The propagation of regional shocks in housing markets: Evidence from oil price shocks in Canada

Paper by Lutz Kilian and Xiaoqing Zhou

Discussion by Ryan Decker
Federal Reserve Board

Oil shocks and house prices

- Model:
  - Oil price shocks affect income and house prices *even in regions with no oil production,* via:
    - (+): Cross-region trade (particularly oil supply chain linkages)
    - (+): Cross-region government transfers
    - (-): Energy consumption prices
  - Positive spillovers require *input slack* in non-oil regions

Oil shocks and house prices

- Model:
  - Oil price shocks affect income and house prices *even in regions with no oil production,* via:
    - (+): Cross-region trade (particularly oil supply chain linkages)
    - (+): Cross-region government transfers
    - (-): Energy consumption prices
  - Positive spillovers require *input slack* in non-oil regions

- Empirics:
  - Increase in (globally determined) oil price associated with increased house prices *even in regions with little oil production*
    - *Causal* effect if plausible assumptions hold
  - Also associated with
    - Higher real output in many industries, including nontradeables
    - Higher government transfers
  - Suggests that non-oil regions receive benefits from higher oil prices that exceed higher energy costs
    - And… suggests presence of slack!

Example

1. Positive oil price shock boosts drilling & extraction in Bakken, North Dakota
2. Oil companies purchase steel pipe from plants in Ohio
3. Income and employment in Ohio steel industry rises (as long as there are enough workers…)
4. Newly employed/higher earning Ohio steel workers buy houses, shop at Walmart, etc.
5. Ohio house prices rise (as long as housing supply is sufficiently constrained)

Big picture implications

- Regional shocks can propagate to housing markets (and other markets) *in other regions*
  - Even without migration, with segmented housing markets, etc.
  - Supply chain linkages and/or fiscal transfers are sufficient

Big picture implications

- Regional shocks can propagate to housing markets (and other markets) *in other regions*
  - Even without migration, with segmented housing markets, etc.
  - Supply chain linkages and/or fiscal transfers are sufficient
- In presence of strong cross-region spillovers, common national macro policy is appropriate

Big picture implications

- Regional shocks can propagate to housing markets (and other markets) *in other regions*
  - Even without migration, with segmented housing markets, etc.
  - Supply chain linkages and/or fiscal transfers are sufficient
- In presence of strong cross-region spillovers, common national macro policy is appropriate
- But: depends on resource utilization in non-oil regions
  - E.g.: If non-oil regions are at full employment, expect oil shocks to simply cause sectoral reallocation in non-oil regions, with no net gains to income, house prices, etc.

Some comments

1. Identification and variation
2. Alternative ways to tell the empirical story
3. The role of “slack”
4. Assorted questions

1a. Identification: oil → house prices

- "We answer this question by employing an empirical strategy in the spirit of Bartik (1991)"
- Estimate:

$$\Delta y_{i,t} = \gamma_i + \beta_1 \Delta p_t + \beta_2 \Delta p_t \times \bar{s}_{i,t} + \delta X + \varepsilon_{i,t}$$

1a. Identification: oil → house prices

- "We answer this question by employing an empirical strategy in the spirit of Bartik (1991)"
- Estimate:

$$\Delta y_{i,t} = \gamma_i + \beta_1 \Delta p_t + \beta_2 \Delta p_t \times \bar{s}_{i,t} + \delta X + \varepsilon_{i,t}$$

Average effect

Effect adjustment based on oil exposure

Local oil activity share

1a. Identification: oil → house prices

- "We answer this question by employing an empirical strategy in the spirit of Bartik (1991)"
- Estimate:

$$\Delta y_{i,t} = \gamma_i + \beta_1 \Delta p_t + \beta_2 \Delta p_t \times \bar{s}_{i,t} + \delta X + \varepsilon_{i,t}$$

Average effect

Effect adjustment based on oil exposure

Local oil activity share

- Authors note requirements for identification:
  - Changes in oil price are exogenous to Canadian economy ✓

1a. Identification: oil → house prices

- "We answer this question by employing an empirical strategy in the spirit of Bartik (1991)"
- Estimate:

$$\Delta y_{i,t} = \gamma_i + \beta_1 \Delta p_t + \beta_2 \Delta p_t \times \bar{s}_{i,t} + \delta X + \varepsilon_{i,t}$$

Average effect

Effect adjustment based on oil exposure

Local oil activity share

- Authors note requirements for identification:
  - Changes in oil price are exogenous to Canadian economy ✓
  - Changes in oil price are unpredictable ✓

1a. Identification: oil → house prices

- "We answer this question by employing an empirical strategy in the spirit of Bartik (1991)"
- Estimate:

$$\Delta y_{i,t} = \gamma_i + \beta_1 \Delta p_t + \beta_2 \Delta p_t \times \bar{s}_{i,t} + \delta X + \varepsilon_{i,t}$$

Average effect

Effect adjustment based on oil exposure

Local oil activity share

- Authors note requirements for identification:
  - Changes in oil price are exogenous to Canadian economy ✓
  - Changes in oil price are unpredictable ✓
  - Changes in oil price are not correlated with exogenous changes in other variables that affect Canadian economy

