THE OPTIMAL MONETARY POLICY RESPONSE TO TARIFFS

Javier Bianchi[1]   Louphou Coulibaly[2]

[1]Federal Reserve Bank of Minneapolis

[2]University of Wisconsin-Madison and NBER

Motivation

- **How should a central bank respond to import tariffs?**

Motivation

- **How should a central bank respond to import tariffs?**
  - Tighten monetary policy to contain inflationary pressures, or...
  - Maintain monetary stance (“look-through”) and allow one-time jump in CPI?

Jay Powell pushes back on calls for Federal Reserve rate cuts as soon as July

US central bank chair tells congressional committee economy remains ‘solid’ but tariffs could push up prices

Jay Powell has been under fire from the US president over the Federal Open Market Committee’s decision to keep interest rates on hold © Mark Schiefelbein/AP

Top Federal Reserve official calls for rate cuts as soon as July

Governor Chris Waller says US has yet to see an inflation ‘shock’ from Donald Trump’s tariffs

Christopher Waller joined the Fed’s policy-setting panel in 2020 after being nominated by Donald Trump during his first term as president © Bloomberg

Motivation

- **How should a central bank respond to import tariffs?**
  - Tighten monetary policy to contain inflationary pressures, or...
  - Maintain monetary stance (“look-through”) and allow one-time jump in CPI?

This paper:

- Optimal monetary policy response to tariffs is **expansionary**

Overview

- Open-economy New Keynesian model with home and importable goods

Overview

- Open-economy New Keynesian model with home and importable goods
    - Macroeconomic effects depend on monetary policy

Overview

flex-price allocation (“look-through”)

- PPI targeting: tariffs generally contractionary—always fall for small tariffs

Overview

flex-price allocation ("look-through")

- PPI targeting: tariffs generally contractionary—always fall for small tariffs

- Optimal policy: **overheating** ⇝ positive PPI inflation & positive output gap

Overview

flex-price allocation (“look-through”)

- PPI targeting: tariffs generally contractionary—always fall for small tariffs

- Optimal policy: **overheating** ⇝ positive PPI inflation & positive output gap
  - Wedge between internal and international price
  - Fiscal externality ⇒ Depress inefficiently imports

≠ terms-of-trade shock

Overview

flex-price allocation (“look-through”)

- PPI targeting: tariffs generally contractionary—always fall for small tariffs

- Optimal policy: **overheating** ⇝ positive PPI inflation & positive output gap
  - Wedge between internal and international price
  - Fiscal externality ⇒ Depress inefficiently imports

Tariffs can lead to an expansion or contraction in output

≠ textbook cost-push shock

Overview

flex-price allocation (“look-through”)

- PPI targeting: tariffs generally contractionary—always fall for small tariffs
- Optimal policy: **overheating** → positive PPI inflation & positive output gap
  - Wedge between internal and international price
  - Fiscal externality ⇒ Depress inefficiently imports

Tariffs can lead to an expansion or contraction in output

Trade surplus and exchange-rate depreciation

→ weak dollar post Liberation Day

Overview

flex-price allocation (“look-through”)

- PPI targeting: tariffs generally contractionary—always fall for small tariffs
- Optimal policy: **overheating** ⇝ positive PPI inflation & positive output gap
  - Wedge between internal and international price
  - Fiscal externality ⇒ Depress inefficiently imports

Tariffs can lead to an expansion or contraction in output

Trade surplus and exchange-rate depreciation

- Extensions: temporary/anticipated, ex/endogenous TOT, supply chains

Literature on Tariffs in International Macro

- Classic question: Are tariffs expansionary or contractionary? Keynes vs. Mundell
- Recent studies: Auray, Devereux, Eyquem (2022,2024); Eichengreen (2019); Barattieri, Cacciatore and Ghironi (2021); Comin and Johnson (2021); Jeanne (2021); Bergin and Corsetti (2021); Erceg, Prestipino and Raffo (2023); Lloyd and Marin (2024)

Focus literature: positive analysis and *joint* optimal tariffs-monetary policy

- Bergin-Corsetti (2023): Optimal cooperative is *contractionary* for tariff-imposing

Our contribution:

- Non-cooperative: optimal policy is expansionary
  - Fiscal externality ⇒ tariff $\neq$ TOT shock
- Analytical conditions for tariffs expansionary/contractionary

Active agenda!

