Questioning the puzzle: fiscal policy, real exchange rate and inflation

Laurent Ferrara (BdF)  Luca Metelli (Bdl)
Filippo Natoli (Bdl)  Daniele Siena (BdF)

BdF-BoE International Macroeconomics Workshop
November 18, 2019

This presentation reflects the opinions of the authors and does not reflect the views of the Banque de France, Banca d’Italia or of the Eurosystem
Motivation

- After the Great Recession renewed interest on fiscal policy
- increasing relevance of open economy aspects

- Increase in government consumption:
  - Is deflationary (Fatás and Mihov [2001], Mountford and Uhlig [2009], Jorgensen and Ravn [2019] and D'Alessandro et al. [2019])
  - not always (Edelberg et al. [1999] and Zeev and Pappa [2017])

- Depreciates the real effective exchange rate (Kim and Roubini [2008], Ravn et al. [2006], Monacelli and Perotti [2010], Enders et al. [2011], Ravn et al. [2012] and Ilzetzki et al. [2013])
  - not always (Kim [2015], Auerbach and Gorodnichenko [2016], Forni and Gambetti [2016], Miyamoto et al. [2019], Boehm [2019] and Born et al [2019])
Motivation

▶ After the Great Recession renewed interest on fiscal policy
  ▶ increasing relevance of open economy aspects

▶ But current evidence finds multiple puzzles
  ▶ Increase in government consumption:
    ▶ Is deflationary (Fatás and Mihov [2001], Mountford and Uhlig [2009], Jorgensen and Ravn [2019] and D'Alessandro et al. [2019])
Motivation

- After the Great Recession renewed interest on fiscal policy
  - increasing relevance of open economy aspects

- But current evidence finds multiple **puzzles**
  - Increase in government consumption:
    - Is *deflationary* (Fatás and Mihov [2001], Mountford and Uhlig [2009], Jorgensen and Ravn [2019] and D'Alessandro et al. [2019])
    - *not always* (Edelberg et al. [1999] and Zeev and Pappa [2017])
Motivation

- After the Great Recession renewed interest on fiscal policy
  - increasing relevance of open economy aspects
- But current evidence finds multiple puzzles
  - Increase in government consumption:
    - Is deflationary (Fátás and Mihov [2001], Mountford and Uhlig [2009], Jorgensen and Ravn [2019] and D’Alessandro et al. [2019]) not always (Edelberg et al. [1999] and Zeev and Pappa [2017])
    - Depreciates the real effective exchange rate (Kim and Roubini [2008], Ravn et al. [2006], Monacelli and Perotti [2010], Enders et al. [2011], Ravn et al. [2012] and Ilzetzki et al. [2013])
Motivation

- After the Great Recession renewed interest on fiscal policy
  - increasing relevance of open economy aspects

- But current evidence finds multiple puzzles
  - Increase in government consumption:
    - Is deflationary (Fatás and Mihov [2001], Mountford and Uhlig [2009], Jorgensen and Ravn [2019] and D’Alessandro et al. [2019])
      not always (Edelberg et al. [1999] and Zeev and Pappa [2017])
    - Depreciates the real effective exchange rate (Kim and Roubini [2008], Ravn et al. [2006], Monacelli and Perotti [2010], Enders et al. [2011], Ravn et al. [2012] and Ilzetzki et al. [2013])
      not always (Kim [2015], Auerbach and Gorodnichenko [2016], Forni and Gambetti [2016], Miyamoto et al. [2019], Boehm [2019] and Born et al [2019])
Our contribution

- Explicitly look at these aspects contemporaneously
Our contribution

- Explicitly look at these aspects contemporaneously

- Show that the puzzles lie in the identification
  
  - Using a proxy-Bayesian SVAR (with Ramey’s narratives shocks) to instrument current government spending:
    
    - an increase in government spending is inflationary and appreciates the REER
Our contribution

- Explicitly look at these aspects contemporaneously

- Show that the puzzles *lie* in the identification
  - Using a proxy-Bayesian SVAR (with Ramey’s narratives shocks) to instrument *current* government spending:
    - an increase in government spending is inflationary and appreciates the REER

- Show that estimating a SOE RBC model using IRF matching:
  - Theory is consistent not only with REER and inflation reaction but also for other validating controversial variables (e.g. trade balance (↓) and consumption(↓) + investment (↓)))
Difficult identifying fiscal shocks - **methodology:**

