

The Heterogeneous Effects of Fiscal Policy

Axelle Ferriere (EUI)

Discussion on
Macroeconomic Stabilization, Fiscal Consolidation and
Recessions with Heterogeneous Agents

ADEMU Final Conference – May 2018

These views are those of the authors and not necessarily those of the Board of Governors or the Federal Reserve System.

On the Size of Fiscal Multipliers

Questions:

How expansionary is government spending?

► More

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To which extent spending multipliers depend on the **tax distribution**?

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“The Heterogeneous Effects of Government Spending”, with G. Navarro

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“The Heterogeneous Effects of Government Spending”, with G. Navarro

Spending is **more expansionary** when financed with **more progressive** taxes

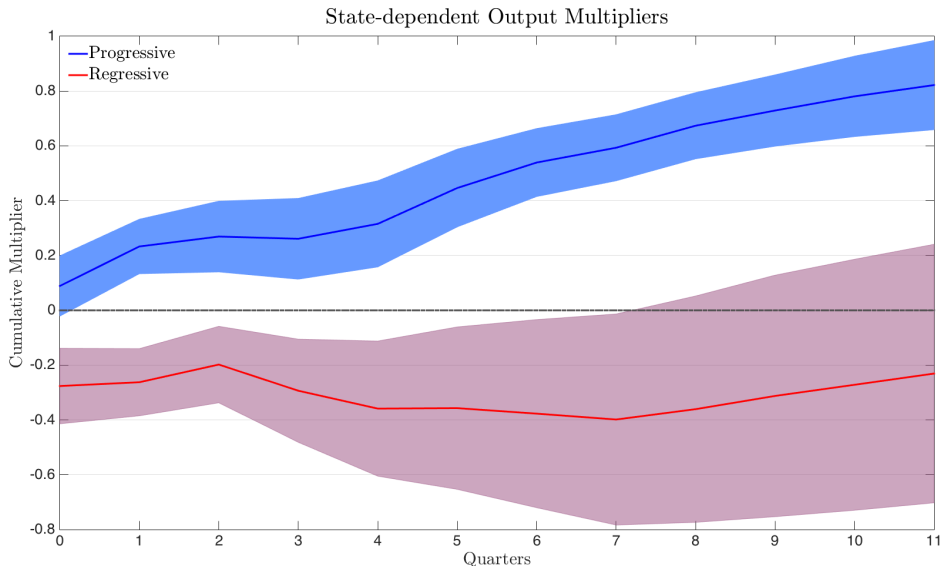
► Empirical & theoretical

► More

Multipliers are Larger in More Progressive Periods

► More

Multipliers are Larger in More Progressive Periods

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Notes: Local projection; US 1913-2006 (quarterly); shocks: Ramey-Zubairi and Blanchard-Perotti; states: authors' computation.

A Standard HANK with Indivisible Labor

Households:

- ▶ Idiosyncratic labor productivity shock
- ▶ Bond economy with borrowing constraint
- ▶ Indivisible labor choice

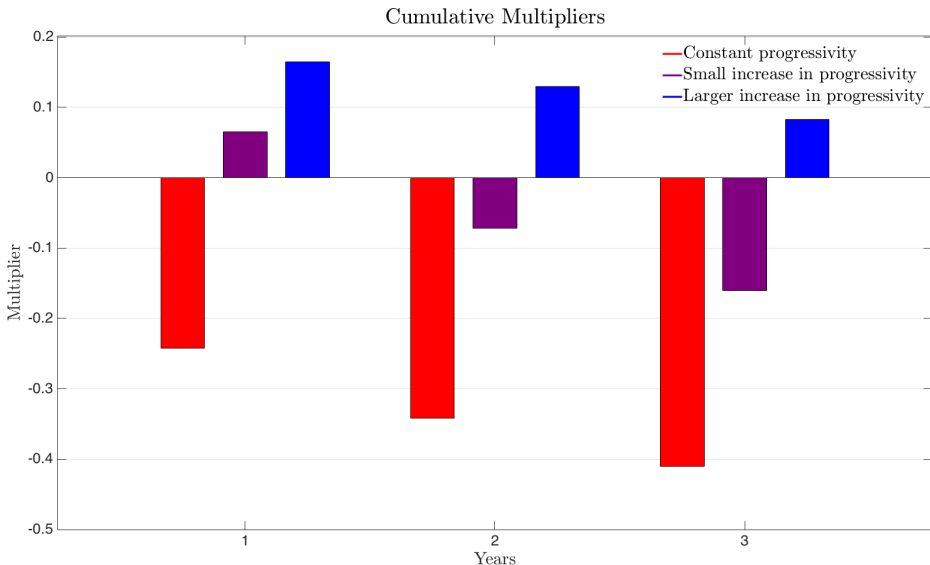
Firms:

