Household Aggregation

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Reminders

1. First project draft due May 4.

Outline

Outline

What is the MPC?

- MPC = marginal propensity to consume.
- Very important parameter in old Keynesian models.
- In standard New Keynesian models ≈ 0.
  - Euler equation $\Rightarrow$ Permanent income consumer.
- TANK and HANK models.

Identification Problem

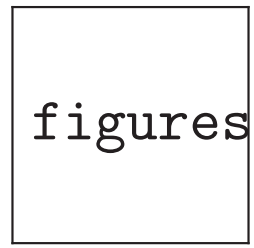
$$c_{it} = \alpha + \beta y_{it} + \varepsilon_{it}$$

- What could go wrong?

Jonathan Parker Oeuvre

- Johnson, Parker, Souleles, AER 2003: 20-40% of 2001 Rebate spent on nondurable goods within 3 months.
- Parker, Souleles, Johnson, McClelland, AER 2008: 50-90% of 2008 Rebate spent on nondurable and durable goods within 3 months.
- Broda, Parker, JME 2014: 2008 rebate caused 10% increase in spending in first week.
- Parker, Schild, Erhard, Johnson, WP 2022: 10% of 2020 stimulus was spent within 3 months.

The 2008 Experiment

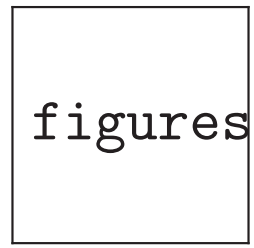


Specification

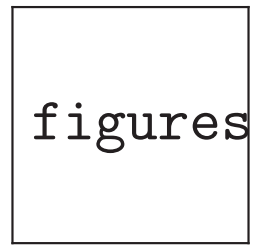
$$C_{i,t+1} - C_{i,t} = \sum_s \beta_{0s} \times month_{s,i} + \beta_1' X_{i,t} + \beta_2 ESP_{i,t+1} + u_{i,t+1}$$

- Comments? Concerns?

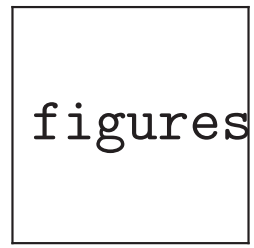
Effects on Expenditure



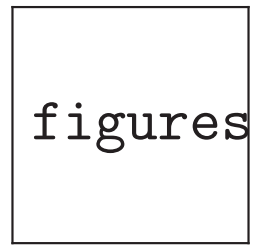
SUB-SAMPLES



Persistence



Heterogeneous Treatment Effects



Convincing?

More MPCs

- Shapiro and Slemrod (AER 2003, AER, 2009): self-reported MPC of 25-30% out of rebates in 2001 / 2008.
- Japielli and Pistaferri (AEJ-Macro, 2014): self-reported MPC of 48% out of hypothetical transitory income shock.
- Faegereng, Holmn, and Natvick (AEJ-Macro, 2021): 50% MPC within one year of large lottery winnings in Norway. Consumption is resiaul from budget constraint: $C = Y - \Delta A$.

Outline

de Chaisemartin and D'Haultfœuille, AER 2020

- Panel, binned into cells g, t (g=group).
- $Y_{i,g,t}$ outcome of unit i in cell g, t.
- $D_{g,t}$ treatment indicator.
- Expectation of OLS 2-way FE estimator:

$$\beta_{fe} = E\left(\sum_{(g,t):D_{g,t}=1} W_{g,t} \Delta_{g,t} \right)$$

  - $W_{g,t}$ are weights, $\sum_{(g,t):D_{g,t}=1} W_{g,t} = 1$.
  - $\Delta_{g,t}$ is the group-specific ATE.

What is the Problem?

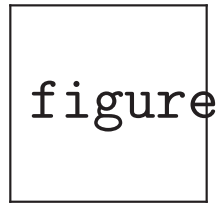
- With homogeneous treatment effects, no problem:

$$\Delta_{g,t} = \Delta \Rightarrow \beta_{fe} = \Delta$$

- With heterogenous treatment effects β_{fe} may be poor guide to average ATE since weights $W_{g,t}$ may be negative.

Outline

Borusyak, Jaravel, and Spiess, WP 2022



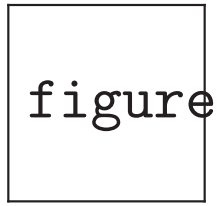
- 2-way FE OLS population coefficient is:

$$\beta_{fe} = \tau_{A2} + \frac{1}{2}\tau_{B3} - \frac{1}{2}\tau_{A3}$$

- Not an ATE!

