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## Mathematical Social Sciences

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# On efficiency and local uniqueness in two-sector OLG economies<sup>☆</sup>

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### ARTICLE INFO

#### Article history:

Received 16 July 2009

Received in revised form

12 October 2009

Accepted 2 November 2009

Available online 12 November 2009

#### JEL classification:

C62

E32

O41

#### Keywords:

Two-sector OLG model

Efficiency

Local uniqueness

### ABSTRACT

We consider a two-sector overlapping generations model with homothetic preferences. Under standard conditions on technologies, upon large enough values for the share of first period consumption over the wage income, we prove that the dynamic efficiency and local uniqueness of the competitive equilibrium hold. On the contrary, for lower values of the share of first period consumption over the wage income which imply dynamic inefficiency of the steady state, local indeterminacy arises when the elasticity of intertemporal substitution in consumption is large enough.

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<sup>☆</sup> This work was supported by the French National Research Agency Grant (ANR-08-BLAN-0245-01). We thank H. d'Albis, J. Benhabib, K. Borissov, B. Decreuse, R. Farmer, C. Ghiglino, C. Hara, T. Kamiyigashi, H. Kubota, N. Kudoh, T. Lloyd-Braga, T. Nakajima, O. Schmitz, T. Seegmuller for useful comments, and more specifically an anonymous referee, an associate editor and F. Dufourt for their many suggestions that allowed us to greatly improve the results and the exposition. This paper is based on two Working Papers by the same authors: "Does dynamic efficiency rule out expectations-driven fluctuations?" (WP GREQAM 2006-49) and "Local indeterminacy in two-sector overlapping generations models" (WP GREQAM 2008-26).

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## 1. Introduction

Contrary to models with a finite number of infinitely-lived agents in which the competitive equilibrium is Pareto efficient and locally unique, Pareto inefficiency and local multiplicities arise within models with an infinite number of finitely-lived agents.<sup>1</sup> The possibility of dynamic inefficiency in the overlapping generations (OLG) model with production has been initially demonstrated by [Diamond \(1965\)](#). It is related to the over-accumulation of the capital stock with respect to the Golden Rule. In other words, it is associated with too high a saving rate, and a Pareto-improvement can be achieved by allowing the current generation to devour a portion of the capital stock while leaving the consumption of all future generations intact.

In spite of the sub-optimality of the competitive equilibrium in the [Diamond \(1965\)](#) OLG model, it is well known that, under gross substitution in consumption, endogenous business cycle fluctuations cannot occur. In contrast, in two-sector models, endogenous fluctuations arise when the consumption good sector is capital intensive even under a gross substitutability assumption. The input allocations across sectors, which are driven by Rybczinsky and Stolper–Samuelson effects, then generate oscillations of the capital accumulation path.<sup>2</sup> Moreover, local indeterminacy and expectations-driven fluctuations can also arise.

Interestingly, and as this was shown by [Reichlin \(1992\)](#), local indeterminacy and endogenous fluctuations can occur under dynamic inefficiency in a two-sector OLG model with Leontief technologies.<sup>3</sup> However, a clear understanding of the relationship between dynamic efficiency and local determinacy with positive elasticities of capital–labor substitution is still missing.

The central question raised in this paper is then whether the dynamic efficiency of the intertemporal allocation of capital may be a strong enough property of the competitive equilibrium to prevent the occurrence of endogenous fluctuations. The answer is positive: we prove that the conditions for dynamic efficiency rule out aggregate volatility derived from local sunspot equilibria, and that local indeterminacy arises when the steady state is dynamically inefficient.<sup>4</sup> Our conclusions appear to be at odd with previous analysis of OLG models in which it is claimed that there is no general connection between determinacy of equilibrium and Pareto efficiency. But, all the known examples of the co-existence of local indeterminacy and Pareto efficiency are based either on pure exchange economies or on production economies in which the standard assumption of gross substitutability is violated (see for instance [Kehoe and Levine \(1985\)](#), [Reichlin \(1992\)](#), and [Woodford \(1984\)](#)).

We consider a formulation of the two-sector OLG model based upon standard sectoral technologies. We also assume a life-cycle utility function which is linearly homogeneous with respect to young and old consumptions so that the propensity to consume, or equivalently the share of first period consumption over the wage income, only depends on the gross rate of return on financial assets and the saving function is linear with respect to wage. Building on this property, we provide simple conditions on the propensity to consume for the existence of a steady state.

Our analysis first focuses on the dynamic efficiency properties of competitive equilibria. We show that the steady state is lower than the Golden Rule capital stock if and only if the share of first period consumption over the wage income is large enough. We also prove that under this condition, any competitive equilibrium converging to the steady state is dynamically efficient. [Reichlin \(1992\)](#) considers a two-sector OLG model in which two steady states exist, a first one called wealth-capital, for which there is an equality between the aggregate stock of capital and total private wealth, and a second one corresponding to the Golden Rule. He provides a detailed dynamical analysis of the wealth-capital steady state but he does not discuss whether the associated capital stock is lower or larger than the Golden Rule.

<sup>1</sup> See [Kehoe et al. \(1990\)](#) and [Woodford \(1984\)](#).

<sup>2</sup> See [Galer \(1992\)](#) and [Venditti \(2005\)](#).

<sup>3</sup> Note that if positive outside money is considered, [Reichlin](#) also shows the possible existence of local indeterminacy around a Golden Rule steady state but this requires the violation of the gross substitutability assumption.

<sup>4</sup> Considering an aggregate OLG model augmented to include endogenous labor, [Cazzavillan and Pintus \(2006, 2007\)](#) also show that local indeterminacy is ruled out if the steady state is characterized by an under-accumulation of capital.

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