- ▶ Final representative firm
- ▶ Intermediate good producers using labor and capital
- ▶ Sticky prices (Rotemberg)

Government:

- ▶ Finances spending with income taxes and debt
- ▶ Taylor rule ($\phi_{\pi} = 1.5$)

Multipliers are Larger with More Progressive Taxes

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Richer Households are Less Elastic

- ▶ Marginal propensities to consume decline with wealth

▶ More

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- ▶ Micro and macro evidence

▶ More

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Taking Stock

- + Tax progressivity is crucial to spending multipliers
 - Implications: **heterogeneity in fiscal multipliers** within EU

Conclusion

Taking Stock

- + Tax progressivity is crucial to spending multipliers
 - Implications: **heterogeneity in fiscal multipliers** within EU

Going Forward

- + An active literature on fiscal policy with heterogeneous agents
 - Heterogeneity in MPCs and in labor elasticities

Appendix

Question:

How **expansionary** is **government spending**?

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- ▶ **Evidence:** output increases, consumption does not decrease

(Barro & Redlick, 2011), (Blanchard & Perotti, 2002), (Ramey, 2016)

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How **expansionary** is **government spending**?

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- ▶ **Puzzle:** “Standard” models predict:

- A moderate output expansion, and private sector crowding-out

(Hall, 2009)

- An output contraction if distortionary taxes are used

(Baxter & King, 1993), (Uhlig, 2010)

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Previous work: Nominal rigidities + Non-Ricardian agents

Main finding:

Spending is **more expansionary** when financed with **more progressive** taxes

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▶ An **empirical** result

- US tax progressivity from 1913 to 2012
- Large changes in progressivity associated with spending shocks
- **Larger spending multipliers** in periods of **higher progressivity**

Main finding:

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- ▶ An **empirical** result
 - US tax progressivity from 1913 to 2012
 - Large changes in progressivity associated with spending shocks
 - **Larger spending multipliers** in periods of **higher progressivity**
- ▶ A **model** with heterogeneous agents can account for this fact
 - Elasticities decline with income
 - **Higher taxes on richer households** imply a **smaller crowding-out**
 - In line with micro evidence

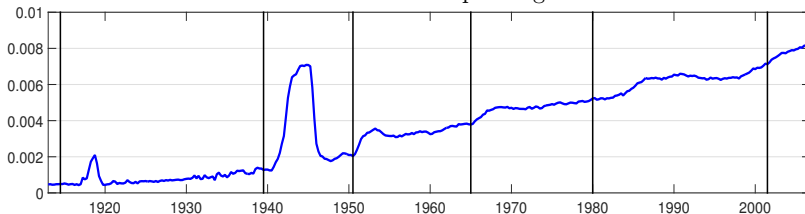
Macro evidence

[▶ Return](#)

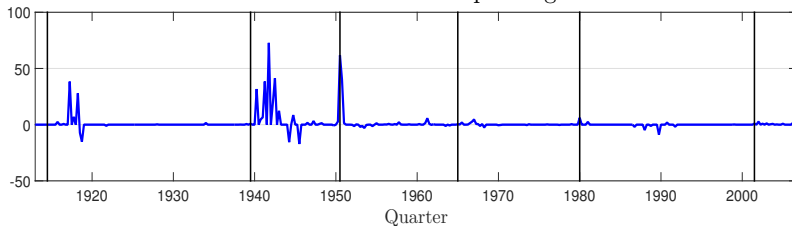
Government spending measures

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Government Spending



News on Defense Spending



Notes: News variable is normalized by last quarter GDP. Source Ramey & Zubairy (2015). Vertical lines correspond to major military events.

