

Ten Years after the Financial Crisis: What Have We Learned from the Renaissance in Fiscal Research?

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We've made progress on all 3 methodological fronts

1. Theory

Incorporation of sticky prices & wages, hand-to-mouth consumers, **lower bounds on policy interest rates**, currency unions, variety of financing methods, effects of anticipated fiscal policy

2. Empirical methods

Identification via natural experiments, narrative methods, Bartik-style instruments; proxy SVAR/external instrument methods, local projection methods for estimating dynamic responses, standardization of methods for computing multipliers, incorporation of state dependence.

3. Data

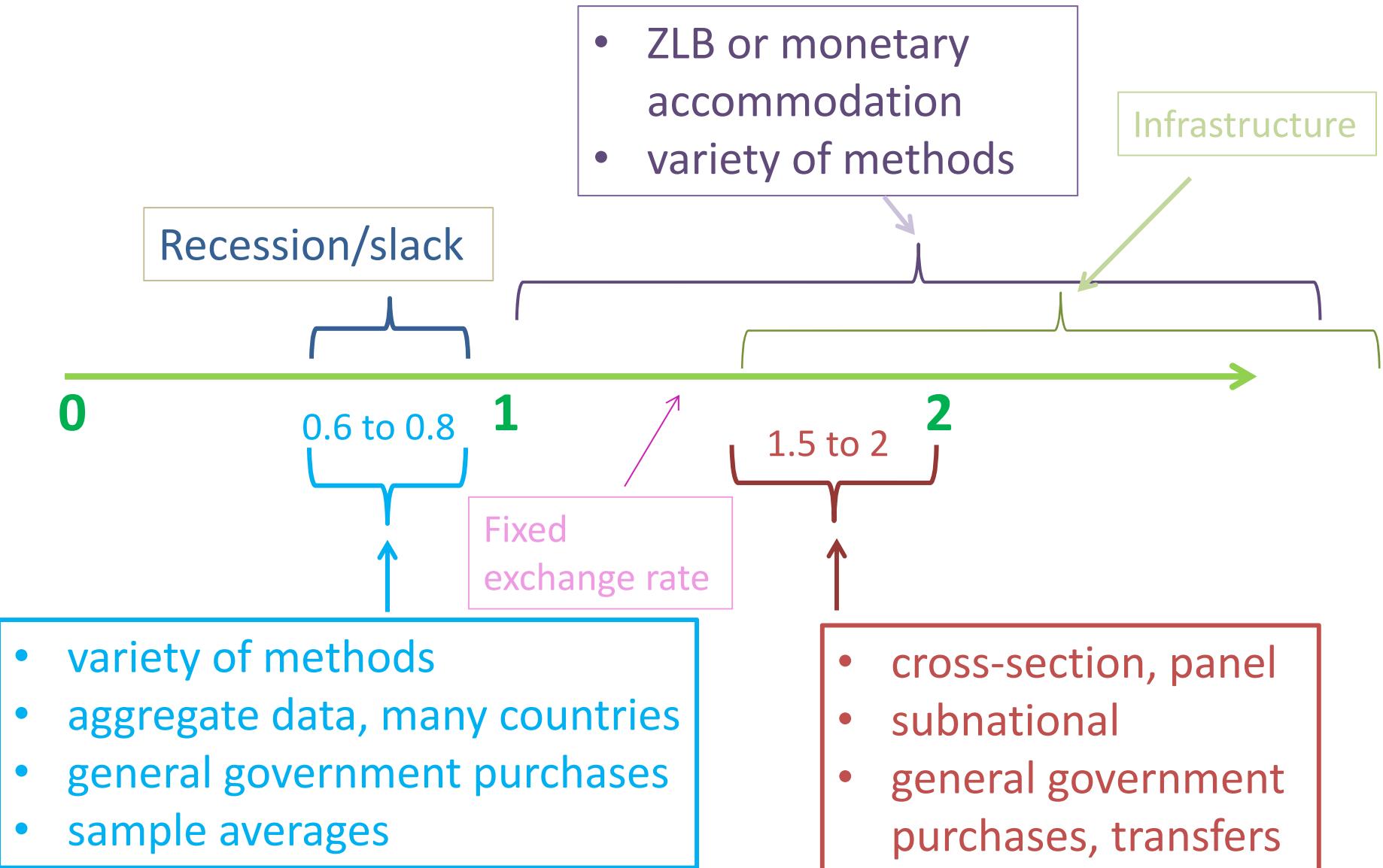
Newly constructed historical and cross-sectional data sets within countries, narrative instruments for panels of countries, exploitation of the **rich new data created by the variety of policymakers' fiscal responses to the crisis**.

