What Do We Learn from Cross-Regional Empirical Estimates in Macroeconomics?

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- Develops a very clever method for recovering "partial equilibrium" effects from regressions using variation across subnational units (e.g. cities, states)

- Applies the method to estimating the MPC out of housing wealth (a parameter estimated in the GMNS companion paper).

- Separately, offers a solution to a puzzle that has arisen with respect to an instrument used for house prices.

- Applied micro "Credibility Revolution" began to diffuse in macro.

  - Diffusion accelerated during the Great Recession as researchers tried to estimate key relationships using cross-state or city data.

  - Many thought that we could simply apply microeconometric methods to answer macro questions.

- In the fiscal multiplier literature, we quickly realized that the intercepts in cross-state regressions and the time-fixed effects in state panels net out the macro effects we care about! (e.g. Ramey JEL 2011, Nakamura-Steinsson AER 2014)

- Realization

  "There is no 'applied micro free lunch' for macroeconomists. Identification of macroeconomic effects must always depend on macroeconomic identification assumptions." (Ramey 2018)
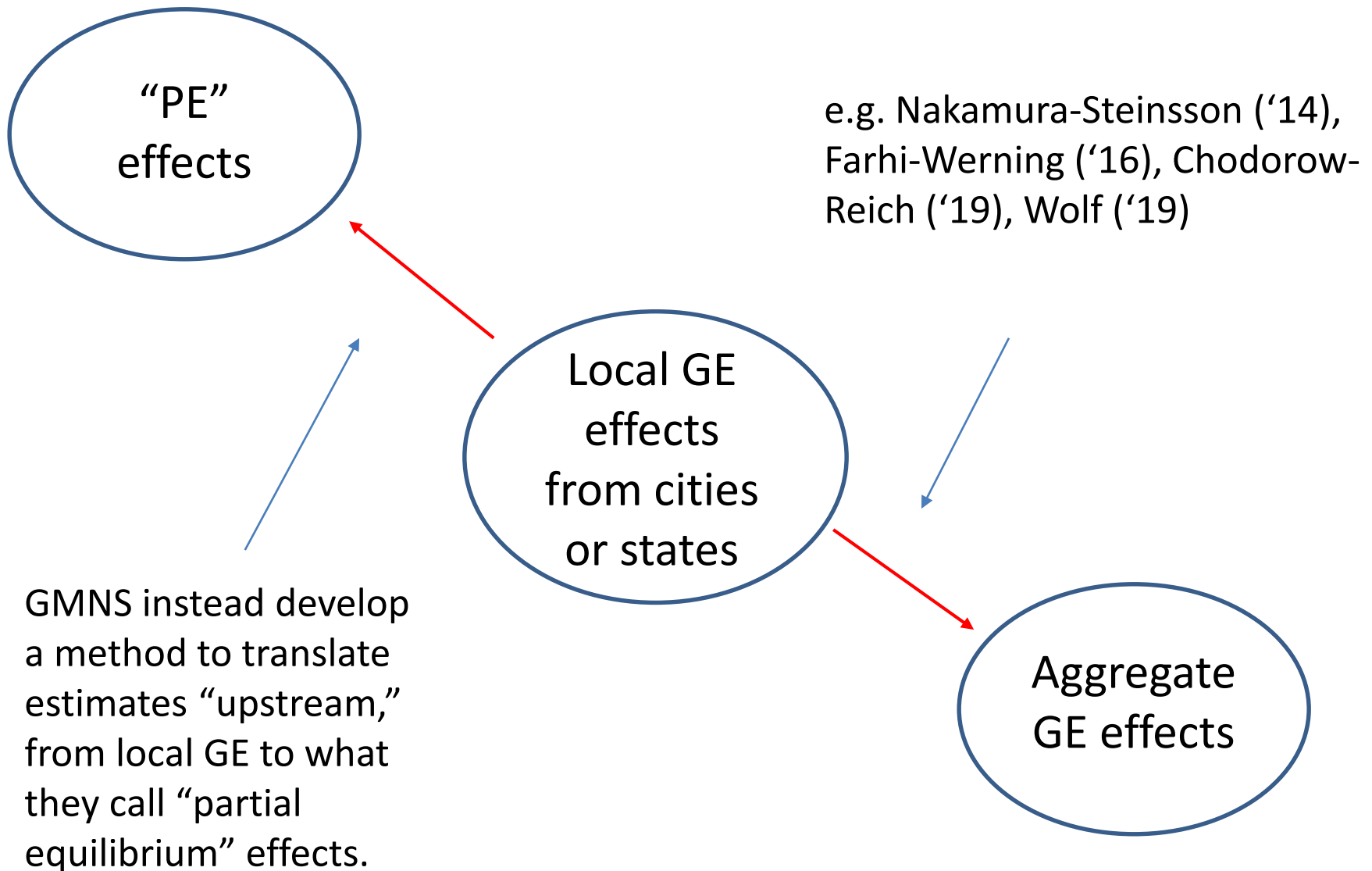
- Methods for identifying macroeconomic causal effects:

