

DISCUSSION:  
WHAT DO WE LEARN FROM CROSS-REGIONAL EMPIRICAL  
ESTIMATES IN MACROECONOMICS?  
BY: GUREN, MCKAY, NAKAMURA, STEINSSON (GMNS)

Gabriel Chodorow-Reich  
Harvard University and NBER

NBER MA  
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# OVERVIEW

- ① Contribution in context.
- ② Method with pure demand shocks.
- ③ What else we learn: conditions for lower bound for aggregate impact.
- ④ Aggregate impact in GMNS model.

Contribution in context

# THE PROBLEM

- Regional variation often plausibly exogenous: government spending, house price changes, etc.
- Chodorow-Reich (forthcoming) lists 50 recently published articles using regional data to answer macroeconomic questions.
- Potential outcome framework with treatment  $W_i$ :  $Y_i^{\text{obs}} = Y_i(W_i)$ .
- Stable unit treatment value assumption (SUTVA): potential outcome of  $i$  does not depend on treatment of  $j$ .
- SUTVA  $\Rightarrow E[(Y_i^{\text{obs}} - Y_j^{\text{obs}})/(W_i - W_j)] = \text{Average Treatment Effect}$ .

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- SUTVA  $\Rightarrow E[(Y_i^{\text{obs}} - Y_j^{\text{obs}})/(W_i - W_j)] = \text{Average Treatment Effect}$ .
- SUTVA fails for regional data in integrated national economy:  
$$Y_i^{\text{obs}} = Y_i(W_1, W_2, \dots, W_i, \dots, \text{aggregate policy response}).$$
- Problem is spillovers from region  $j$  to region  $i$ .

# HISTORY OF DEMAND MULTIPLIERS

- Keynesian cross:  $Y = C_x X + C_y(Y - T) + I_r r + G$

$$\Rightarrow \frac{dY}{dG} = \frac{1}{1 - C_y}, \frac{dY}{dT} = -C_y \frac{dY}{dG}, \frac{dY}{dX} = C_x \frac{dY}{dG}.$$

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## CBO USE OF DEMAND MULTIPLIER

*Direct effects consist of changes in purchases of goods and services by federal agencies and by the people and organizations who are recipients of federal payments or payers of federal taxes. The size of the direct effects of a change in policies depends on the behavior of those recipients and payers. The indirect effects can be summarized by a demand multiplier. CBO's analysis applies the same demand multiplier to any \$1 of direct effect from a change in fiscal policies. The product of a direct effect and a demand multiplier is sometimes referred to as an output multiplier. A change in federal purchases has a direct effect of 1, so the output multiplier for federal purchases equals the demand multiplier; most other changes in fiscal policies have direct effects that are less than 1 (because recipients of benefits and payers of taxes tend to adjust their spending less than one-for-one with changes in their income).*

—Felix Reichling and Charles Whalen, “Assessing the Short-Term Effects on Output of Changes in Federal Fiscal Policies,” CBO Working Paper 2012-08.



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- Auclert, Rognlie, Straub (WP): static Keynesian cross also holds dynamically with *MPCs* replaced by matrices.
- GNMS (forthcoming): adapt “demand multiplier” to regional analysis.
- Chodorow-Reich, Nenov, Simsek (WP): regional demand multiplier integrating over periods where nominal stickiness holds.
- Wolf (WP), GMNS Macroannual: conditions for exact demand multiplier in dynamic setting and simulations.

## HOW WELL DO WE MEASURE LOCAL MULTIPLIER?

- GMNS use 1.5, based on Nakamura and Steinsson (AER, 2014).
- In Chodorow-Reich (2019) I surveyed literature (16 studies) and found mean/median multiplier of 1.6.
- For this purpose, do not want to adjust for “outside financing” of local fiscal multipliers.

# Simple regional model and lower bound

## SIMPLE MODEL WITH DEMAND SHOCKS

- Each area  $a$  produces tradable ( $T$ ) and nontradable ( $N$ ) good with technologies  $Y_{a,t}^N = L_{a,t}^N$ ,  $Y_{a,t}^T = L_{a,t}^T$ , and  $C_{a,t} = (C_{a,t}^N)^{1-\phi} (C_{a,t}^T)^\phi$ .
- Unit elasticity of substitution across varieties of tradable good.
- At time 0 area  $a$  experiences **change in wealth** (future Lucas tree dividend)  $\bar{\Delta} + \Delta_a$ ,  $\int_a \Delta_a = 0$ .
- Wages partially sticky in period 0 then fully flexible.
- Partial equilibrium *MPC* of  $\rho$  (e.g. log utility across time).
- Each area infinitesimal.
- Simple version of model in Chodorow-Reich, Nenov, Simsek (“Stock Market Wealth and the Real Economy”).

