et al., 1988; Weil, 1987), liquidity constraints (Heller and Starr, 1979; Hubbard and Judd, 1986), distortionary taxes (Judd, 1987), and endogenous fertility (Becker and Barro, 1988; Lapan and Enders, 1990; Wildasin, 1990; Zhang, 1997).