  1. Estimate using macro data.

     - Apply identifying assumptions in a time series model.
     - Estimate a DSGE model.

  2. Estimate micro or subnational effects and translate them to macro using a macro model.
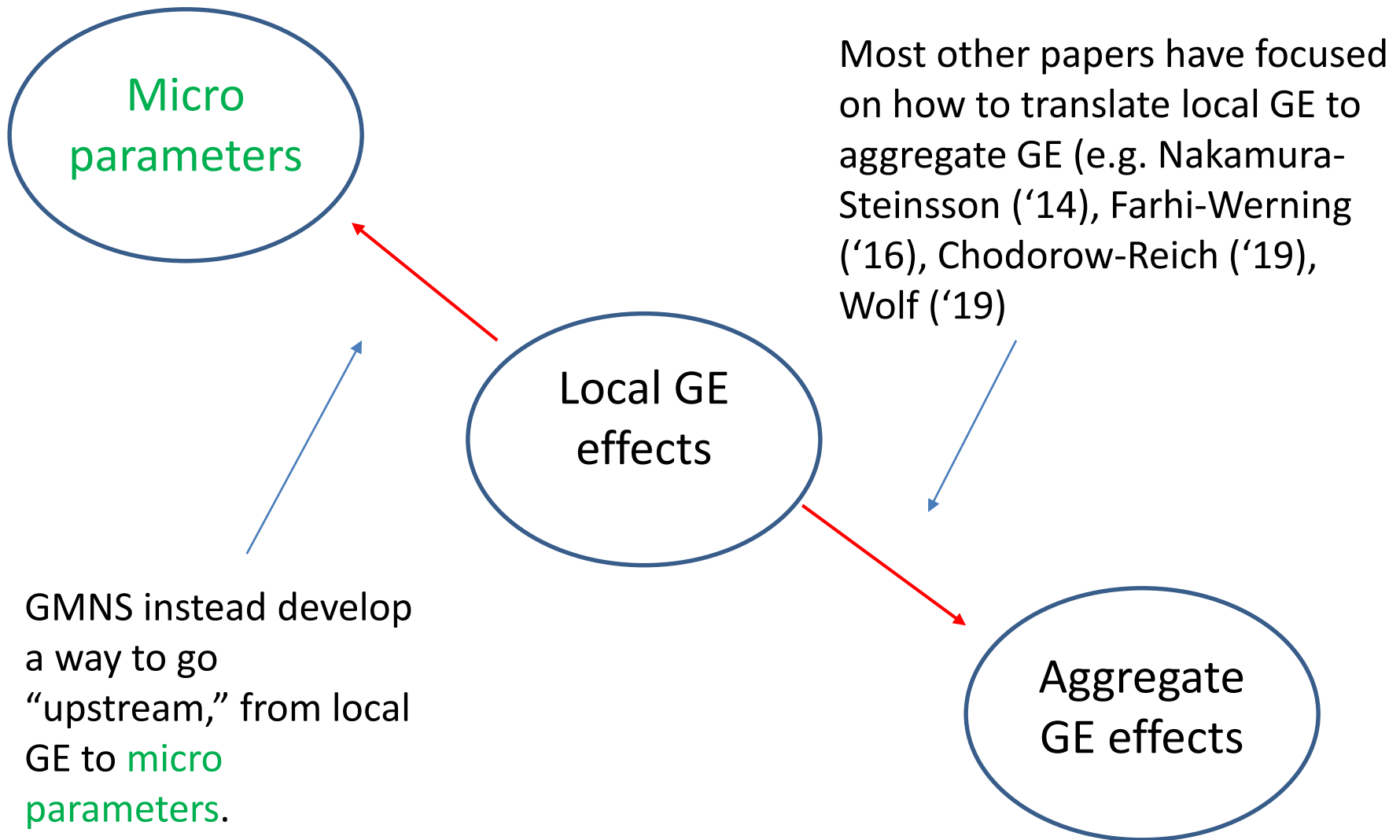
"PE" effects