1a. Identification: oil → house prices

- "We answer this question by employing an empirical strategy in the spirit of Bartik (1991)"
- Estimate:

$$\Delta y_{i,t} = \gamma_i + \beta_1 \Delta p_t + \beta_2 \Delta p_t \times \bar{s}_{i,t} + \delta X + \varepsilon_{i,t}$$

Average effect

Effect adjustment based on oil exposure

Local oil activity share

- Authors note requirements for identification:
  - Changes in oil price are exogenous to Canadian economy ✓
  - Changes in oil price are unpredictable ✓
  - Changes in oil price are not correlated with exogenous changes in other variables that affect Canadian economy
    - This is a difficult one—one could imagine multiple confounders, though many implausible
    - Could break sample in half and compare elasticities
    - Could omit periods of big global events (esp. GFC)

1b. Identification: Bartik perspectives

- Goldsmith-Pinkham, Sorkin, & Swift (2019):
  - Bartik instrument is isomorphic to using local industry shares as instruments
  - “The central identification worry is that the industry shares predict outcomes through channels other than those posited by the researcher”
- Kilian & Zhou is special case of canonical Bartik

1b. Identification: Bartik perspectives

- Goldsmith-Pinkham, Sorkin, & Swift (2019):
  - Bartik instrument is isomorphic to using local industry shares as instruments
  - “The central identification worry is that the industry shares predict outcomes through channels other than those posited by the researcher”
- Kilian & Zhou is special case of canonical Bartik

- Identification also depends on variation in *shares*

1b. Identification: Bartik perspectives

- Goldsmith-Pinkham, Sorkin, & Swift (2019):
  - Bartik instrument is isomorphic to using local industry shares as instruments
  - “The central identification worry is that the industry shares predict outcomes through channels other than those posited by the researcher”
- Kilian & Zhou is special case of canonical Bartik

- Identification also depends on variation in *shares*
  - Does exclusion restriction hold? Might shares affect dependent variables through channels not driven by oil shocks?

1b. Identification: Bartik perspectives

- Goldsmith-Pinkham, Sorkin, & Swift (2019):
  - Bartik instrument is isomorphic to using local industry shares as instruments
  - “The central identification worry is that the industry shares predict outcomes through channels other than those posited by the researcher”
- Kilian & Zhou is special case of canonical Bartik

- Identification also depends on variation in *shares*
  - Does exclusion restriction hold? Might shares affect dependent variables through channels not driven by oil shocks?
  - i.e.: Do high-oil areas differ from low-oil areas along dimensions that are not driven by oil shocks but matter for house price *growth*?

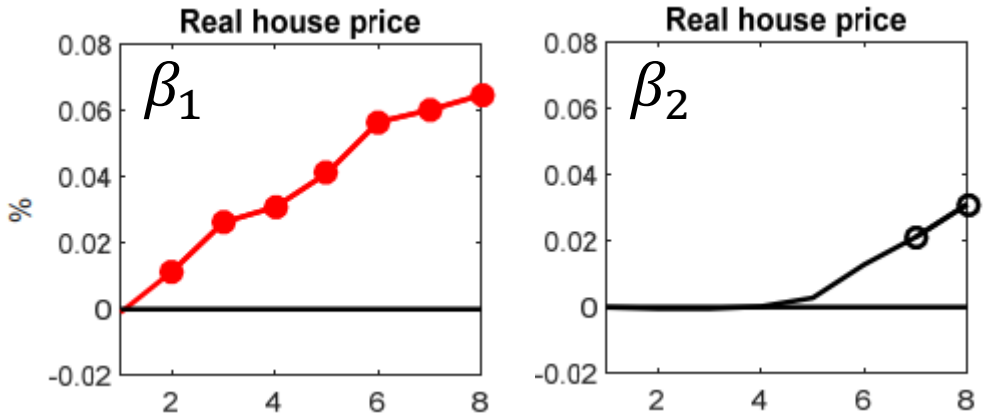
1b. Identification: Bartik perspectives

- Goldsmith-Pinkham, Sorkin, & Swift (2019):
  - Bartik instrument is isomorphic to using local industry shares as instruments
  - “The central identification worry is that the industry shares predict outcomes through channels other than those posited by the researcher”
- Kilian & Zhou is special case of canonical Bartik

- Identification also depends on variation in *shares*
  - Does exclusion restriction hold? Might shares affect dependent variables through channels not driven by oil shocks?
  - i.e.: Do high-oil areas differ from low-oil areas along dimensions that are not driven by oil shocks but matter for house price *growth*?
  - We are probably ok, but this is another identifying assumption that should be explicit