- What is OLS doing here?

Test for Pre-Trends



- Pre-trend coefficient for lag 2:

$$\beta_{fe,-2} = \tau_{A3} - \tau_{B3}$$

- What is OLS doing here?

- Identified?

Notation

- Binary treatment D_{it}, outcome Y_{it}
- Event date E_{it} where D_{it} switches from 0 to 1.
- Observations $\Omega_1 = \{it \in \Omega : \ D_{it} = 1\}$ and not-yet-treated Ω_0 (includes never treated).
  - Treated: $\Omega_1 = \{it \in \Omega : \ D_{it} = 1\}$, $|\Omega_1| = N_1$
  - Not-yet-treated: $\Omega_0 = \{it \in \Omega : \ D_{it} = 0\}$, $|\Omega_0| = N_0$
- $Y_{it}(0)$ potential outcome if never treated.
- Causal effect $\tau_{it} = E[Y_{it} - Y_{it}(0)]$.

Start from First Principles

- Estimation target:

$$\tau_w = \sum_{it \in \Omega_1} w_{it} \tau_{it} = w' \tau$$

- Assumption 1: Parallel trends

$$E[Y_{it}(0)] = \alpha_i + \beta_t \qquad \forall it \in \Omega$$

- Assumption 2: No anticipation

$$Y_{it} = Y_{it}(0) \qquad \forall it \in \Omega_0$$

- Assumption 3': Restricted causal effects

$$\tau = \Gamma \theta$$

  - θ is unknown $N_1 - M \times 1$, Γ is known $N_1 \times (N_1 - M)$
  - M restrictions on treatment effect. $M = N_1 - 1 =$ homogenous effects.

BSJ Theorem 1 [Simplified]

- Suppose Assumptions 1, 2, 3', and 4 [homoscedastic errors] hold. Then among linear unbiased estimators of τ_w, the (unique) efficient estimator $\hat{\tau}_w^*$ can be obtained with the following steps:

  1. Estimate θ by $\hat{\theta}$ from the linear regression

  $$Y_{it} = \alpha_i + \beta_t + D_{it}\Gamma_{it}'\theta + \varepsilon_{it}.$$

  2. Estimate the vector of treatment effects τ by $\hat{\tau} = \Gamma\hat{\theta}$.

  3. Estimate the target τ_t by $\hat{\tau}_w^* = w'\hat{\tau}$

BSJ Theorem 2 [Simplified]

- With unrestricted treatment effects ($M = 0$), the unique efficient linear unbiased estimator $\hat{\tau}_w^*$ of τ_w from Theorem 1 can be obtained via an imputation procedure:

  1. Within the untreated observations only ($it \in \Omega_0$), estimate by OLS:

  $$Y_{it} = \alpha_i + \beta_t + \varepsilon_{it}.$$

  2. For each treated observations ($it \in \Omega_1$) with $w_{it} \neq 0$, set $\hat{Y}_{it}(0) = \hat{\alpha}_i + \hat{\beta}_t$ and $\hat{\tau}_{it} = \hat{Y}_{it} - \hat{Y}_{it}(0)$.

  3. Estimate the target τ_w by a weighted sum $\hat{\tau}_w^* = w'\hat{\tau}$

Inference

- Inference problem for treated units:

$$Y_{it} = \alpha_i + \beta_t + \tau_{it} + \varepsilon_{it}.$$

- How to distinguish between unrestricted τ_{it} and ε_{it}?

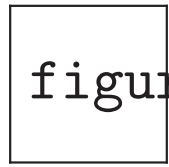
- "Conservative" standard errors: impose some homogeneity, so attribute some variance to ε_{it} that belongs to τ_{it}.

- Yields asymptotically weakly conservative standard errors.

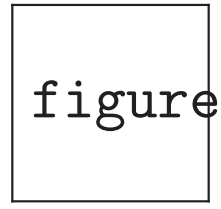
Pre-trends

- To test for pre-trends augment model for untreated observations with additional pre-determined variables and test that the coefficients are zero.
- Does not distort inference conditional on test passing.
- What happens if we then include these variables in the regression model? Do we satisfy parallel trends?

