UNIVERSITY OF CALIFORNIA
DEPARTMENT OF ECONOMICS

Economics 134
Spring 2018
Professor David Romer

LECTURE 13

DOES FISCAL POLICY MATTER?
MARCH 5, 2018

I. THE EFFECTS OF FISCAL POLICY IN THE IS-MP-IA MODEL
   A. The Short-Run Effects on Output and the Real Interest Rate: The IS-MP Diagram
   B. The Effects on Output, Inflation, and the Real Interest Rate over Time: The AD-IA Diagram
   C. Discussion

II. HALL'S EVIDENCE
   A. Hall's Regression
   B. What Question Are We Trying to Answer?
   C. Possible Sources of Omitted-Variable Bias
   D. Results
   E. Hall's Conclusion

III. NAKAMURA AND STEINSSON'S EVIDENCE
   A. Nakamura and Steinsson's Basic Model
   B. Possible Sources of Omitted-Variable Bias If We Used Ordinary Least Squares Regression
   C. Nakamura and Steinsson's Approach
      1. The basic idea
      2. Instrumental variables implementation
   D. Results and Discussion

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Announcements

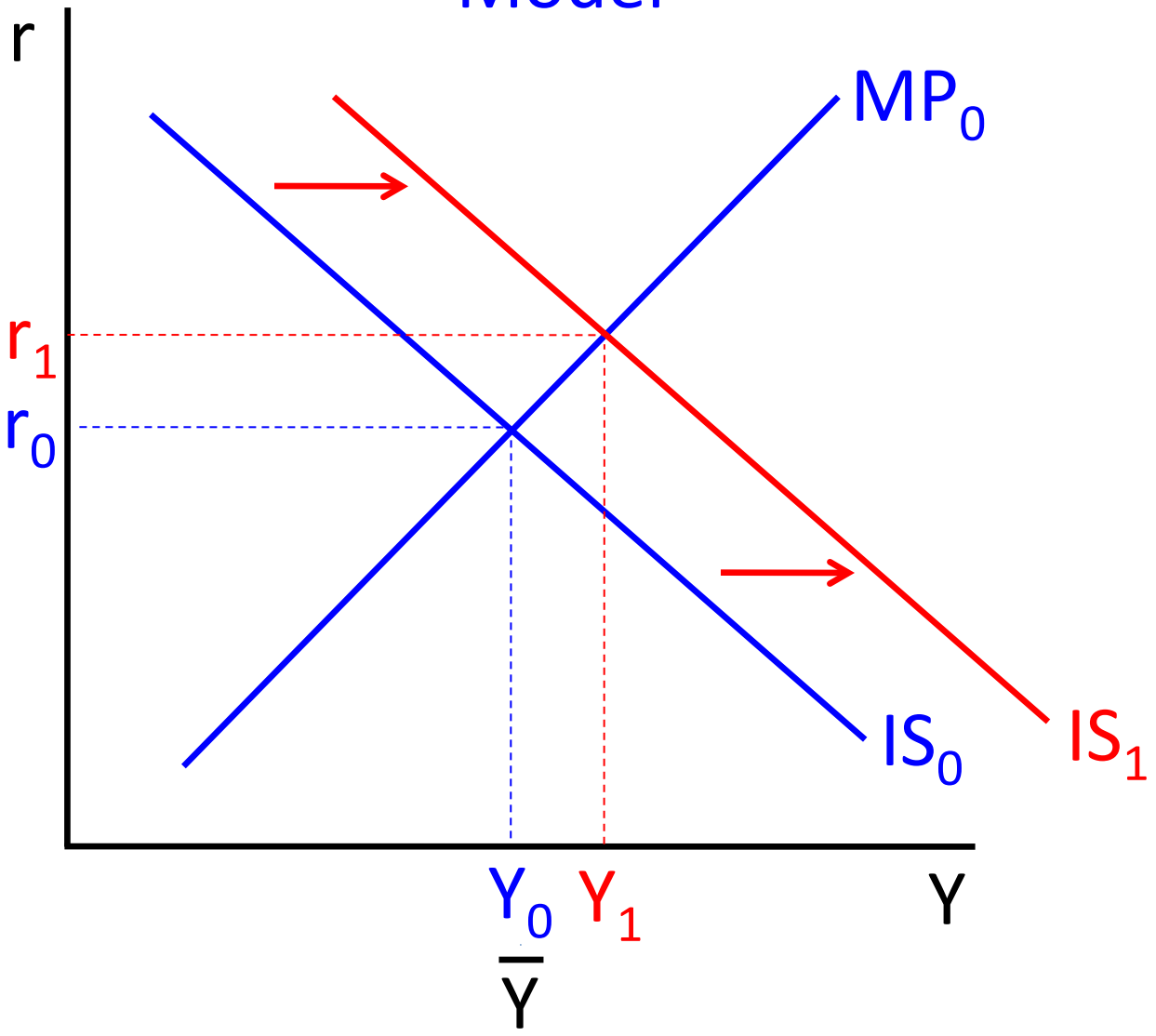
- Midterm logistics:
  - Wednesday, March 7, 5:10–6:30.
  - If your GSI is Matthias Hoelzlein, go to 2040 VLSB.
  - Students with DSP accommodations should have received an email from me. If not, let me know.
  - Everyone else should come to the usual room.
  - You do not need a blue book.