## LOCAL GE ADJUSTMENT AND AGGREGATE IMPACT

- Relative local (nominal) consumption expenditure and output:

$$\text{Consumption: } \frac{dP_{a,0}C_{a,0}}{P_0C_0} = d(p_{a,0} + c_{a,0}) = \frac{\mathcal{M}_a\rho\Delta_a}{P_0C_0},$$

where: 
$$\mathcal{M}_a = \frac{1}{1 - (1 - \phi)\rho}.$$

- Recover PE *MPC* by dividing local estimate by local multiplier  $\mathcal{M}_a$ .

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- Local responses are **lower bound** for aggregate responses:
  - Closed economy multiplier larger than local, open-economy multiplier.
  - Local output responds only to rise in local demand that falls on nontradable goods. In aggregate, everything is nontradable.

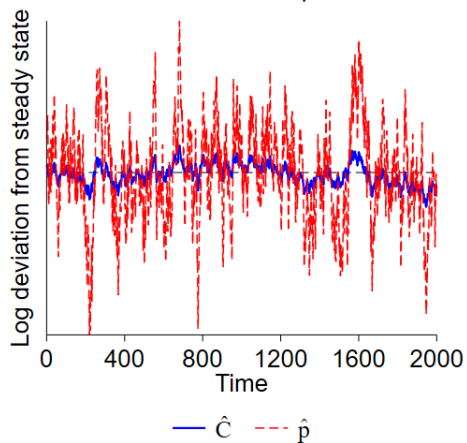
## SUFFICIENT CONDITIONS FOR LOWER BOUND

- 1 Local demand shock.
- 2 Proper closed economy scenario: fixed interest rates, no other endogenous responses to shock...
- 3 Factors of production immobile. May be testable.
- 4 Applies to *output*, not necessarily to *absorption*.

Lower bound in GNMS model

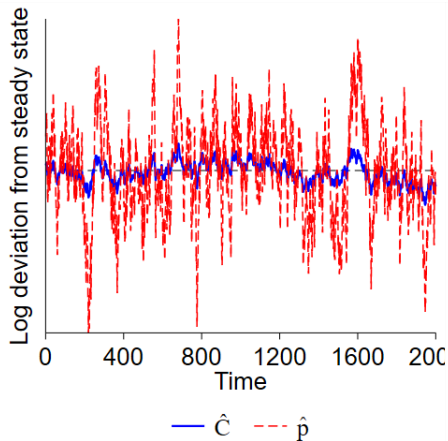
# GMNS FULL MODEL

Cross-sectional Response

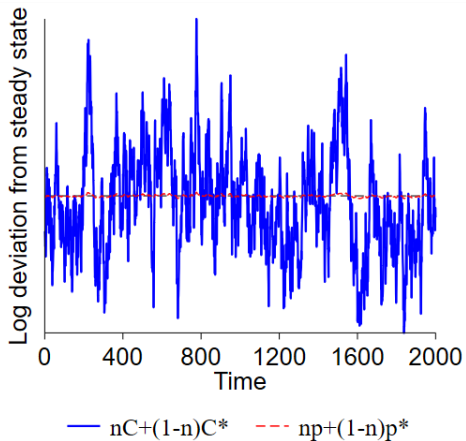


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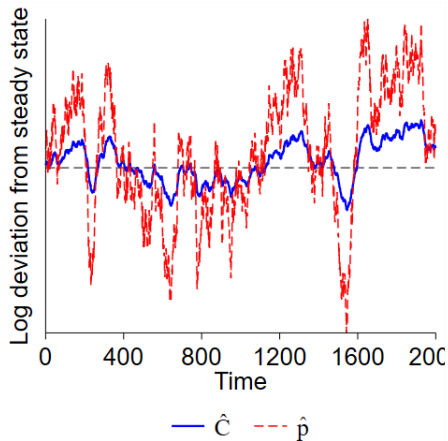


## Aggregate Responses

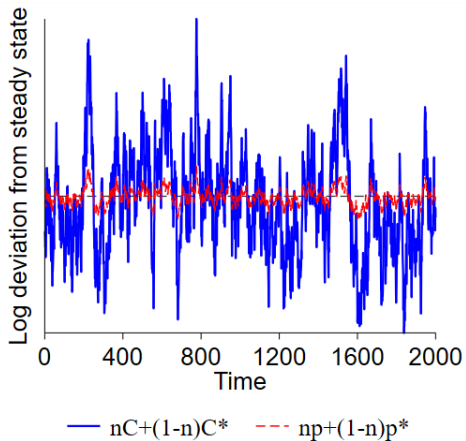


# GMNS WITH NO INFLATION OR CONSTRUCTION

## Cross-sectional Response



## Aggregate Responses



# CONCLUSION

- Useful method with lots of applications.
- GNMS dot *is* and cross *ts* and show simple version “works”.
- Not the only way to make use of regional data for macro:
  - ▶ Lower bound for aggregate under certain conditions.
  - ▶ Identifying restriction in aggregate system (Beraja, Hurst, Ospina, 2020).
  - ▶ Estimate local GE directly using multi-layered randomization (Huber, 2018; Berg and Streitz, WP; Egger et al., WP).