1. VAR restrictions (institutional features - Blanchard and Perotti [2002], sign - Mountford and Uhlig [2009])
   - **Pro:** parsimonious characterization of the shock transmission mechanism
   - **Cons:** controversial identification assumptions

2. Narrative approach (Romer and Romer [2010], Ramey [2011])
   - **Pro:** accounts for relevant features of a large information set
   - **Cons:** measurement error, judgment and pollution

3. Proxy-SVAR (1 + 2) (Mertens and Ravn [2013])
   - **Pro:** informational content of narrative approach in a VAR without imposing restrictions on structural parameters
   - **Cons:** extend narrative approach and allows for testing the instrument
Difficult identifying fiscal shocks - methodology:

1. VAR restrictions (institutional features - Blanchard and Perotti [2002], sign - Mountford and Uhlig [2009])
   - Pro: parsimonious characterization of the shock transmission mechanism
   - Cons: controversial identification assumptions

2. Narrative approach (Romer and Romer [2010], Ramey [2011])
   - Pro: accounts for relevant features of a large information set
   - Cons: measurement error, judgment and pollution
Difficult identifying fiscal shocks - **methodology:**

1. VAR restrictions (institutional features - Blanchard and Perotti [2002], sign - Mountford and Uhlig [2009])
   - Pro: parsimonious characterization of the shock transmission mechanism
   - Cons: controversial identification assumptions

2. Narrative approach (Romer and Romer [2010], Ramey [2011])
   - Pro: accounts for relevant features of a large information set
   - Cons: measurement error, judgment and pollution

3. Proxy-SVAR (1 + 2) (Mertens and Ravn [2013])
   - informational content of narrative approach in a VAR without imposing restrictions on structural parameters
   - extend narrative approach and allows for testing the instrument
Difficulty - 2

- Difficult identifying fiscal shocks - **timing**:

  1. Expected or unexpected (Ramey [2011] - military)
    - Most of fiscal shocks are anticipated, forgetting this leads to wrong IRF
    - Anticipated shocks can help explaining the puzzle but...(Forni and Gambetti [2016])

  ▶️ Using military spending as anticipated shocks, needs war episodes (WWII and Korea)

  ▶️ Starting from the 80's changes the results
Difficult identifying fiscal shocks - **timing**:

1. Expected or unexpected (Ramey [2011] - military)
   - Most of fiscal shocks are anticipated, forgetting this leads to wrong IRF
   - Anticipated shocks can help explaining the puzzle but...(Forni and Gambetti [2016])

2. Importance of the time-sample of the analysis
   - Using military spending as anticipated shocks, needs war episodes (WWII and Korea)
   - Starting from the 80’s changes the results
This paper:

1. Proxy-SVAR using narrative military spending to instrument current government spending

2. Comparing new results to a standard open economy model
This paper:

1. Proxy-SVAR using narrative military spending to instrument current government spending

2. Comparing new results to a standard open economy model

Plan of the talk

- Proxy-SVAR
- Results
- Robustness
- Model
Proxy-SVAR

Reduced form

\[ X_t = c_0 + \sum_{k=1}^{P} A_k X_{t-k} + u_t \quad u_t \sim N(0, \Sigma) \tag{1} \]
Proxy-SVAR

Reduced form

\[ X_t = c_0 + \sum_{k=1}^{P} A_k X_{t-k} + u_t \quad u_t \sim N(0, \Sigma) \quad (1) \]

Structural - needs to specify a matrix \( P_0 \)

\[ P_0 X_t = P_0 c_0 + c_1 t + P_0 \sum_{k=1}^{P} A_k X_{t-k} + \epsilon_t \quad \epsilon_t = P_0 u_t \quad (2) \]
Proxy-SVAR

Reduced form

\[ X_t = c_0 + \sum_{k=1}^{P} A_k X_{t-k} + u_t \quad u_t \sim N(0, \Sigma) \] (1)

Structural - needs to specify a matrix \( P_0 \)

\[ P_0 X_t = P_0 c_0 + c_1 t + P_0 \sum_{k=1}^{P} A_k X_{t-k} + \epsilon_t \quad \epsilon_t = P_0 u_t \] (2)