Announcements (cont.)

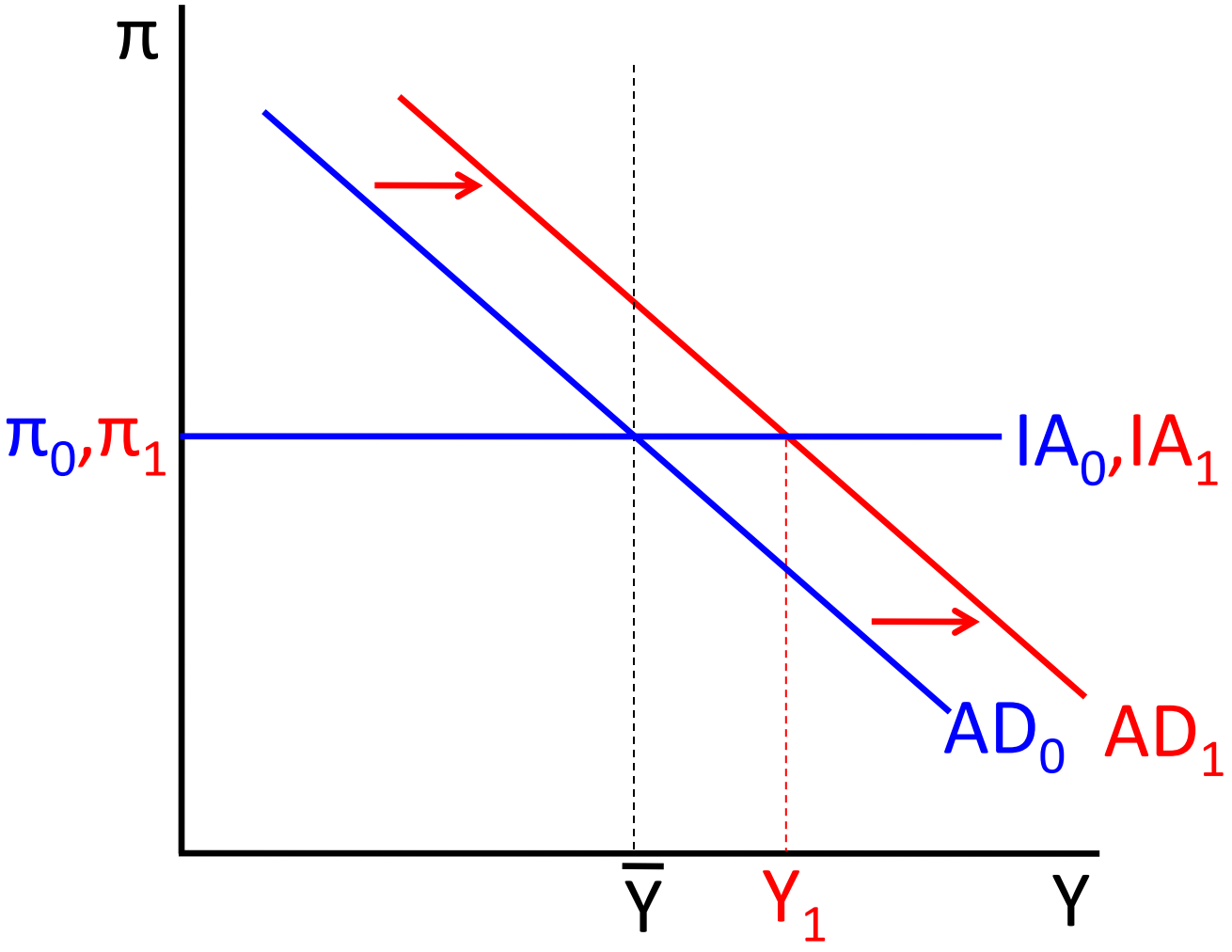
- For next lecture (March 12):
  - The assigned reading is selected pages from one paper—so please do the reading carefully.