Current Range of Leading Estimates of Fiscal Multipliers

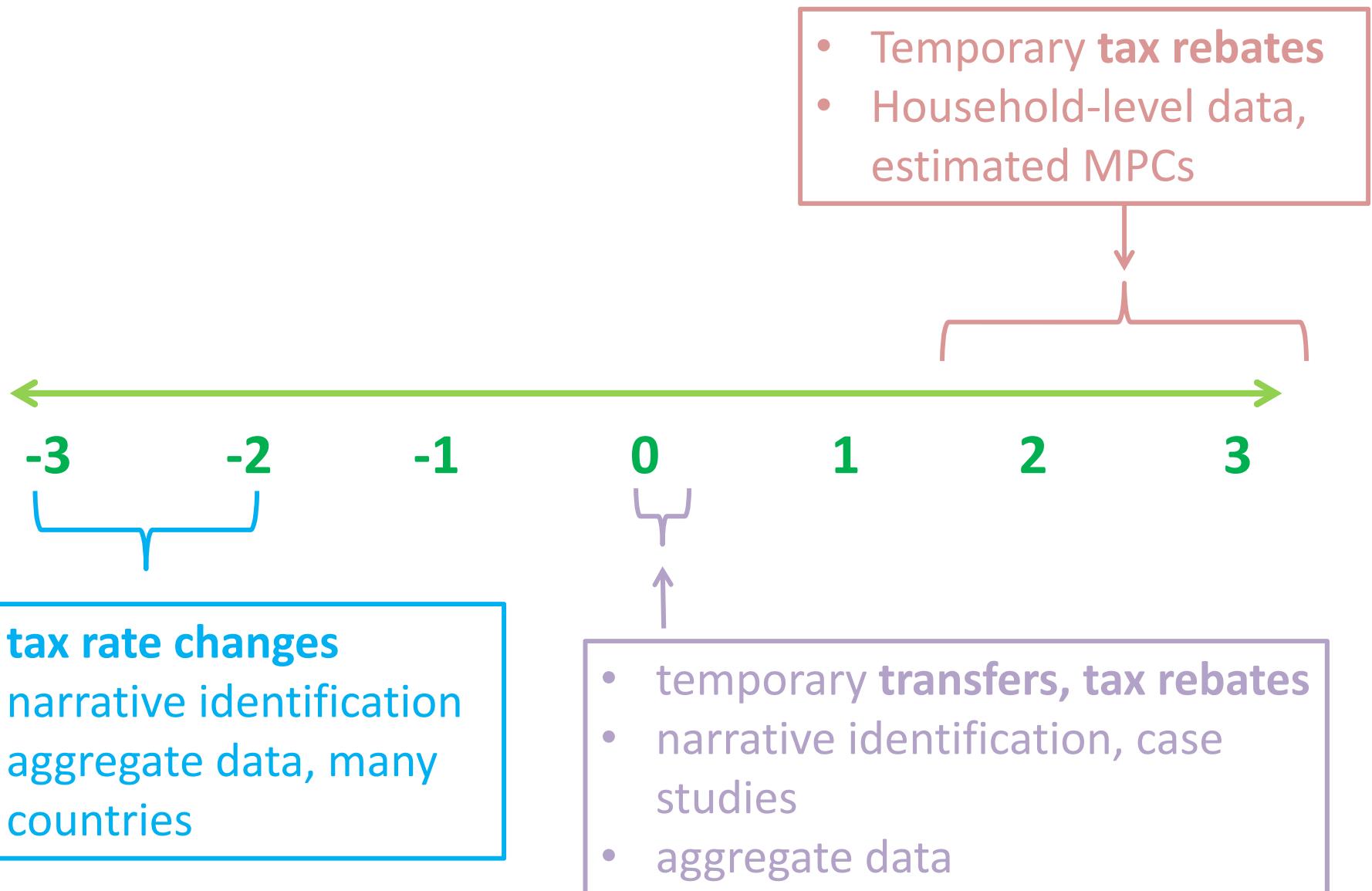
Scope of summary:

- Multipliers within the **first two to five years**.
- **Industrialized** countries.
- Estimates based on a **variety of methodologies**: time series models, narratives, and estimated New Keynesian DSGE models.
- Excludes estimates that do not use the best practices.
- **Ranges** shown are **for the majority of the estimates**, but don't include some notable outliers produced with good methodology.

