Lecture 1 - Introduction to Empirical Macro and Finance

UCLA - Econ 221 - Fall 2018

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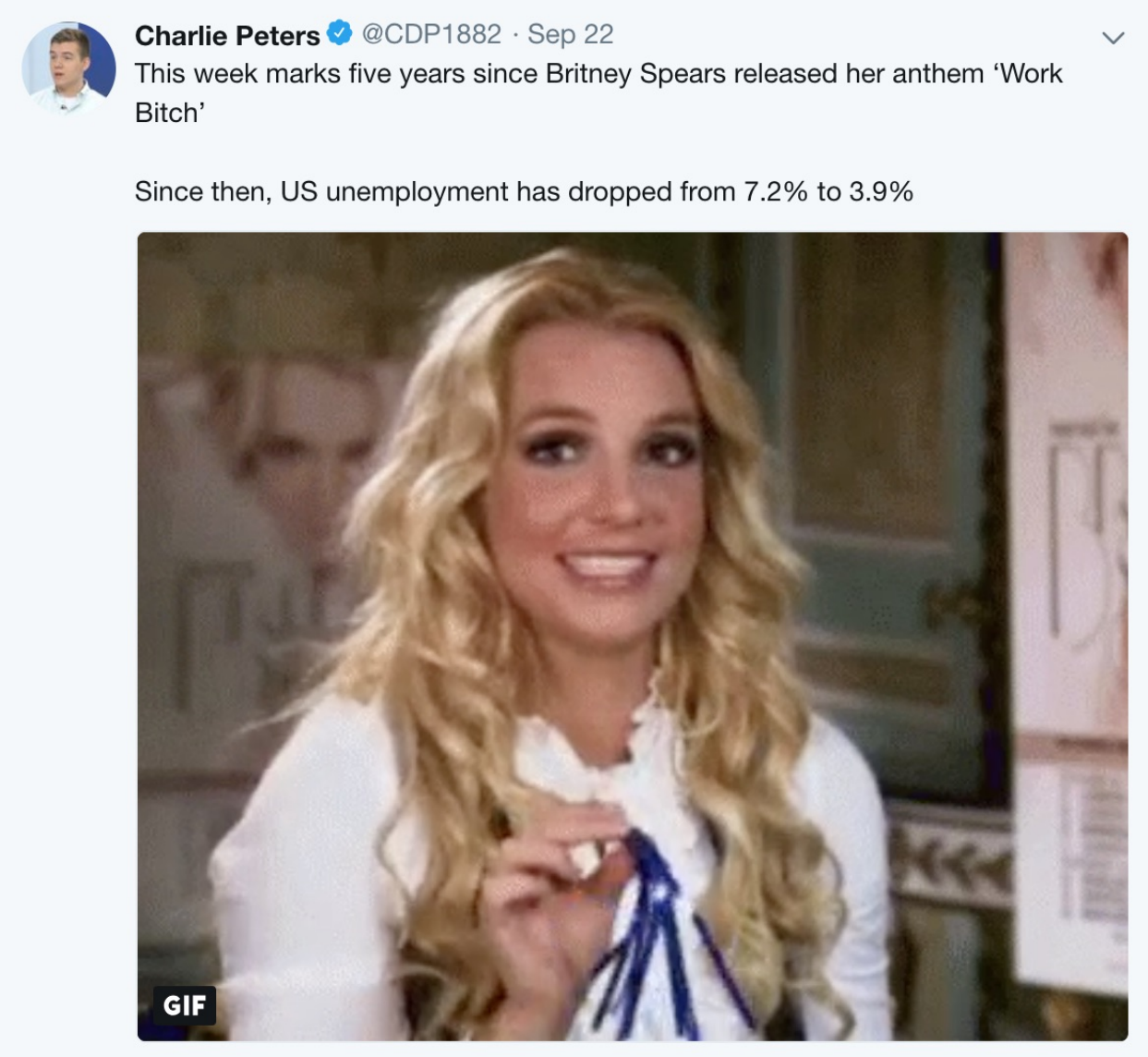
The Problem with Empirical Macro



1. Outline of the class
2. Nakamura and Steinsson (2017)
3. Model based identification / structural VARs
4. Narrative Approach and Case Studies
   - Romer and Romer (2004)
   - Romer and Romer (2010)
   - Case studies
5. Overview of available datasets
   - Different levels of aggregation
   - Making sense of the 2007-2009 Financial crisis

Grading of the course

1. First, I will ask you to replicate **two** empirical macro or/and finance papers, using **publicly available data** (e.g. national accounts, Compustat, CRSP, Nielsen Scanner data, other WRDS material, etc.), but for which the replication code was not made available online by the authors (or not fully). I shall give you a list of papers among which to choose **next week**. I believe that the best way to learn empirical methods in macroeconomics and finance is to "get your hands dirty", and practice working with data. The first replication exercise will count towards 40% of your final grade, and the second will count towards 40%.

2. Second, I will ask you to **present a recent paper in empirical macroeconomics** during the last two lectures. (30 minutes each) Again, I will give you a list from which to choose. This will count towards 20% of your final grade.

Outline of the course

- This course will follow an inductive, or bottom-up, approach. Whenever possible, I will start from the facts, and review different theories in light of these facts.
- I will particularly emphasize empirical observations that have not been explained by currently discussed theories.
- My hope is that you will find here some inspiration for a dissertation topic.
- Requirement: Use R! (see the class webpage)

Why empirical macroeconomics? the example of Keynes (1936)

- Historically, economics has been shaped by ideas and models, rather than evidence. For example, J.M. believed in the power of ideas to change policymarkers' mind and influence their course of action (Keynes (1936)):

  The ideas of economists and political philosophers, both when they are right and when they are wrong, are more powerful than is commonly understood. Indeed the world is ruled by little else. Practical men, who believe themselves to be quite exempt from any intellectual influence, are usually the slaves of some defunct economist.

Why empirical macroeconomics? the example of Keynes (1936)

- At the same time, Keynes (1936)'s initial argument/intuition comes from looking at the data:

  For professional economists, after Malthus, were apparently ***unmoved by the lack of correspondence between the results of their theory and the facts of observation;—a discrepancy which the ordinary man has not failed to observe, with the result of his growing unwillingness to accord to economists that measure of respect which he gives to other groups of scientists*** *whose theoretical results are confirmed by observation when they are applied to the facts.*

- J.M. Keynes changes in mind multiple times, between *The Economic Consequences of the Peace* (1919), *A Tract on Monetary Reform* (1923), *Essays in Persuasion* (1931), *The General Theory of Employment, Interest and Money* (1936).

Why empirical macroeconomics? the example of Keynes (1936)

- The Great Depression provides a good laboratory to test macroeconomic theory (large shock).
- Looking at different policies that are then put in place, he thinks that the economy responds in way that are at odds with the mainstream theory:
  - More saving does not lead to more investment.
  - Austerity is contractionary.

Why empirical macroeconomics?

- Compared to Keynes (1936)'s time, we should be doing a much better job now ! He did not even have access to the National Income and Product Accounts (NIPA), which were created after World War II.
- Now we have harmonized national accounts for at least **30 OECD countries.** We have more (perhaps less harmonized) from the IMF, the World Bank, the UN.
- We also have:
  - Many more years of data.
  - Many fiscal / monetary experiments.
  - Case studies (start of the Euro, emerging market crises, etc.)
  - **Local area statistics:** county-level unemployment, etc.
  - **Individual level data. (administrative, survey)**
  - **Other levels of aggregation.**
- We have no excuse not to look at data! (even if we don't like what we find!)

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Introduction

- Many of the main empirical questions in macroeconomics are the same as they were 80 years ago when macroeconomics came into being as a separate sub-discipline of economics in the wake of the Great Depression:
  - What are the sources of business cycle fluctuations?
  - How does monetary policy affect the economy?
  - How does fiscal policy affect the economy?
  - Why do some countries grow faster than others?
- How can it be that after all this time we don't know the answers to these questions?
- **Identification** in macroeconomics is difficult.

Monetary policy "shocks"?

- We need exogenous variation in monetary policy.
- Unfortunately, or fortunately, the Federal Reserve employs hundreds of PhD economists to pore over every little bit of incoming data about the economy so as to make monetary policy as endogenous as it possibly can be.
- The main purpose of the Federal Reserve is to vary monetary policy in a way that reacts to other developments that are affecting output and inflation.
- This fact, of course, makes our lives as empirical macroeconomists very difficult.

Challenges

1. **Exogeneity.** Exogenous variation in macro policy? Trump?
2. **External validity.** The natural experiments we can identify in the data are rarely exactly the experiments we would need to answer the policy question we are interested in. One such issue is that the dynamic nature of monetary and fiscal policy makes these policies very high dimensional.e.g. The effects of monetary policy, of course, also depend on the response of fiscal and tax policies.
3. (Related) **Statistical power.** Macroeconomists have relatively few data points to work with.
4. **State dependance.** Effects of monetary and fiscal policy may differ depending on the level of slack in the economy and various other characteristics of the economy, such as how open it is.
5. **Expectations.** The degree to which a policy action is a surprise can affect both how strongly and when the economy reacts to it. (maybe this worry is a bit overstated though?)

Structural work?

- This is why macroeconomists want to write models so much. That's what is called "structural work". Such work typically takes the form of researchers **identifying a set of moments** in the data and arguing that **these moments can discriminate** between different models of how the economy works.
- All too often, this structural mode of inference is viewed as completely separate from empirical work seeking to uncover causal effects. (this is true of the calibration tradition)

Structural work?