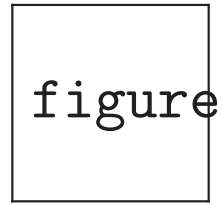
Application to Broda and Parker, JME 2014



Dynamic Treatment Effects

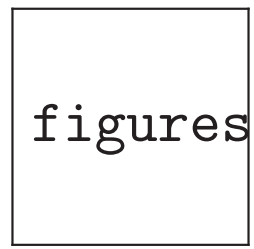


Weights



Outline

Expenditures on New Motor Vehicles: Actual vs. Counterfactual



Update of Sahm, Shapiro, Slemrod (2012) calculation, no general equilibrium feedbacks.

G.E. Effects Can Increase Puzzle

- Direct micro effect - governed by *micro MPC* .

- Induced macro effect - governed by *general equilibrium MPC* (GE-MPC)

GE-MPC $=$ micro MPC $+$ induced macro effect

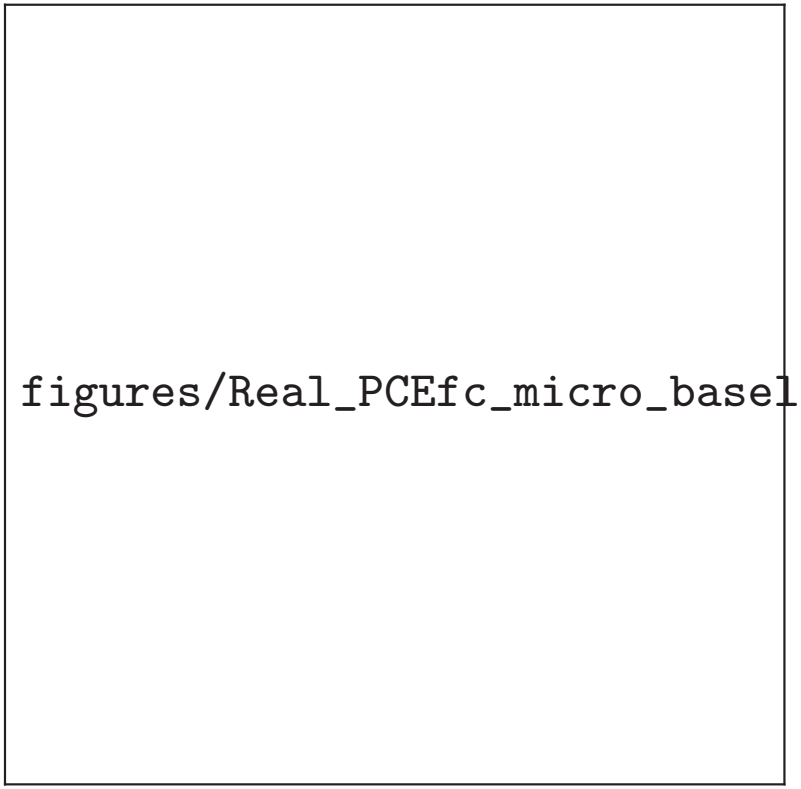
$\equiv$ the multiplier in a closed economy with no capital.

Methodology for creating macro counterfactuals

- Construct a medium-scale two-good, two-agent New Keynesian model with nondurables and durables (interpreted as motor vehicles).
- Calibrate fraction of hand-to-mouth households to match micro MPCs.
- Simulate response of consumption to rebates.
- Subtract simulated responses from actual consumption data from 2008 to derive the counterfactual path with no rebate.

Counterfactual Consumption Expenditure: Baseline Model

Real PCE: Micro MPCs



Real PCE GE: Baseline

Motor Vehicles: Micro MPCs

Motor Vehicles: GE Baseline

Reconciling Implausible Macro G.E. Effects

- **G.E. Dampening**
  - Key: 2/3 (or more) of estimated micro-mpc from new vehicle purchases
  - Durable good demand is elastic and if supply is less elastic, G.E. effects can dampen micro-effects
- **Micro MPCs**
  - Apply B.J.S. method to CEX data
  - Resulting micro-mpc is .3 (compared to .52 in Parker et. al.)
  - Why? Mostly explained by negative weights on past treated units

