

# Indeterminacy in a Small Open Economy Ramsey Growth Model

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This paper presents a small open economy version of the J. Benhabib and R. E. A. Farmer (1996, *J. Monet. Econ.* 37, 421–443) two sector optimal growth model with production externalities. It is shown that indeterminacy is considerably easier to obtain under a regime of perfect world capital markets than in the closed economy variant. Furthermore, the result is not dependent on a high labor supply elasticity since that input is fixed. The paper also examines a variant which takes into account external borrowing constraints and it is shown that the qualitative results on indeterminacy remain basically unaffected by this extension. *Journal of Economic Literature* Classification Numbers: E32, F12. © 2001 Academic Press

*Key Words:* indeterminacy; small open economies; increasing returns.

## 1. INTRODUCTION

Recent advances in macroeconomics have highlighted the importance of self-fulfilling prophecies in explaining economic instability. Models identified with this “indeterminacy literature” are able to account for business cycles and other macroeconomic phenomena without having to rely on shocks to fundamentals (see Benhabib and Farmer [3] for an extensive survey). Furthermore, it has been demonstrated that the occurrence of indeterminacy is not restricted to assumptions that are *a priori* unrealistic. Indeed non-uniqueness of equilibria can arise straightforwardly in dynamic general equilibrium settings once the hypothesis of perfect markets and constant returns in production is abandoned.

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In this context, the intent of this paper is to develop a two sector open economy model with externalities in production. In particular, we study an international economy version of Benhabib and Farmer [2]. It will be shown here that indeterminacy is obtained not only at lower returns to scale than in the closed economy case but also at insignificant levels thereof. This aspect of the model is of importance since recent empirical work has demonstrated that aggregate scale economies are close to constant (see, for example, Basu and Fernald [1], Burnside [7], and Harrison [8]). Moreover, these estimates have pointed to values that are too low to give a number of existing indeterminacy models a sufficient empirical foundation.

The reason for indeterminacy in the present model is that perfect capital markets allow the smoothing of consumption via international lending and borrowing at a constant world interest rate. Accordingly, the implied irrelevance of utility curvature makes it easier to construct alternative investment paths—the need to curtail consumption as a consequence of investment bunching disappears. Indeterminacy still arises from a correct path of prices in the presence of externalities, however, these can be minimal in size. Unlike the closed economy variant, the desire to smooth consumption must not be offset by a sufficient amount of increasing returns.

The assumption of a constant external interest rate can be justified as long as the country is small compared to the world market. However, there are many situations where the rate of interest does depend on the amount of debt. We shall therefore also consider an open economy which faces an imperfect capital market. It will be shown that the qualitative results remain unchanged even when the economy is facing constraint lending.

In a related work, Lahiri [11] establishes that in a (perfect market) small open economy endogenous growth model indeterminacy arises more straightforwardly than in closed economy versions. The model that is constructed here is less abstractly formulated than Lahiri's and consequently allows for a more elaborate specification of imperfections, e.g., increasing returns. That is, we can quantify returns to scale in a way that we can draw plausible inferences from empirical work. Furthermore, our model structure is well embedded in the formulation most recently used in the indeterminacy literature. Thus, a comparison to closed economy versions can easily be undertaken. Meng and Velasco [12] specify a two sector open economy along the lines of Benhabib and Nishimura [4]. That is, they allow for decreasing internal and constant overall returns to scale in production. In their case, increasing returns may come from fixed costs rather from a declining marginal costs schedule. Here we specify only differing externalities so as to isolate the importance of these effects while assuming constant returns at the firm level. Finally, both Lahiri's and the Meng–Velasco works do not consider imperfect capital markets which will be done here.

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