I. The Effects of Fiscal Policy in the IS-MP-IA Model

The Short-Run Effects of a Tax Cut in the IS-MP Model



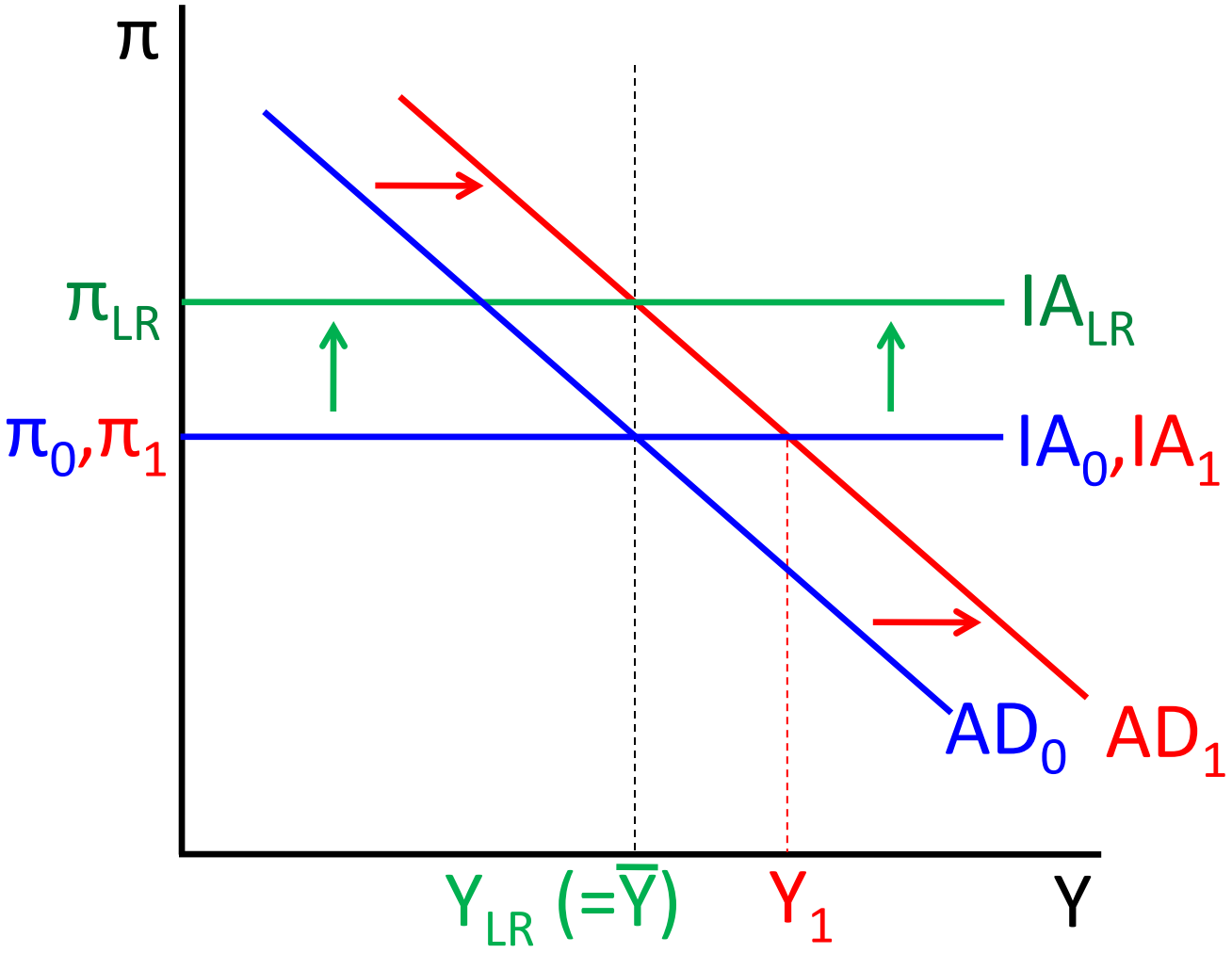
The Short-Run Effects of a Tax Cut in Terms of the AD-IA Diagram



