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How do oil price shocks affect consumer prices?☆

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ABSTRACT

This paper evaluates the degree of pass-through from oil price shocks to disaggregate U.S. consumer prices. We find significantly positive effects of the oil price shock only on energy-intensive CPIs, which imply that significantly positive, though quantitatively small, response of the total CPI is mainly driven by substantial increases in prices of energy-related commodities. Unexpected changes in the oil price may result in decreases in the budget for non-energy commodities, if the demand for energy is inelastic (Edelstein and Kilian, 2009). Decreases in the demand for non-energy commodities will then result in limited influences on prices of those goods, which is consistent with our empirical findings.

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1. Introduction

The extent to which oil price shocks are passed through to domestic inflation has a long tradition in macroeconomics (see, e.g., Barsky and Kilian, 2002; Hooker, 2002; van den Noord and Andre, 2007; Chen, 2009; Kilian and Lewis, 2011). As discussed in Kilian (forthcoming), from a theoretical point of view, the effect of exogenous oil price shocks on consumer prices is ambiguous. On the one hand, oil price shocks may raise the price level, to the extent that they reduce the domestic supply of real output. On the other hand, they may lower the price level to the extent that they depress domestic demand.

This paper provides disaggregate evidence on the effect of oil price shocks on the components of the U.S. consumer price index (CPI), complementing existing evidence on the pass-through at the aggregate level. The importance of studying the effects of oil price shocks using disaggregate data has been illustrated in a number of related contexts including stock returns (Kilian and Park, 2009), consumer expenditures (Edelstein and Kilian, 2009), and industrial production (Herrera, Lagalo, and Wada, 2011).

In what follows, we report very strong and statistically significant inflationary effects only in the expenditure categories of highly energy-intensive commodities, while very limited degree of pass-through to goods and services is found from less energy-intensive expenditures.

We interpret these findings as follows. When the oil price shock occurs, consumers may experience a decrease in real consumption expenditures for non-energy-related goods and services, if the demand for energy-related goods and services is inelastic (Edelstein and Kilian, 2009). This may shift the demand for less energy-intensive goods and services more than those of highly energy-intensive expenditures, resulting in heterogeneous responses to the oil price shock.

The rest of our manuscript is organized as follows. Section 2 provides a data description and the empirical model to study the degree of pass-through to U.S. CPIs. In Section 3, we provide our main findings using highly disaggregated CPI components as well as aggregate level indices. Section 4 concludes.

2. Data descriptions and the empirical model

All data are seasonally adjusted and obtained from the Federal Reserve Economic Data (FRED). The oil price is the spot western Texas intermediate (WTI) and deflated by the U.S. CPI. We study pass-through from the oil price shock to 5 categories of CPI sub-indices that include: Food and Beverages; Housing; Apparel; Medical Care; and Transportations. We also implement similar analysis for 24 components in two additional categories:

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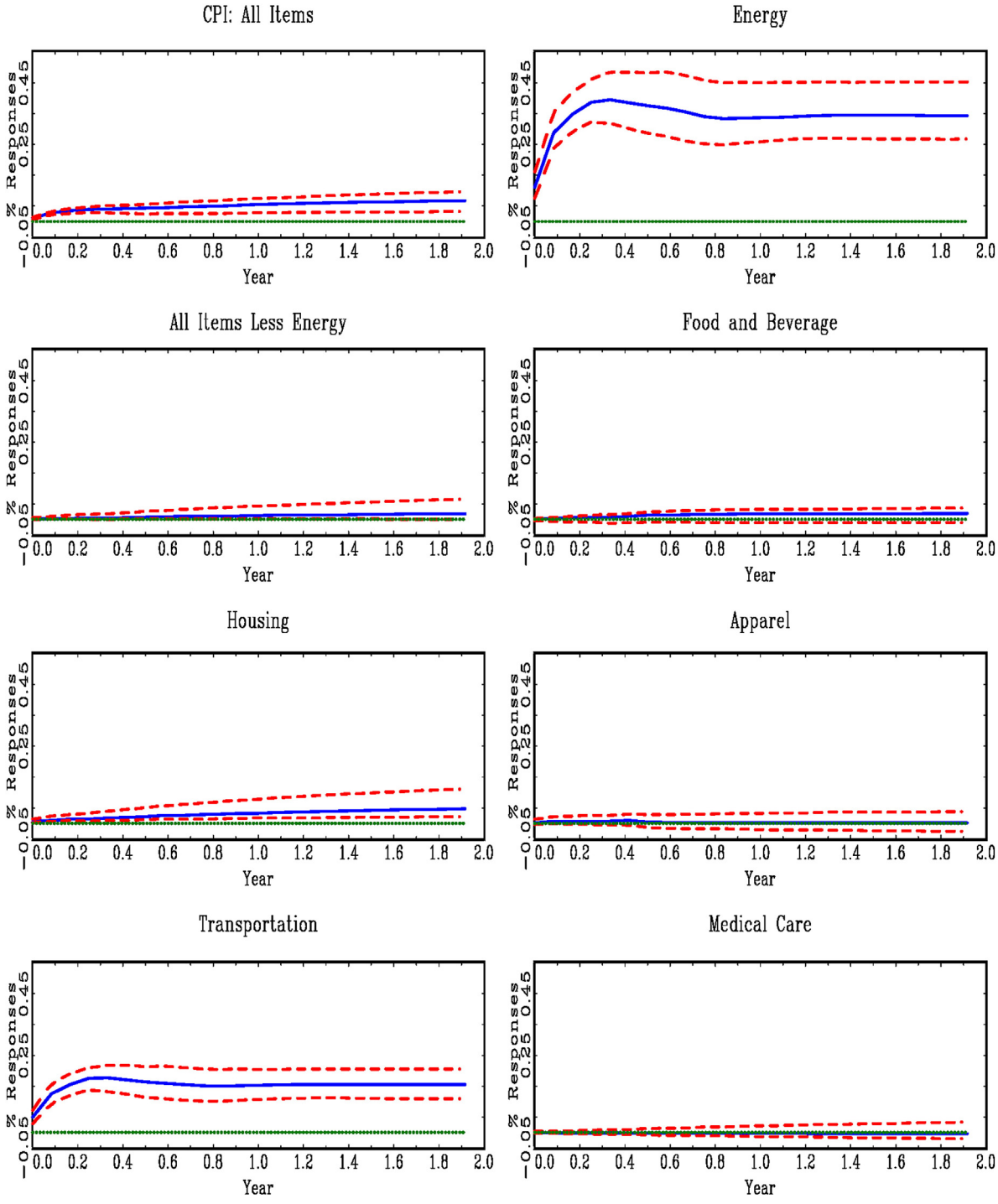

Fig. 1. Consumer Price Index responses to a 1% oil price shock. Note: Accumulated response functions are obtained from a bivariate vector autoregressive model with the real oil price inflation ordered first. The 95% confidence bands (dashed lines) are obtained from 2000 recursive design wild bootstrap draws (Goncalves and Kilian, 2004).

Commodity and Services Groups; Special Indexes. Observations are monthly and span from 1974 M1 to 2014 M7 for most indices.[2] [3] [4]

To measure the dynamic effects of an oil price shock on each CPI component, we employ structural impulse response analysis. We postulate a recursively identified bivariate vector autoregressive (VAR) model for the change in the real spot oil price (Δr_t) and the jth component of CPI inflation (π_t^j).

$$\boldsymbol{x}_t = v + \sum_{i=1}^{6} \boldsymbol{A}_i \boldsymbol{x}_{t-i} + \boldsymbol{u}_t, \tag{1}$$

Where v is the intercept, $\boldsymbol{A}_i$ denotes the slope parameter matrices, $\boldsymbol{u}_t$ is a vector of independent white noise processes, and $\boldsymbol{x}_t = [\Delta r_t, \pi_t^j]'$. We use six lags to be consistent with Edelstein and Kilian (2009).[5] The identifying assumption is that the real price of oil is predetermined with

[2] We follow Alquist, Kilian, and Vigfusson (2013) in restricting the sample to start in 1974 in recognition of the structural change taking place in late 1973 in the relationship between oil prices and the U.S. economy.

[3] We don't report empirical results for Recreation, and Education and Communication due to lack of observations.

[4] Detailed information is available upon request.

[5] Results with 3 lags yielded similar results. These results are available upon request.

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