e.g. Nakamura-Steinsson ('14), Farhi-Werning ('16), Chodorow-Reich ('19), Wolf ('19)

Local GE effects from cities or states

GMNS instead develop a method to translate estimates "upstream," from local GE to what they call "partial equilibrium" effects.

Aggregate GE effects

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Partial Equilibrium?

- Why are some macroeconomists and public finance economists calling micro parameters "partial equilibrium effects"?

- Partial equilibrium refers to the equilibrium in one market, taking as exogenous prices in other markets as well as agents' incomes. The partial equilibrium effect of an exogenous shock is the change in *equilibrium* price and quantity in that market.

- The response of household or city-level consumption to a change in house prices, *ceteris paribus*, represents the optimal responses of individual households. It is based on the outcome of a constrained maximization problem for households; it is not a partial equilibrium outcome.

Micro parameters

Most other papers have focused on how to translate local GE to aggregate GE (e.g. Nakamura-Steinsson ('14), Farhi-Werning ('16), Chodorow-Reich ('19), Wolf ('19)

Local GE effects

GMNS instead develop a way to go "upstream," from local GE to micro parameters.

Aggregate GE effects

GMNS Idea in an Undergraduate Keynesian Model

$$Y = C + G$$ NIPA identity

$$C = mpc \cdot Y + mpch \cdot H$$ Consump. function

$$Y^{eq} = \frac{1}{1 - mpc}[mpch \cdot H + G]$$ Equilibrium

The city-level regressions estimate:

$$\frac{dY}{dH} = \frac{mpch}{1 - mpc}$$

Suppose we want to identify ***mpch***.

Then we can use the fact that

$$\frac{dY}{dG} = \frac{1}{1 - mpc}$$ to divide dY/dH by dY/dG to identify ***mpch***.

Y = income

C = consumption

G = government purchases

H = house wealth

mpc = marginal propensity to consume out of income

$mpch$ = marginal propensity to consume out of house wealth.

- It is a really neat idea to use fiscal multipliers to help identify other key parameters.

- The idea is related to some independent contemporaneous work (e.g. Auclert-Rognlie, Wolf).

- The present paper generalizes the idea with both analytic results and a dynamic macro model of multiple regions with potentially incomplete markets – robust approximation under numerous generalizations.

Very impressive analysis!

- Why are micro parameters such as *MPCH* useful for macro?

  We can use them to calibrate or check our estimation of micro parameters in a macroeconomic model.

- But is the authors' method the best way to estimate a parameter such as *MPCH*?

- I will argue that while their method can be valuable in cases where there is no good micro data, in most cases there are better ways to estimate these parameters. These alternatives:

      - exploit rich household data
      - don't require a host of auxiliary assumptions.

Some Direct Micro Estimates of MPCH

- Campbell and Cocco (JME 2007) "How Do House Prices Affect Consumption? Evidence from Micro Data"

  - UK data, household level, create synthetic panel
  - Estimated elasticities of nondurable consumption range from 0 for renters to 1.7 for older homeowners. The baseline 1.22 elasticity is approximately an *MPCH* = 0.077.

