

# Social security reform with uninsurable income risk and endogenous borrowing constraints

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## Abstract

We study the effects of a social security reform in a large overlapping generations model where markets are incomplete and households face uninsurable idiosyncratic income shocks. We depart from the previous literature by assuming that, because of lack of commitment in the credit market, the borrowing constraint in the unique asset is endogenously determined by individuals' incentives to default on previous debts. In our model, after the reform the incentives to default are lower and consequently households face more relaxed borrowing limits, leading to an increase in debt and a reduction in the size of precautionary savings. However, the quantitative impact of this mechanism on stationary aggregate savings is small. Computing the transitional dynamics for the basic model following the social security reform we obtain important welfare gains for workers at the bottom of the income distribution (equivalent to 1.3% of consumption each period) associated to the relaxation of the endogenous borrowing constraints, which are missed in an environment with fixed borrowing limits.

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## 1. Introduction

In this paper, we address the following methodological question: Are endogenous borrowing constraints, arising from the lack of commitment in the credit market, important in order to understand the effects of reforming social security? Our answer is that, when idiosyncratic income risk is important and borrowing limits are endogenous, the magnitude of the increase in capital accumulation after a social security reform is reduced, although this effect is quantitatively small. Moreover, eliminating the public pay-as-you-go social security system has large effects on aggregate debt and the welfare of individuals at the bottom of the income distribution which are not accounted for by models with exogenous borrowing constraints.

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There is a well-established literature on social security reform using dynamic general equilibrium models. The seminal example of this tradition is the deterministic model by Auerbach and Kotlikoff (1987). More recently, some studies have addressed the aggregate effects of reforming social security in model economies with idiosyncratic income risk. The work of Imrohoroglu et al. (1995), Conesa and Krueger (1999) and Storesletten et al. (1999) are typical examples. With the probable exception of Fuster (1999), who works on a dynastic framework, these studies find that eliminating the pay-as-you-go system has large positive effects on capital accumulation and savings, as well as important welfare and distributional effects.

One common feature in these models is that individuals face exogenous borrowing constraints, in fact, zero-borrowing limits. Consequently, they do not account for the possible effect that a change in the social security regime may have on the incentives to default on previous debts. With limited commitment, financial intermediaries take into account an individual rationality constraint from the borrower's side, namely, that the value of paying back the debt is no less than the value of defaulting given an exogenous punishment, associated to some level of exclusion from financial markets in the future. Hence, a drastic change in the economic environment like a social security reform may affect the relative value of default and the endogenous debt constraints associated to it. If idiosyncratic risk is important, these changes in borrowing limits affect precautionary savings and household's debt position.<sup>1</sup>

To analyze (and quantify) this mechanism, we build a large overlapping generations model where households face uninsurable idiosyncratic earnings shocks. Agents live for a maximum number of periods and retire at an exogenous age. In addition to idiosyncratic income risk, agents face a life cycle profile of average earnings and mortality risk after retirement. All agents are ex-ante equal. Markets are incomplete by assumption, since we only allow for one asset. These features of the model are standard in the social security literature and correspond closely to the assumptions in Imrohoroglu et al. (1995). We depart from this literature by assuming that, because of lack of commitment, financial intermediaries are only willing to lend to a worker the maximum amount of resources that satisfies the rationality condition of no default for *all* possible values of the earnings shock tomorrow. A similar assumption has been used by Zhang (1997), Fernandez Villaverde and Krueger (2002), and Bai and Zhang (2005), among others. Consequently, individuals face age-specific borrowing limits and there is no default in equilibrium.

Our choice of the financial structure requires some discussion. In the incomplete markets literature our structure lies somewhere in between two classes of models. On the one hand, precautionary savings models (as in Huggett, 1993 and Aiyagari, 1994) exogenously restrict the number of assets to one and assume a borrowing limit (often, zero borrowing). On the other hand, the seminal paper by Kehoe and Levine (1993), followed by Alvarez and Jermann (2000), assumes a full set of contingent assets but with an endogenous borrowing limit in each arising from the lack of commitment from the borrower's side. In our model we do restrict the set of assets, as in the first framework, but we also endogenize the borrowing limit, as in the second. The main reason for not following Kehoe and Levine (1993) throughout and assume a complete set of contingent assets is because such a formulation would minimize the role of precautionary savings, which are key to our story. Moreover, the results would be less comparable to the current social security literature, which assumes one asset and exogenous limits.<sup>2</sup>

We start from the steady state of our economy under a pay-as-you-go social security system with a generous replacement rate. Each worker pays a social security tax proportional to her labor income when working, and collect benefits after retirement. We assume that the benefits are the same for all retirees, independently of the amount contributed to the social security fund. Hence, social security plays an insurance role against earnings shocks during the working life. The basic experiment is to compare this steady state, calibrated to reproduce some key statistics for the US economy, to one in which the replacement rate is zero so workers have also to build their own savings for retire-

<sup>1</sup> A similar intuition is provided by the paper of Krueger and Perri (1999), although their experiment is to change the progressivity of income taxation instead of eliminating social security. In an economy with complete set of assets but endogenous debt limits, they do find important effects on the amount of risk-sharing that can be sustained in equilibrium. A previous attempt to incorporate endogenous borrowing constraints in social security models is the work by Andolfatto and Gervais (2001). Using a three-period overlapping generations model with no income risk, they find that modeling borrowing constraints endogenously is not quantitatively important. By adding income risk and precautionary savings, we are able to generate a more significant role for endogenous borrowing limits.

<sup>2</sup> Even constrained to not have state-contingent assets, our financial structure is not optimal in the sense that there are incentives for financial intermediaries to offer loans with a positive probability of default at a higher, type-specific, interest rate. In Section 6, we check the robustness of our results to the addition of risky loans with a default option, as in Chatterjee et al. (2004). Our qualitative results do not change and we do obtain additional predictions for default rates after a social security reform.

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