To restrict \( P_0 \), use \( m_t \) narrative series as proxies, assuming

\[ E(m, t) = 0 \] (3)

\[ E[m_t, \epsilon_{f,t}] = \gamma \] (4)

\[ E[m_t, \epsilon_{nf,t}] = 0 \] (5)

Then two-stage least squares (2SLS) estimates of all fiscal (and not) residuals on the fiscal residual, using each time \( m_t \) as an instrument + impose restrictions (3) + (4) + (5);
Data and specification

- The narrative series is the military news series of Ramey [2016]
- Narrow real effective exchange rate from BIS - av. from 1964
- Quarterly data, constant + four lags - Bayesian techniques (dummy observations to impose a Minnesota prior on the reduced-form VAR parameters - Del Negro and Schorfheide [2011])
- Baseline sample 1964Q1 to 2015Q4
- Data taken in logs (with exception of prices and $\frac{TB}{GDP}$)
Baseline specification

- 9 Variables VAR:
  - Government Spending, Tax revenue, Real GDP, Real consumption, Inflation, TFP, Trade balance, Stock price, Real exchange rate (⇑ Appreciation)
Baseline specification

- 9 Variables VAR:
  - Government Spending, Tax revenue, Real GDP, Real consumption, Inflation, TFP, Trade balance, Stock price, Real exchange rate (⇑ Appreciation)

- Stock prices of defense firms: additional variable that react to signals about future changes in (military) policy to control for anticipation
Baseline specification

- 9 Variables VAR:
  - Government Spending, Tax revenue, Real GDP, Real consumption, Inflation, TFP, Trade balance, Stock price, Real exchange rate (↑ Appreciation)

- Stock prices of defense firms: additional variable that react to signals about future changes in (military) policy to control for anticipation

Using Ramey narrative military spending instrument to account for government spending - use it from 1964

⇒ Is it a good instrument for current spending?
Instrumenting current spending

Ramey [2016] *news* on military spending - net present value of current and expected military expenditures in the United States
Instrumenting current spending

Ramey [2016] news on military spending - net present value of current and expected military expenditures in the United States

BUT
Instrumenting current spending

Ramey [2016] *news* on military spending - net present value of current and expected military expenditures in the United States

BUT

▶ We use it to instrument only contemporaneous spending - *surprise*
Instrumenting current spending

Ramey [2016] *news* on military spending - net present value of current and expected military expenditures in the United States

**BUT**

▶ We use it to instrument only contemporaneous spending - *surprise*

▶ Need to test the strength of the instrument

**F-TEST**

\[
\sum_{j=0}^{h} g_{t+j} = \gamma h + m_{h \text{ narrative}} t + \phi_h(L) z_{t-1} + \omega_{t+h}
\]

Vs.

\[
\sum_{j=0}^{h} g_{t+j} = \gamma h + \phi_h(L) z_{t-1} + \omega_{t+h}
\]
F-Test

- Control variables (4 lags):
  - Few controls: 1964-2015 and 1947-2015 with only tax revenue and GDP as controls (blue and red dotted lines)
  - All controls: same as the baseline specification (1964-2015) tax revenues, GDP, inflation, TFP, consumption, stock prices, short term interest rate and the real exchange rate (blue solid line)
F-Test

- Control variables (4 lags):
  - Few controls: 1964-2015 and 1947-2015 with only tax revenue and GDP as controls (blue and red dotted lines)
  - All controls: same as the baseline specification (1964-2015) tax revenues, GDP, inflation, TFP, consumption, stock prices, short term interest rate and the real exchange rate (blue solid line)

- Threshold for weak instrument depends on serial-correlation of residuals [Montiel Olea and Pflueger, 2013]
  - Ljung-Box Q-test on the three regression specifications, one for each $h$ series of residuals $\omega_{t+h}$
    - Only the residuals of the contemporaneous regression are not autocorrelated, when using VAR specification
F-Test

▶ Control variables (4 lags):
  ▶ Few controls: 1964-2015 and 1947-2015 with only tax revenue and GDP as controls (blue and red dotted lines)
  ▶ All controls: same as the baseline specification (1964-2015) tax revenues, GDP, inflation, TFP, consumption, stock prices, short term interest rate and the real exchange rate (blue solid line)