- In fact, however, estimates of causal effects (i.e., the response to structural shocks) are often particularly informative moments for distinguishing between important classes of macroeconomic models. The reason for this is that the value of such "identified moments" often provide evidence on a specific causal mechanism and are insensitive to other aspects of the economy.
- The term "identified moments" may seems odd to some. In econometrics, it is parameters that are identified, not moments. We use the term "moment" in a broad sense to refer to a target statistic that a researcher wants his or her model to match. We use the term "identified" because the target statistics we have in mind are estimates of causal effect parameters (or what macroeconomists would call estimated responses to "identified structural shocks") as opposed to simple unconditional moments such as means, variances and covariances. In other words, we are using the term "identified moments" as short-hand for "target statistics derived from estimators of responses to identified structural shocks."

Examples of well-identified moments

- Rotemberg and Woodford (1997); Christiano et al. (2005). Impulse Response to a monetary policy shock? RBC models imply that monetary shocks should affect inflation but not output, while the empirical evidence suggests a substantial response of output.
- Gali (1999) and Basu et al. (2006) argue that identified responses of output and hours to productivity shocks reject RBC models in favor of New Keynesian models. Suggests that improvements in productivity lead firms to fire workers in the short run.
- Estimates of the marginal propensity to consume (MPC) from a transitory fiscal rebate is another example of an identified moment. Quarterly MPC of roughly 0.25 for non-durable consumption (Johnson et al. (2006); Parker et al. (2013)). We'll come back to this moment when looking at consumption.

Advantage of well-identified moments (Greene (2012))

- Aggregate supply and aggregate demand may both determine GDP $\Rightarrow$ IV.

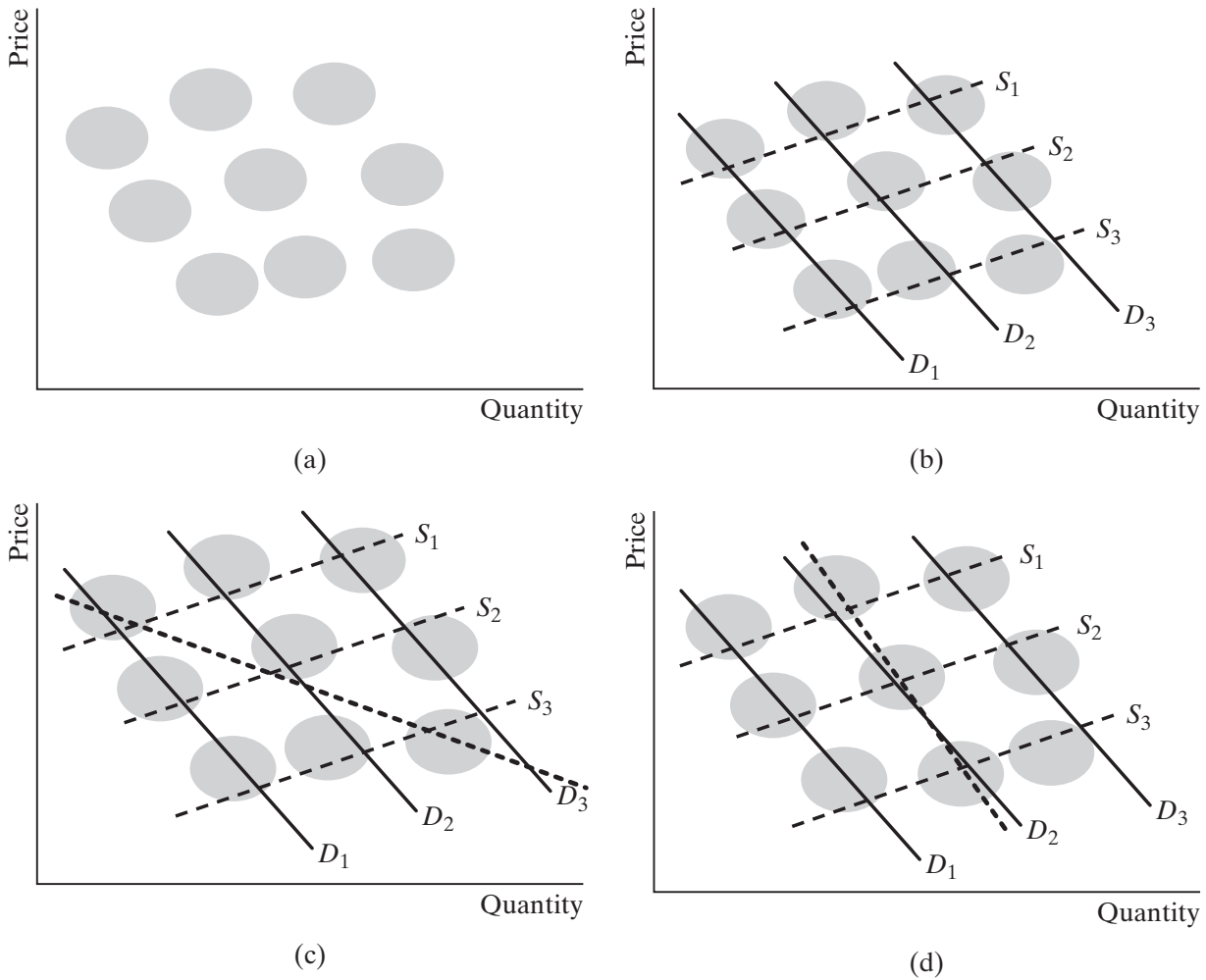

FIGURE 8.1 Identifying a Demand Curve with an Instrumental Variable.

Turning to regional data

- Advantage: multiply the number of data points.
- Disadvantage: how about General Equilibrium Effects.
- For example: Keynesian multipliers are non existent at the individual level, by definition. (only incentive effects matter) Thus, applied micro is not always a panacea. One needs to aggregate!
- Example: Nakamura and Steinsson (2014). Cross-state variation in government spending. However: do not directly answer the policy question macroeconomists are most interested in—the effect of fiscal stimulus at the national level—since various types of general equilibrium effects are "differenced out" by time fixed effects.

"Unconditional" Micro and Macro Moments

- Micro moments: constructed on micro data on the behavior of individuals. e.g. frequency of price change and related statistics on price rigidity. (Nakamura and Steinsson (2008, 2013))
- Much easier to identify !! Thousands, if not millions of data points.
- Macro moments: "equity premium"
- Real wages have risen by a large amount while hours worked have been stable or fallen slightly $\Rightarrow$ income effects are large. (slightly larger than substitution effects)

Identified moments

- Identified moments correspond directly to a particular deep structural parameter.
- Identifying ausal effects using credible research design (RD) based on the use of:
  - Instrumental Variables. (IVs)
  - Difference-in-Difference analysis. (DDs)
  - Regression Discontinuities. (RDs)
  - Randomized Controlled Trials. (RCTs)
- Advantage: more invariant to model features. cf recent debate on the role of changes in house prices in causing the Great Recession of 2007-2009.

Aggregate versus cross-sectional

- Researchers use geographically disaggregated panel data sets — often disaggregated to the state or metropolitan statistical area level — to identify novel causal effects.
- Powerful class of IVs is differential regional exposure to aggregate shocks: Mian and Sufi (2014), Autor et al. (2013).
- Big question is how to aggregate. Problem is GE effects. So cross-sectional identification does not quite answer the right question. Think for example of spillover effects.
- Mian and Sufi (2014) find that the dramatic fall in house prices between 2006 and 2009 did not differentially affect tradables employment increases with larger house prices between 2006 and 2009. (only non-tradables) One way to go is theory + empirics.

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Monetary Policy -> Fiscal Policy

- Few things are more endogenous than monetary policy.
- Why do we study it so much?
- Official view:
  - Post 1970s consensus that aggregate demand management should be managed by monetary policy. However: that has not stopped governments from changing taxes!
  - Monetary policy faces a time inconsistent problem, thus should be managed by independant central banks. This gives an important role to "experts" (economics PhDs).
- Cynical view:
  - Many grants for economic research come from central banks.
  - This is the one thing that economists control.
  - Monetary policy seems very complicated, so it seems to make sense to delegate it to experts. (???)

Question: What is the fiscal multiplier?

- Ramey (2016) provides an excellent summary of the literature.

There is a very large literature:

- Blanchard and Perotti (2002) found low multipliers.
- Mertens and Ravn (2013) found much larger multipliers.
- Romer and Romer (2010) based on a narrative approach find multipliers close to 3.

Framework

- Blanchard and Perotti (2002) consider

$$
\begin{aligned}
v_t^T &= \theta_G \sigma_G e_t^G + \theta_Y v_t^Y + \sigma_T e_t^T, \\
v_t^G &= \gamma_T \sigma_T e_t^T + \gamma_Y v_t^Y + \sigma_G e_t^G, \\
v_t^Y &= \zeta_T v_t^T + \zeta_G v_t^G + \sigma_Y e_t^Y.
\end{aligned}
$$

where the observables are the following:

- T_t is Log Real Federal Tax Revenues per capita,
- G_t is Log Real Federal Government depending on Final Goods per capita,
- Y_t is Log Real GDP per capita.