Multipliers on Government Purchases



Multipliers on Taxes and Transfers



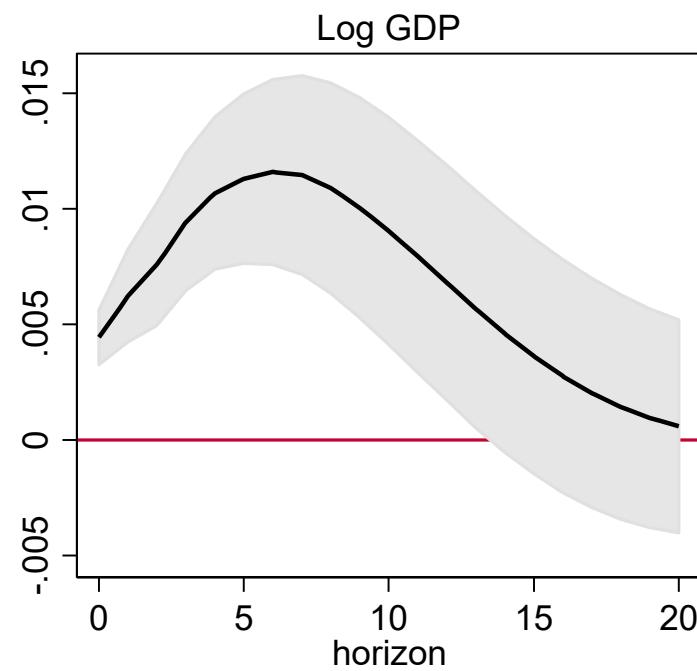
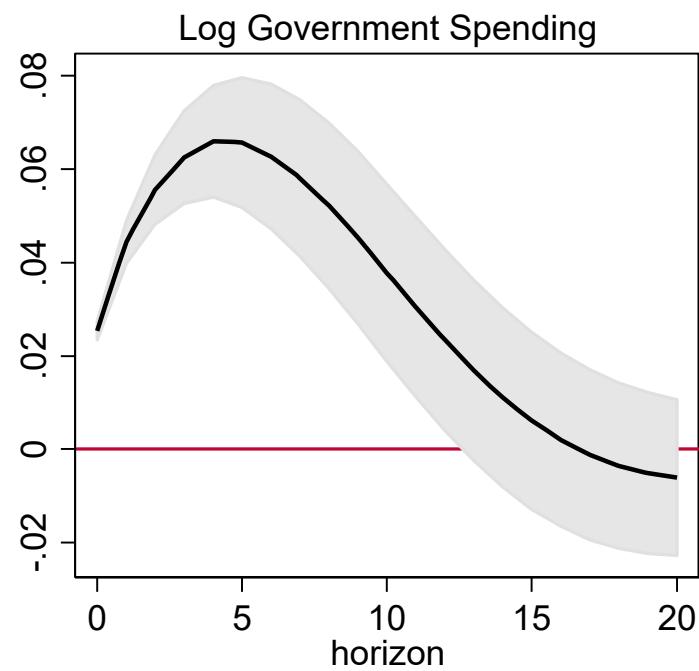
Pitfalls in Calculating Multipliers

- A recent lesson learned from the literature is that an important source of the wide range of multiplier estimates is **due to differences in the method for calculating multipliers.**
- I will highlight two commonly used methods that often lead to **upward bias in multipliers.**

Illustration for government purchases multipliers

- Structural VAR (SVAR) using **Blanchard-Perotti identification**, which orders government spending first.
- Quarterly data from 1939:1 – 2015:4.
- **5 variables:**
 - log real total government spending per capita
 - log real GDP per capita
 - log real federal tax receipts per capita
 - 3-month Treasury bill interest rate
 - inflation rate.
- 4 lags, quadratic trend.

Estimated responses to government spending shock.