What Is the Short-Run Effect of the Tax Cut on Net Exports and the Exchange Rate?

- To figure out what happens to NX and ε, we need to figure out what happens to net capital outflows.
- Net capital outflows are a deceasing function of r.
- r rises, so CF falls.
- NX = CF, so NX falls.
- NX are a decreasing function of the real exchange rate, so for NX to fall, ε must rise.
- Conclusion: NX falls, ε rises.

The Effects of a Tax Cut over Time



II. Hall's Evidence

Hall's Regression

$$\frac{Y_t - Y_{t-1}}{Y_{t-1}} = a + b\frac{G_t - G_{t-1}}{Y_{t-1}} + e_t,$$

where Y is real GDP and G is real government military purchases (and the data are annual).

Notice the resemblance to a regression of output growth on money growth:

$$\Delta \ln Y_t = a + b\,\Delta \ln M_t + e_t.$$

What Question Are We Trying to Answer?

It depends – there are various possible questions. In late 2008/early 2009, you might have been most interested in an increase in government purchases:

- With the nominal federal funds rate held constant.
- With no changes in tax policy.
- With the increase in G fairly short-lived.
- In a weak, financially distressed economy.

Possible Sources of Omitted-Var. Bias (I)

Recall Hall's regression:

$$\frac{Y_t - Y_{t-1}}{Y_{t-1}} = a + b\frac{G_t - G_{t-1}}{Y_{t-1}} + e_t,$$

Omitted variable bias occurs when there is correlation between the determinant of output growth we are focusing on ($[G_t - G_{t-1}]/Y_{t-1}$) and influences on output growth that are left out of the regression (e_t).

Possible Sources of Omitted-Var. Bias (II)

A concrete example of possible omitted variable bias:

- Suppose in response to the big movements in G in Hall's sample, the Fed raises i when G rises and cuts i when G falls.
- Then (relative to the case of i held fixed) there is an influence on output not in the regression correlated with ΔG: monetary policy is reducing ΔY when ΔG is high, and raising it when ΔG is low.
- That is, e and ΔG are negatively correlated.
- Thus, the OLS estimate of b will be less than the true b.

Possible Sources of Omitted-Var. Bias (III)

Reasons that the episodes that drive Hall's estimates might differ in important ways from an ideal episode for answering our question:

- Tax policy wasn't held constant.
- There were policies to directly reduce private spending.
- Patriotism may have had important effects.
- The increases in G weren't all viewed as short-lived.
- The economy generally wasn't weak and financially distressed.

Hall's Estimates

Table 1. Ordinary Least Squares Estimates of Government Purchases Multipliers for Military Spending[a]

Period	*GDP multiplier*
1930–2008	0.55
	(0.08)
1948–2008	0.47
	(0.28)
1960–2008	0.13
	(0.65)
1939–48	0.53
	(0.07)
1949–55	0.48
	(0.56)
1939–44	0.36
	(0.10)
1945–49	0.39
	(0.08)

Source: Author's calculations.

a. Numbers in parentheses are standard errors.