Framework

- The following 9 parameters thus need to be estimated: θ_G, θ_Y, σ_G, σ_T, σ_Y, γ_T, γ_Y, ζ_T, ζ_G . Now let's try to write the residuals in the following form:

$$v_t = \mathcal{D} e_t$$

Or, expanding the matrices:

$$\begin{bmatrix} v_t^T \\ v_t^G \\ v_t^Y \end{bmatrix} = \begin{bmatrix} d_{11} & d_{12} & d_{13} \\ d_{21} & d_{22} & d_{23} \\ d_{31} & d_{32} & d_{33} \end{bmatrix} \begin{bmatrix} e_t^T \\ e_t^G \\ e_t^Y \end{bmatrix}$$

- Using Blanchard and Perotti (2002)'s methodology:

$$\begin{bmatrix} 1 & 0 & -\theta_Y \\ 0 & 1 & -\gamma_Y \\ -\zeta_T & -\zeta_G & 1 \end{bmatrix} \begin{bmatrix} v_t^T \\ v_t^G \\ v_t^Y \end{bmatrix} = \begin{bmatrix} \sigma_T & \theta_G \sigma_G & 0 \\ \gamma_T \sigma_T & \sigma_G & 0 \\ 0 & 0 & \sigma_Y \end{bmatrix} \begin{bmatrix} e_t^T \\ e_t^G \\ e_t^Y \end{bmatrix}$$

$$\Rightarrow \quad \mathcal{D} = \begin{bmatrix} 1 & 0 & -\theta_Y \\ 0 & 1 & -\gamma_Y \\ -\zeta_T & -\zeta_G & 1 \end{bmatrix}^{-1} \begin{bmatrix} \sigma_T & \theta_G \sigma_G & 0 \\ \gamma_T \sigma_T & \sigma_G & 0 \\ 0 & 0 & \sigma_Y \end{bmatrix}$$

Framework

- The variance covariance matrix of reduced form residuals:

$$\mathbb{E}\left[v_t v_t'\right] = \mathcal{D}\mathcal{D}'$$

provides 6 independent restrictions on parameters, defining matrix $\mathcal{D}$. On the other hand, assumptions are made about decision lags and the effects of output on taxes due to automatic stabilizers:

  - $\gamma_Y = \gamma_T = 0$ based on decision and recognition lags
  - $\theta_Y = 2.08$ based on OECD estimates.

- Only 6 numbers are used to: θ_G, σ_G, σ_T, σ_Y, ζ_T, ζ_G. Using the R file blanchard-perotti.R, one gets the following estimates:

$$\theta_G = -0.116, \quad \sigma_G = 0.050, \quad \sigma_Y = 0.082,$$
$$\sigma_T = 0.058, \quad \zeta_T = -1.585, \quad \zeta_G = 0.254.$$

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Narrative Approach

- First narrative approach study is Friedman and Schwartz (1963).
- Modern narrative approach study to monetary policy is Romer and Romer (1989). They argue that monetary policy does matter. Main outcome variable: industrial production.
- Narrative approach using fiscal shocks studied by Romer and Romer (2010).
- Narrative approach is the closest to "casual empiricism" done in the policy world: there was a (policy) shock, what happened then? It's just a more sophisticated version of that, with many shocks.

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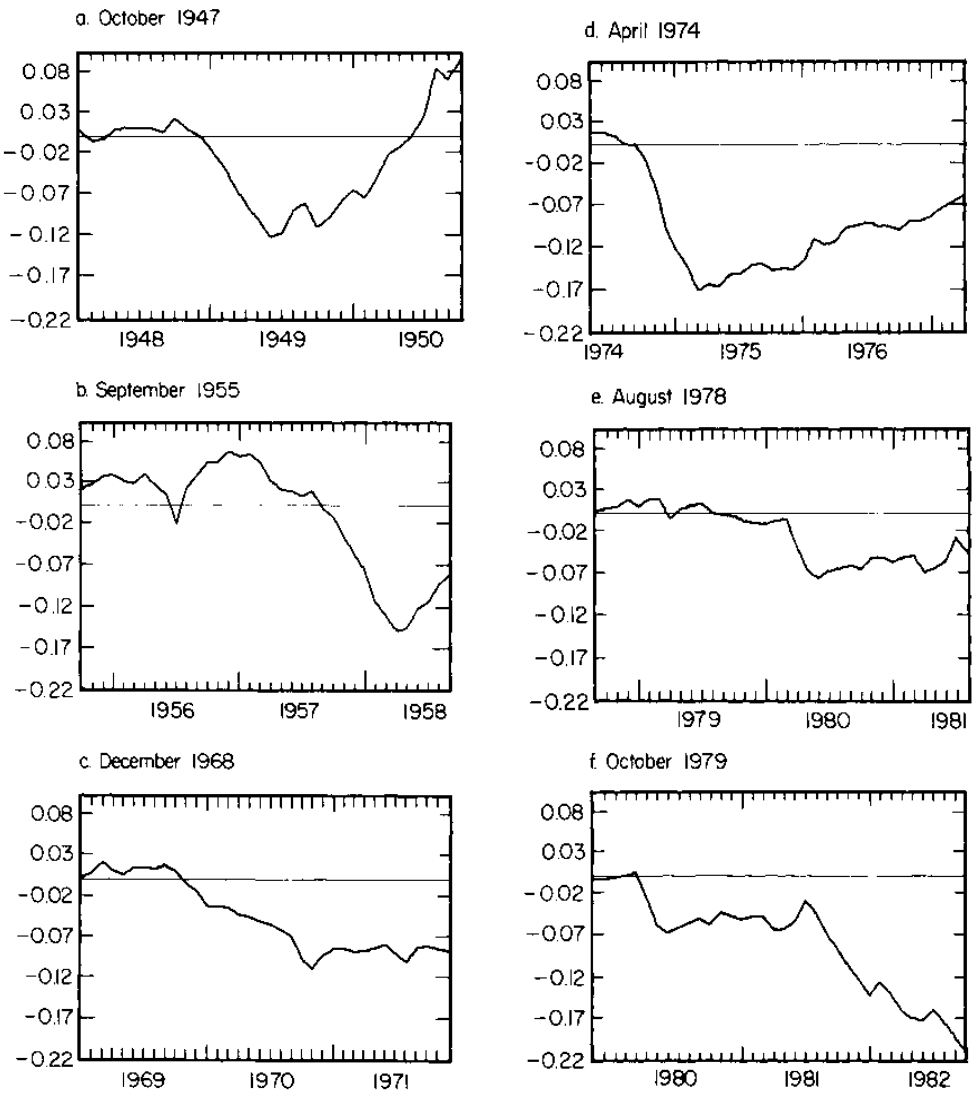
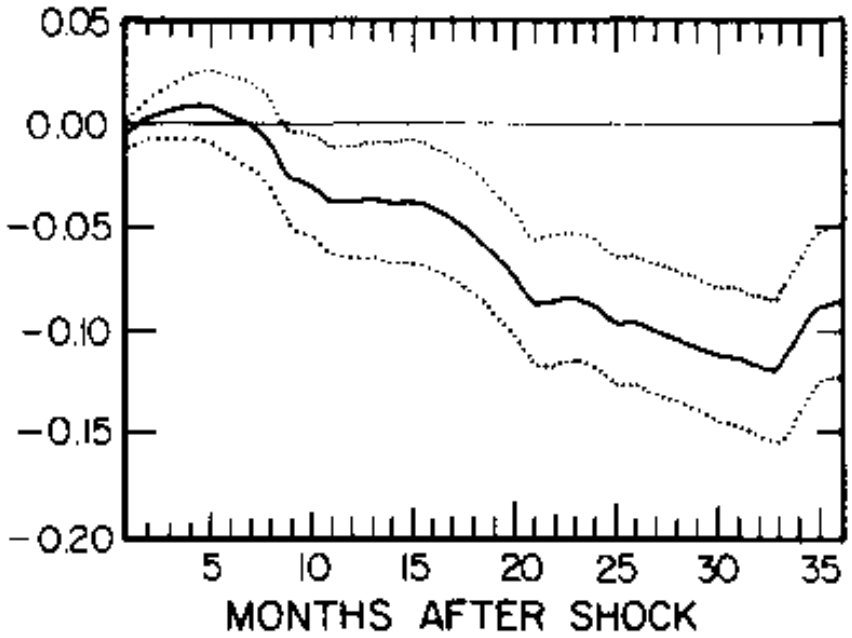
Narrative Approach



Industrial production

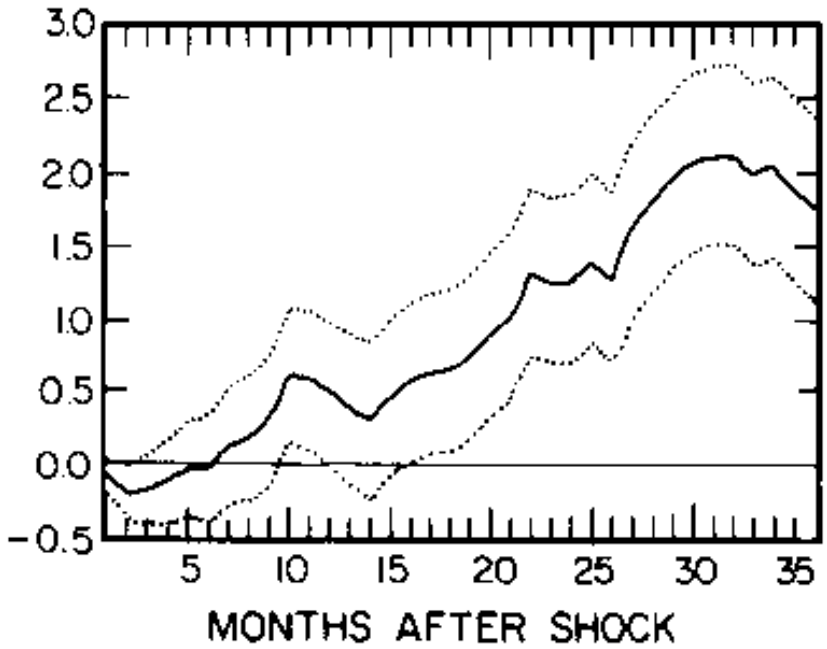
Figure 4 IMPULSE RESPONSE FUNCTION FOR BASIC INDUSTRIAL PRODUCTION REGRESSION



Notes: The impulse response function shows the impact of a unit shock to the monetary dummy variable. The impulse responses for the change in industrial production have been cumulated to reflect the effect on the log level. The coefficient estimates used to generate the impulse response function are given in Table 1. The dashed lines show the one standard error bands.

Unemployment

Figure 5 IMPULSE RESPONSE FUNCTION FOR BASIC UNEMPLOYMENT REGRESSION.



Notes: The impulse response function shows the impact of a unit shock to the monetary dummy variable on the level of the unemployment rate (expressed in percentage points). The coefficient estimates used to generate the impulse response function are given in Table 2. The dashed lines show the one standard error bands.

Romer and Romer (2004)

At times the Federal Reserve has been concerned about the exchange rate above and beyond any implications exchange rate movements might have for future inflation and output growth. This appears to have been the case in late 1984 and early 1985, when the FOMC repeatedly cited the strength of the dollar as one reason for easing policy (see, for example, Board of Governors, Annual Report, 1984, pp. 139 – 40, and 1985, pp. 87–8). Our shock series shows substantial negative values during this period.

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Romer and Romer (2010)

- This study is interested in the macroeconomic effects of tax changes in the United States.
- They find quite large effects of tax cuts and increases on economic activity (with multipliers close to 3).
- Let us replicate this paper.

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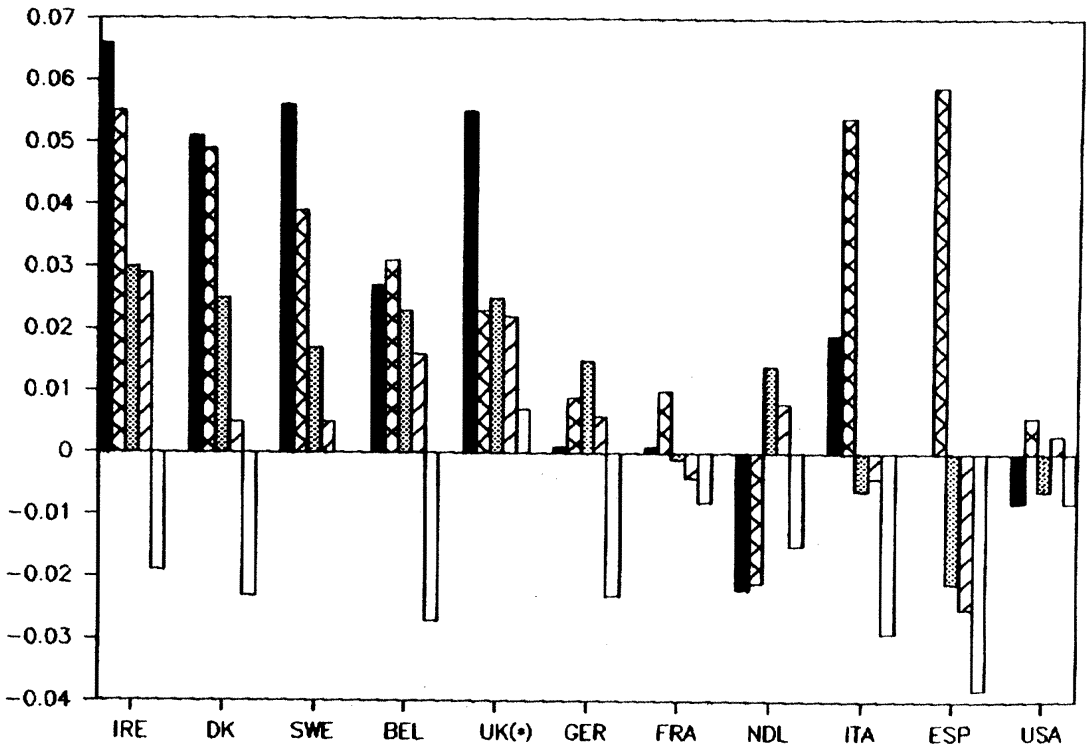
Anti-keynesian effects of austerity policies: Giavazzi and Pagano (1990)

- A starting point is the evidence next slide: there were fiscal stabilization programs implemented throughout the world in the 80s, which did not lead to substantial reductions in output. In contrast, it is argued that by improving expectations about the future, those fiscal expansions lead households to consume more.

Contributions to fiscal

Figure 1 CONTRIBUTIONS TO FISCAL STABILIZATION

Changes in the Ratio to GDP Between 1981 and 1989



(•) 1979–1989

SOURCE: OECD, National Income Accounts.
US Gov. Inv. from IMF, Governement Finance Statistics (1981–88)

Two examples

- **Denmark**: in 1982, conservative government cuts spending. Note: interest rates are also reduced due to a decrease in inflation expectations (and devaluation expectations). Thus, the "expansionary austerity" comes together with a housing boom. Moreover, many mortgages in Denmark are variable rate.
- **Ireland**: in **1982**, first attempt at fiscal adjustment (large current account deficits then). Increases in discretionary taxes (5.5% of GDP – this is huge). "Monetary authorities embarked in a sharp desinflation plan, pegging the value of the Irish punt with the EMS, and thus, relative to the German mark. Although this resulted in a drop in both nominal and real interest rates, house and share prices declined – **contrary to what happened in Denmark about the same time**." Big difference: Denmark did not engage in sharp tax increases.

Two examples

- Ireland: in **1987**, led by Charles Haughley, tried again. This time, there were more G (consumption and investment) decreases rather than tax increases. The devaluation stimulated domestic demand by enhancing the credibility of the new parity and thus producing a fall in interest rates.
- Commitment of the central bank to maintain the value of the currency.

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Individual data

- Surveys:
  - **Census Integrated Public Use Sample.** New ones
  - American Community Survey (ACS). Education, age, and gender.
- Individual level data:
  - **QCEW**: Quarterly Census of Employment and wages. Bulk data available here: `https://www.bls.gov/cew/datatoc.htm`. Layout: `https://data.bls.gov/cew/doc/layouts/csv_quarterly_layout.htm` This contains aggregate and average weekly wages for sector - counties.
  - **OES**: Occupational Employment Statistics.
  - **BD**: Business Employment Dynamics. `https://download.bls.gov/pub/time.series/bd/`. At the sector-state level, creation and destruction of jobs/ establishments.

Macro statistics

- **UN Comtrade**: imports and exports available at the 6-digit HS.
- **OECD Stats**: Many different datasets on macroeconomic aggregates.
- **Flow of funds.** Many datasets.
- **NIPA**. Many time series.
- **NIPA Fixed Asset Tables.**

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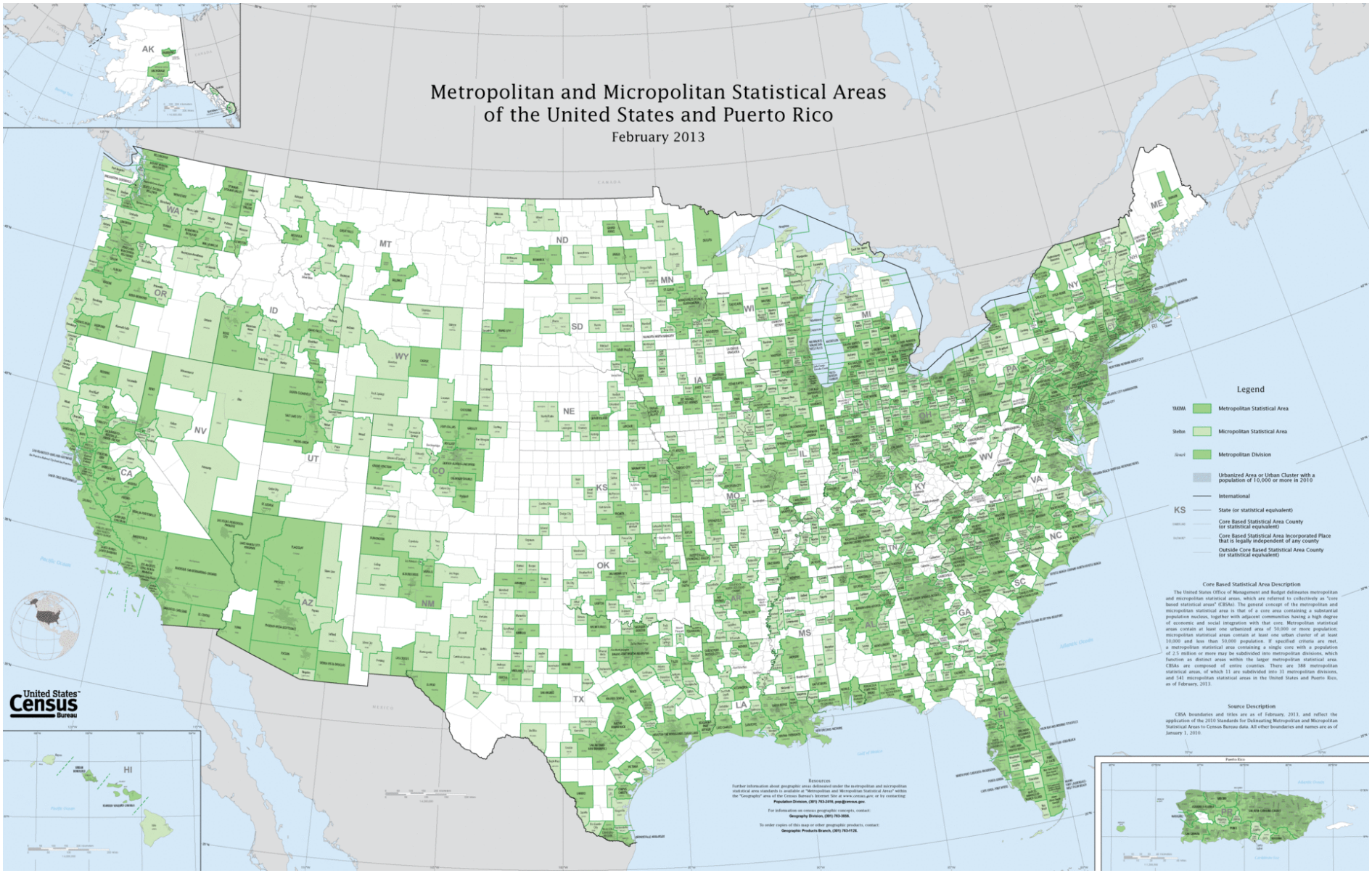
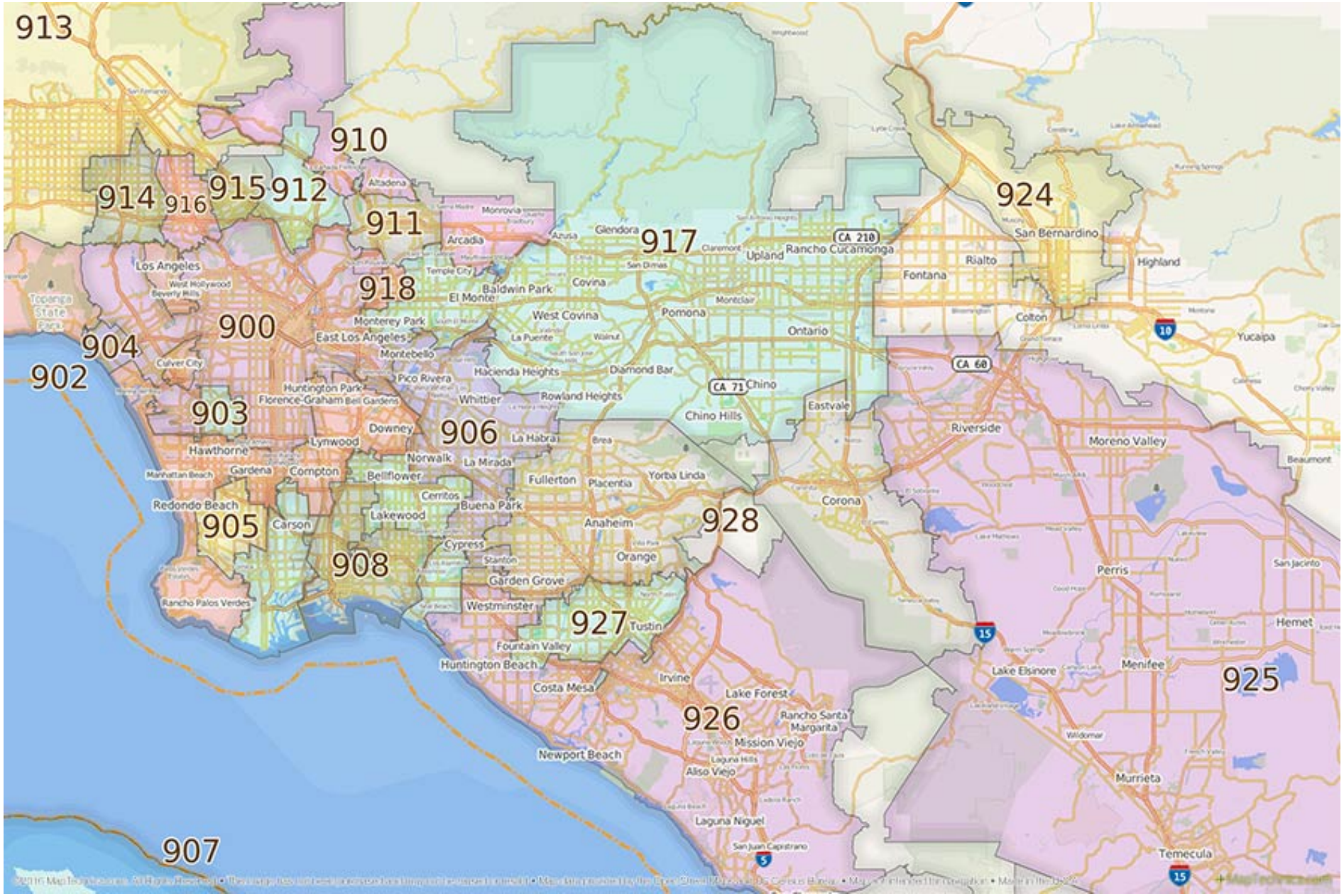
50 states


Washington
Oregon
California
Idaho
Nevada
Montana
Wyoming
Utah
Arizona
Colorado
New Mexico
North Dakota
South Dakota
Nebraska
Kansas
Oklahoma
Texas
Minnesota
Iowa
Missouri
Arkansas
Louisiana
Wisconsin
Illinois
Michigan
Indiana
Ohio
Kentucky
Tennessee
Mississippi
Alabama
Georgia
Florida
South Carolina
North Carolina
Virginia
West Virginia
Pennsylvania
New York
Maryland
Delaware
New Jersey
Connecticut
Rhode Island
Massachusetts
Vermont
New Hampshire
Maine
Alaska
Hawaii

388 MSAs, 929 Core Based Statistical Areas (CBSAs)



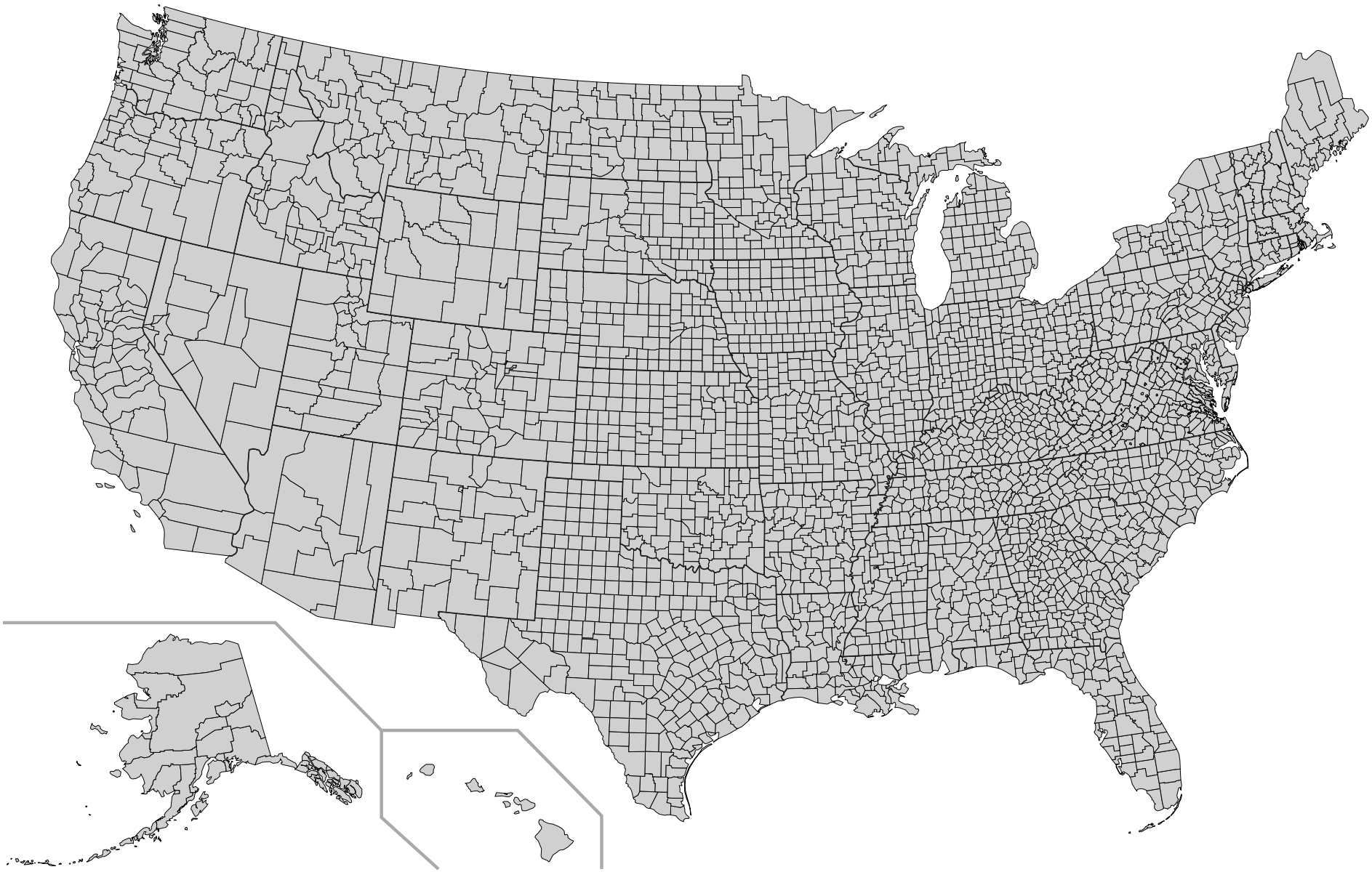
3-digit zipcodes (Rare)



722 Commuting Zones: Clusters of Counties

- County-level commuting data from 1990 Census data.
- Create 741 clusters of counties characterized by strong commuting ties within CZ, and weak commuting ties across CZs.
- Industry employment structure: County Business Patterns. (CBP)
- Example: Autor et al. (2013)

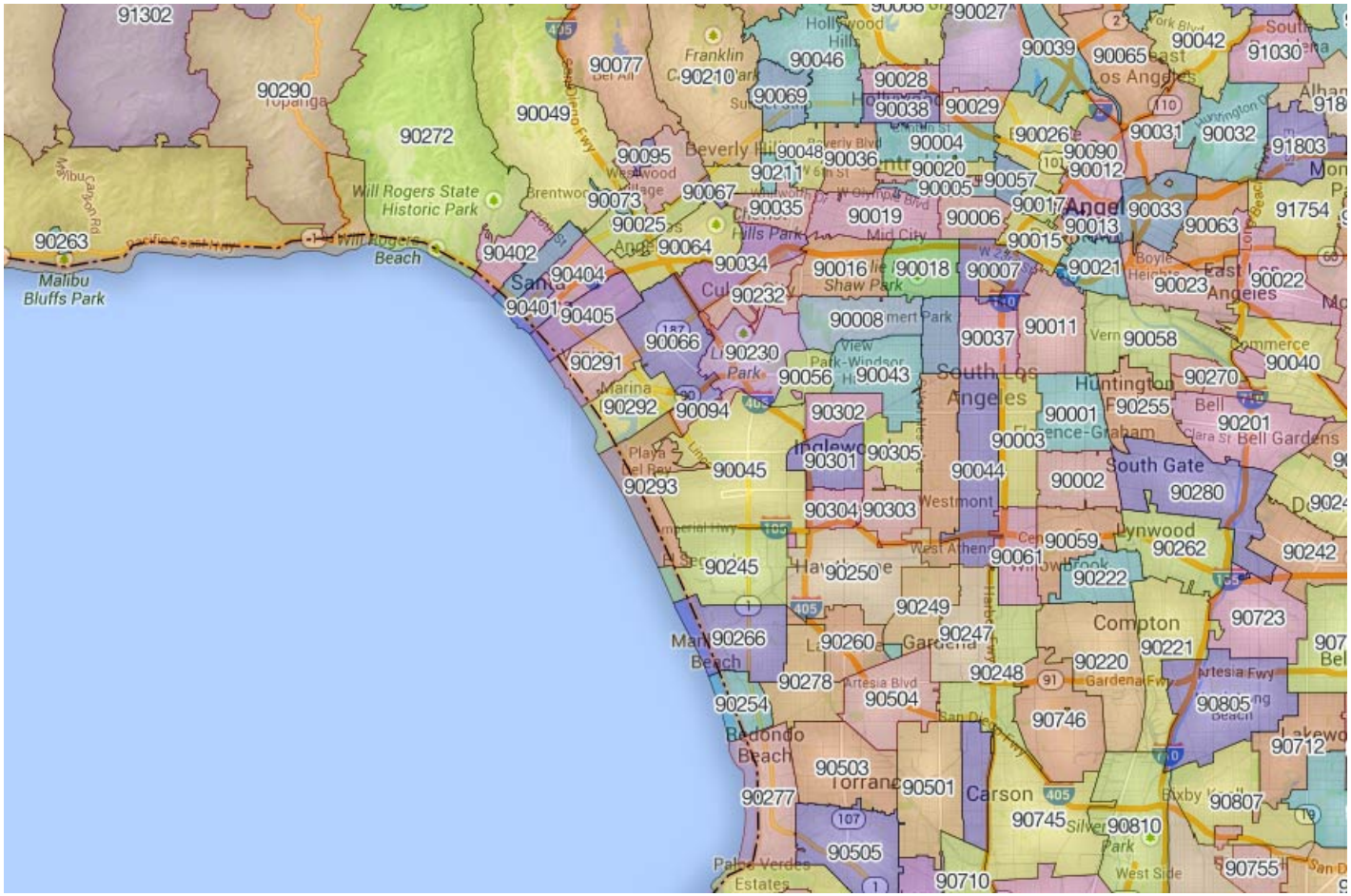
3142 Counties



For example, in California

43000 Zipcodes

- For example: 90095 is Westwood, 90069 is West Hollywood, 90049 is Brentwood.
- Question: how much variation do we get here?



Very important: More disaggregated $\neq$ better

- **More disaggregated** is not necessarily **better**. The notion of a "control" and a "treatment" group is problematic. General equilibrium effects happen only at the aggregate level.
- Consider indeed the classic questions of calculating fiscal multipliers.
- At the individual level, there can be no fiscal multiplier, by construction. As one aggregates, the share of spending on one's own production mechanically increases:
  - **Individual** level data: how much do you consume of your own production?
  - **Census-tract** level data: haircuts, retail (if you don't take your car)
  - **Zipcode** level data.
  - **County** level data.
  - **CBSA** level data.
  - **State** level data.
  - **Country** level data: small countries VS large countries.

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Cross-sectional data

- I use a series of papers by Mian and Sufi (2014), in order to illustrate the different empirical methods in macroeconomics, around an account of the 2007-2009 financial crisis.
- It will quickly become clear how cross-sectional data can be used to inform policy.
- However, it will prove challenging to go from micro to macro elasticities.
- We will discuss why.

Trade and Macro

- Note: empirical macroeconomics and empirical trade are actually very similar.
- In terms of methodologies and in terms of the connections between micro to macro.
- I strongly encourage you to follow an empirical trade class if you are interested in the issues I discuss here.

Two main topics

- There are two main topics:
  - Consumption, unemployment: the **household side**.
  - Investment, employment: the **firm side**.
- Naturally, the two are interrelated:
  - Firms, when deciding to cut back on employment, may lead to a decrease in aggregate consumption (Ganong and Noel (2017)).
  - Conversely, households' decisions to consume or ability to consume (coming from changing disposable income, for example) may decrease firms' demand for their products, which in turn decreases investment by firms (Keynes (1936)).

State level data: Kaplan et al. (2016)

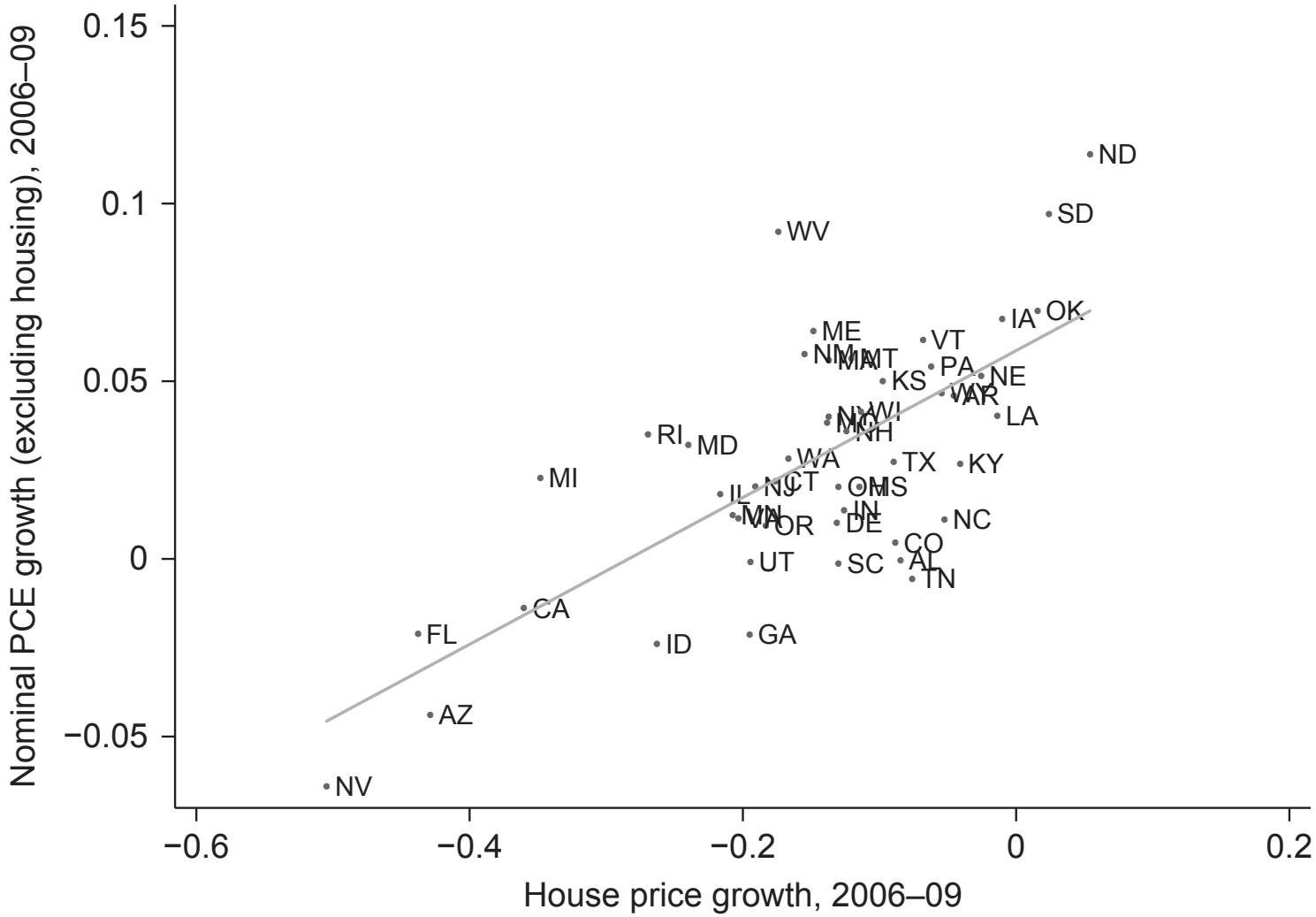


Fig. 10 Consumption growth and house price growth across states, 2006–09. This figure plots consumption growth from 2006 to 2009 against house price growth from 2006 to 2009 for states. We use BEA state-level data on personal consumption growth and house price growth data from CoreLogic.

County-level data: Mian and Sufi (2010)

- Mian and Sufi (2010) sort counties by the change in household debt to income ration from 2002 and 2006.
- They then examine how the deline in new auto purchases and residential investment during the Great Recession is related to the previous increase in household debt.
- Of course, the question is what created this heterogeneity in debt to income ratios in the first place.
- Ideally, one would wish to assign debt to income ratios randomly.

County-level data: Mian and Sufi (2010)

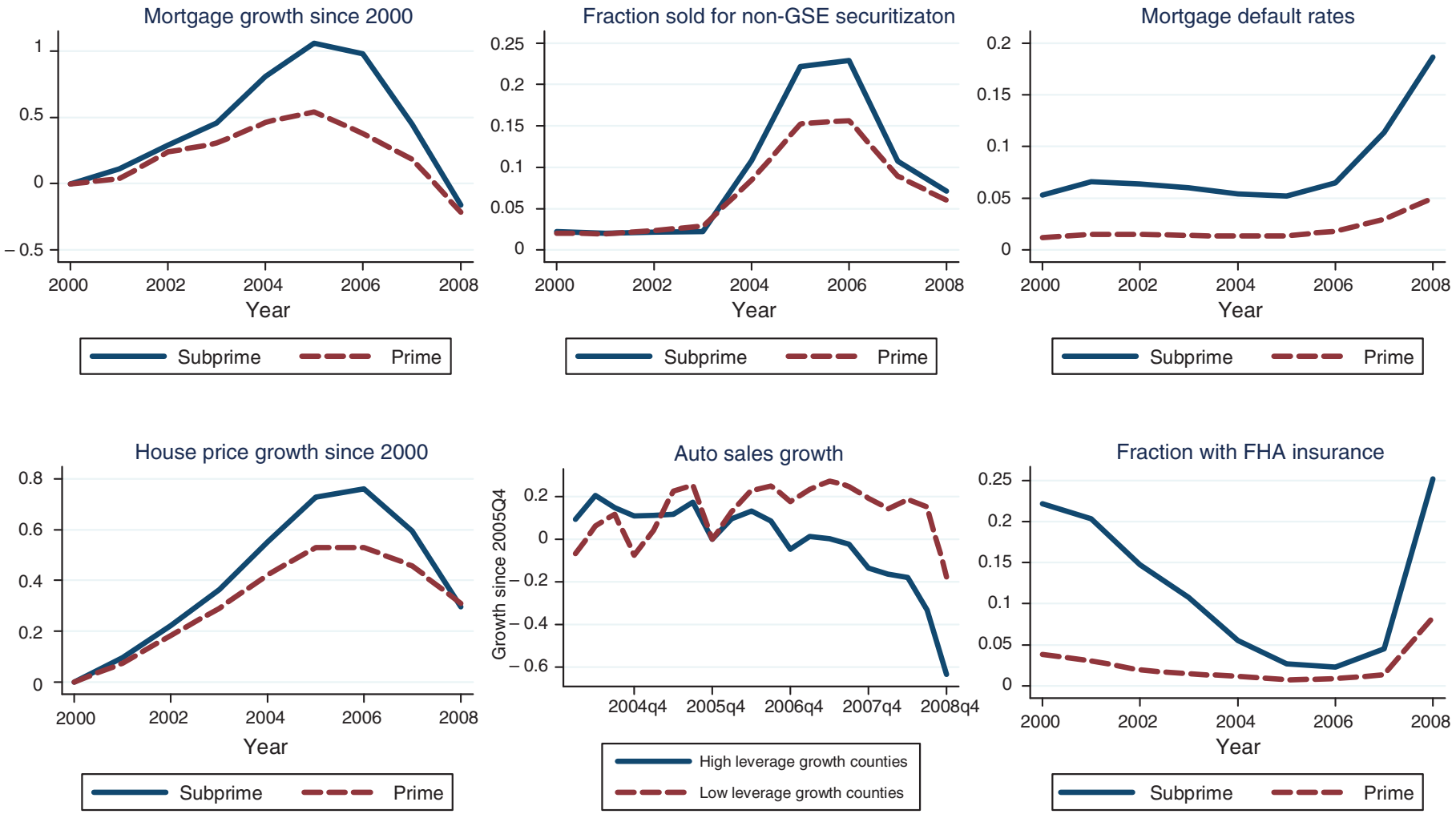


FIGURE 1. HOUSEHOLD CREDIT CYCLE AND THE MACROECONOMY

Notes: Subprime and prime categories correspond to the top and bottom quartiles based on the fraction of borrowers in the zip code with a credit score less than 660 as of 2000. Quartiles are population weighted so that both subprime and prime zip

County-level data: Mian and Sufi (2010)

- Moreover, there is always an issue of interpretation of the data, which empirical work cannot really do without the help of a model.
- For example, what would you conclude from Mian and Sufi (2010)'s evidence?
- Things were worse ex-post in counties with lots of subprime borrowers.
  - But should we restrict credit, to avoid these bad consequences ex-post?
  - Or were these policies put in place for good reasons beforehand.
  - And would the 2002-2006 boom have occured were it not for lax lending policies to subprime?

Zipcode-level data on consumption: Mian et al. (2013), replicated in Kaplan et al. (2016)

- 31000 zip codes.
- Little power to identify differrential MPC using county-level data: indeed, within-county standard deviation in net worth is \$440K, while the between-county standard deviation in net worth is \$237K. Much better is to instead look at zipcode level data.
- CoreLogic data on house prices covers approximately 6600 of the 31000 zipcodes. (approx 65% of the population in the US)
- Two measures of consumption data at the zip code level.
- Of course, again, one would ideally like to have individual level data in order to look at agents' consumption patterns.
- New auto sales at R.L. Polk (based on new vehicle registrations).
- Purchases from debit card and credit card transactions from MasterCard Advisers.

Zipcode-level data on consumption: Mian et al. (2013), replicated in Kaplan et al. (2016)

