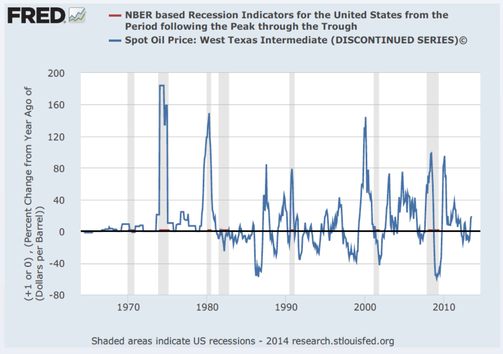
Energy Price Increases and Firm Entry

Soma Patra

Department of Economics, Southern Methodist University

Motivation

• Nine out of the last ten U.S. recessions have been preceded by an increase in the price of oil as noted by Hamilton (1983, 1996).



•How to explain the substantial effects of oil price increases on the economy when the share of oil in production is really small (around 3-4%)?

•Explore the response of firm entry or firm startups with respect to oil price shocks using U.S. firm level data.

•In theoretical macroeconomic models, inclusion of firm entry generates another transmission channel for energy price shocks and generates bigger decline in output compared to standard models.

Empirical Model

• Estimate a Vector Auto regression Model to estimate the effect of oil price shocks on Firm Startups.

• I identify oil price shocks following Hamilton. The Hamilton variable uses producer price index(PPI) for crude oil prices and is calculated in the following way ;

$x_t=\max\{0, X_t-\max\{X_{t-1},..,X_{t-12}\}\}$ where X_t is log level of the PPI value..

• Allows us to isolate large increases in the price of oil.

•New Firm Incorporations and Establishment Births are used to construct the measure for Entry.

•The other variables in the VAR model are real GDP, Federal funds rate and the GDP Deflator.

• I set the lag length to 4, given quarterly data.

Data

•The entry series is constructed from New Business Incorporations from Survey of Current Business (1964:II-1993:II) and from Private Sector Births from Bureau of Labor Statistics (1993:III-2013:IV).

•The data for real GDP, GDP deflator are taken from Bureau of Economic Analysis..

• Federal funds rate data is available from the St. Louis Fed website.

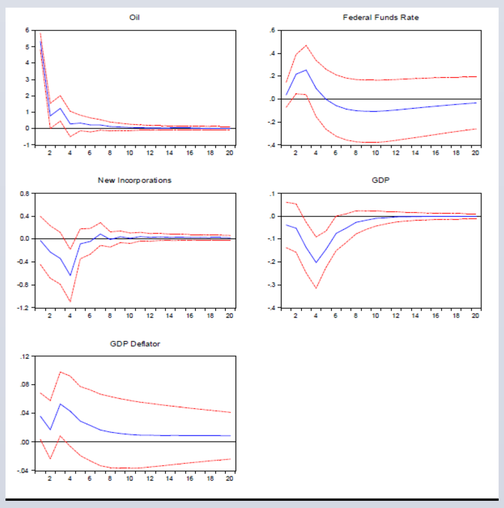
Results: VAR Model

•Rising energy prices have a statistically significant negative effect on Firm start-ups.

•An increase in oil prices cause a 0.6% drop in New Incorporations and 0.2% drop in GDP.

•Rise in GDP Deflator implies more inflation.

•The federal funds rate increases due to the Fed's contractionary monetary policy.



DSGE Model

• The DSGE model builds on the approach of Bilbiie, Ghironi and Melitz (2012).

•Rise in oil prices, cause profits to fall, returns to Entry falls.

•Due to sunk cost of Entry, households decide to reallocate resources from the Entry sector to the Production sector.

•Entry falls along with consumption and generates a bigger drop in output.

• Oil price increases also lead to lower real wages and lower stock prices.

Results: DSGE Model

•A 10% increase in oil prices causes a 4% decline in entry on impact.

•The impact on GDP is 1% for the same increase in oil prices.

•DSGE model in the paper successfully captures both the sign and the higher responsiveness of firm entry with respect to oil price shocks.