Hall's Conclusion

- "I conclude that the evidence from U.S. historical experience on the magnitude of the multipliers only makes the case that the multiplier is above 0.5."

III. Nakamura and Steinsson's Evidence

Nakamura and Steinsson's Basic Model

$$\frac{Y_{i,t} - Y_{i,t-2}}{Y_{i,t-2}} = \alpha_i + \gamma_t + \beta \frac{G_{i,t} - G_{i,t-2}}{Y_{i,t-2}} + \varepsilon_{i,t},$$

where:

- *i* indexes states (or regions);
- *t* indexes years;
- *Y* is real GDP (per capita);
- *G* is real military purchases (per capita).

Nakamura and Steinsson's Model (in Words)

GDP growth in state *i* over the two years from *t*–2 to *t* depends on:

- The state's normal GDP growth (α_i);
- Normal national growth from *t* – 2 to *t* (γ_t);
- The increase in federal military spending in that state over that same 2-year period, as a share of its initial GDP ($[G_{i,t} - G_{i,t-2}]/Y_{i,t-2}$).
- Other things (ε_t).

If We Estimated Nakamura and Steinsson's Model by OLS, What Are Possible Sources of Omitted-Variable Bias?

- Perhaps military spending is directed to states that are in worse economic shape.
- Perhaps powerful members of Congress direct military spending and other government support to their home states.
- Perhaps there is measurement error in our G data.

Nakamura and Steinsson's Basic Idea

- Use the fact that military spending in different states generally responds differently to changes in national military spending.