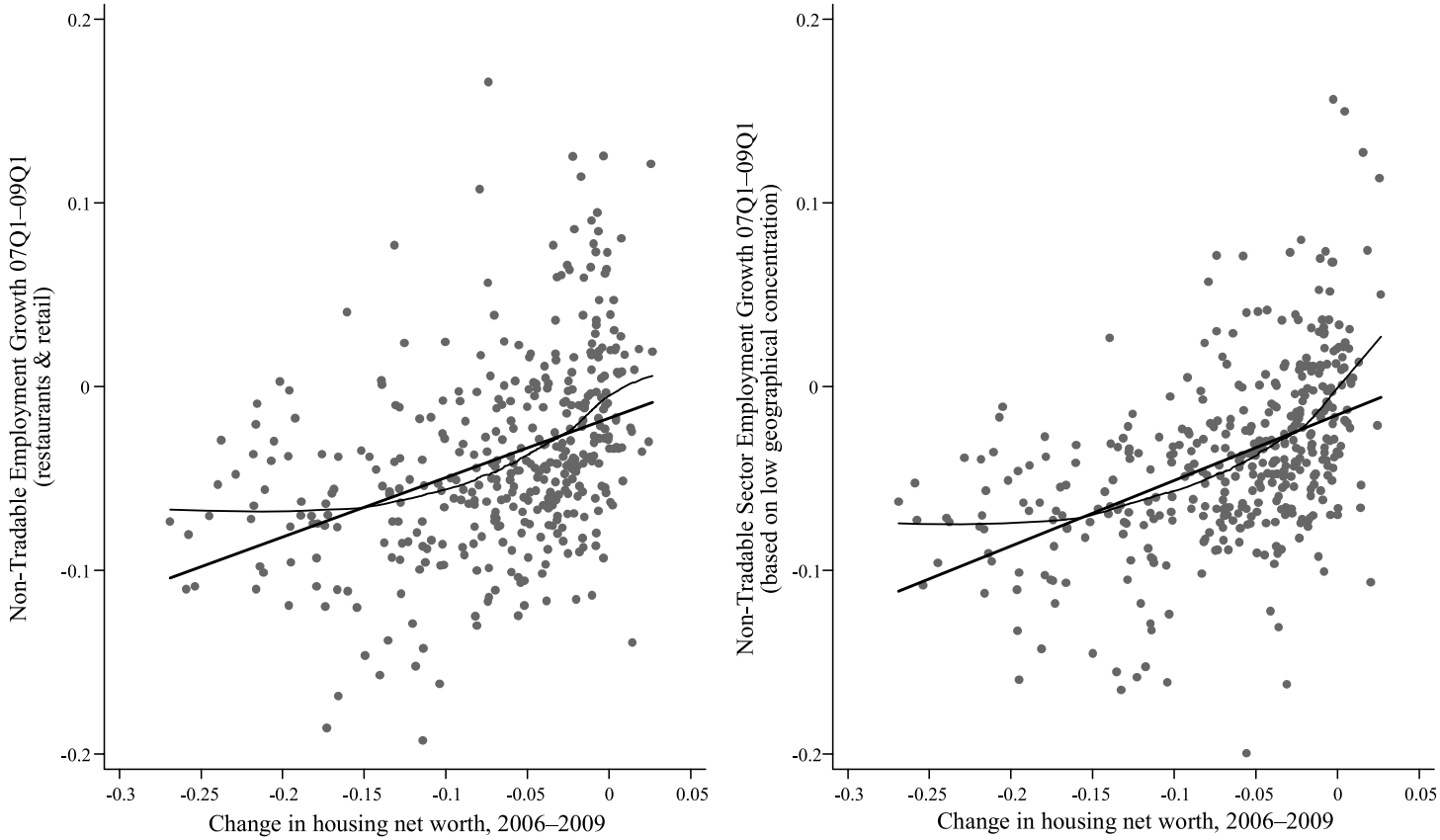
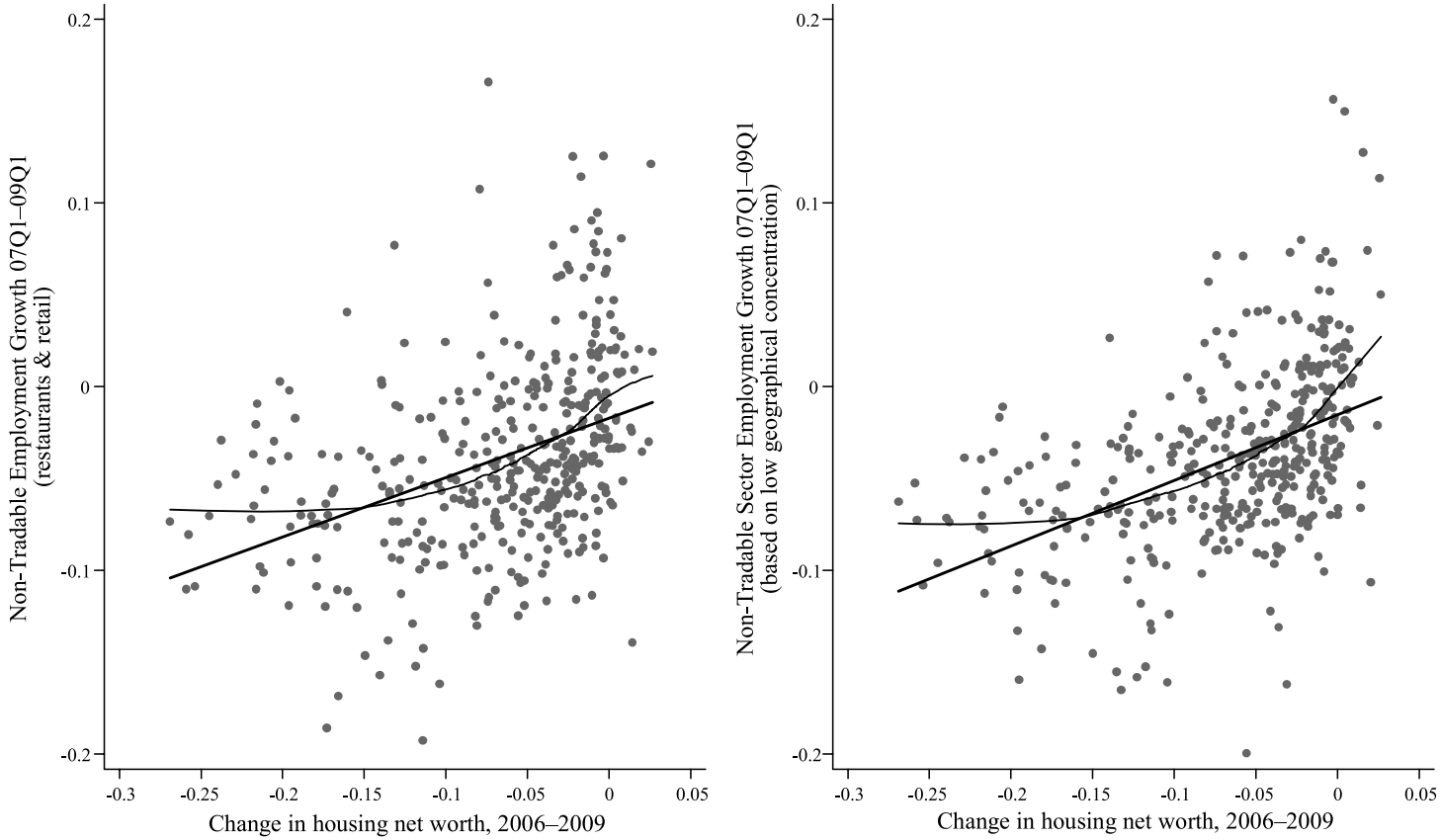


FIGURE 1.—Non-tradable employment and the housing net worth shock. This figure presents scatter-plots of county-level non-tradable employment growth from 2007Q1 to 2009Q1 against the change in housing net worth from 2006 to 2009. The left panel defines industries in restaurant and retail sector as non-tradable, and the right panel defines industries as non-tradable if they are geographically dispersed throughout the United States. The sample includes counties with more than 50,000 households. The thin black line in the left panel is the non-parametric plot of non–tradable employment growth against change in housing net worth.

Zipcode-level data on consumption: Mian et al. (2013), replicated in Kaplan et al. (2016)



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Zipcode-level data on consumption: Mian et al. (2013)

TABLE I

INDUSTRY CATEGORIZATION[a]

Non-Tradable Industries			Tradable Industries		
NAICS	Industry Name	NT?	NAICS	Industry Name	T?
Panel A: Industry classification based on retail, restaurants, and US—world trade					
7221	Full-service restaurants	1	3261	Plastics product manufacturing	0
7222	Limited-service eating places	1	3231	Printing and related support activities	0
4451	Grocery stores	1	3363	Motor vehicle parts manufacturing	0
4521	Department stores	1	3116	Animal slaughtering and processing	0
4529	Other general merchandise stores	1	3364	Aerospace product & parts manufacturing	1
4481	Clothing stores	0	3327	Machine shops; screw nut & bolt manuf.	0
4461	Health and personal care stores	1	3345	Navigational & control instruments manuf.	0
4471	Gasoline stations	1	3344	Semiconductor and other electronic manuf.	1
7223	Special food services	0	3399	Other miscellaneous manufacturing	0
4511	Sporting goods hobby and music stores	1	5112	Software publishers	1
7224	Drinking places (alcoholic beverages)	0	3391	Medical equipment and supplies manuf.	0
4532	Office supplies stationery and gift stores	1	3222	Converted paper product manufacturing	0
4539	Other miscellaneous store retailers	1	3118	Bakeries and tortilla manufacturing	0
4482	Shoe stores	0	3339	Other general purpose machinery manuf.	0
4512	Book, periodical, and music stores	0	3329	Other fabricated metal product manuf.	0
4452	Specialty food stores	0	3254	Pharmaceutical and medicine manuf.	0
4483	Jewelry luggage and leather goods stores	1	3331	Agriculture and mining machinery manuf.	0
4453	Beer wine and liquor stores	1	3361	Motor vehicle manufacturing	1
4533	Used merchandise stores	1	3251	Basic chemical manufacturing	1
4531	Florists	1	3114	Fruit & vegetable preserving & manuf.	0

(*Continues*)

Housing supply elasticity, by Saiz (2010)

- The Saiz (2010) housing supply elasticity is provided at the CBSA level. (Core-Based Statistical Area)
- "This is not available for all of the CBSA's in which we observe store-level changes in expenditure because not all CBSAs. As a result, the OLS and IV samples differ."
- Therefore, one uses CBSA-level housing share of net worth.
- The Saiz (2010) housing supply elasticity has been questioned by Davidoff (2013) and Davidoff (2016).

Kaplan et al. (2016)

	2006-09 CBSA			2006-09 County		2006-09 CBSA - MRS HNW	
	OLS	IV	IV (linear)	OLS	IV	OLS	IV
ΔHNW^i	0.239**	0.361**	0.405**	0.207**	0.192*	0.341**	0.286**
	(0.029)	(0.077)	(0.089)	(0.025)	(0.080)	(0.047)	(0.116)
N	14,756	12,701	12,701	21,226	16,748	22,945	19,513
Clusters	281	181	181	584	382	330	233
R^2	0.024	0.017	0.012	0.017	0.017	0.019	0.018

Next Lecture

- **Our task for next lecture: replicate Mian and Sufi in 2 hours !**
- See you all next week.

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