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Social security is NOT a substitute for annuity markets <sup>☆</sup>Frank N. Caliendo <sup>a</sup>, Nick L. Guo <sup>b</sup>, Roozbeh Hosseini <sup>c,\*</sup><sup>a</sup> Utah State University, United States<sup>b</sup> University of Wisconsin-Whitewater, United States<sup>c</sup> Arizona State University, United States

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## ABSTRACT

Common wisdom suggests that a fully-funded actuarially fair social security system should increase welfare when households face longevity risk and annuity markets are missing. This wisdom is based on the observation that social security pays benefits as life annuities and therefore appears to complete the market. However, we argue that common wisdom is based on a benefit-only analysis that ignores a fundamental cost—social security crowds out the bequests that households leave (and receive) in general equilibrium. We conduct a general equilibrium cost-benefit analysis of the longevity insurance role of social security, and we show that under certain conditions this decline in bequest income offsets any possible gains from access to a public annuity pool. We abstract from distortions to national income and factor prices to show that the equilibrium bequest channel is all that is needed to reach this conclusion.

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## 1. Introduction

A normative rationale for the existence of social security is the provision of lifetime annuity insurance.<sup>1</sup> The private annuity market in the US is very thin, which means that few households are sharing their longevity risk in the market.<sup>2</sup> Given this fact, a common view is that a fully-funded actuarially fair social security system should increase welfare since social security pays benefits as life annuities that provide a higher implicit return than can be found in the market.

In this paper we claim that common wisdom about the insurance role of social security is not correct. We argue that common wisdom is based on a *benefit-only* analysis that ignores a fundamental cost—social security crowds out the bequests that households leave (and receive) in general equilibrium. We show that under certain conditions this crowding out of bequest income is in fact large enough to cancel out any welfare gains from participating in a public annuity pool with an above-market return. We abstract from distortions to national income and factor prices to show that the equilibrium bequest channel is all that is needed to reach this conclusion. This is because social security payments, unlike annuities purchased

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<sup>1</sup> See for example Diamond (1977, 2004) and Feldstein (2005).

<sup>2</sup> See Pashchenko (2013) for a survey and quantitative analysis of the leading explanations for why the annuity market is so thin.

with one's savings on the private market, are independent of saving decisions and therefore do not affect intertemporal trade-offs (Euler equation). Thus social security only affects the lifetime income of the household. But if bequest income is carefully accounted for in general equilibrium, then any increase in lifetime income from participating in a mandatory annuity pool must be offset by a reduction in bequest income or else the aggregate resource constraint is violated.

Therefore, when we say that “social security is not a substitute for annuity markets,” we mean that social security falls short of what a private (competitive) annuity market could accomplish. Unlike a private annuity market which would allow households to insure their longevity risk and reach the first-best consumption allocation, social security fails to provide any welfare gains at all even when households have no other way to insure their longevity risk. This is true even when we assume social security is actuarially fair and there are no inefficiencies in financing the system (fully funded).

We first use a stylized two-period OLG model in Section 2 to make our intuition clear. Rational households face survival uncertainty but lack access to annuity markets. They can only save in a zero-interest storage technology. The rate of population growth is also zero. Households may die with assets (accidental bequests), which are distributed anonymously to survivors in the population without regard to specific linkages between parents and children (we relax this assumption later). This assumption is motivated by a vast literature in quantitative macroeconomics that uses life-cycle OLG models (see for example Hubbard and Judd, 1987; İmrohoroğlu et al., 1995; Conesa and Krueger, 1999; Huggett and Ventura, 1999; Hong and Ríos-Rull, 2007, and Nishiyama and Smetters, 2007 among many others). To focus on the longevity insurance aspect of social security and to abstract from its effect on work incentives and retirement, we assume inelastic labor supply and exogenous retirement. In this setting we prove analytically that, as long as borrowing constraints do not bind, a fully-funded actuarially fair social security system improves welfare when bequest income is fixed but has no effect at all on consumption or welfare when bequest income is endogenous.

Next, in Section 3 we extend the two-period model to a continuous-time OLG model, but we keep the assumption that the rate of population growth equals the interest rate on savings (though they need not be zero). The continuous-time setting allows us to consider all possible equilibrium age-distributions of bequest income. We again prove analytically that, as long as borrowing constraints do not bind, social security has no effect on consumption or welfare when bequest income is endogenous.

Then in Section 4 we conduct numerical experiments to show that our result continues to hold and actually grows stronger as we expand the analysis to allow the interest rate to exceed the rate of population growth. We make a direct comparison to Hubbard and Judd (1987). By holding bequest income fixed, we replicate the results found in Hubbard and Judd (1987): a fully-funded social security system can generate large welfare gains when liquidity constraints are absent but these gains are reduced or even reversed when liquidity constraints are present. However, by allowing bequest income to adjust in general equilibrium, we confirm our analytical findings and we uncover a set of new findings not found in Hubbard and Judd (1987): now a fully-funded social security system reduces welfare for all parameterizations in which the interest rate exceeds the population growth rate and for any assumption about liquidity constraints. Reductions in equilibrium bequest income more than crowd out any gains from mandatory annuitization.

Finally, in a detailed appendix we relax the anonymous-bequest assumption and adopt an alternative that is less popular (mainly because of its analytical and computational complexity) but perhaps more realistic. We assume bequests are distributed through direct linkages between deceased parents and surviving children (as in Eckstein et al., 1985a and Abel, 1985). In this alternative case, there is heterogeneity in wealth across households due to heterogeneity in the timing of the deaths of their entire ancestry. We show that while such an assumption can lead to a welfare role for social security, the welfare gains are due to reducing the variance of the distribution of wealth. In other words, social security improves welfare because it redistributes wealth from the rich to the poor or because it provides insurance against bequest income risk. Whether the gains come through the former or the latter channel depends on the assumptions we make about the timing of information. But in either case, the gains are not coming from longevity insurance, unless we broaden longevity insurance to include insurance against which ancestral line individuals will join at birth.

### 1.1. Related literature

The usefulness of social security as a provider of longevity insurance has been quantitatively explored by Hubbard and Judd (1987), İmrohoroğlu et al. (1995), Conesa and Krueger (1999), Hong and Ríos-Rull (2007) among many others. These papers study the welfare implications of various social security arrangements in dynamic OLG models with multiple layers of uncertainty, market incompleteness and (possibly) multiple social insurance programs. We complement their quantitative analysis by proving analytically that under certain conditions social security, *in isolation*, fails to improve welfare when annuity markets are missing. To our knowledge, this fundamental result is new to the literature.

It has long been known (at least since Eckstein et al., 1985a and Abel, 1988) that social security does not improve welfare when households already have access to perfect annuity markets. But our contribution is to show that social security does not improve welfare even when annuity markets are totally missing. In making these statements we are, of course, focusing just on the longevity insurance role of social security while abstracting from other roles such as other forms of risk sharing, wealth redistribution, and solving the government time-inconsistency problem.

Abel (1986) and Eckstein et al. (1985b) point out that there is a welfare enhancing role for social security in the presence of adverse selection in the annuity market. Social security forces households with different mortality types to pool their survival risk and hence provides a better implicit rate of return than annuity contracts traded in the market. Our assumption

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