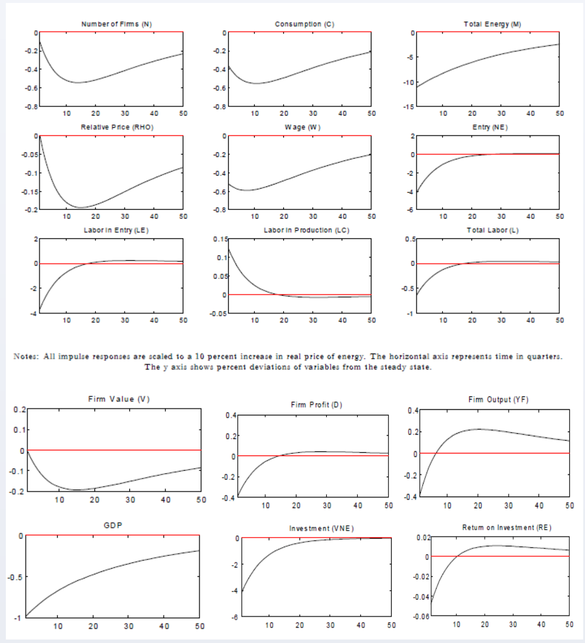
• The model also provides a way of linking stock prices to energy price shocks.

• A 10% increase in oil prices causes a 0.2% decline in stock prices.

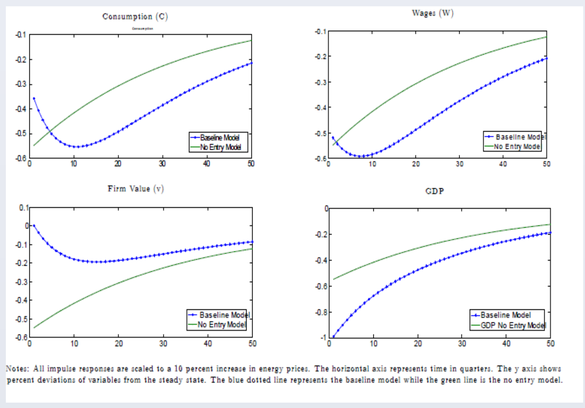
•Entry also serves as an amplifying mechanism for oil price shocks.

•A 10% increase in energy prices causes a 1% decline in GDP in the baseline model with entry vs. 0.55% drop in GDP in the model without entry.

•Furthermore, when oil price increases are persistent it acts a big deterrent to entrepreneurship and is the primary channel rather than reduced firm level production as suggested in the standard literature.



Notes: All impulse responses are scaled to a 10 percent increase in real price of energy. The horizontal axis represents time in quarters. The y axis shows percent deviations of variables from the steady state.



Notes: All impulse responses are scaled to a 10 percent increase in energy prices. The horizontal axis represents time in quarters. The y axis shows percent deviations of variables from the steady state. The blue dotted line represents the baseline model while the green line is the no entry model.

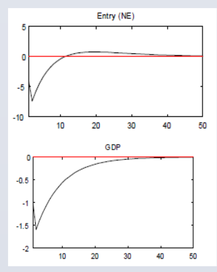
Sensitivity Analysis

•Baseline DSGE model uses a AR(1) specification for the exogenous oil price shock.

•Introduce ARMA(1) specification, impulse responses are closer to empirical responses.

•Baseline model uses Cobb Douglas production function, using CES gives us similar results.

ARMA Specification



Future Research

•In all model specifications, real wages fall and help mitigate the effect of oil price shocks.

•Introducing sticky wages may give us an even bigger decline in GDP.

•A better specification of the oil price shock might also help in replicating patterns found in the data.

• In addition to firm startups or entry, firm exits may also respond to oil price shocks.

•Lower entry and higher firm exit would also be helpful in getting big drop in output.

Conclusion

•First paper to analyze the effect of oil price shocks on Firm Entry.

•Shows oil price shocks have a significant negative effect on Firm start ups using U.S. data.

•Incorporates Firm Entry in a theoretical DSGE model.

•DSGE model with Firm Entry predicts a bigger drop in GDP in response to oil price shocks.

• Firm Entry may be one of the potential explanations behind oil price shocks and U.S. recessions.

Thank You!

Contact: spatra@smu.edu