Systematic Tax Policy and the U.S. Business Cycle

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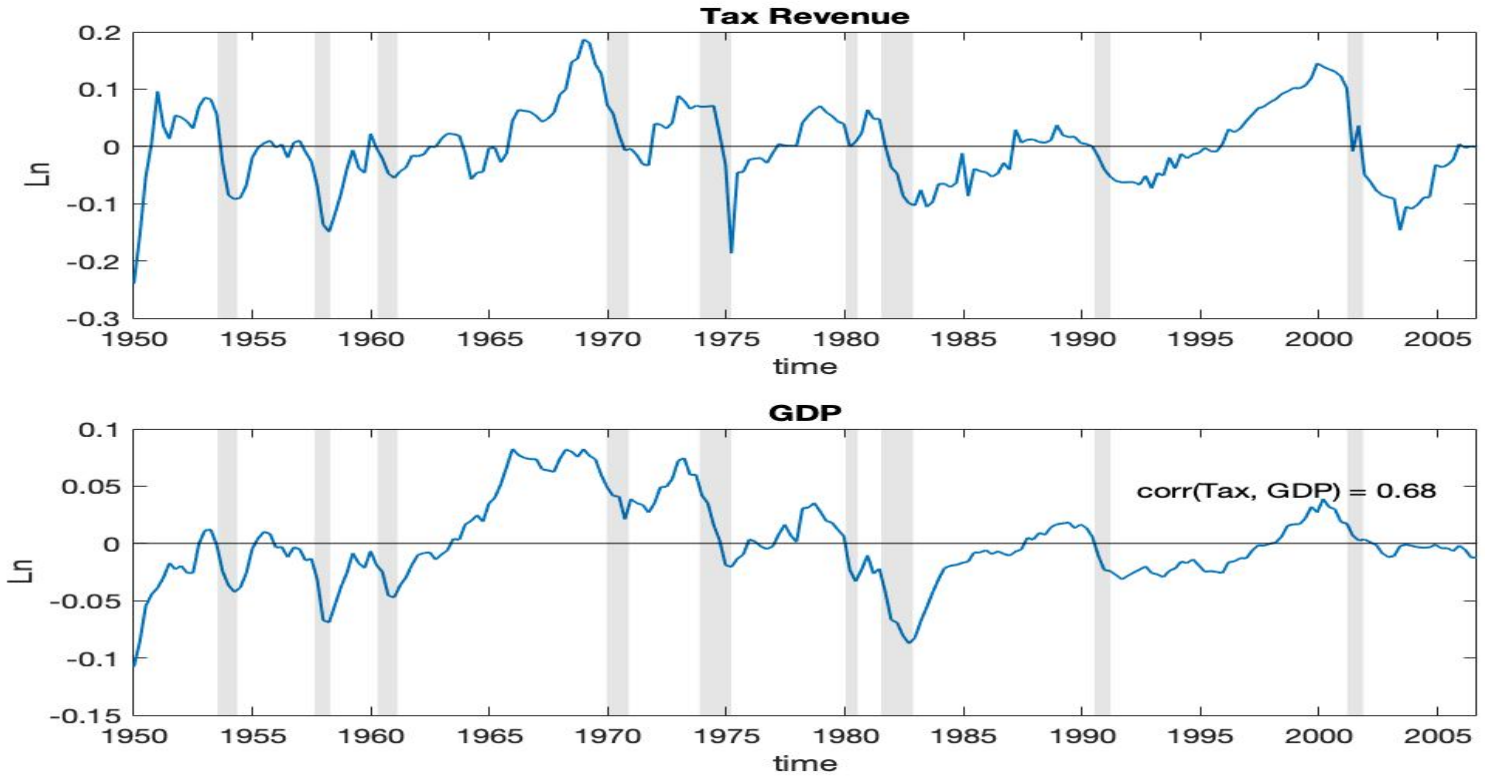
Motivation



1. Strong comovement between tax revenue and GDP.
2. Positive correlation mostly ascribed to automatic stabilizers.
3. Little research devoted to quantify importance of tax stabilizers.

