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Capital externalities in OLG economies

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Abstract

The recent literature has stressed that *externalities*, however small, may lead to indeterminacy and endogenous fluctuations while, on the contrary, *intertemporal substitution in consumption* leads to local uniqueness. This paper introduces increasing returns, through aggregate capital externalities, into the overlapping generations model with endogenous labor and consumption in both periods of life. We show that local determinacy of the steady state prevails, when externalities are arbitrarily small, as long as the fraction of young-age consumption out of wage income is large enough. Conversely, local indeterminacy with small externalities requires both labor supply to be close to indivisible and unrealistic values of the propensity to save out of the wage income. More surprising is the fact that increasing the size of externalities indeed *reduces* the range of values of the consumption-to-wage ratio associated with multiple equilibria, because of two conflicting effects on savings that operate through wage and interest rate.

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1. Introduction

It is well known that endogenous labor supply coupled with aggregate externalities may lead to local indeterminacy, sunspots and endogenous cycles in a variety of dynamic models. This is, for instance, the case in the Ramsey model, as modified by Benhabib and Farmer (1994); in models with capital market imperfections, see Cazzavillan et al. (1998); in multi-sector frameworks, e.g. Ladron-de-Guevarra et al. (1999); in the overlapping generations model (OLG thereafter), as shown in Cazzavillan (2001). In particular, the latter contribution has proved that local indeterminacy and endogenous fluctuations may occur in the OLG model when externalities originated by the average capital stock are arbitrarily small. On the other hand, Cazzavillan and Pintus (2004) have pointed out, in the context of OLG economies without externalities, that intertemporal substitution in consumption is a critical mechanism which enables agents to arbitrage away expectation-driven fluctuations when the ratio between savings and wage is reasonably low.

To summarize, the current literature stresses the fact that *externalities*, however small, may lead to indeterminacy when consumption only occurs in the second period of life (Cazzavillan, 2001), while, on the contrary, *intertemporal substitution in consumption* leads to local uniqueness (Cazzavillan and Pintus, 2004). Therefore, one naturally wonders whether intertemporal equilibria are locally (in)determinate when arbitrarily small externalities are introduced in OLG economies with consumption in both periods of life. In particular, it remains unclear if local indeterminacy occurs for reasonable parameter values, including both (close to) Cobb–Douglas technology and a not too small propensity to consume out of wage income. Moreover, it is still an open question to understand whether introducing capital externalities enlarges or reduces the range of parameter values compatible with endogenous fluctuations.

This paper aims at answering these questions. We focus on the average capital stock spillover effects, following the standard Arrow–Frankel–Romer like learning-by-doing argument, which we view as consistent with the length of the period implied by the OLG setting. We show that, in the presence of arbitrarily small capital externalities, assuming that the young generation consumes a realistically large fraction of his wage income leads to an important prediction: exactly as in the standard optimal growth model, there is, when it exists, a *unique* equilibrium path converging to the steady state. Therefore, intertemporal substitution in consumption across periods is shown to be a critical mechanism which is not weakened by the presence of externalities, as it enables *short-lived* agents to rule out, by arbitrage, expectation-driven fluctuations when the ratio between savings and wage is reasonably low. Most importantly, *we show that the larger capital externalities, the lower the values of the consumption/wage ratio that are associated with local indeterminacy and expectation-driven fluctuations.* The following intuitive description may help the reader to clarify the mechanisms at work and their interplay. In this model, cyclical paths (be they deterministic or stochastic) arise because of the interaction of two conflicting effects: when the capital stock increases (say, from its steady-state value), this triggers an increase in wage and, therefore, an increase in savings which leads to a higher capital stock in the next period. However, capital

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