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## Asymmetries in the response of economic activity to oil price increases and decreases?☆

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### ABSTRACT

It has been common to assume that the relationship between economic activity and oil prices is asymmetric. Theoretical underpinnings for this asymmetry include costly sectoral reallocation, partial equilibrium models of irreversible investment, and some version of precautionary savings. Yet, recent studies that use new methodologies to test for asymmetries in U.S. data have cast some doubts on that premise. In this paper, we use state-of-the-art techniques to evaluate the presence of asymmetries for a set of OECD countries containing both oil exporters and oil importers. We find very little support for the hypothesis that the response of industrial production to oil price increases and decreases is

\* The on-line appendix is available at [http://gatton.uky.edu/faculty/herrera/documents/HLWcou\\_appendix.pdf](http://gatton.uky.edu/faculty/herrera/documents/HLWcou_appendix.pdf). We thank Lutz Kilian, Christiane Baumeister, seminar participants at the 2011 Midwest Econometrics Group Meeting, the Norges Bank workshop on Modeling and Forecasting Oil Prices, the University of Saskatchewan, the University of Windsor, Clemson University, and the University of Kentucky, and two anonymous referees for helpful comments and suggestions. All remaining errors are ours. This paper was previously circulated with the titles "Nonlinearities in the Oil Price-Industrial Production Relationship: Evidence from 18 OECD Countries" and "Asymmetries in the Transmission of Oil Price Shocks to Industrial Production? Evidence from 18 OECD Countries."

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asymmetric. Our results have important implications for theoretical models of the transmission of oil price shocks: they point towards the importance of direct-supply and direct-demand transmission channels, as well as indirect transmission channels that imply a symmetric response.

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## 1. Introduction

How does economic activity respond to oil price shocks? Does economic activity contract when oil prices increase, but no boom ensues when oil prices fall? Until recently, a consensus seemed to exist regarding the asymmetric nature of the relationship between oil prices and the macroeconomy. Indeed, discussions in academic and policy circles often refer –explicitly or implicitly– to the asymmetric nature of the relationship between GDP growth and oil price shocks (see, e.g., [Bernanke et al., 1997](#); [Bernanke, 2006](#)). However, recent work by [Kilian and Vigfusson \(2011a\)](#) has called into question the view that oil price innovations have an asymmetric effect on U.S. GDP growth. In particular, they prove that the methodology commonly used in the empirical literature to assess the possible asymmetry in the response of economic activity to oil price shocks may lead to inconsistent parameter estimates due to a censoring bias. Moreover, they show that the slope based tests carried out in most studies are not informative about the presence of asymmetry in the impulse response functions.

Evaluating whether the relationship between oil prices and economic activity is symmetric constitutes a crucial step in deciding how to model oil prices, in selecting among alternative models of the transmission of oil price shocks, and in getting a good grasp on the magnitude of the macroeconomic effect that positive and negative innovations entail. Despite the large number of studies on the relationship between oil prices and the macroeconomy, almost all we know regarding the importance of the asymmetric channels of oil price transmission has been informed by U.S. data (e.g., [Kilian and Vigfusson, 2011a,b](#)) or stems from estimating censored models with international data, which may lead to inconsistent estimates of the impulse response functions.<sup>4</sup> One thus has to wonder whether the results obtained for the U.S. are just a figment of the particular data set or whether it is a result that generalizes to other countries. If it is the former, then there is no need to revise the way in which we model asymmetries; yet, if it is not, then we should re-think not only the estimation techniques, but also our theoretical models of the transmission of oil price shocks.

Our aim is to explore whether the empirical implications of different models of the transmission of oil price shocks are borne out by the country-level responses to positive and negative oil price innovations. To do so we examine the estimated responses of industrial production for 18 countries belonging to the Organization for Economic Co-operation and Development (OECD). We believe this data set provides a good testing ground for several reasons. First, theoretical explanations for an asymmetric response apply both to oil producers and oil importers, but have only been explored using impulse response based tests for U.S. data. Clearly, the theoretical underpinnings for an asymmetric response apply not only to the U.S., but also to other large net oil importers such as Japan and Germany (see [Fig. 1](#)).

Second, data for oil exporting countries is particularly valuable. In particular, crude oil production represents a large part of GDP for Norway and Canada (see [Fig. 2](#)); hence, conditions for an unexpected oil price innovation to have a large economic impact hold by construction. These data allow us to evaluate whether the presence (or absence) of asymmetry in the industrial production-oil price relationship is related to the share of crude oil production in aggregate output.

<sup>4</sup> Although research into the question of symmetry using OECD data is not new (see, for instance, [Mork et al., 1994](#); [Cunado and Pérez de Gracia, 2003](#); [Jiménez-Rodríguez and Sánchez, 2005](#)), most papers test for symmetry using slope based tests.

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