Our Contribution

We study the role of the systematic component of tax policy for the U.S. business cycle using Structural Vector Autoregressions (SVAR).

1. Characterize tax rules and tax shocks using proxy identification. Mertens and Ravn (2013), Caldara and Kamps (2017)
2. Quantify the importance of automatic stabilizers for the transmission of TFP shocks.
   - Transmission to GDP under estimated policy rule;
   - Transmission to GDP under alternative paths of tax revenue.
3. Main finding: Weaker (but plausible) tax stabilization induces a 20 percent increase in the response of output to TFP.

Fixing Ideas: Tax Rule and Tax Multiplier

- Tax Rule: Response of tax revenue (tr) to economic activity (gdp):

$$u_{tr,t} = \eta_{tr,gdp} u_{gdp,t} + e_{tr,t}.$$

- Response of economic activity to tax revenue:

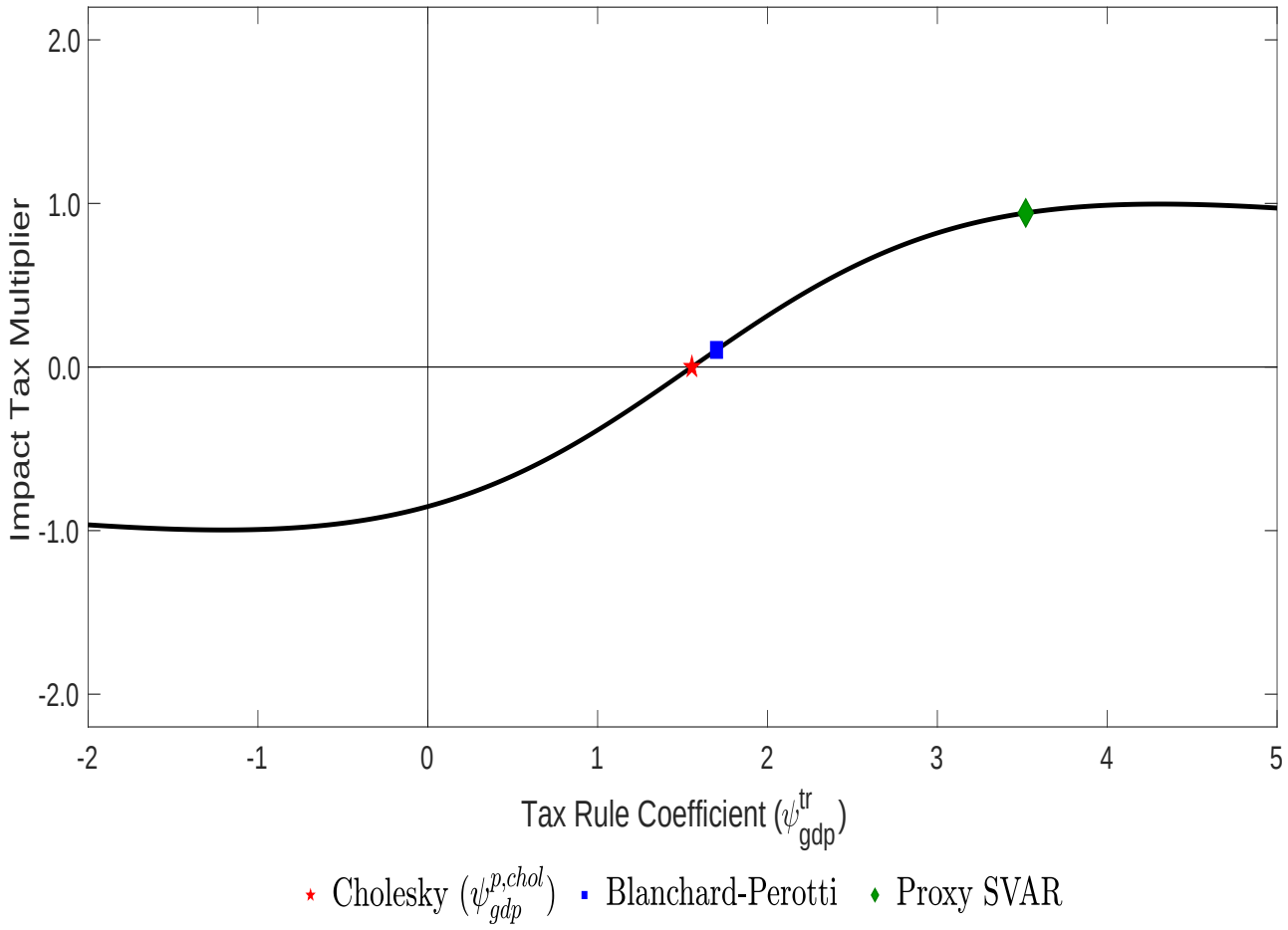
$$u_{gdp,t} = \eta_1 u_{tr,t} + e_{gdp,t}.$$