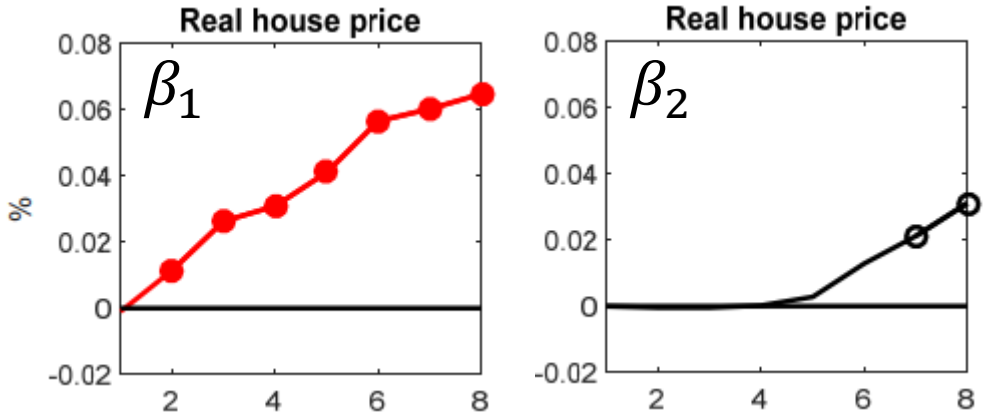
2. Alternative specification

- Main approach is to compare oil price main effect (β_1) to oil price × share interaction coefficient (β_2)
  - Interpretation can be difficult: comparing hypothetical *average* oil exposure localities to all non-zero localities (with linear effect)



2. Alternative specification

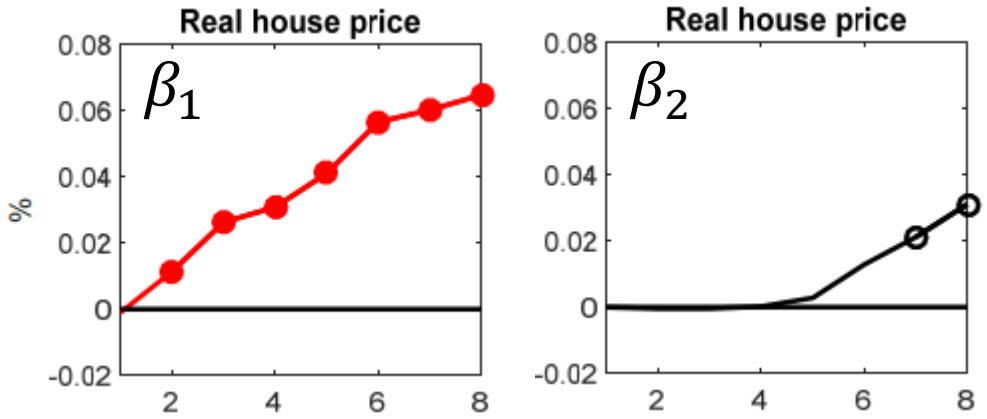
- Main approach is to compare oil price main effect (β_1) to oil price × share interaction coefficient (β_2)
  - Interpretation can be difficult: comparing hypothetical *average* oil exposure localities to all non-zero localities (with linear effect)



- Alternative: use exposure bins
  - Break sample into low, medium, high exposure, with separate coefficients
  - Can illustrate:
    - Which kind of localities drive the result/is it really linear
    - What is the practical range of effects (i.e., can expand on Vancouver vs. Calgary example)

2. Alternative specification

- Main approach is to compare oil price main effect (β_1) to oil price × share interaction coefficient (β_2)
  - Interpretation can be difficult: comparing hypothetical *average* oil exposure localities to all non-zero localities (with linear effect)



- Alternative: use exposure bins
  - Break sample into low, medium, high exposure, with separate coefficients
  - Can illustrate:
    - Which kind of localities drive the result/is it really linear
    - What is the practical range of effects (i.e., can expand on Vancouver vs. Calgary example)
- Provide practical examples of price change magnitude
  - E.g.: 2008 price event raised house prices in Vancouver by X%, Calgary by Y%

3. Slack

- Model insight: positive spillovers require slack
  - Requires $\partial N / \partial p > 0$
  - Slack dependence is empirically testable

3. Slack

- Model insight: positive spillovers require slack
  - Requires $\partial N / \partial p > 0$
  - Slack dependence is empirically testable
- Could divide sample into high-slack and low-slack periods
  - Recession vs. expansion (nationwide)?
  - Interact local oil price effects with initial unemployment rate (or labor force participation)?

4. Assorted questions

- GDP by sector results are compelling but are at the province level.
  - Can you do *local employment* by sector? Not *quite* the same but would be suggestive
- Oil supply chain dependence likely varies among non-oil regions
  - Do spillovers vary as well?
  - Could use I-O tables to put regions in “oil supply chain” bins
- Interesting measures of “motor fuel” expenditures
  - But oil is an intermediate input for a wide range of products
  - Negative spillover of higher oil prices likely broader than just motor fuel
- What’s the story behind the boost in *gross* migration? Seems interesting!
- Figures: useful to show statistical significance of $(\beta_1 + \beta_2)$

Nice paper with big picture implications

- Regional shocks can propagate to housing markets (and other markets) in other regions
  - Even without migration, with segmented housing markets, etc.
  - Supply chain linkages and/or fiscal transfers are sufficient
- In presence of strong cross-region spillovers, common national macro policy is appropriate
- But: depends on resource utilization in non-oil regions

Thanks