A tax progressivity measure

[▶ Return](#)

Assume a **non-linear** income tax: $\tau(y) = 1 - \lambda y^{-\gamma}$

[▶ More](#)

(Heathcote, Storesletten & Violante, 2013), (Feenberg, Ferriere & Navarro, 2016)

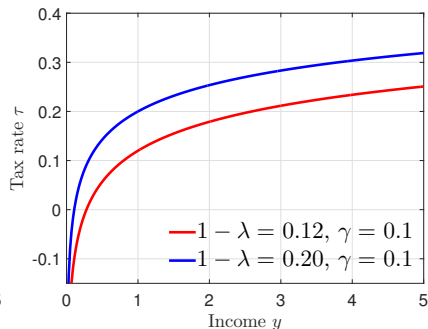
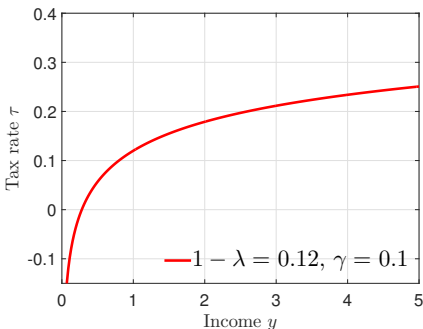
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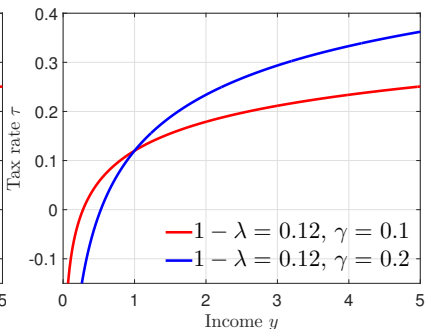
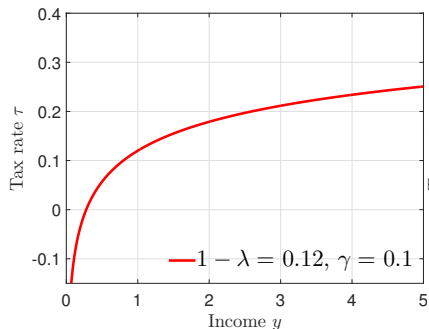
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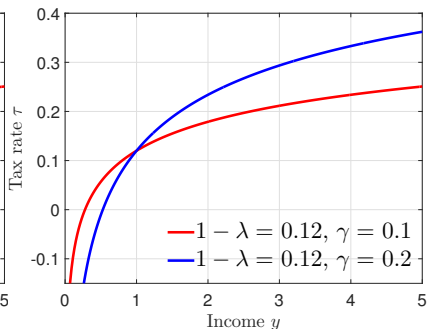
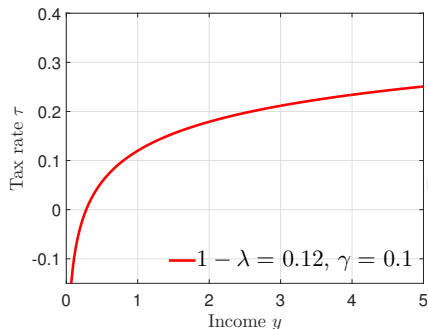
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► Compute γ for 1913-2012 as

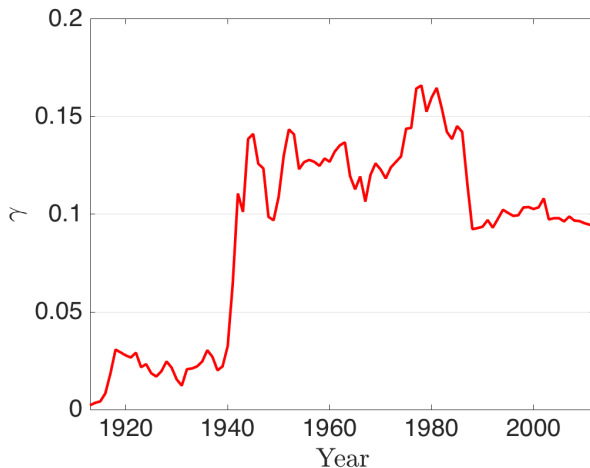
[More](#)