- Impact tax multiplier:

$$u_{gdp,t} = \frac{\eta_1}{1 - \eta_1 \eta_{tr,gdp}} e_{tr,t}.$$

- Differences in identification schemes to control for endogeneity of tax policy to economic conditions.
- $\eta_{tr,gdp} > 1$ and $\eta_1 < 0 \implies$ Automatic stabilizers

Effects of a Tax Cut



Source: Caldara and Kamps (2017)

The Tax Policy Equation

- y_t is the $n \times 1$ vector of endogenous variables.
- Assume tax revenues tr_t is ordered first in y_t.
- First equation of the SVAR is the tax policy equation:

$$y_t' A_{0,1} = x_t' A_{+,1} + e_{tr,t}$$

- We can rewrite the tax policy equation as:

$$tr_t = \sum_{j=2}^{n} y_{j,t}' \psi_{0,j} + \sum_{l=1}^{p} y_{t-l}' \psi_l + \sigma_{tr} e_{tr,t}$$

- Identification of $e_{tr,t}$ requires identification of the systematic component of tax policy and vice versa.

Quantifying Automatic Stabilizers: VAR Approach

Baseline model. We proceed in two steps:

1. Proxy identification of tax shocks:
   - We follow Mertens and Ravn (2014) $\longrightarrow$ narrative series of tax shocks.
   - Identification of tax shocks implies identification of tax rule Caldara and Kamps (2017).

2. Penalty function identification of TFP shocks.
   - TFP shock maximizes the impact response of TFP...
   - and orthogonal to the tax shock.
   - This identification makes TFP exogenous conditional on tax shocks.

Alternative identification of tax shocks following Caldara and Kamps (2017).

Data and Estimation

- Data:
  1. Federal tax revenues, (tr_t)
  2. Factor utilization-adjusted total factor productivity (tfp_t)
  3. Gross domestic product (gdp_t)
  4. Federal government spending, defined as the sum of government consumption and investment (g_t)
  5. Consumer price inflation (π_t)
  6. Federal funds rate (r_t)
- We estimate a quarterly model from 1950 to 2006.
- OLS + wild bootstrap confidence intervals.