Environment

- Deterministic SOE, infinite horizon, representative household
- Two final consumption goods: home-produced (h) and foreign-produced (f)
  - Prices of domestic inputs are sticky in domestic currency
- Monetary authority: sets monetary policy optimally, taking as given tariffs $\{\tau_t\}$

Environment

- Deterministic SOE, infinite horizon, representative household
- Two final consumption goods: home-produced (h) and foreign-produced (f)
  - Prices of domestic inputs are sticky in domestic currency
- Monetary authority: sets monetary policy optimally, taking as given tariffs $\{\tau_t\}$
- Country is small $\Rightarrow$ no market power in goods or capital markets
  - **No role for terms-of-trade manipulation:**
    - Optimal tariff is zero
    - Monetary policy does not affect terms of trade

Environment

- Deterministic SOE, infinite horizon, representative household
- Two final consumption goods: home-produced (h) and foreign-produced (f)
    - Prices of domestic inputs are sticky in domestic currency
- Monetary authority: sets monetary policy optimally, taking as given tariffs $\{\tau_t\}$
- Country is small $\Rightarrow$ no market power in goods or capital markets
    - **No role for terms-of-trade manipulation:**
        - Optimal tariff is zero
        - Monetary policy does not affect terms of trade

Households

$$\sum_{t=0}^{\infty} \beta^t \left[U(c_t^h, c_t^f) - v(\ell_t) \right]$$

$$U(c_t^h, c_t^f) = \frac{\sigma}{\sigma - 1} \left[\omega (c_t^h)^{1-\frac{1}{\gamma}} + (1-\omega)(c_t^f)^{1-\frac{1}{\gamma}} \right]^{\frac{\gamma}{\gamma-1}\frac{\sigma-1}{\sigma}}, \quad v(\ell_t) = \omega \frac{\ell_t^{1+\psi}}{1+\psi}$$

Households

$$\sum_{t=0}^{\infty} \beta^t \Big[U(c_t^h, c_t^f) - v(\ell_t) \Big]$$

$$U(c_t^h, c_t^f) = \frac{\sigma}{\sigma - 1} \left[\omega (c_t^h)^{1-\frac{1}{\gamma}} + (1-\omega)(c_t^f)^{1-\frac{1}{\gamma}} \right]^{\frac{\gamma}{\gamma-1}\frac{\sigma-1}{\sigma}}, \quad v(\ell_t) = \omega \frac{\ell_t^{1+\psi}}{1+\psi}$$

- Budget constraint:

$$P_t^h c_t^h + P_t^f (1 + \tau_t) c_t^f + \frac{e_t b_{t+1}}{R^*} + \frac{B_{t+1}}{R_t} = e_t b_t + B_t + W_t \ell_t + T_t + D_t$$

- Law of one price (before tariffs): $P_t^h = e_t P_t^{h*}, \quad P_t^f = e_t P_t^{f*}$

Households

$$\sum_{t=0}^{\infty} \beta^t \left[U(c_t^h, c_t^f) - v(\ell_t) \right]$$

$$U(c_t^h, c_t^f) = \frac{\sigma}{\sigma - 1} \left[\omega (c_t^h)^{1-\frac{1}{\gamma}} + (1-\omega)(c_t^f)^{1-\frac{1}{\gamma}} \right]^{\frac{\gamma}{\gamma-1} \frac{\sigma-1}{\sigma}}, \quad v(\ell_t) = \omega \frac{\ell_t^{1+\psi}}{1+\psi}$$