$$\gamma = \frac{AMTR - ATR}{1 - ATR}$$

$AMTR$ = average marginal tax rate, ATR = average tax rate

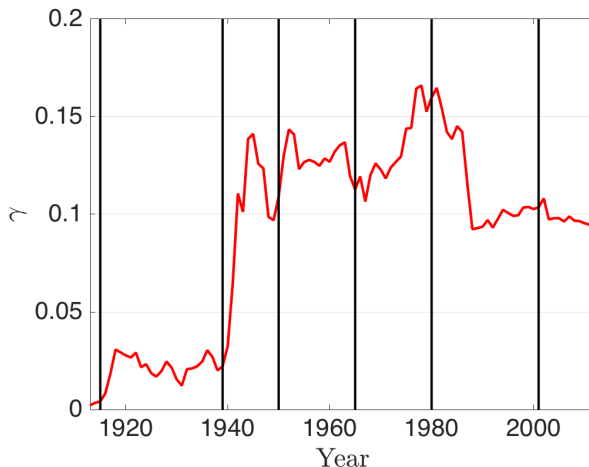
A century of U.S. tax progressivity

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Notes: Tax progressivity corresponds to one minus tax-rate elasticity with respect to income. Authors' computations.

A century of U.S. tax progressivity

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The linear case: Jorda (2005)

- For a vector $x_{t+h} = \left[\frac{Y_{t+h} - Y_{t-1}}{Y_{t-1}}, \frac{G_{t+h} - G_{t-1}}{Y_{t-1}} \right]$

$$x_{t+h} = \alpha_h + A_h Z_{t-1} + \beta_h g_t^* + \text{trend} + \varepsilon_{t+h}$$

- Shock g_t^*
- Control Z_t : lags of GDP, total spending and g_t^*

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- Cumulative multiplier** at horizon h

$$m_h = \left(\sum_{j=0}^h \beta_j^Y \right) / \left(\sum_{j=0}^h \beta_j^G \right)$$

The state-dependent case: Ramey and Zubairy (2016)

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- Progressive state ($s_t = P$) if γ is higher on average for the next 3 years
+ Cumulative multiplier $m_{h,P}, m_{h,R}$

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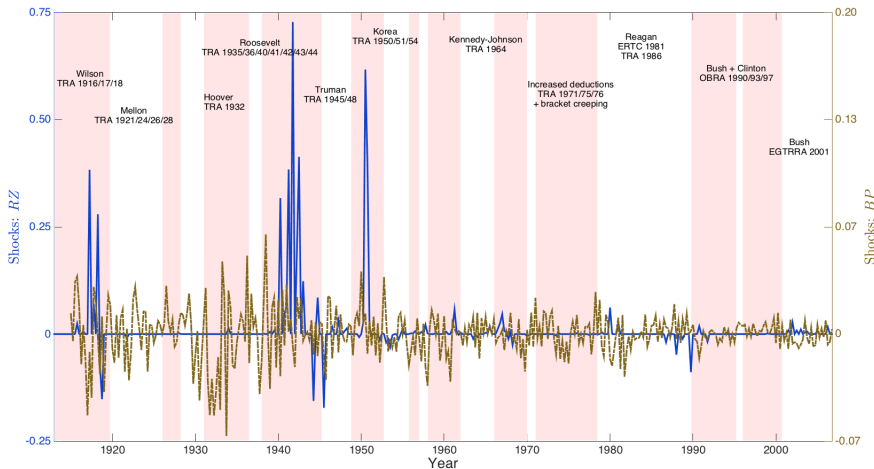
- An Instrumental Variable estimation:

+ Ramey and Blanchard Perotti shocks

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States: in line with a narrative approach

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Notes: Spending shocks (left axis: Ramey; right axis: Blanchard Perotti) and states (shaded areas represent periods of more progressive taxes).

Evidence: Output and Consumption Multipliers

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	Output	Consumption
Blanchard and Perotti	0.90 (0.30)	0.5 (0.21)
Gali, Lopez-Salido and Valles	0.41 (0.16)	0.1 (0.10)
Barro and Redlick	0.45 (0.07)	0.005 (0.09)
Mountford and Uhlig	0.65 (0.39)	0.001 (0.0003)
Ramey	0.30 (0.10)	0.02 (0.001)

Note: output/consumption multiplier refers to the increase in output/consumption after a unit increase in government spending.

Why a Puzzle?

