State Dependence of Fiscal Multipliers: The Source of Fluctuations Matters

Mishel Ghassibe Francesco Zanetti

CREi University of Oxford

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Fiscal multipliers and states of the world

- Empirical debate:

Auerbach and Gorodnichenko (2012, 2013)
Fazzari, Morley and Panovska (2015) vs Ramey and Zubairy (2018)

(State dependence) (No state dependence)

- Theoretical models:

  Fiscal multipliers almost state-independent in workhorse models (Sims and Wolff, 2017):

$$\frac{dY}{dG}(s) \approx \frac{dY}{dG}(s'), \qquad s' \neq s$$

  where $s, s' \in S$ are states of the world (away from ZLB)

This paper: main results

- **Theory** of state-dependent government spending and taxation multipliers, in a framework with interaction between **idle capacity** and **unsatisfied demand**
  - Cyclicality of fiscal multipliers depends on the **source of fluctuations**
  - **Spending multipliers** high in demand-driven recessions, low if recession supply driven
  - **Tax cut multipliers** high in supply-driven recessions, low if recession demand driven
  - **Spending austerity** effective in supply recessions or periods of excessive demand if the labor market is sufficiently rigid
- **Estimation** of state-dependent multipliers, **conditional** on the source of fluctuations
  - Use co-movement of economic activity and inflation to identify states; findings support theory

Standard approach vs. our novel approach

- **Standard approach**: production is equal to demand

$$Y = C + G \tag{1}$$

- **Our approach**: presence of *idle capacity* and *unsatisfied demand*, use search and matching frictions in the goods market

Framework: search-and-matching in the goods market

- Framework similar to Michaillat and Saez (2015)
- Matching function maps sales (y) to capacity (k) and purchasing visits (v), so that $y \leq \min\{k, v\}$:

$$\underbrace{y}_{\text{Sales}} = \Big(\underbrace{k^{-\delta}}_{\text{“Shop size”}} + \underbrace{v^{-\delta}}_{\text{“Queue length”}} \Big)^{-\frac{1}{\delta}}$$

- Goods market tightness (x):

$$x \equiv \underbrace{\frac{v}{k}}_{\text{“Shop congestion”}}$$

- Pr. of selling a product: $f(x) \equiv \frac{y}{k} = (1 + x^{-\delta})^{-\frac{1}{\delta}}, f' > 0$
- Pr. of a successful visit: $q(x) \equiv \frac{y}{v} = (1 + x^{\delta})^{-\frac{1}{\delta}}, q' < 0$
- Government spending affects v, and (supply-side) taxes affect k

Sketch of the model

- Households maximize utility subject to shopping costs:

$$p[1 + \gamma(x)]c + m \leq wl + \Pi - T + \bar{m}.$$

- Firms maximize sales:

$$\Pi = pf(x)an^{\alpha} - wn(1 + \tau)$$

- Government faces shopping costs:

$$T = p[1 + \gamma(x)]G - wn\tau.$$

Equilibrium: analytical conditions

- Goods market clearing:

$$\frac{f(x)}{1+\gamma(x)}k(n;\tau) = c(p,x) + G$$

- Labour market clearing:

$$l(w) = n(p,x,w;\tau)$$

Closing the model: two polar cases

- **Competitive equilibrium**: fix tightness at the efficient level $(x = x^*)$, and let (p^*, w^*) clear the markets
- **Fixprice equilibrium**: fix the price $(p = p_0)$, let (x, w) clear the markets

Competitive equilibrium multipliers

Proposition 1. *In a competitive equilibrium, the demand-side fiscal multiplier and the supply-side fiscal multiplier are equal and given by*:

$$\varphi^* = \frac{\alpha}{1+\psi} \in [0, 1].$$

- Thus φ^* depends on labour market flexibility

Fixprice equilibrium multipliers

Fixed capacity fiscal multiplier

Lemma 3. *Define the fixed capacity fiscal multiplier $\theta(x)$ to be the demand-side fiscal multiplier under fixed labour supply in the economy, so that*

$$\theta(x) \equiv \frac{dZ}{dG}\Big|_{\psi\to\infty}, \text{ where } Z = c + G$$

then $\theta(x)$ has the following properties:

$$\theta(x) = \begin{cases} (-\infty, 0), & \text{if } x \in (x^*, x^m) \\ 0, & \text{if } x = x^* \\ (0, 1), & \text{if } x \in (0, x^*) \end{cases}$$