- Budget constraint:

$$P_t^h c_t^h + P_t^f (1 + \tau_t) c_t^f + \frac{e_t b_{t+1}}{R^*} + \frac{B_{t+1}}{R_t} = e_t b_t + B_t + W_t \ell_t + T_t + D_t$$

- Law of one price (before tariffs): $P_t^h = e_t P_t^{h*}$, $P_t^f = e_t P_t^{f*}$
- Terms-of-trade exogenous $p \equiv \dfrac{P_t^{f*}}{P_t^{h*}}$ $\Leftarrow$ Limit case w/ export elasticity = ∞

Firms

- Production of final home good is competitive

$$Y_t = \left(\int_0^1 y_{jt}^{\frac{\varepsilon-1}{\varepsilon}} \, dj \right)^{\frac{\varepsilon}{\varepsilon-1}}$$

- Intermediate good varieties

$$y_{jt} = \ell_{jt}$$

Firms

- Production of final home good is competitive

$$Y_t = \left(\int_0^1 y_{jt}^{\frac{\varepsilon-1}{\varepsilon}} \, dj \right)^{\frac{\varepsilon}{\varepsilon-1}}$$

- Intermediate good varieties

$$y_{jt} = \ell_{jt}$$

  - Monop. competitive w/ Rotemberg price adjustment costs φ

$$\max_{\{y_{jt}, P_{jt}\}} \sum_{t=0}^{\infty} \Lambda_{t+1} \left[(1 + s) P_{jt} \, y_{jt} - W_t \, y_{jt} - \frac{\varphi}{2} \left(\frac{P_{jt}}{P_{j,t-1}} - 1 \right)^2 P_t^h \, y_t \right]$$

$$\text{s.t.} \quad y_{jt} = \left(\frac{P_{jt}}{P_t^h} \right)^{-\varepsilon} y_t$$

Constant subsidy to correct markup distortion

Firms

- Production of final home good is competitive

$$Y_t = \left(\int_0^1 y_{jt}^{\frac{\varepsilon-1}{\varepsilon}} \, dj \right)^{\frac{\varepsilon}{\varepsilon-1}}$$

- Intermediate good varieties

$$y_{jt} = \ell_{jt}$$

  - NK Phillips Curve

$$(1+\pi_t)\pi_t = \frac{\varepsilon}{\varphi}\left[\frac{W_t}{P_t^h} - 1\right] + \beta \frac{u_h(c_{t+1}^h, c_{t+1}^f)}{u_h(c_t^h, c_t^f)} \frac{\ell_{t+1}}{\ell_t}(1+\pi_{t+1})\pi_{t+1}$$

where $\pi_t \equiv P_t^h / P_{t-1}^h - 1$ denotes Producer Price Index PPI inflation

Competitive Equilibrium

- Optimization (households and firms) + govt. budget + labor mk. clearing.

$$\tau_t P_t^f c_t^f = T_t + s P_t^h y_t$$

Competitive Equilibrium

- Optimization (households and firms) + govt. budget + labor mk. clearing.

$$\tau_t P_t^f c_t^f = T_t + sP_t^h y_t$$

- Assume fraction 1-Υ of price adjustment costs are rebated (rest is a deadweight loss)

$$\underbrace{\left(1-\Upsilon\frac{\varphi}{2}\pi_t^2\right)\ell_t - c_t^h}_{\text{exports}} - \underbrace{pc_t^f}_{\text{imports}} = \underbrace{\frac{b_{t+1}}{R^*} - b_t}_{\text{capital outflows}} \qquad \text{(Country budget constraint)}$$

  - If $\Upsilon = 0$, sticky prices distort employment but have no resource costs

Competitive Equilibrium

- Optimization (households and firms) + govt. budget + labor mk. clearing.