[▶ Return](#)[▶ Return](#)

- ▶ Assume $U(C, H) = \frac{C^{1-\sigma}}{1-\sigma} - \frac{H^{1+\varphi}}{1+\varphi}$ and competitive labor markets.
- ▶ Then (in logs)

$$m p h_t = \sigma c_t + \varphi h_t$$

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+ Indivisible labor of agents heterogeneous in productivity

$$mph_t \downarrow \leq \sigma c_t^i + \varphi h_t^i \uparrow$$

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- + Distribution of taxes

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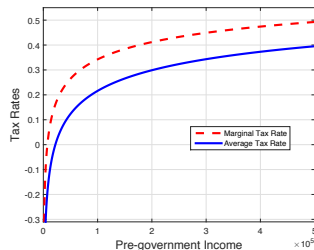
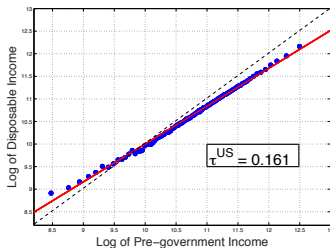
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$$\log(1 - \uparrow \downarrow \tau_t^i) + mph_t \downarrow \leq \sigma c_t^i + \varphi h_t^i \uparrow$$

- + Progressivity shapes the effects of government spending.

Measurement of τ^{US}

- PSID 2000-06, age of head of hh 25-60, $N = 12,943$
- **Pre gov. income:** income minus deductions (medical expenses, state taxes, mortgage interest and charitable contributions)
- **Post-gov income:** ... minus taxes (TAXSIM) plus transfers



- ▶ Tax function given by $\tau(y) = 1 - \lambda y^{-\gamma}$
- ▶ Total tax $T(y) = \tau(y)y$ and marginal tax $T'(y)$.

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- ▶ $AMTR = \int T'(y)$ from [Barro & Redlick \(2011\)](#) and [Mertens \(2015\)](#)
- ▶ $ATR = \int \tau(y)$ our computations using IRS data and [Piketty & Saez \(2003\)](#)'s income measure.

- ▶ Sixteen Amendment (1913) makes income taxation constitutional
- ▶ WWI: Tax Revenue Acts (TRA) of 1916, 1917 and 1918
 - + Top marginal tax rates increased from 15% in 1913 to 73% in 1918
 - + Increase was much steeper at the top of income distribution
 - Bottom marginal tax rates went from 2% to 4%.
 - + By 1919, income taxes became an important component
 - About 15% of American households paid any income tax (Brownlee, 2016)
 - Income (corporate + individual) taxes represented 2/3 of federal tax revenues (about 11% of GDP)

- ▶ Starting with TRA of 1932 (Hoover), top marginal tax rates increase almost every year during the 30s.
 - + TRA 1932, 1934, 1936, 1938. Marginal tax rates at the top increase from 25% to 70 – 79%
- ▶ TRA of 1940, 1941, 1942, 1945 increases progressivity even further
 - TRA 1940 increases corporate income taxes from 19% to 33%
 - TRA 1941 and 1942 increases top marginal tax rates from 70 – 79% to 85 – 94%.
 - Taxes at the bottom also increases, from 4% to 10% in 1941 and 10% to 20% in 1942

- ▶ TRA 1948: top marginal taxes decreased from $\sim 90\%$ to $\sim 84\%$
- ▶ TRA 1950 & 1951: top marginal taxes returned to their WWII level
- ▶ Taxes at the bottom are virtually not affected.

- ▶ TRA 1964: decreased marginal tax rates
- ▶ TRA 1968: increases taxes again to cover the Vietnam War expenses.
 - Tax increase of 10% for everyone in 1968. Temporary, one-time change.
 - Again by 2.5% in 1969 and 1970.

- ▶ Tax acts 1981 and 1986 reduce top marginal tax rate from 70% to 50% and then again to 35%.
- ▶ Elimination of brackets implies an increase in marginal tax rates at the bottom
- ▶ The change was ment to be revenue-neutral, and is the beginning of years of deficitis.

- Progressive state ($s_t = P$) if

$$\frac{1}{N_a} \sum_{j=0}^{N_a-1} \gamma_{t+j} > \frac{1}{N_b} \sum_{j=1}^{N_b} \gamma_{t-j}, \quad N_a = 12, \quad N_b = 8.$$

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- An Instrumental Variable estimation:

$$\begin{aligned} \sum_{j=0}^h \Delta y_{t+j} &= \mathbb{I}(s_t = P) \left\{ \alpha_{P,h} + A_{P,H} Z_{t-1} + m_{P,h} \sum_{j=0}^h \Delta g_{t+j} \right\} \\ &+ \mathbb{I}(s_t = R) \left\{ \alpha_{R,h} + A_{R,H} Z_{t-1} + m_{R,h} \sum_{j=0}^h \Delta g_{t+j} \right\} + \text{trend} + \varepsilon_{t+h} \end{aligned}$$

where $\Delta x_{t+j} = (x_{t+h} - x_{t-1})/Y_{t-1}$.