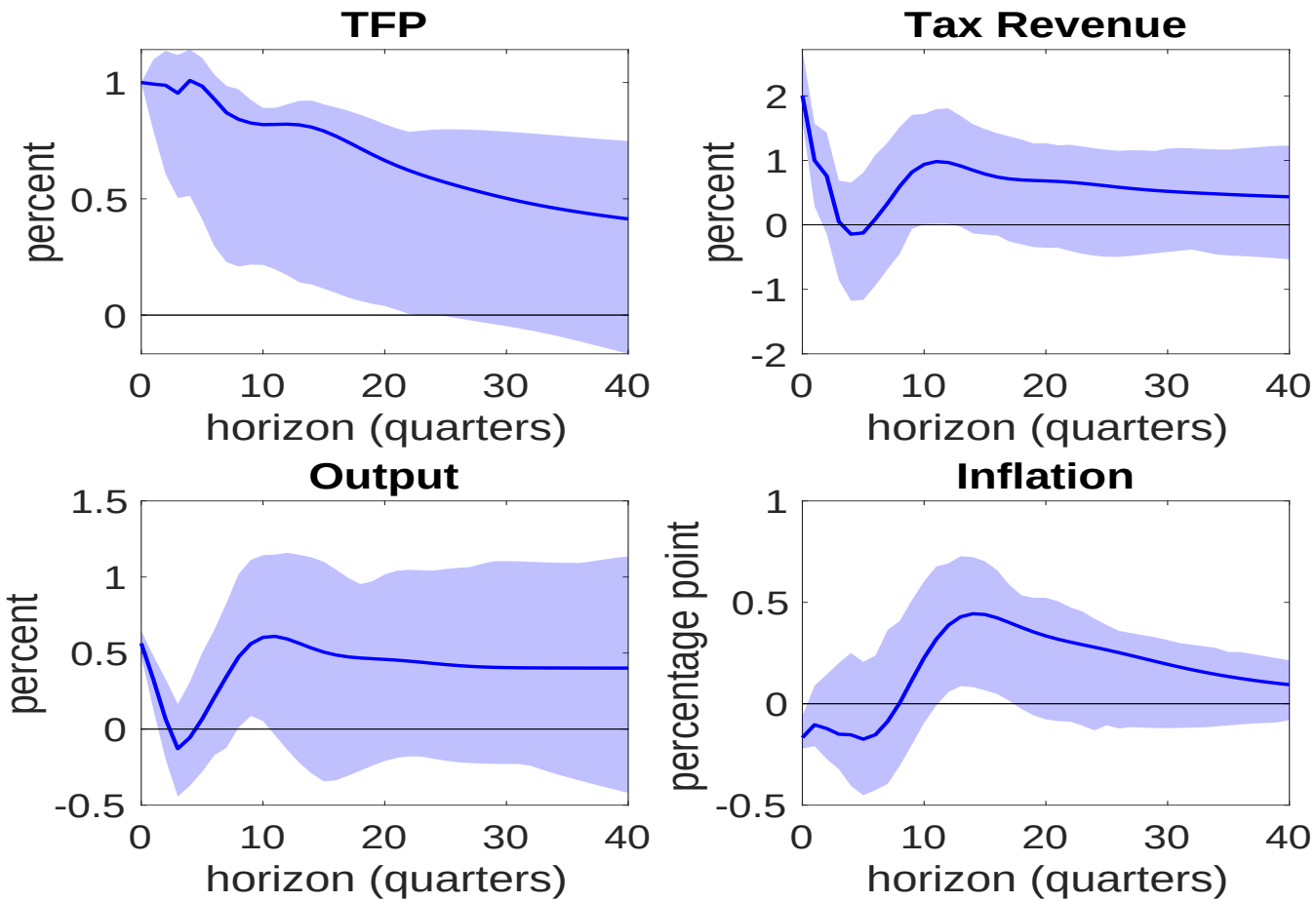
Tax Rule Coefficient Estimates

Table: Parameter estimates using proxy measures for tax shocks

The Tax Rule	Proxy SVAR	Blanchard-Perotti
ψ_{tfp}	0.73	0.00
	[-0.36 1.73]	
ψ_{gdp}	3.23	1.70
	[2.04 4.36]	
ψ_g	-0.14	0.00
	[-0.36 -0.08]	
ψ_π	2.17	0.00
	[1.09 2.99]	
ψ_r	-0.65	0.00
	[-1.55 0.07]	