$$\tau_t P_t^f c_t^f = T_t + sP_t^h y_t$$

- Assume fraction $1\text{-}\Upsilon$ of price adjustment costs are rebated (rest is a deadweight loss)

$$\underbrace{\left(1-\Upsilon\frac{\varphi}{2}\pi_t^2\right)\ell_t - c_t^h}_{\text{exports}} - \underbrace{pc_t^f}_{\text{imports}} = \underbrace{\frac{b_{t+1}}{R^*} - b_t}_{\text{capital outflows}} \qquad \text{(Country budget constraint)}$$

  - If $\Upsilon = 0$, sticky prices distort employment but have no resource costs

- Portfolio undetermined, assume $B_0 = 0$ ⇐ Abstract from valuation effects

Efficient Allocation

$$\max_{\left\{b_{t+1},c_t^f,c_t^h,\ell_t\right\}} \sum_{t=0}^{\infty} \beta^t [u(c_t^h, c_t^f) - v(\ell_t)],$$

$$\text{s.t}\ \ c_t^h + pc_t^f + \frac{b_{t+1}}{R^*} = \ b_t + \ell_t.$$

Competitive equilibrium

$$(1+\pi_t)\pi_t = \frac{\varepsilon}{\varphi}\left[\frac{v'(\ell_t)}{u_h(c_t^h, c_t^f)} - 1\right] + \frac{1}{R^*}\frac{\ell_{t+1}}{\ell_t}(1+\pi_{t+1})\pi_{t+1}$$

$$\frac{u_f(c_t^h, c_t^f)}{u_h(c_t^h, c_t^f)} = p(1+\tau_t)$$

$$u_h(c_t^h, c_t^f) = \beta R^* u_h(c_{t+1}^h, c_{t+1}^f)$$

$$\left(1 - \Upsilon\frac{\varphi}{2}{\pi_t}^2\right)\ell_t - c_t^h - pc_t^f = \frac{b_{t+1}}{R^*} - b_t$$

Efficient allocation

$$\frac{v'(\ell_t)}{u_h(c_t^h, c_t^f)} = 1$$

$$\frac{u_f(c_t^h, c_t^f)}{u_h(c_t^h, c_t^f)} = p$$

$$u_h(c_t^h, c_t^f) = \beta R^* u_h(c_{t+1}^h, c_{t+1}^f)$$

$$\ell_t - c_t^h - pc_t^f = \frac{b_{t+1}}{R^*} - b_t$$

Competitive equilibrium

$$(1+\pi_t)\pi_t = \frac{\varepsilon}{\varphi}\left[\frac{v'(\ell_t)}{u_h(c_t^h, c_t^f)} - 1\right] + \frac{1}{R^*}\frac{\ell_{t+1}}{\ell_t}(1+\pi_{t+1})\pi_{t+1}$$

$$\frac{u_f(c_t^h, c_t^f)}{u_h(c_t^h, c_t^f)} = p(1+\tau_t)$$

$$u_h(c_t^h, c_t^f) = \beta R^* u_h(c_{t+1}^h, c_{t+1}^f)$$

$$\left(1 - \Upsilon\frac{\varphi}{2}{\pi_t}^2\right)\ell_t - c_t^h - pc_t^f = \frac{b_{t+1}}{R^*} - b_t$$

Efficient allocation

$$\frac{v'(\ell_t)}{u_h(c_t^h, c_t^f)} = 1$$

$$\frac{u_f(c_t^h, c_t^f)}{u_h(c_t^h, c_t^f)} = p$$

$$u_h(c_t^h, c_t^f) = \beta R^* u_h(c_{t+1}^h, c_{t+1}^f)$$

$$\ell_t - c_t^h - pc_t^f = \frac{b_{t+1}}{R^*} - b_t$$

- Tariffs: distort MRS $= p$ constraint
- Sticky prices: labor wedge & inflation costs

