Journal of Economic Dynamics & Control 32 (2008) 3502–3519

Contents lists available at ScienceDirect

Journal of Economic Dynamics & Control

journal homepage: www.elsevier.com/locate/jedc

Business cycles with free entry ruled by animal spirits

Rodolphe Dos Santos Ferreira [a,*], Teresa Lloyd-Braga [b]

[a] BETA-Theme, Université Louis Pasteur, Strasbourg and Institut Universitaire de France, France
[b] FCEE, Universidade Católica Portuguesa, Lisboa and CEPR, Portugal

ARTICLE INFO

Article history:
Received 15 November 2006
Accepted 19 June 2007
Available online 4 March 2008

JEL classification:
D43
E32
L1

Keywords:
Business cycles
Sunspots
Free entry equilibrium
Indeterminacy

ABSTRACT

We approach business cycles on the basis of extrinsic uncertainty, related to static indeterminacy of free entry oligopolistic equilibria. Firms, producing under increasing returns to scale, compete in prices in contestable markets. The number of active firms varies across sectoral equilibria, which depend upon (correct) producers' conjectures on competitors' actions. Coordination of these conjectures by some Markov chain generates endogenous shocks in markups and productivity. Consumers' expectations may in addition magnify this extrinsic uncertainty. As the source of fluctuations does not rely on dynamic indeterminacy, the required degree of increasing returns may be arbitrarily small, provided goods substitutability within each sector becomes arbitrarily large.

1. Introduction

Business cycles have been principally explained either by exogenous random shocks on the fundamentals (as in the RBC literature) or by extrinsic uncertainty due to indeterminacy occurring in the autonomous dynamic system that characterizes intertemporal equilibria of a stationary economy (as in the endogenous fluctuations literature).[1] Such indeterminacy is usually assigned to the asymptotic local stability of a steady state (or of another attracting orbit[2]), or else to the multiplicity of steady states. Here we propose a different explanation, in which indeterminacy appears as a property of static (temporary) equilibria prevailing in each period and in each production sector. We assume contestable oligopolistic output markets (with competition in prices), where multiple free

* Corresponding author.
E-mail addresses: rdsf@cournot.u-strasbg.fr (R. Dos Santos Ferreira), tlb@fcee.ucp.pt (T. Lloyd-Braga).

[1] Surveys of these two approaches are given by King and Rebelo (1999) and Benhabib and Farmer (1999), respectively.
[2] For instance, a two-period cycle, as in the seminal paper of Azariadis (1981).

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doi:10.1016/j.jedc.2007.06.018

entry equilibria may exist, each one characterized by a number of producing firms that varies according to the (correct) conjectures of all the competitors, whether active or not.[3] This multiplicity is easy to understand. As the individual scale of production is higher the lower the number of active firms at equilibrium, the demand for the output of the $(n+1)$-th firm, contingent on the scales of its n producing competitors, may well be low enough in a n firm equilibrium to make it unprofitable to carry out any vendible production, yet high enough in a $n+1$ firm equilibrium to allow profitable scales to be attained. In spite of market contestability, free entry equilibria will in general be compatible with positive profits: the usual *zero profit condition* appears in fact as a selection device implying that firms always coordinate on the least profitable of all consistent strategy profiles.[4]

In presence of equilibrium multiplicity, producers' conjectures have to be somehow coordinated. We assume that producers refer to some extrinsic stationary Markovian process which, by randomly selecting sectoral equilibria, generates endogenous shocks on total factor productivity (because of increasing returns) and on markups (varying with the degree of concentration). Of course, we may still ascribe the possibility of such endogenous fluctuations to the multiplicity of steady states, but this multiplicity emerges now as a consequence not of the properties of the dynamic system characterizing intertemporal equilibria, but of stochastic perturbations of the system itself, like in RBC models. The difference with these models lies simply in the fact that such perturbations result from firms decisions either to produce or to stay inactive at equilibrium, decisions that are entirely ruled by *animal spirits*[5] in a completely deterministic environment.

This approach is to some extent related to Chatterjee and Cooper (1989) and Chatterjee et al. (1993), except that equilibrium multiplicity crucially depends in their work upon heterogeneity of the fixed costs incurred by entrants as well as upon intersectoral complementarity, whereas we insist on free entry, hence on complete symmetry of the game, and do not rely upon any intersectoral effects. Also, we give conditions for generic existence of a non-degenerate interval of positive integers, each one representing the number of active firms in some existent sectoral equilibrium, whereas they only prove that multiple equilibria *may* exist and, if so, that they are characterized by different, not necessarily contiguous, numbers of active firms. A closely related contribution is Matsuyama (1997), where equilibrium multiplicity in a Dixit–Stiglitz framework results from non-monotonicity, in terms of the number of active producers of intermediate goods, of the share of each one of these goods in the cost of final output. Such non-monotonicity results from the variability of cost sharing between labor and intermediate goods, and is itself the consequence either of asymmetric technologies for different classes of producers of the final good or of multiple technologies available to each one of them. Wang and Wen (2006a), also in a Dixit–Stiglitz framework, introduce two technologies, but now differentiated by the elasticity of substitution among intermediate products. At equilibrium, these technologies lead to the same cost of producing the final good, so that they can be both adopted by new entrants, in an arbitrary proportion that changes in response to sunspots and thus induces markup variations. Finally, Wang and Wen (2006b) obtain existence of sunspots by assuming that the prices of intermediate goods are set under extrinsic uncertainty, before the levels of demand and of factor

[3] The *equilibrium with free entry*, a quite standard Nash solution concept for a non-cooperative one-shot game in which part of the competing firms may end up inactive, has been introduced by Novshek (1980) in the context of Cournot competition. Multiplicity of such equilibria, leading to an indeterminate number of active firms, is not difficult to obtain in spite of the complete symmetry of the game, as shown by d'Aspremont et al. (2000) and Dos Santos Ferreira and Dufourt (2007).

[4] Of course, under the zero profit condition, the equilibrium number of producing firms is determinate (as a result of the implicit selection resulting from that condition), so that it can only vary because of perturbations of market demand, resulting from shocks either on fundamentals or on expectations, and acting upon profitable individual scales. To give but a few examples, see Chatterjee and Cooper (1993) and Portier (1995), both focusing on the endogenous propagation of exogenous disturbances, or Dos Santos Ferreira and Lloyd-Braga (2005), where variations in the number of Cournotian firms can be sustained by self-fulfilling expectations because of either dynamic indeterminacy or multiplicity of steady states. Jaimovich (2007) applies the same overall approach (resorting to dynamic indeterminacy) to oligopolistic price competition.

[5] We thus come closer than usually to the original Keynes' (1936) view of 'animal spirits' as 'a spontaneous urge to action rather than inaction' (p. 161).