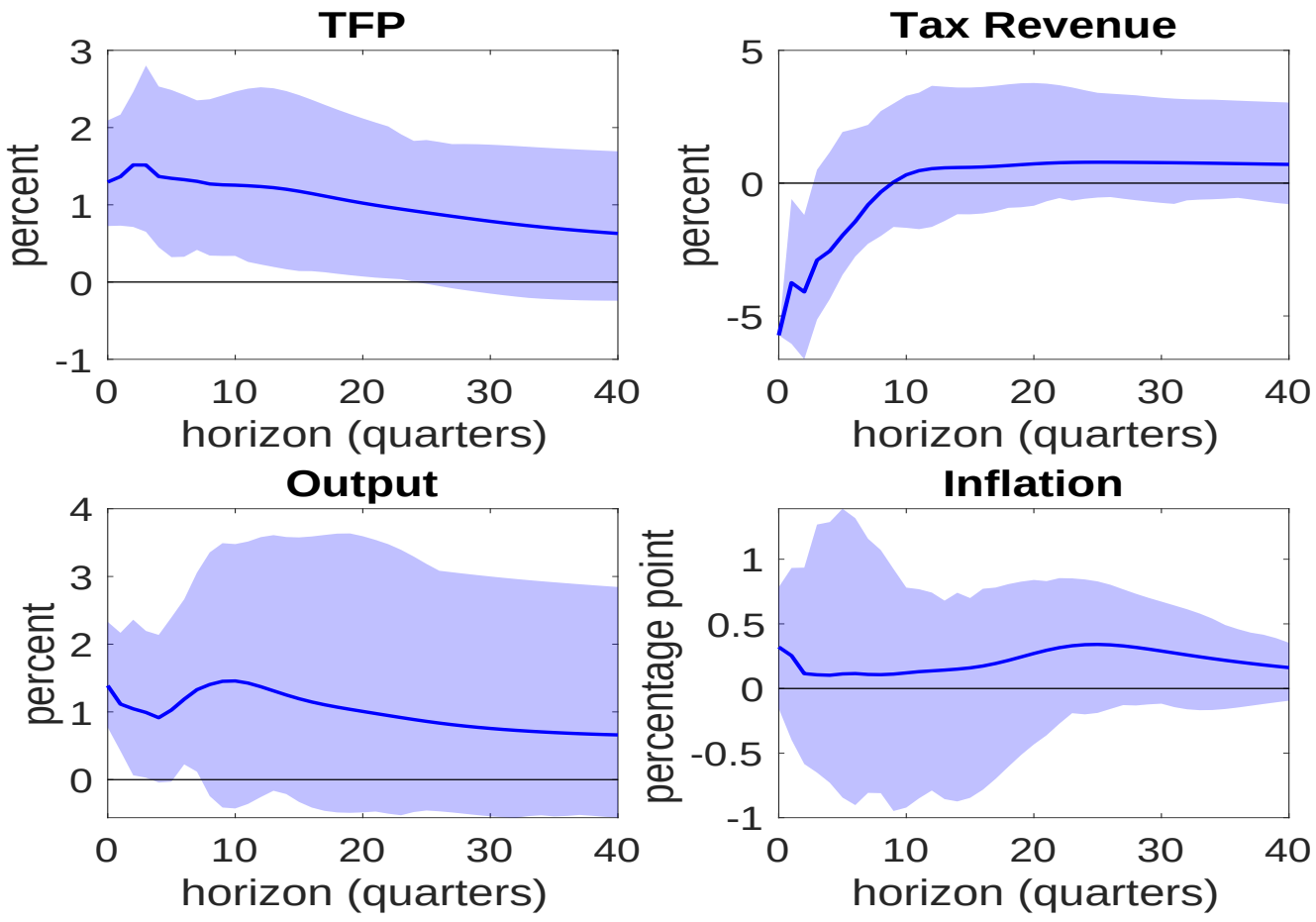
Note: Values in paranthesis are 95% percentiles computed using 100 bootstrap replications.

Impulse Responses to a TFP shock



Note: The size of TFP shock is standardized to 1%;
Bands are for 95% confidence intervals

Impulse Responses to a Tax Cut of 1% of GDP

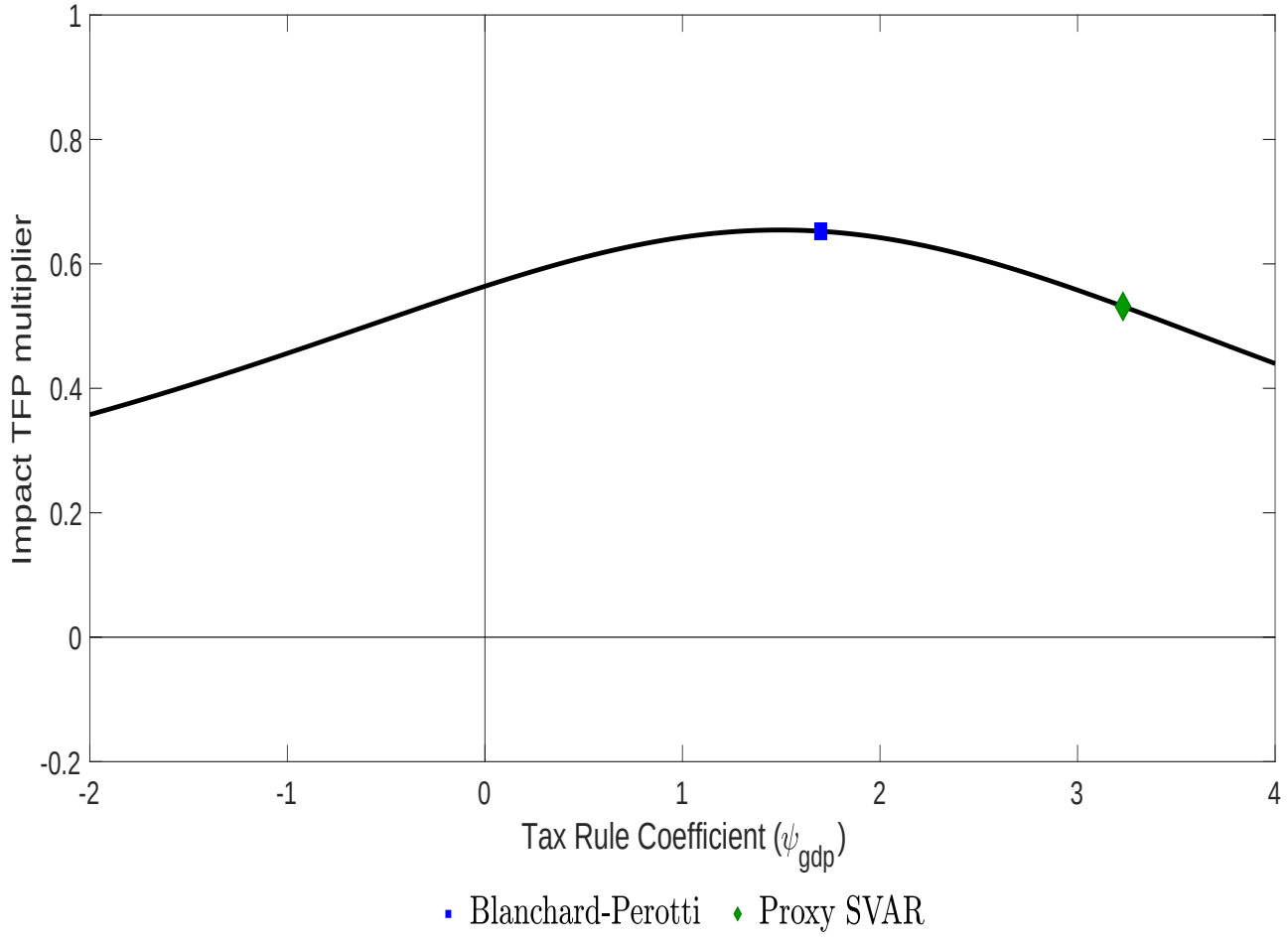


Note: Bands are for 95% confidence intervals

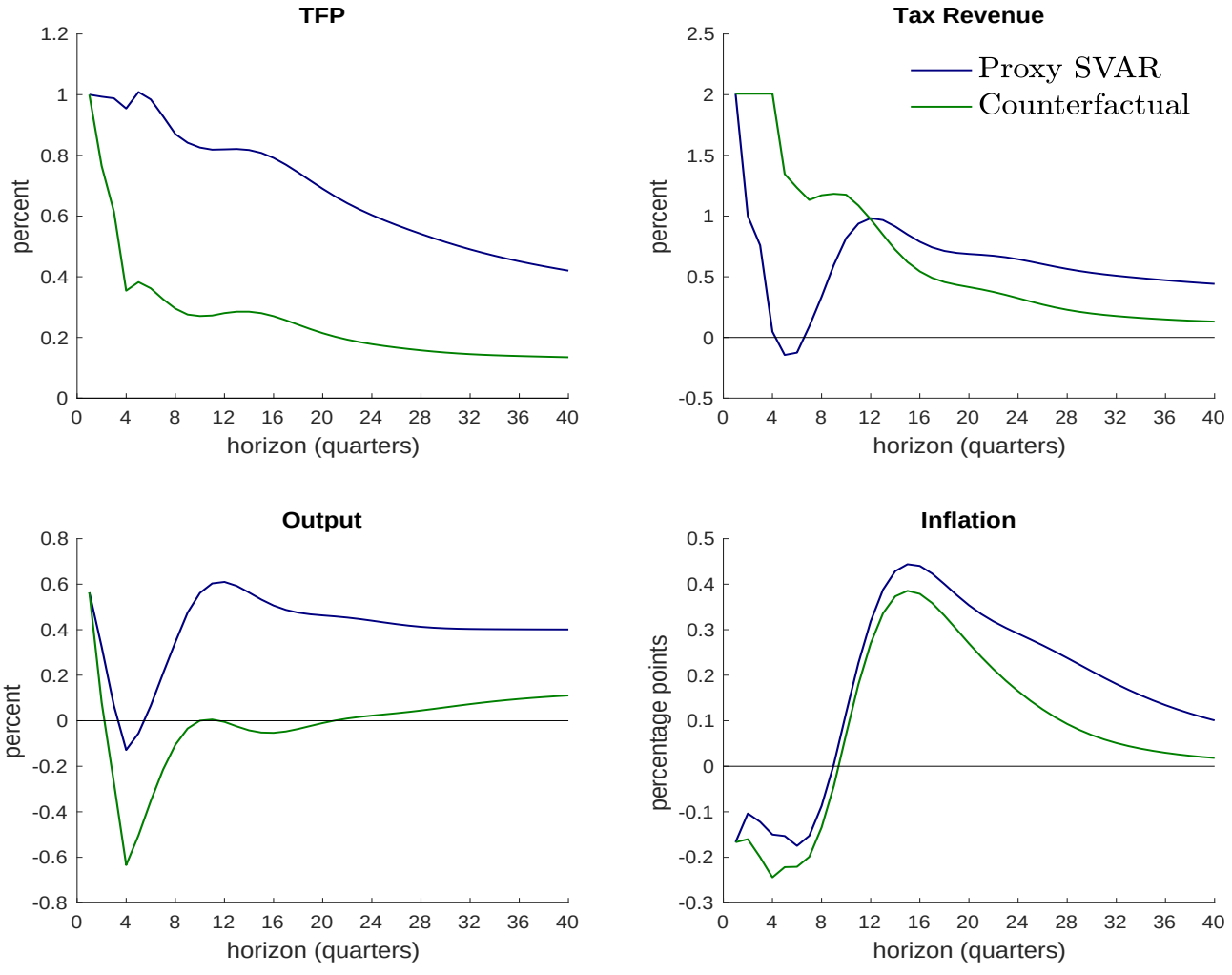
Overview of Findings

- Results consistent with automatic stabilizers:
  - In response to a technology shock, tax revenues increase by more than output does, i.e. $\eta_{tr,gdp} > 1$
  - In response to a tax cut, output increases, i.e. $\eta_1 < 0$
- To quantify the importance of automatic stabilizers, we run two experiments that alter the response of tax revenues to technology shocks:
  - Experiment 1: Change the elasticity $\eta_{tr,gdp}$ in the tax rule;
  - Experiment 2: Sequence of 'small' tax shocks.