$\Big\}$ Two distortions

Competitive equilibrium $\tau = 0$

$$(1+\pi_t)\pi_t = \frac{\varepsilon}{\varphi}\left[\frac{v'(\ell_t)}{u_h(c_t^h, c_t^f)} - 1\right] + \frac{1}{R^*}\frac{\ell_{t+1}}{\ell_t}(1+\pi_{t+1})\pi_{t+1}$$

$$\frac{u_f(c_t^h, c_t^f)}{u_h(c_t^h, c_t^f)} = p$$

$$u_h(c_t^h, c_t^f) = \beta R^* u_h(c_{t+1}^h, c_{t+1}^f)$$

$$\left(1 - \Upsilon\frac{\varphi}{2}{\pi_t}^2\right)\ell_t - c_t^h - pc_t^f = \frac{b_{t+1}}{R^*} - b_t$$

Efficient allocation

$$\frac{v'(\ell_t)}{u_h(c_t^h, c_t^f)} = 1$$

$$\frac{u_f(c_t^h, c_t^f)}{u_h(c_t^h, c_t^f)} = p$$

$$u_h(c_t^h, c_t^f) = \beta R^* u_h(c_{t+1}^h, c_{t+1}^f)$$

$$\ell_t - c_t^h - pc_t^f = \frac{b_{t+1}}{R^*} - b_t$$

Competitive equilibrium $\tau = 0$ (with $\pi_t = 0$)

$$0 = \frac{\varepsilon}{\varphi}\left[\frac{v'(\ell_t)}{u_h(c_t^h, c_t^f)} - 1\right]$$

$$\frac{u_f(c_t^h, c_t^f)}{u_h(c_t^h, c_t^f)} = p$$

$$u_h(c_t^h, c_t^f) = \beta R^* u_h(c_{t+1}^h, c_{t+1}^f)$$

$$\ell_t - c_t^h - pc_t^f = \frac{b_{t+1}}{R^*} - b_t$$

Efficient allocation

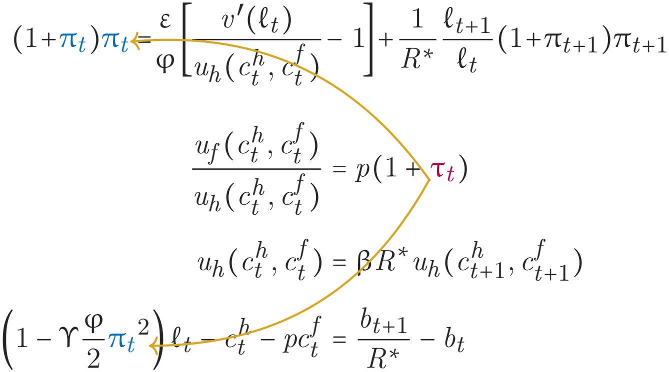
$$\frac{v'(\ell_t)}{u_h(c_t^h, c_t^f)} = 1$$

$$\frac{u_f(c_t^h, c_t^f)}{u_h(c_t^h, c_t^f)} = p$$

$$u_h(c_t^h, c_t^f) = \beta R^* u_h(c_{t+1}^h, c_{t+1}^f)$$

$$\ell_t - c_t^h - pc_t^f = \frac{b_{t+1}}{R^*} - b_t$$

Competitive equilibrium $\tau > 0$



$$(1+\pi_t)\pi_t = \frac{\varepsilon}{\varphi}\left[\frac{v'(\ell_t)}{u_h(c_t^h, c_t^f)} - 1\right] + \frac{1}{R^*}\frac{\ell_{t+1}}{\ell_t}(1+\pi_{t+1})\pi_{t+1}$$

$$\frac{u_f(c_t^h, c_t^f)}{u_h(c_t^h, c_t^f)} = p(1+\tau_t)$$

$$u_h(c_t^h, c_t^f) = \beta R^* u_h(c_{t+1}^h, c_{t+1}^f)$$

$$\left(1 - \Upsilon\frac{\varphi}{2}\pi_t{}^2\right)\ell_t - c_t^h - pc_t^f = \frac{b_{t+1}}{R^*} - b_t$$

