On Intersectoral allocations, factors substitutability and multiple long-run growth paths

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Summary. This article considers a two-sector model of economic growth with “labour-augmenting” intersectoral external effects stemming from the aggregate capital stock. It is shown that equilibrium balanced growth paths with a non-trivial labour allocation scheme become available. A set of sufficient conditions for the existence of multiple equilibrium growth rays is provided and their determinacy properties are then characterised. Finally, examination of a parameterised C.E.S. economy illustrates the central role of non-unitary values for the elasticity of substitution in the multiplicity issue.

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JEL Classification Numbers: E32, O41.

1 Introduction

This contribution addresses the scope for long-run indeterminacies that result from the consideration of labour-augmenting intersectoral external effects in a benchmark multisector growth model with one consumption good and one capital good. The argument proceeds by first showing how an unmodified classical...
optimal growth structure can be reconciled with growth paths once these effects are introduced. This builds on an explicit labour allocation mechanism in the two sectors which is obtained under the assumption that labour can costlessly be shifted at each instant from one sector to the other. The analysis then provides a sufficient condition for the existence of multiple stationary growth rates. It is shown that the possibility of multiplicity results directly from the non-trivial allocation mechanism of the fixed factor between the two sectors together with non-unitary values for the sectoral elasticities of substitution between capital and labour. It is also shown that such a sufficient condition is intimately related to the standard capital intensity condition of the optimal growth literature, i.e., a relatively capital intensive investment good industry. Careful examination of a C.E.S. model reveals all these features, particularly the emergence of multiple equilibrium growth rays.

The only explicit example of multiple equilibrium growth rays that is available in the literature is due to Benhabib and Perli [2]. The example here differs from theirs in at least three respects. Firstly, the endogeneity of labour supply is a key ingredient to their argument while it is not considered here. Secondly, and more substantially, by building upon an entirely classical private representation, a non-trivial answer for the allocation mechanisms of the two inputs is preserved and turns out to be essential to the multiplicity issue. Thirdly, retaining a non-unitary elasticity of substitution is essential in the multiplicity perspective. In opposition to this, the whole line of argument of Benhabib and Perli is based on Cobb-Douglas specifications.

On related concerns, a recent contribution by Benhabib, Meng and Nishimura [1] has delivered an interesting picture of indeterminacy for multiple capital goods in a Cobb-Douglas economy with sector-specific external effects, though their argument is limited by the fact that it builds upon an atypical sectoral configuration where the consumption good is capital intensive at the private level. This contrasts with the set of conclusions obtained here which are based upon intersectoral external effects where indeterminacy can only be obtained when the investment good is relatively capital intensive.

The basic framework is developed in Section 2. Section 3 provides a set of multiplicity and indeterminacy results. Section 4 is devoted to the extensive examination of a C.E.S. economy. The main proofs are gathered in a final appendix.

2 An enriched growth-consistent multisector model

2.1 The technological structure

Time is continuous. There are two sectors in the economy. At any date, the first sector produces an amount \( y^0(t) \) of the consumption good whereas the second sector produces an amount \( y(t) \) of the investment good. Both productive activities use capital and labour as inputs. The aggregate capital stock \( x \) and the unitary labour endowment are split at any date between the two sectors: