

# U.S. and Canadian Industrial Production Indices As Coupled Oscillators

Heather M. Anderson  
Department of Economics  
Texas A&M University  
College Station, TX 77843

James B. Ramsey\*  
Department of Economics  
New York University  
New York, NY 10003.

December 1998

## Abstract

This paper explores the impact of different types of dynamical linkages (coupling) between the indices of industrial production for the U.S. and Canada. The Ozaki model provides an appropriate empirical framework for analyzing the dynamic path of each economy's productive activity because it provides an effective approximation to continuous time differential equations. We examine a combination of six different types of linkage between the indices of production. Major questions we study include whether the linkages increase or decrease the stability of the equilibrium paths, whether the linkages encourage or discourage business cycle oscillations, and whether the oscillations are synchronized.

The empirical analysis reveals that for each country the requisite lag structure extends for up to six years and that the coupling linkages are functions of lagged changes in growth rates. Incorporating these linkages leads to an increased degree of oscillation in the equilibrium paths, a marginal improvement in stability, and somewhat greater synchronization between the two series. The out-of-sample forecasts for each series are improved by the coupling.

*JEL classification:* C32, E32.

Keywords: Coupled dynamics, synchronization, macrodynamics, industrial production, Ozaki model, forecasting.

\*Corresponding author: James B. Ramsey, Department of Economics, New York University, 269 Mercer St, New York, NY 10003. Telephone: (212) 998-8947, Fax: (212) 995-3932, e-mail: Ramseyj@Fasecon.Econ.NYU.edu