Model

An Aiyagari economy with indivisible labor

Description of the steady-state:

+ A continuum of **households**:

- Bond economy with **borrowing constraint**.
- **Indivisible labor** choice.
- **Idiosyncratic** labor productivity shock.

► More

+ **Government**:

- A **constant** level of government expenditures G .
- Financed by **constant** taxes and debt.

+ A representative **firm**

Richer Households are Less Elastic

► [Return](#)

Richer Households are Less Elastic

[▶ Return](#)

- ▶ **Marginal propensities to consume** decline with wealth.

	Average	Bottom-10	Top-90
MPCs	0.04	0.18	0.02

Table: Rebate 10% weekly wage; households sorted by wealth

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- ▶ **Labor participation elasticities** decline with income.

	Average	Bottom-90	Top-10
ε	-0.36	-0.43	-0.03

Table: Participation elasticity w.r.t. labor income tax rate; households sorted by income

- ▶ **Micro and macro evidence**

[▶ More](#)

Marginal propensities to consume:

- ▶ Av. estimated MPC ~ 0.25 (Kaplan & Violante, 2014)
- ▶ Range from 0.50 to 0 (Misra & Surico, 2011)

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Labor participation elasticities:

- ▶ Micro estimates:
 - Av. $\varepsilon < 1$ (Chetty and al., 2011)
 - Range from 1 to 0 (Kleven & Kreiner, 2006)
(Eissa and Liebman, 1996), (Meyer and Rosenbaum, 2001), (Triest, 1990), (Van Soest, 1995)

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(Eissa and Liebman, 1996), (Meyer and Rosenbaum, 2001), (Triest, 1990), (Van Soest, 1995)
- ▶ Macro estimates:
 - Tax shock $\uparrow 1\%$ GDP (Zidar, 2017)
 - On the **top-10%** of the income distribution: **no effect** on employment
 - On the **bottom-90%**: employment $\downarrow 2\%$ over a 3-year period

Quantitative Investigation

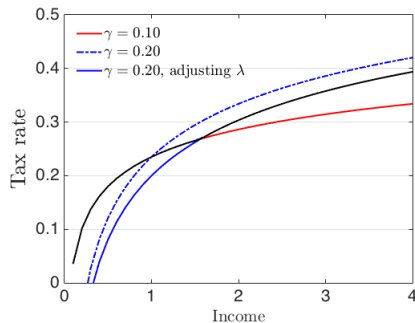
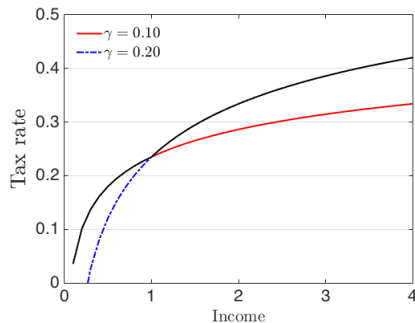
Modified exercise: No decrease in taxes for anyone

$$\hat{\tau}_{L,t}(y_L) = \max \left(\underbrace{1 - \lambda_{ss} y_L^{-\gamma_{ss}}}_{\tau_{L,ss}(y_L)}; \underbrace{1 - \lambda_t y_L^{-\gamma_t}}_{\tau_{L,t}(y_L)} \right)$$

Quantitative investigation

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Government Spending Shocks

Spending shock:

- + A temporary unexpected increase in spending
- + Financed with debt and labor taxes

Government Spending Shocks

Spending shock:

- + A temporary unexpected increase in spending
- + Financed with debt and labor taxes
 1. **Constant progressivity**: all workers finance the shock
 2. **Small increase in progressivity**: 90% workers finance the shock
 3. **Larger increase in progressivity**: 35% workers finance the shock

Micro evidence

Cross-sectional data: **TAXSIM**

- Pre-tax income of all taxpayers
- 1960-2008, annual

Micro evidence

Cross-sectional data: TAXSIM

- Pre-tax income of all taxpayers
- 1960-2008, annual

State-dependent estimation:

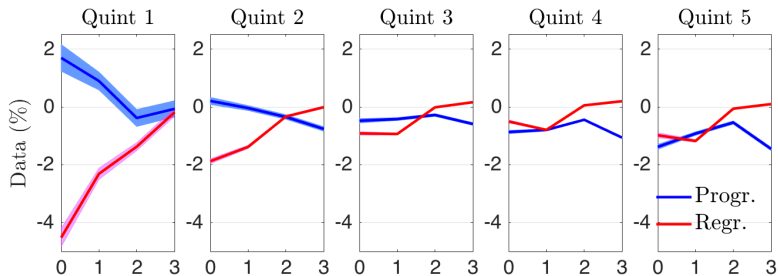
- For household i in quantile d , with pre-tax income $y_{i,t+h}$

$$\ln y_{i,t+h} = \mathbb{I}(s_t = P) \left\{ \alpha_{h,P}^d + A_{h,P}^d Z_{t-1} + \delta_{h,P}^d \ln G_{t+h} \right\} \\ + \mathbb{I}(s_t = R) \left\{ \alpha_{h,R}^d + A_{h,R}^d Z_{t-1} + \delta_{h,R}^d \ln G_{t+h} \right\} + \text{trend} + \varepsilon_{i,t+h}$$

- IV: $\ln G_{t+h}$ instrumented by Ramey and Blanchard Perotti shocks

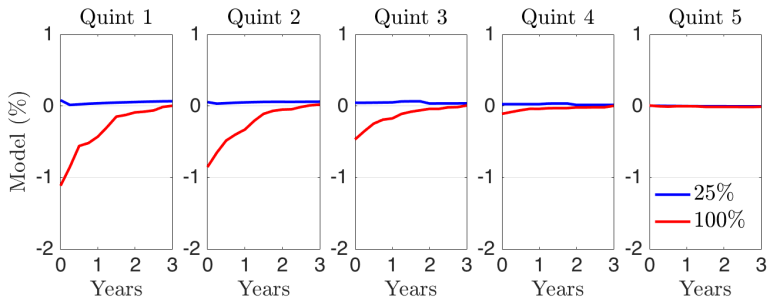
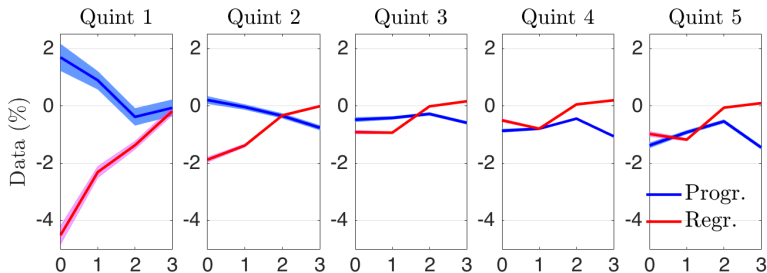
Quantitative investigation at the micro level

► More



Quantitative investigation at the micro level

[► More](#)



Policy implications

Use taxes, not spending

What is the effect of a temporary increase in progressivity?

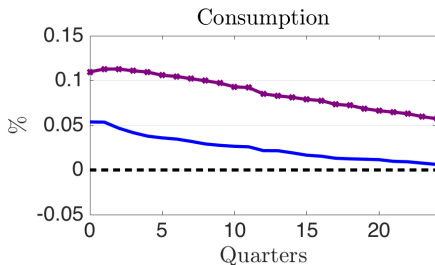
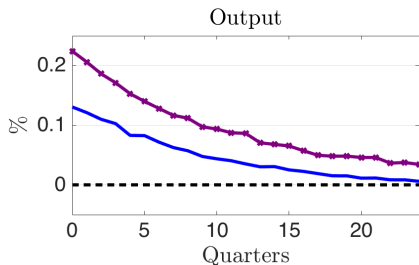
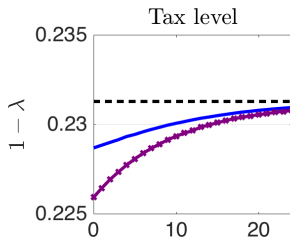
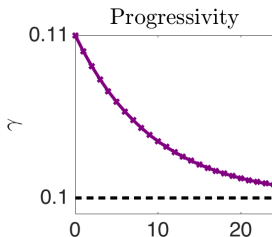
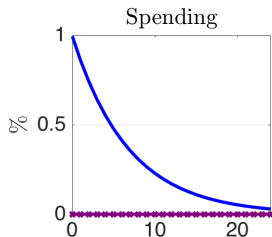
Exercise:

- + Same path for $\{\gamma_t\}$ as before.
- + No increase in spending.
- + No debt.

