The dynamics of sustainable growth with overlapping generations

Goenka, Aditya* Jafarey, Saqib† Liu, Lin ‡ Poulsen, Odile§

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Abstract

We study the dynamics of an overlapping generations economy with renewable resources, labor and capital. Extraction of the renewable resource, which has a concave regeneration function, is costly requiring labor input.[1] While the stock of resource itself does not have property rights, the extracted resource does. There is a choice of how much labor to allocate to production of the final good and to the extraction of the renewable resource that is solely used for production of the final good. We study different configurations of the production technology and characterize sustainability, i.e. the stock of the renewable resource is positive in a steady state, and multiplicity and dynamics of the steady state. If the production function for final output is of a standard form modified for three factors: namely, Cobb Douglas or CES, or of a form in which the resource augments the productivity of labour alone, then the dynamics of resource extraction are independent of the capital stock, leading to a unique steady state with monotonic convergence to the steady state. If the natural resource is capital augmenting, then there can be multiple steady states - one with a high and one with a low stock of the natural resource.[2]. The former is a sink. We show that regardless of the nature of steady states, if the initial stock of capital is not too high, the economy will converge to an interior steady state in the natural resource, i.e. the renewable natural resource will be sustainable. In our framework, it is the cost of extraction of the renewable resource that makes it sustainable unlike some of the literature where it is the ownership of the stock of resource that generates incentives to keep it sustainable (see Mourmouras (1991) and Farmer (2000)).

*University of Birmingham, a.goenka@bham.ac.uk

†City, University of London, s.s.jafarey@city.ac.uk

‡University of Liverpool, lin.liu@liverpool.ac.uk

§University of East Anglia

[1] As in Elliason and Turnovsky (2004) who study an infinitely lived agent model.

[2] See also Koskela, Ollikainen and Puhakka (2001)