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Regional Business Cycle Synchronization through Expectations*

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Abstract

This paper provides an example in which regional business cycles may synchronize via producers' expectations, even though there is no interregional trade, by means of a system of globally coupled, noninvertible maps.

The economy is divided into N regions, each of which has a separate market. For simplicity, let us suppose that there is only one producer in each region, so that there exist N producers in total in the economy. The producer in each region produces homogeneous

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goods and supplies them to the market he operates in. Consumers purchase goods from the market they belong to. Let us assume that there is no interregional trade. Instead the regional markets are connected with each other in the following way: The government announces the average price and the average output of the whole economy at each time period and the producer decides his production plan for the next period based on such average information and other factors.

The derived model is as follows:

$$x_{t+1}(i) = (1-\varepsilon)f(x_t(i)) + \frac{\varepsilon}{N}\sum_{j=1}^{N} f(x_t(j)), \quad i = 1, 2, \cdots, N,$$

where

$$f(x_t(i)) = (1-\phi)x_t(i) + \frac{\phi}{(x_t(i))^{\eta}},$$

$x_t(i)$ is output of i-th region, $\varepsilon \in (0,1)$ is an expectation adjustment coefficient, $\phi \in (0,1)$ is a production adjustment coefficient, and $\eta > 0$ is the inverse of the price elasticity of demand.

We concentrate on the dependence of the dynamics on a parameter η. Simulation results show that several phases (the short transient, the complete asynchronous, the long transient, and the intermediate transient) appear one after another as η increases. In the long transient phase, the intermittent clustering process with a long chaotic transient appears repeatedly.

JEL classification: E32, R12

Key words: Regional business cycle; Synchronization; Globally coupled map; Long transient; Clustering