$$\theta'(x) < 0, \qquad x \in (0, x^m)$$

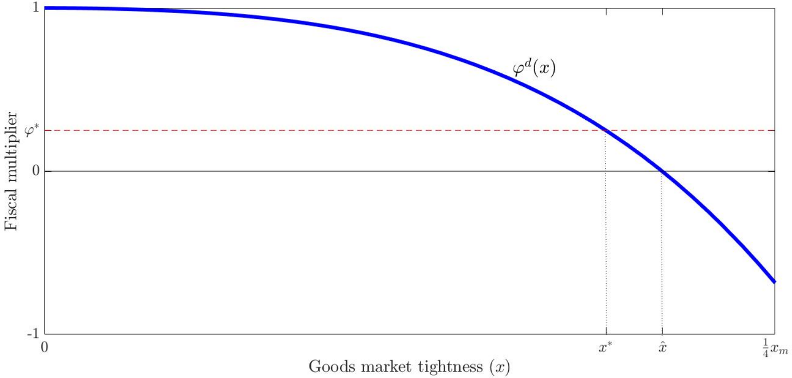
Demand-side fiscal multiplier (fixprice equilibrium)

Proposition 2. *In a fixprice equilibrium, the demand-side fiscal multiplier $\varphi^d(x)$ is given by*

$$\varphi^d(x) = \underbrace{\varphi^*}_{\text{State-invariant component}} + \underbrace{\theta(x) \times (1 - \varphi^*)}_{\text{State-dependent component}}$$

- Convex combination: $1 \times \varphi^* + \theta(x) \times (1 - \varphi^*)$

Demand-side fiscal multiplier (fixprice equilibrium)



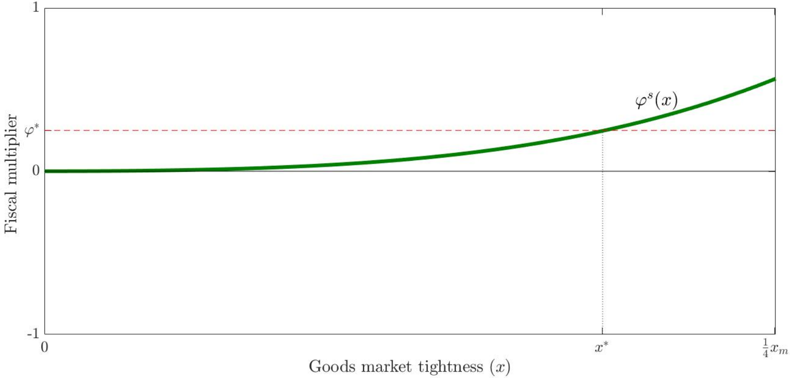
Supply-side fiscal multiplier (fixprice equilibrium)

Proposition 3. *In a fixprice equilibrium, the supply-side fiscal multiplier $\varphi^s(x)$ is given by*

$$\varphi^s(x) = \underbrace{\varphi^*}_{\text{State-invariant component}} - \underbrace{\theta(x) \times \varphi^*}_{\text{State-dependent component}},$$

- $\frac{d\varphi^s}{dx} > 0$, so moves in the same direction as tightness

Supply-side fiscal multiplier (fixprice equilibrium)



Relationship between the two multipliers

Corollary 2. *In a fixprice equilibrium, the demand-side and supply-side fiscal multipliers are related as*

$$\underbrace{\varphi^d(x)}_{\text{Demand-side multiplier}} = \underbrace{\theta(x)}_{\text{Fixed capacity multiplier}} + \underbrace{\varphi^s(x)}_{\text{Supply-side multiplier}},$$

so that the difference between the two is just the fixed capacity fiscal multiplier.

- Given the properties of $\theta(x)$, it follows that $\varphi^d(x) > \varphi^s(x)$ if $x < x^*$ and vice versa
- Is there any stimulative role for fiscal austerity?

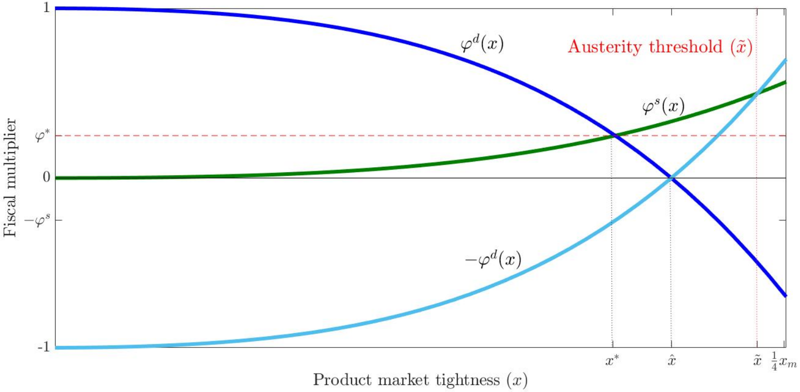
Spending austerity threshold

Corollary 3. *Suppose* $\varphi^* < 0.5$*, then there always exists tightness* $\tilde{x} \in [x^*, x^m)$ *such that:*