- Aladangady (AER 2017) "Housing Wealth and Consumption: Evidence from Geographically-Linked Microdata"

  - Uses very rich confidential data – CEX, etc.
  - Response of total consumption less housing expenses.
  - Estimates an *MPCH* = 0.047 (se =.022) for homeowners and 0 for renters.

GMNS (this paper and companion paper):

1. Estimate an *elasticity* of consumption to house prices of 0.072 (se. .015).

    -   Based on a log difference specification using annual data on a panel of cities, instrument for housing prices.

    - As they argue, this estimate includes the local GE effects.

2. Convert the elasticity to a local GE MPCH = 0.033 by dividing by average H/C ratio from 1985 to 2016, which was 2.17.

3. Purge this estimate of local GE effects by dividing by Nakamura-Steinsson (2014) state-level government spending multiplier of 1.5.

GMNS bottom line: MPCH = 0.022

- The micro evidence shows us that there is important heterogeneity in the MPCH.

  For obvious reasons, it is much higher for homeowners than renters.

- Thus, GMNS's estimate of MPCH purged of local GE effects confounds the response with the fraction of renters versus homeowners in the average city.

$$MPCH_{city} = \lambda\, MPCH_{homeowners} + (1 - \lambda)\, MPCH_{renters}$$

- Because their baseline estimates do not weight cities by population, the λ implicit in their MPCH estimate is not necessarily nationally representative.

Potential Issues with GMNS Method

- GMNS already consider many generalizations.

  - They are very upfront showing that the approximation errors can be large for reasonable generalizations.

  - Relative errors are often above 30%

- In addition to the confounding of household MPCH's with the fraction of renters, there are other worries that I have with respect to their method.

- I will now discuss several of these.

- dY/dG is key factor - allows conversion of local GE estimate to a micro parameter for a macro model.

- GMNS use estimates of the multiplier of 1.5 from Nakamura-Steinsson AER 2014 (NS).

- When NS was published, the paper was state-of-the-art.

- However, technological progress has been so rapid in this literature in the last few years that we have figured out some of the things we did just a few years ago can be improved upon.

- They study the effects of defense contracts on state (or region) level output and employment in a panel of states, annually from 1966-2006.

$$(1) \qquad \frac{Y_{it} - Y_{it-2}}{Y_{it-2}} = \alpha_i + \gamma_t + \beta \frac{G_{it} - G_{it-2}}{Y_{it-2}} + \varepsilon_{it},$$

Y is per capita output in state i, G is per capita military procurement spending in state i. State and time fixed effects are included. β is the estimate of the multiplier.

- They consider two possible instruments:

  (i) an interaction of state dummies with aggregate procurement growth

  (ii) a Bartik instrument that interacts state historical sensitivity to aggregate procurement spending with the aggregate change in procurement spending.

Baseline estimates:

Table 2, using state dummies interacted with aggregate prime contracts as the instruments.

	Output	
	States	Regions
Prime military contracts	1.43 (0.36)	1.85 (0.58)
Prime contracts plus military compensation	1.62 (0.40)	1.62 (0.84)
Observations	1,989	390

However, these instruments (which are numerous) have a first stage F-statistic suggesting weak instruments.

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Alternative estimates:

Table 3, using Bartik instruments.

	1. Output level instr.	
	States	Regions
Prime military contracts	2.48 (0.94)	2.75 (0.69)
Prime contracts plus military compensation	4.79 (2.65)	2.60 (1.18)
Observations	1,989	390

Very high first stage F-statistic, suggesting strong instruments.

Aligning the Timing

- GMNS's estimate of the marginal propensity to consume out of house wealth is based on one-year differences.

- Nakamura-Steinsson's dY/dG estimates are based on two-year differences.

- I used Nakamura-Steinsson's replication files to look at multipliers for one-year changes, in order to match up with their MPCH estimates.

Multipliers	Baseline instruments	Bartik instruments
2-year horizon	1.43 (0.36)	2.48 (0.94)
1-year horizon	0.69 (0.33)	1.65 (0.77)

Other Issues

- I discovered that the instruments are serially correlated – correlation with instrument (which is a two-year difference) and the previous two-year difference is 0.28.

- Because NS 2014 didn't include lagged Y's, G's, and instruments as controls, it means that their estimates probably don't satisfy Stock and Watson's (EJ 2018) lead-lag exogeneity condition.

- When I re-estimate their baseline including a few lags, their multiplier estimate falls from 1.43 to 1.24 (se 0.3). For the Bartik Instrument specification, the estimate falls from 2.5 to 1.5.
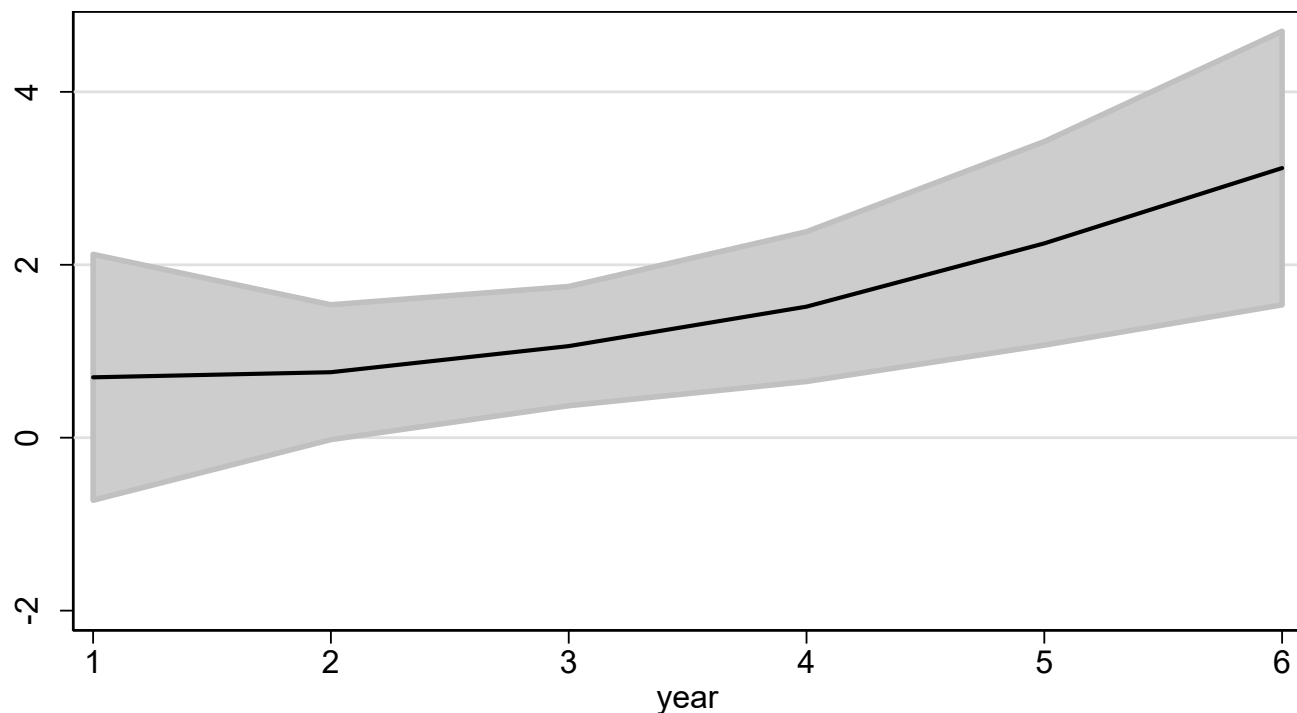
- If we care about the dynamics, we can't use their static model.

- The best way to account for dynamics is to use the external instrument in an SVAR or local projection.

- I use their data and their Bartik instrument (just the one-year difference version) and estimate multipliers and IRFs with local projections, including 2 annual lags of the growth of output, government spending, and instrument as controls.