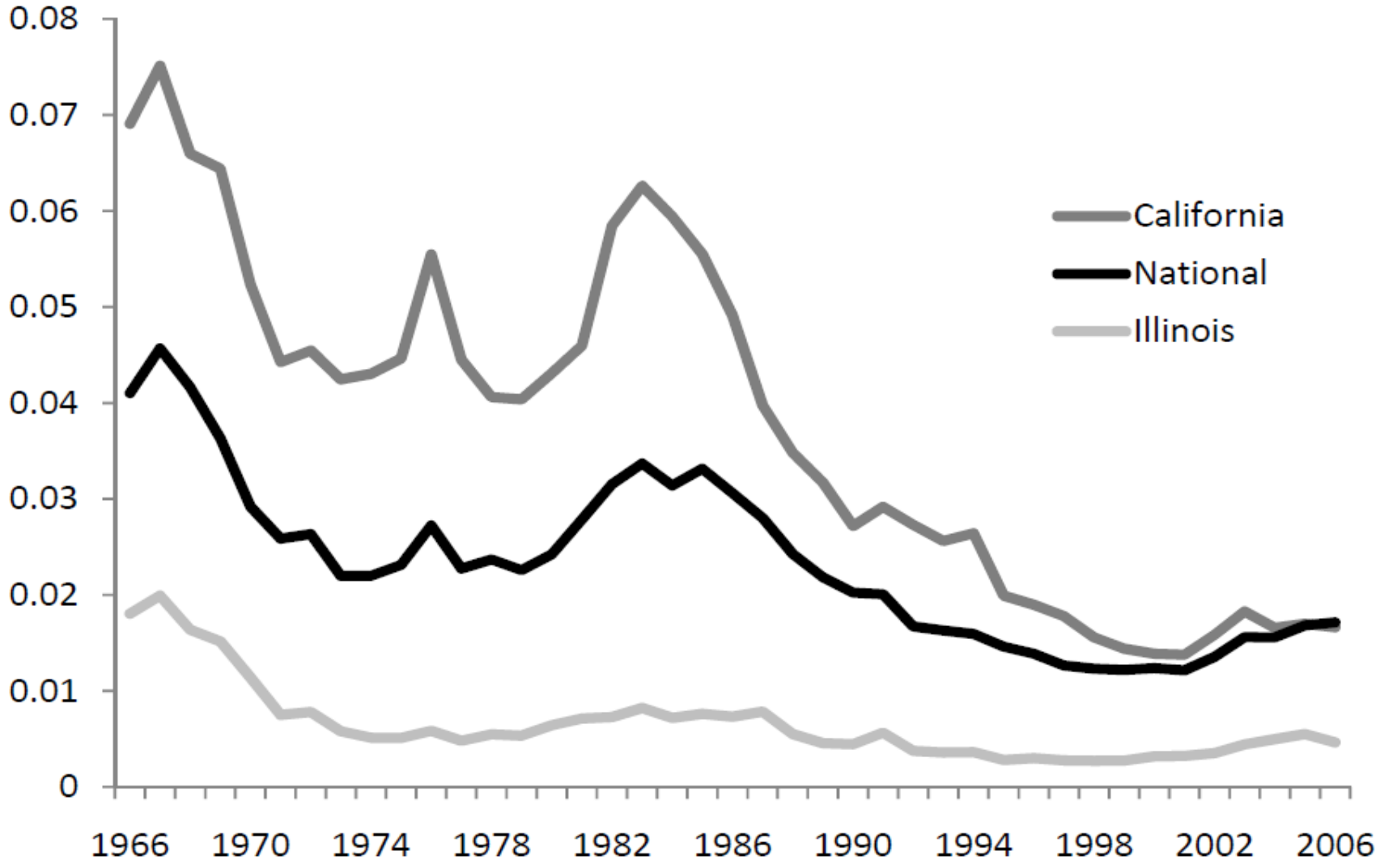


Figure I
Prime Military Contract Spending as a Fraction of State GDP

Nakamura and Steinsson's Instrumental Variables Approach – Step 1

- Estimate a separate OLS regression for each state:

$$\frac{G_{i,t} - G_{i,t-2}}{Y_{i,t-2}} = a_i + c_t + b_i \frac{G_t - G_{t-2}}{Y_{t-2}} + e_{i,t}$$

(Subscripts are very important here: $G_{i,t}$ is military spending in state i, G_t is national military purchases.)

- Let $Z_{i,t}$ denote the fitted value of this regression. That is,

$$Z_{i,t} = \hat{a}_i + \hat{c}_t + \hat{b}_i \frac{G_t - G_{t-2}}{Y_{t-2}}.$$

Nakamura and Steinsson's Instrumental Variables Approach – Step 2

- Step 2: Estimate, by OLS:

$$\frac{Y_{i,t} - Y_{i,t-2}}{Y_{i,t-2}} = \alpha_i + \gamma_t + \beta Z_{i,t} + \varepsilon_{i,t}.$$

- In words: Estimate the relationship between state-level output growth and the component of the change in military spending in the state that is due to the usual response of military spending in that state to national military spending.
- Or, more simply: When national military spending rises, does GDP rise more in California than in Illinois – and if so, by how much?

TABLE II
The Effects of Military Spending

	Output	
	States	Regions
Prime Military Contracts	1.43	1.85
	(0.36)	(0.58)
Prime Contracts plus Military Compensation	1.61	1.62
	(0.40)	(0.84)
Num. Obs.	1989	390

Each cell in the table reports results for a different regression with a shorthand for the main regressor of interest listed in the far left column. A shorthand for the dependent variable is stated at the top of each column. The dependent variable is a two year change divided by the initial value in each case. Output and employment are per capita. The regressor is the two year change divided by output. Military spending variables are per capita except in Population regression. Standard errors are in parentheses. All regressions include region and time fixed effects, and are estimated by two stage least squares. The sample period is 1966-2006 for output, employment and population, and 1969-2006 for the CPI. Output is state GDP, first deflated by the national CPI and then by our state CPI measures. Employment is from the BLS payroll survey. The CPI measure is described in the text. Standard errors are clustered by state or region.

Interpreting Nakamura and Steinsson's Results

- Their empirical results provide estimates of what they call the "open economy relative multiplier."
- Unfortunately, what we're likely to be interested in is what they call the "closed economy aggregate multiplier" under a certain set of conditions (for example, *i* held constant).
- In the part of the paper that was not assigned, N&S argue that models that imply an open economy relative multiplier similar to what they find empirically imply an even larger closed economy aggregate multiplier when *i* is held constant.