95-percent confidence bands

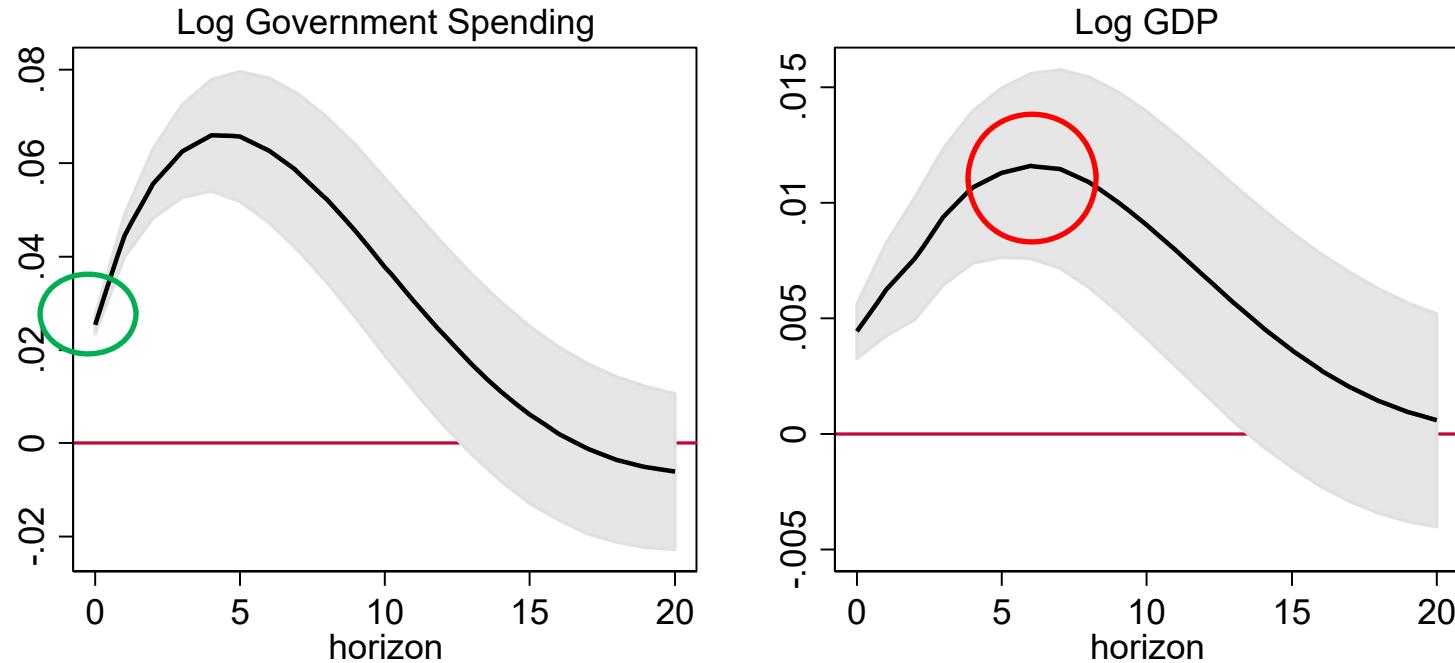
Calculating Multipliers

- How do we use the dynamic responses of the log variables to multipliers to answer the question:

How much does GDP rise when government spending rises by \$1?

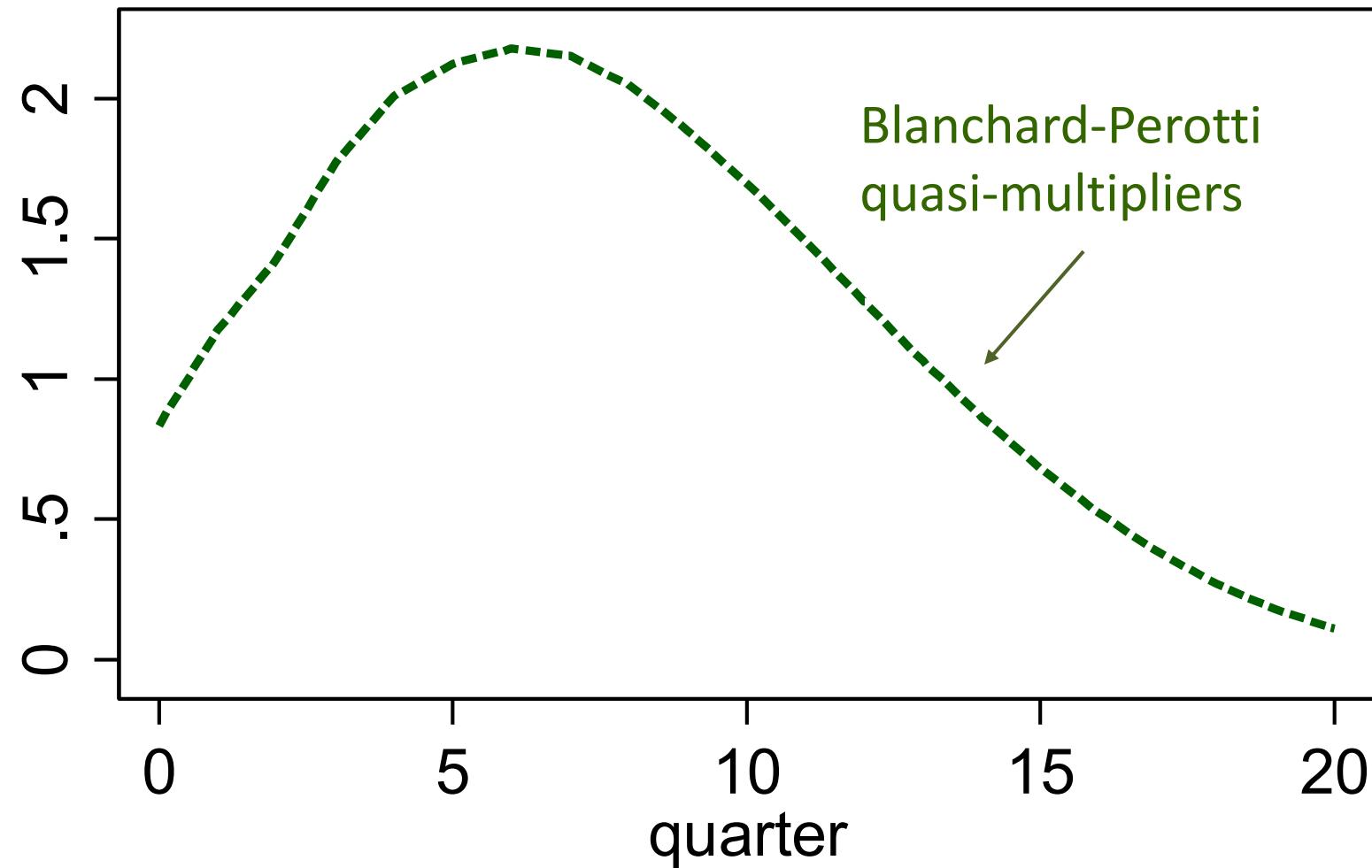
- I will show how seemingly small changes in the method can lead to large changes in the multiplier.

1. Blanchard-Perotti (2002) Quasi-Multipliers



- Compute the ratio of the **log GDP response at horizon h** to the **impact response (i.e. horizon 0) log government spending**.
- Convert elasticities (since logs) to \$ multipliers by multiplying the ratio in (a) by the sample average GDP/Gov (4.8 in this sample).

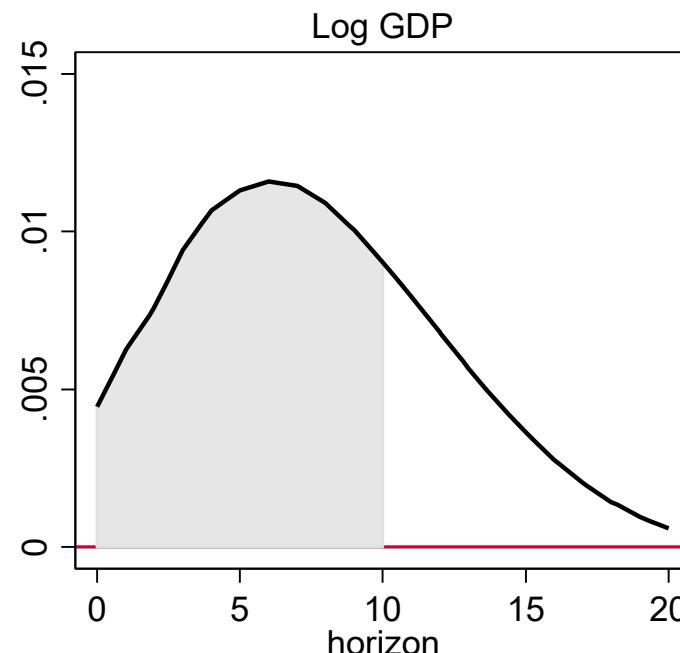
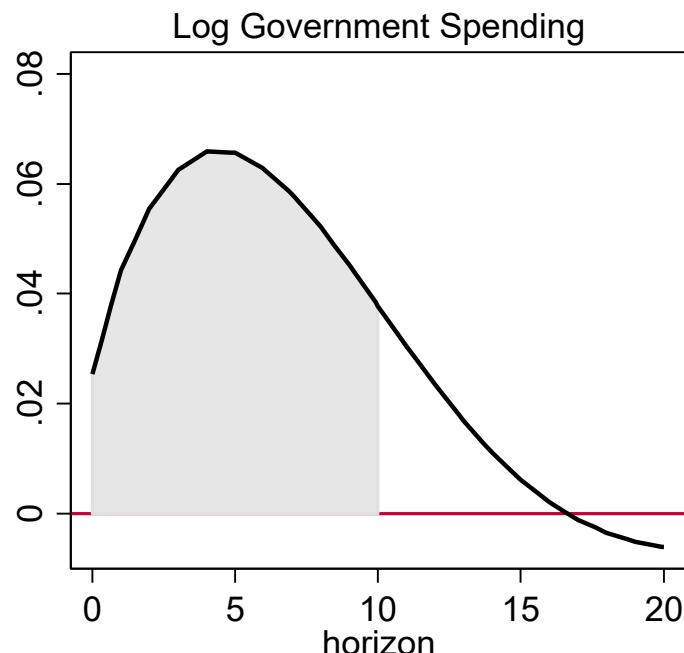
Multipliers by Horizon



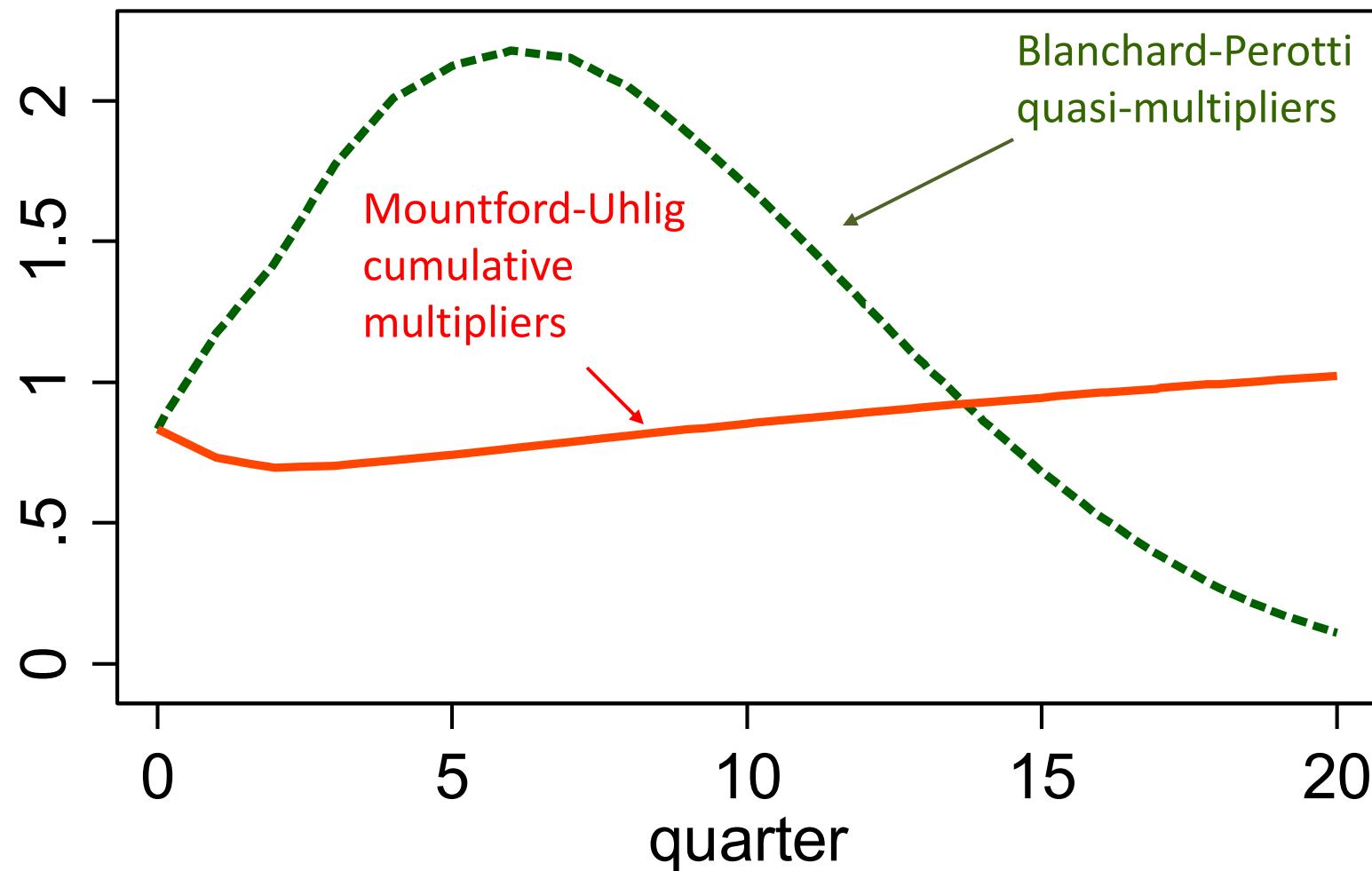
Blanchard and Perotti's quasi-multipliers are above 2 at the peak.

Mountford-Uhlig Method

- a. Compute the ratio of the **present value of the cumulative responses**.
- b. Convert elasticities to \$ multipliers, as with previous method.



Multipliers by Horizon



Elasticities versus Multipliers

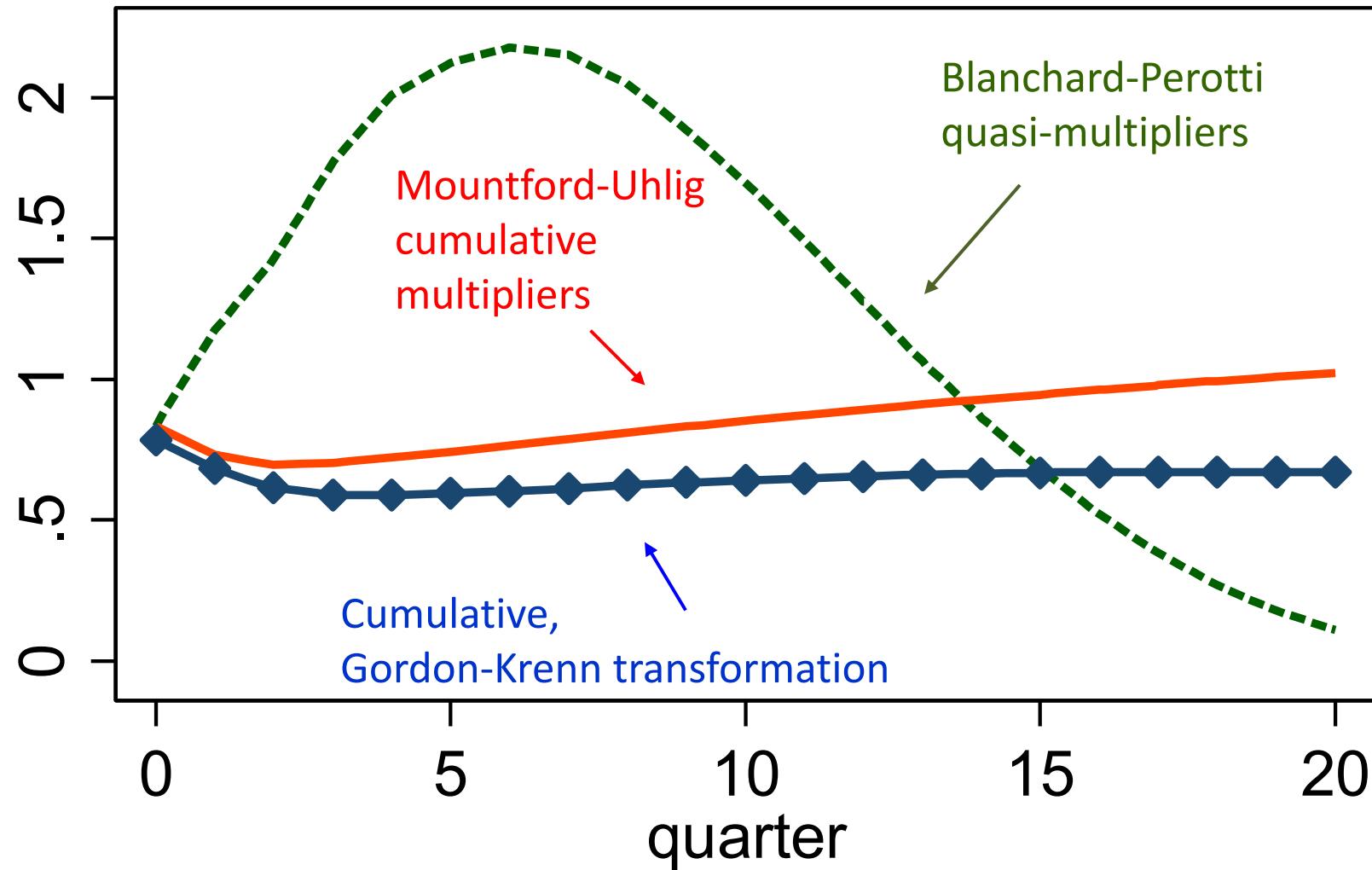
- The standard log specification yields estimates of **elasticities, not multipliers**.
- The standard method has been to convert elasticities to multipliers by multiplying by the **sample average of Y/G**.

$$\frac{dY}{dG} = \frac{d\ln(Y)}{d\ln(G)} \cdot \frac{\bar{Y}}{\bar{G}}$$

- **Alternative method:** Transform the variables to same units before estimation. Hall, Barro-Redlick divided changes in Y and G by lagged Y.

Gordon-Krenn: $\frac{Y_t}{Y_t^P}, \frac{G_t}{Y_t^P}$

Multipliers by Horizon



Additional issue for tax multipliers

- Most tax multipliers reported are based on the **legislative forecast of the budget impact, not taking into account dynamic feedback.**

But tax cuts raise GDP, which mitigates the negative effect of the tax cut on tax revenue.

- **Tax multipliers are even greater** (in magnitude) if reported relative to the actual change in tax revenue.

Bottom Line

Many of the **big differences in reported multipliers** are not due to the estimation method, sample, etc.

Rather, they are **due to the reporting of quasi-multipliers** that don't take into account the dynamic path of government spending or to the use of **ad hoc conversion factors** to deal with estimates based on logs.

Were Multipliers Greater for the Recent European Fiscal Consolidations?

- In the wake of the financial crisis, numerous European countries undertook fiscal consolidations.
- Some were more spending-based and others were more tax-based.
- Studies using narrative evidence for identification find that on average tax-based consolidations have much larger output effects than spending-based consolidations.
These results are consistent with the U.S. findings for tax versus spending multipliers.

- Alesina, Favero, and Giavazzi (2018, forthcoming) find that once they control for tax vs. spending features, multipliers in the wake of the financial crisis are not different from those on average.
- However, Blanchard and Leigh (2013, 2014) and House, Proebsting, and Tesar (2017) present indirect evidence of multipliers larger than those assumed in large macro models, using correlations between GDP forecasts errors and the size of the fiscal consolidations.

Were Multipliers Greater for the ARRA?

Evidence in favor of higher multipliers

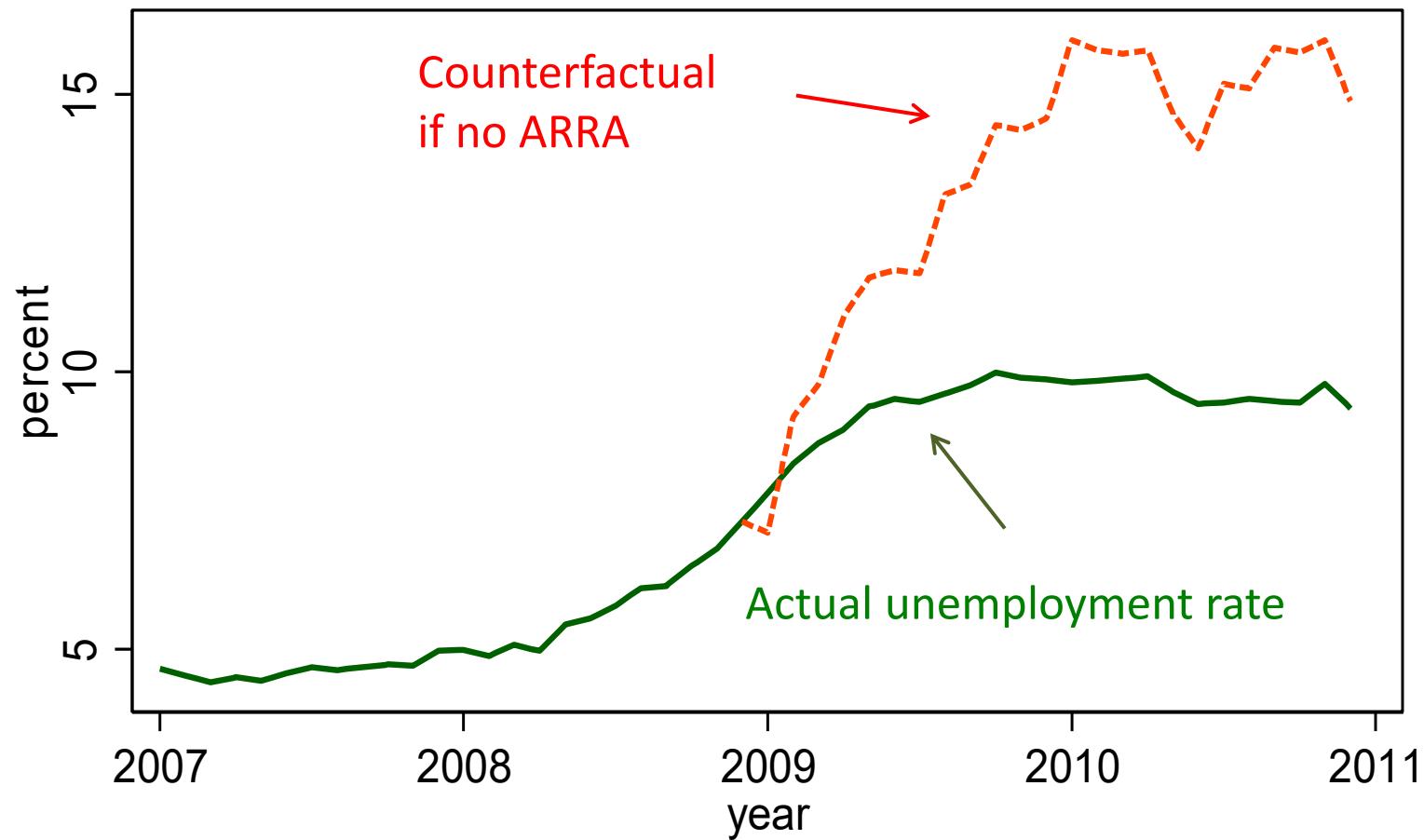
- Recall that theory and some empirical evidence suggests that **multipliers may be greater than one during periods of monetary accommodation**, such as at the ZLB.
- The **cross-state estimates** of the impact of the ARRA suggest **big employment and output multipliers**.

Chodorow-Reich (forthcoming) standardizes and synthesizes the ARRA evidence and estimates multipliers from 1.7 to 2 on output or 2 job-years created per \$100K.

Caveats

- Subnational multipliers are not the same as aggregate multipliers for a variety of reasons.
- However, Chodorow-Reich (forthcoming) uses theoretical arguments from Farhi-Werning to argue that at the ZLB, the cross-state multipliers for externally financed spending are *lower bounds* on the aggregate multiplier.
- This leaves us with the question: why are the cross-state multipliers so much higher than those estimated using aggregate data?

Aggregate Implications of the Cross-State Multiplier Estimates



The counterfactual estimates are based on Chodorow-Reich (forthcoming) estimates of the effects of the ARRA on employment by month through December 2010.

Why the existing ARRA multipliers don't apply to the aggregate

- They are not nationally representative.
 - The ARRA studies use per capita variables by state but don't weight their regressions by state population, i.e., they give North Dakota the same weight as California.
 - If treatment effects are heterogeneous across states, then the unweighted estimates won't be nationally representative.
- They don't account for all government spending.

Much of the ARRA consisted of federal transfers to states. Several studies have found that induced state spending was more than one-for-one.

What happens if we correct the estimates?

- Using Chodorow-Reich's replication files, I re-estimate his model but weight each state by population and use total state and local induced spending.
- The estimates are for job-years per \$100K but that is approximately equal to the output multiplier.

	Chodorow-Reich estimate	Weighted by population	All govt spending, weighted by pop
Multiplier	2.01	1.15	0.89
Robust s.e.	(0.59)	(0.72)	(0.45)

Bottom line: now the ARRA multiplier estimates look like the average historical aggregate estimates.

Conclusions

- There really has been a **renaissance in fiscal research**.
- We know much more now than we did ten years ago.
- **Garden-variety government purchases multipliers** are probably between 0.6 and 1, though there are a few credible estimates above 1.
- **Tax rate change multipliers** are probably between -2 and -3.
- Multipliers on **infrastructure** and during periods of **monetary accommodation** are probably above one, possibly substantially above one, but more research should be done to assess the robustness of these results.