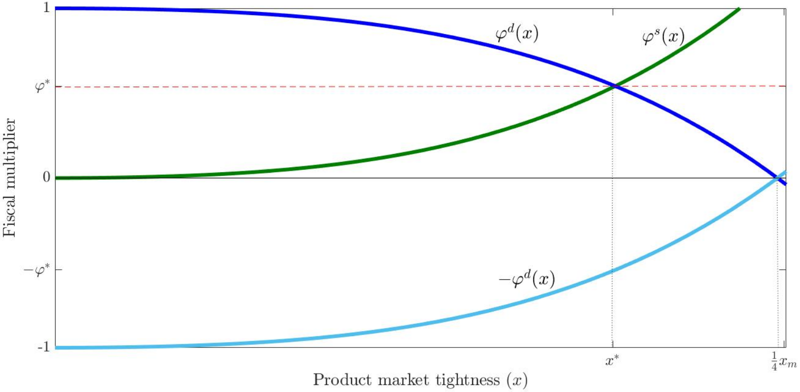
$$-\varphi^d(x) > \varphi^s(x) > \varphi^d(x), \quad \forall x \in (\tilde{x}, x^m).$$

- If the labour market is sufficiently inelastic $(\varphi^* < 0.5)$ and the fixprice equilibrium is sufficiently tight $(x > \tilde{x} > x^*)$, then *spending austerity* is the policy with the highest multiplier

Inelastic labour market ($\varphi^* < 0.5$)



Elastic labour market ($\varphi^* > 0.5$)



Conditional state-dependent spending multipliers

- Extend the one-step IV procedure from Ramey and Zubairy (2018):

$$\sum_{s=t}^{t+H}\left(\frac{GDP}{GDP^*}\right)_s = \mathbf{1}\{U_{t-1} < \bar{U}\}\left[\alpha_H^E + \beta_H^E \sum_{s=t}^{t+H}\left(\frac{G}{GDP^*}\right)_s + \gamma_H^E \mathbf{z}_{t-1}\right] +$$

$$\mathbf{1}\{U_{t-1} \geq \bar{U}; \pi_{t-1} < \tilde{\pi}_{t-1}\}\left[\alpha_H^{DR} + \beta_H^{DR} \sum_{s=t}^{t+H}\left(\frac{G}{GDP^*}\right)_s + \gamma_H^{DR} \mathbf{z}_{t-1}\right] +$$

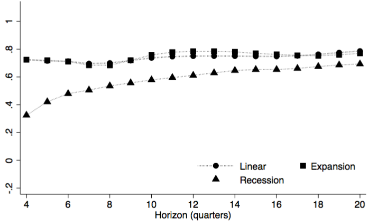
$$\mathbf{1}\{U_{t-1} \geq \bar{U}; \pi_{t-1} \geq \tilde{\pi}_{t-1}\}\left[\alpha_H^{SR} + \beta_H^{SR} \sum_{s=t}^{t+H}\left(\frac{G}{GDP^*}\right)_s + \gamma_H^{SR} \mathbf{z}_{t-1}\right] + \varepsilon_{t+H}$$

- Spending instrument: historical data on military spending news in US (1889-2015) (Owyang, Ramey and Zubairy, 2013)

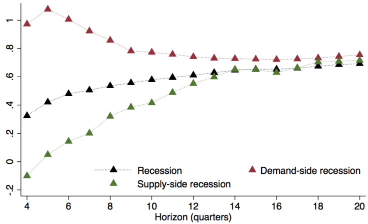
Conditional state-dependent spending multipliers

US data (1889-2015)	2 year			4 year	
State	(1)	(2)	(3)	(4)	(5)
Linear	**0.70*****				
	(0.06)				
$\mathbf{1}\{U_t < \bar{U}\}$		**0.68*****	**0.68*****	**0.76*****	**0.76*****
		(0.10)	*(0.10)*	*(0.13)*	*(0.12)*
$\mathbf{1}\{U_t \geq \bar{U}\}$		**0.54*****		**0.65*****	
		(0.13)		*(0.08)*	
$\mathbf{1}\{U_t \geq \bar{U}; \pi_t < \tilde{\pi}_t\}$			**0.86*****		**0.71*****
			(0.33)		*(0.12)*
$\mathbf{1}\{U_t \geq \bar{U}; \pi_t \geq \tilde{\pi}_t\}$			**0.32*****		**0.63*****
			(0.11)		*(0.09)*
T	416	416	416	408	408

Government spending multipliers across horizons



Government spending multipliers in recessions and expansions across horizons



Government spending multipliers in demand-side and supply-side recessions across horizons

Conclusion

- We develop a theory of state-dependent spending and taxation multipliers, in a framework with idle capacity and unsatisfied demand
- Key finding: the cyclicality of fiscal multipliers depends on the source of fluctuations
- Econometric estimation conditional on the source of fluctuations corroborates our theory on the state dependence of fiscal multipliers
- Provide a resolution to contrasting empirical findings