Use taxes, not spending

► A static example γ

► A static example λ



Comparing the model to Zidar (2017)

[▶ Return](#)

	Tax shock			Employment response	
	Total	Top-10	Bottom-90	Model	<i>Data</i>
(a)	0.071%	0.065%	0.006%	0.002%	<i>0.004%</i>
(b)	0.127%	0.004%	0.122%	-0.232%	<i>-0.264%</i>

- ▶ Case (a): a fiscal shock financed with more progressive taxes [$\gamma = 0.11$, bounded below by steady-state taxes, persistence: 0.5].
- ▶ Case (b): a fiscal shock financed with less progressive taxes [$\gamma = 0.09$, bounded below by steady-state taxes, persistence: 0.5].
- ▶ The employment responses report the average %-change in employment over $y = 0, 1, 2$. The fiscal shock is expressed in %GDP.

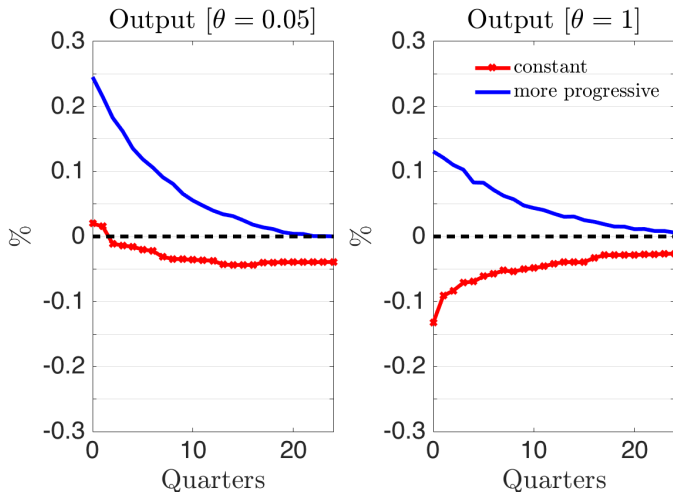
Intratemporal and intertemporal tax allocation

How important is debt financing?

Exercise:

- + Same path for $\{G_t\}$ and $\{\gamma_t\}$ as before.
- + A fraction financed with debt, implies a different path for $\{\lambda_t\}$.
- + Uhlig (2010): $B_{t+1} - B_{ss} = (1 - \theta)(d_t - d_{ss})$,
where $d_t = G_t + r_t B_t - \tau^k r_t A_t$.
 - ▶ $\theta = 1$: no additional debt
 - ▶ $\theta = 0.05$: $\approx 95\%$ of additional spending financed with debt

Intratemporal and intertemporal tax allocation

[Return](#)

- ▶ Final good producer
 - + demands goods from intermediate good producers
- ▶ Intermediate good producers
 - + monopolistic competition
 - + quadratic adjustment cost on prices (Rotemberg)
- ▶ Households' problem same as before: real assets and wages
- ▶ Monetary policy responds to inflation
- ▶ However:
 - No capital utilization
 - No sticky wages
 - No accommodative monetary policy

Tax distribution in a NK model

► Intermediate Goods Producers

$$J_t(p_{jt-1}) = \max_{p_{jt}, y_{jt}, L, K, d_{jt}} \left\{ d_{jt} + \frac{1}{1+r_t} J_{t+1}(p_{jt}) \right\}$$

s. to

$$d_{jt} = \frac{p_{jt}}{P_t} y_{jt} - (1 - \tau_C) \mathcal{C}_t(y_{jt}) - \Theta(p_{jt}, p_{jt-1}) - \Phi$$

$$y_{jt} = \left(\frac{p_{jt}}{P_t} \right)^{-\varepsilon} Y_t$$

$$\mathcal{C}_t(y_{jt}) = \min_{K, L} \{ w_t L + (r_t + \delta) K : L^\alpha K^{1-\alpha} = y_{jt} \}$$

$$\Theta(p_{jt}, p_{j,t-1}) = \frac{\theta}{2} \left(\frac{p_{jt}}{p_{j,t-1}} - \bar{\Pi} \right)^2 Y_t$$

► Policy rule: $\ln \left(\frac{1+i_t}{1+i} \right) = \phi_\Pi \ln \left(\frac{\Pi_t}{\bar{\Pi}} \right)$

Tax distribution in a NK model ($\Phi_{\Pi} = 1.5$)

[Return](#)