Experiment 1: TFP Multipliers and Alternative Tax Rules

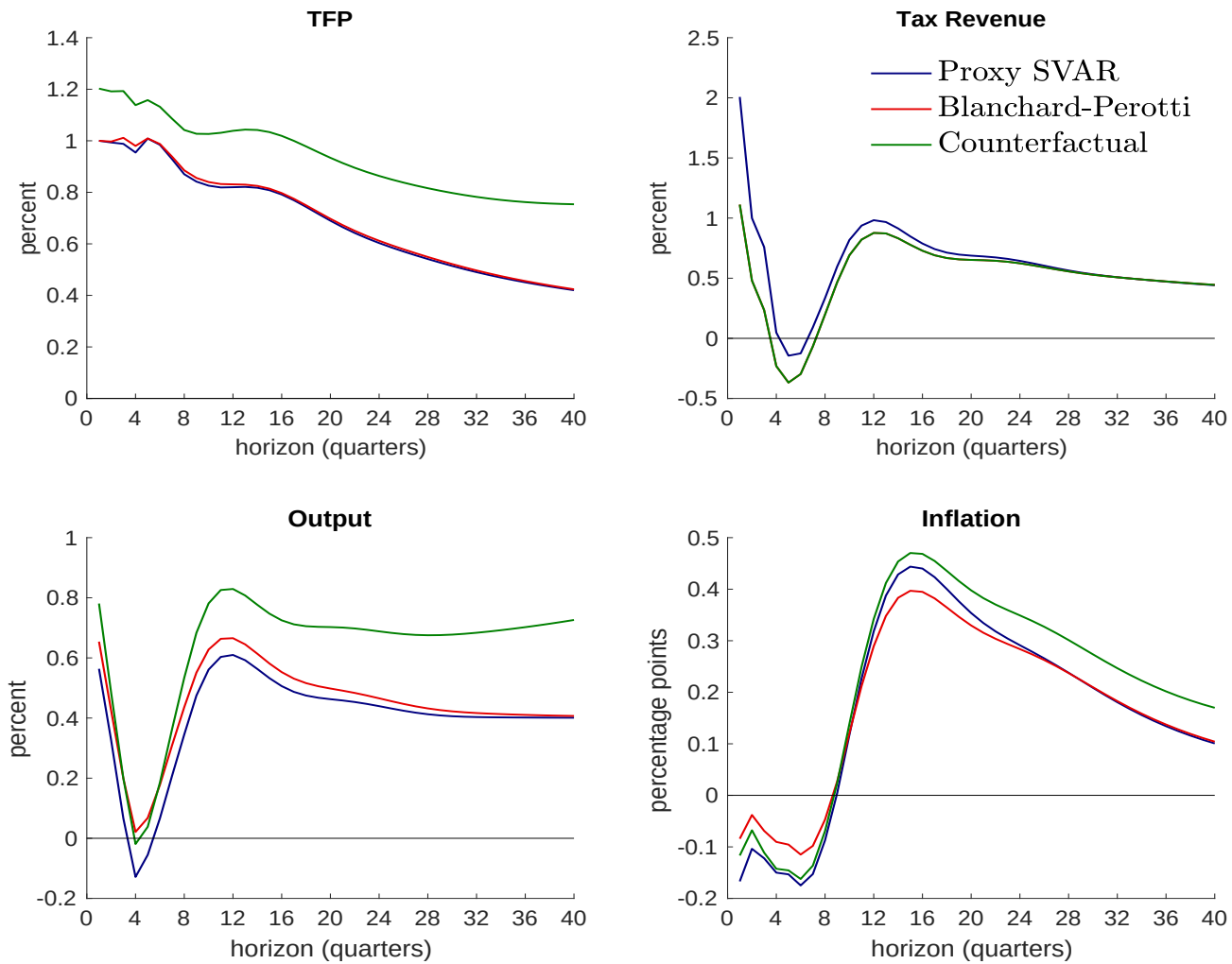


Experiment 2: Fix Tax Revenues for 4 Quarters



Note: IRFs to TFP shock

Experiment 3: Keeping Response of Tax Revenues Fixed at Blanchard-Perotti Estimates



Note: IRFs to TFP shock

Conclusions

- We provided a framework to assess importance of automatic tax stabilizers for the U.S. business cycle.
- We showed that the transmission of TFP shocks depends on the strength of tax stabilizers.
- To do list: look at impact on inflation; look at other measures of stabilization (e.g. volatility, historical decomposition),...
- Explore implications for the identification of non-policy shocks:
  - TFP is not exogenous to taxes.
  - Typical VARs used to identify TFP shocks do not include fiscal variables; shocks might be contaminated.

References I

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