

Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

International and Domestic Business Cycles as Dynamics of a Network of Networks YUICHI IKEDA, GSAIS, Kyoto University, HIROSHI IYETOMI, Niigata University, HIDEAKI AOYAMA, Kyoto University, HIROSHI YOSHIKAWA, University of Tokyo — Synchronization in business cycles has attracted economists and physicists as self-organization in the time domain. From a different point of view, international and domestic business cycles are also interesting as dynamics of a network of networks or a multi-level network. In this paper, we analyze the Indices of Industrial Production monthly time-series in Japan from January 1988 to December 2007 to develop a deeper understanding of domestic business cycles. The frequency entrainment and the partial phase locking were observed for the 16 sectors to be direct evidence of synchronization. We also showed that the information of the economic shock is carried by the phase time-series. The common shock and individual shocks are separated using phase time-series. The former dominates the economic recession in all of 1992, 1998 and 2001. In addition to the above analysis, we analyze the quarterly GDP time series for Australia, Canada, France, Italy, the United Kingdom, and the United States from Q2 1960 to Q1 2010 in order to clarify its origin. We find frequency entrainment and partial phase locking. Furthermore, a coupled limit-cycle oscillator model is developed to explain the mechanism of synchronization. In this model, the interaction due to international trade is interpreted as the origin of the synchronization. The obtained results suggest that the business cycle may be described as a dynamics of the multi-level coupled oscillators exposed to random individual shocks.

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Date submitted: 15 Nov 2013

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