



Indeterminacy in a dynamic small open economy

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Received 28 June 2000; accepted 16 April 2001

Abstract

We show that, even under socially constant returns to scale, indeterminacy, i.e., continuum of dynamic general equilibrium paths converging to a common steady state, can arise in a dynamic small open economy with production externalities and endogenous time preferences in which production is incompletely specialized. © 2002 Elsevier Science B.V. All rights reserved.

JEL classification: C61; F43

Keywords: Indeterminacy; Small open economies; Endogenous time preferences

1. Introduction

The purpose of this paper is to study the properties of equilibrium paths in a dynamic small open economy with external effects. We will show that indeterminacy can arise under constant returns to scale production functions and endogenous time preference.

The growing interest in indeterminacy¹ is, to a considerable extent, based on its potential usefulness in macro-economics. Since indeterminacy means

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¹ See a recent survey article, Benhabib and Farmer (1999).

that there exists a continuum of equilibria starting from the same initial condition, it allows the introduction of sunspot shocks that is an alternative impulse to shocks in economic fundamentals like preferences, technologies and resource endowments. Thus, indeterminacy provides a new theoretical basis for explaining economic fluctuations in market economies.

In the theoretical literature, indeterminacy was obtained under the assumption that production displays socially increasing returns to scale.² However, recent empirical studies have suggested that returns to scale are roughly constant, if not decreasing.³ Thus, it is natural to ask whether indeterminacy is theoretically possible under socially constant returns. Recently, Benhabib and Nishimura (1998) and Benhabib et al. (2000) gave a positive answer. They showed that indeterminacy can arise in multisector models with concave utility function and Cobb–Douglas production functions that exhibit socially constant but privately decreasing returns. Subsequently, Meng and Velasco (1998) showed that the same is true for an open economy model by introducing an international credit market.

This paper shows that indeterminacy arises if the ranking of private and social factor intensities among sectors satisfies certain conditions and if the rate of time preference is an increasing function of the level of consumption. This main result makes three contributions to the literature on indeterminacy and to that on endogenous time preference.

First, while Benhabib et al. assumed socially constant but privately decreasing returns, our result means that indeterminacy can arise even under *both socially and privately constant returns*, if a part of the assumed externalities is negative. This result implies that indeterminacy is compatible with the standard free entry and exit condition: We do not need to assume any type of market imperfection or regulation that fixes the number of firms.

Second, based on the main result, we can prove that under the same ranking of factor intensities as above, the steady state is saddlepoint stable if the rate of discount is decreasing in the level of consumption. That is, if the steady state is stable in the ordinary sense under the Uzawa (1968) assumption of an increasing discount rate then it is saddlepoint-stable under the Fisher (1907) assumption of a decreasing discount rate. It is well known in the literature on endogenous time preference that the Uzawa assumption is necessary for convergence of the infinite-horizon optimal saving.⁴ On the other hand, the main result implies that we can characterize dynamic equilibrium paths even under the Fisher assumption.

Third, while Benhabib and Nishimura (1998) and Benhabib et al. (2000) specify production functions as Cobb–Douglas, the main result in this paper

² See Benhabib and Farmer (1994).

³ See Basu and Fernald (1994a, b), Burnside et al. (1995) and Burnside (1996).

⁴ The Uzawa assumption was used by Nairy (1984), Epstein (1987) and Obstfeld (1990).

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