Multipliers by Horizon

Nakamura-Steinsson Data, Bartik instrument shock
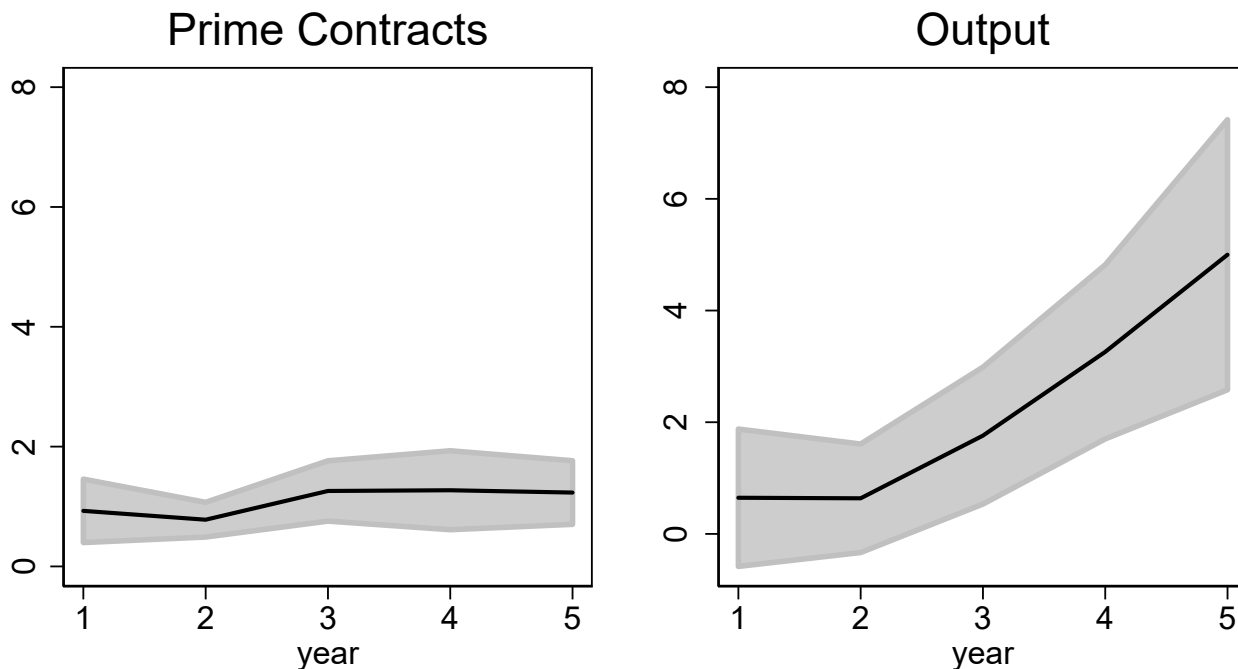

The multipliers during the first three years are 0.7, 0.75, 1.
The multipliers seem to grow at longer horizons!

IRFs by Horizon

Nakamura-Steinsson Data, Bartik instrument shock

Either Larry Summers is right about permanent effects of government spending or something funny is going on.

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- Level of aggregation: state vs. city

  Spillovers are more likely to be netted out by the intercept in city regressions than higher level aggregation regressions.

- They use only prime contract spending as their government spending variable.

  If other federal spending is positively correlated, or if state and local government spending rises as a result, the multipliers will be biased upward.

Elasticities vs. Multipliers and MPCs

- The log specification of the GMNS MPCH regressions yields estimates of elasticities, not multipliers or MPCs.

- GMNS convert elasticities to multipliers by dividing by the sample average of H/C.

$$\frac{dC}{dH} = \frac{dln(C)}{dln(H)} \bigg/ \frac{\overline{H}}{C}$$

- In the fiscal literature, we have discovered that this procedure can bias government spending multipliers upward.

- As Sims and Wolff (2018) noted in the fiscal multiplier context, the conversion factor also tends to bias multipliers differentially, making them seem much higher during recessions ⟹ state dependent biases.

- A similar point applies to the house price effects literature. H/C varies between 2 and 3 over the GMNS sample.

- The MPCH and the elasticity cannot both be constants!

Conclusions

- Very important and insightful work linking estimates at different levels of aggregation.

- Their method can be used for many types of situations.

- Even when other methods are available, their method can be used as simple back-of-the-envelope check.

- But remember that even though they offer a great recipe, the final product depends crucially on the ingredients and how they are combined:

    - local GE estimates

    - government spending multiplier estimates