Effects of uncertain lifetime and annuity insurance on capital accumulation and growth

Luisa Fuster
Departament d'Economia i Empresa, Universitat Pompeu Fabra,
Ramon Trias Fargas 25-27, E-08005 Barcelona, SPAIN (e-mail: luisa.fuster@econ.upf.es)

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Summary. This paper studies the effects of uncertain lifetime on capital accumulation and growth and also the sensitivity of those effects to the existence of a perfect annuities market. The model is an overlapping generations model with uncertain lifetimes. The technology is convex and such that the marginal product of capital is bounded away from zero. A contribution of this paper is to show that the existence of accidental bequests may lead the economy to an equilibrium that exhibits asymptotic growth, which is impossible in an economy with a perfect annuities market or with certain lifetimes. This paper also shows that if individuals face a positive probability of surviving in every period, they may be willing to save at any age. This effect of uncertain lifetime on savings may also lead the economy to an equilibrium exhibiting asymptotic growth even if there exists a perfect annuities market.

Keywords and Phrases: Asymptotic growth, Convex technology, Uncertain lifetimes, Accidental bequests, Perfect annuities market.

JEL Classification Numbers: E21, D81, D91.

1 Introduction

It is well known that in the class of convex technology models equilibrium growth is not possible when lifetimes are bounded. This paper studies...
equilibrium growth in this class of models with bounded but uncertain lifetimes. I show that equilibrium growth is possible when there is no annuities market. I also show that equilibrium growth is possible even in the presence of an annuities market if individuals face a constant conditional probability of surviving at any age.

In an overlapping generations model with a convex technology, Boldrin [3] and Jones and Manuelli [10] demonstrated that equilibrium growth is not possible when lifetimes are deterministic and finite. They also showed that equilibrium growth requires that the young buy from the old an ever increasing stock of capital. But the young cannot afford to buy an increasing stock of capital because their income grows at a lower rate than capital. This suggests two ways of restoring equilibrium growth. One is to provide the young with enough resources to afford an ever increasing stock of capital. I show that accidental bequests can play this role. Another way is to prevent the old from exhausting their assets. I show that if individuals face a positive probability of surviving at any age, they may be willing to save at any age.

The effects of uncertain lifetimes on growth have not yet been analyzed. The early contributions in the literature focused on the effects of uncertain lifetimes on individuals’ savings decisions in a partial equilibrium setting (see, for instance, Yaari [13] and Davies [4]). More recently Abel [1] and also Kotlikoff, Shoven, and Spivak [11] focused on the impact of uncertain lifetimes and annuity insurance on aggregate wealth accumulation. Abel used a partial equilibrium model for an analytical study while Kotlikoff et al. relied on simulations using a general equilibrium setting. In contrast to these analyses my paper provides an analytical study of the growth effects of uncertain lifetimes in a general equilibrium framework.

I use a version of the standard overlapping generations model used by Boldrin [3] and Jones and Manuelli [10] where lifetimes are uncertain. In particular, I develop two models of uncertain lifetime: bounded uncertain lifetime and unbounded uncertain lifetime. In the first model individuals’ age has a bounded support while in the second the support of individuals’ age is unbounded. In both models expected lifetime is finite.

I use the first model to show that equilibrium growth is possible in the class of convex technology models with finite horizons. If there is no annuities market, there is a region of parameter values for which there exists an equilibrium that exhibits growth and that is unique. On the other hand, if there are annuities, growth is not possible because annuities preclude accidental bequests.

My model with bounded lifetimes can be viewed as a general equilibrium version of the framework studied in Abel [1]. Abel found that an annuities market may induce an increase or a decrease in aggregate capital accumulation depending on the elasticity of intertemporal substitution of consumption. My findings show that Abel’s results only apply when the equilibrium of the economy without annuity insurance does not exhibit growth.

In the model with unbounded uncertain lifetimes, equilibrium growth is possible even when there are no accidental bequests. Transfers to the young