Decomposing OLS v.DID Imputation

Period Weights

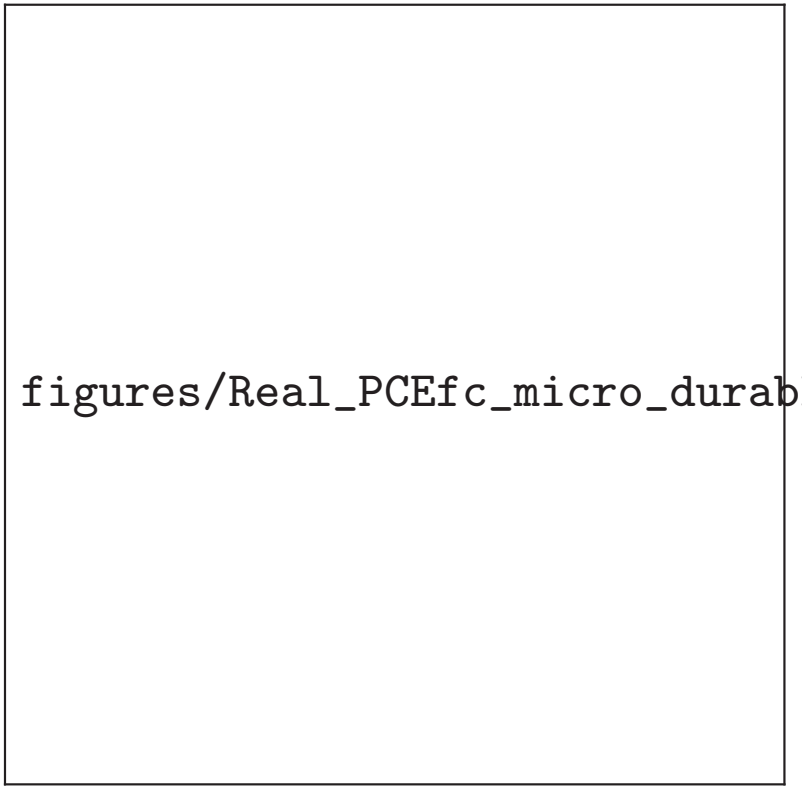
Period Coefficients

Decomposed Coefficient

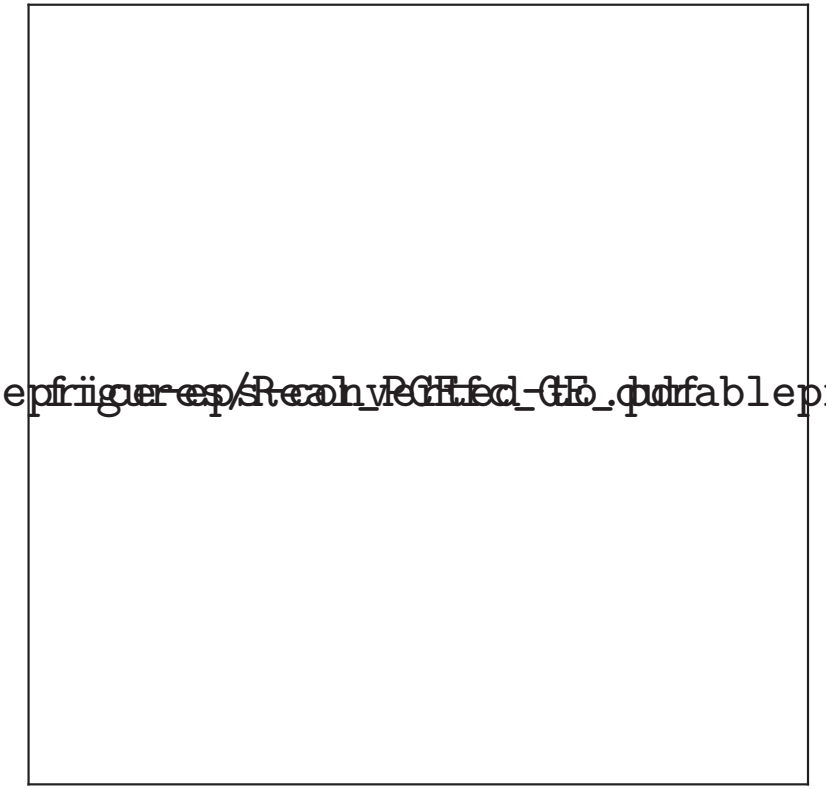
Relative Contributions

Counterfactual: Less Elastic Durable Supply Model

Real PCE: Micro MPCs



Real PCE: GE Less Elastic



Motor Vehicles: Micro MPCs

Motor Vehicles: GE Less Elastic