▶ Threshold for weak instrument depends on serial-correlation of residuals [Montiel Olea and Pflueger, 2013]
  ▶ Ljung-Box Q-test on the three regression specifications, one for each $h$ series of residuals $\omega_{t+h}$
    ▶ Only the residuals of the contemporaneous regression are not autocorrelated, when using VAR specification

⇒ For the serially uncorrelated case, we apply the threshold of Montiel Olea et al. [2018] - i.e. 3.84. For the other cases we use 23.1085 (Montiel Olea and Pflueger [2013] and Ramey and Zubairy [2018])
F-test results

Deviations over horizons of F-statistics from their critical values
Other test - F-test on other VAR variables

Wald F-statistic for all variables

Other tests

- F-test on other variables
- F-test with McCracken and Ng (2016) factors
Other tests

- F-test on other variables
- F-test with McCracken and Ng (2016) factors
- Non-fundamentalness test
Other tests

- F-test on other variables
- F-test with McCracken and Ng (2016) factors
- Non-fundamentalness test

⇒ Good instrument for current government spending
The puzzle and our result
The puzzle - Cholesky (1964Q1-2015Q4)
The puzzle - Cholesky (1964Q1-2015Q4)
Proxy-SVAR (1964Q1-2015Q4)
Proxy-SVAR (1964Q1-2015Q4)
Investment response - keeping 9 VAR

- Government spending
- Tax revenue
- Real GDP
- Real Investment
- PCE inflation
- TFP
- Trade Balance
- Stock price
- Real exchange rate
Robustness

- Do not trust the instrument: use changes in gov. defense investment
- Bretton woods: 1976-2015
- Great Recession: 1964-2006
- What about the nominal?
- What about inflation and deflation - Lambertini and Proebsting [2019]
Defense investment as instrument
Robustness

- Do not trust the instrument: use changes in gov. defense investment
- Bretton woods: 1976-2015
- Great Recession: 1964-2006
- What about the nominal?
- What about inflation measure? Lambertini and Proebsting [2019]
Theory
Is it consistent with theory

Construct a simple small open economy RBC model based on Mendoza [1991] with

- two goods
- habits in consumption
- investment adjustment costs
- JR preferences
- Endogenous discount factor

Impulse-response matching
### Estimated parameter values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trade elasticity</td>
<td>0.694</td>
<td>0.096</td>
</tr>
<tr>
<td>Capital adjustment cost</td>
<td>0.714</td>
<td>0.032</td>
</tr>
<tr>
<td>Wealth Elasticity</td>
<td>0.894</td>
<td>0.1</td>
</tr>
<tr>
<td>AR 1</td>
<td>1.41</td>
<td>0.081</td>
</tr>
<tr>
<td>AR 2</td>
<td>-0.416</td>
<td>0.1</td>
</tr>
<tr>
<td>Inter-temporal elasticity of substitution</td>
<td>0.644</td>
<td>0.042</td>
</tr>
<tr>
<td>Home bias in consumption</td>
<td>0.798</td>
<td>0.012</td>
</tr>
</tbody>
</table>
Model and empirical responses
Conclusions

- Using a different identification scheme (Proxy-SVAR with narrative defense shocks) puts puzzles under pressure
  - In response to an increase in government consumption shock
    - The real exchange rate appreciates and inflation increases
    - Consumption falls and net exports falls

- Results are consistent with SOE RBC (or NK) theory, which matches well the behavior of standard macro variables
Thank you!
IRF - matching GDP
### Estimated parameter values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trade elasticity</td>
<td>0.356</td>
</tr>
<tr>
<td>Capital adjustment cost</td>
<td>1.52</td>
</tr>
<tr>
<td>Wealth Elasticity</td>
<td>0.894</td>
</tr>
<tr>
<td>Inter-temporal elasticity of substitution</td>
<td>2.6</td>
</tr>
<tr>
<td>Home bias in consumption</td>
<td>0.49</td>
</tr>
</tbody>
</table>
Closed economy - unfair slide!


Soyoung Kim. Country characteristics and the effects of government consumption shocks on the current account and real


Tommaso Monacelli and Roberto Perotti. Fiscal Policy, the Real


Valerie A. Ramey and Sarah Zubairy. Government spending multipliers in good times and in bad: Evidence from us historical