Efficient allocation

$$\frac{v'(\ell_t)}{u_h(c_t^h, c_t^f)} = 1$$

$$\frac{u_f(c_t^h, c_t^f)}{u_h(c_t^h, c_t^f)} = p$$

$$u_h(c_t^h, c_t^f) = \beta R^* u_h(c_{t+1}^h, c_{t+1}^f)$$

$$\ell_t - c_t^h - pc_t^f = \frac{b_{t+1}}{R^*} - b_t$$

Look-Through Policy

Definition: A policy of ***look-through*** targets PPI inflation, $\pi_t = 0$ for all t

Look-Through Policy

Definition: A policy of ***look-through*** targets PPI inflation, $\pi_t = 0$ for all t

- Closes labor wedge and replicates flex-price allocation

Absent tariffs, this is optimal ⇐ Divine coincidence

Look-Through Policy

Definition: A policy of ***look-through*** targets PPI inflation, $\pi_t = 0$ for all t

- Closes labor wedge and replicates flex-price allocation

Absent tariffs, this is optimal $\Leftarrow$ Divine coincidence

Proposition. Assume that $\beta R^* = 1, \tau_t = \tau$. Then, employment is given by

$$\ell_t(\tau) = \left[\frac{\Theta_\tau + \tau}{1+\tau}\left(\omega\Theta_\tau\right)^{\frac{\sigma-\gamma}{\gamma-1}}\right]^{\frac{1}{1+\sigma\psi}}, \qquad \Theta_\tau \equiv 1 + \left(\frac{1-\omega}{\omega}\right)^{\gamma}\left(p(1+\tau)\right)^{1-\gamma} > 1$$

Look-Through Policy

Definition: A policy of ***look-through*** targets PPI inflation, $\pi_t = 0$ for all t

- Closes labor wedge and replicates flex-price allocation

Absent tariffs, this is optimal ⇐ Divine coincidence

Proposition. Assume that $\beta R^* = 1, \tau_t = \tau$. Then, employment is given by

$$\ell_t(\tau) = \left[\frac{\Theta_\tau + \tau}{1+\tau}\left(\omega\Theta_\tau\right)^{\frac{\sigma-\gamma}{\gamma-1}}\right]^{\frac{1}{1+\sigma\psi}}, \qquad \Theta_\tau \equiv 1 + \left(\frac{1-\omega}{\omega}\right)^{\gamma}\left(p(1+\tau)\right)^{1-\gamma} > 1$$

and

$$c_t^h(\tau) = \frac{1+\tau}{\Theta_\tau + \tau}\ell_t(\tau), \qquad c_t^f(\tau) = \frac{\Theta_\tau - 1}{p\left(\Theta_\tau + \tau\right)}\ell_t(\tau)$$

Are Tariffs Expansionary or Contracionary?

- Under look-through policy ⇝ flex-price allocation

$$\frac{d\log\ell(\tau)}{d\tau} = -\overbrace{\frac{(\Theta_\tau - 1)}{(1+\sigma\psi)(1+\tau)(\Theta_\tau+\tau)\Theta_\tau}}^{>0}\left[\sigma\Theta_\tau + (\sigma-\gamma)\tau\right]$$

Are Tariffs Expansionary or Contracionary?

- Under look-through policy $\rightsquigarrow$ flex-price allocation

$$\frac{d\log \ell(\tau)}{d\tau} = -\overbrace{\frac{(\Theta_\tau - 1)}{(1+\sigma\psi)(1+\tau)(\Theta_\tau+\tau)\Theta_\tau}}^{>0}\left[\sigma\Theta_\tau \qquad\qquad\qquad \right] < 0$$

  - For small τ, increase in tariffs are always contractionary
    - Consumption rebalancing towards c^h leads to $\downarrow u_h$, which implies in a flex-price eqm. a lower level of employment

Are Tariffs Expansionary or Contracionary?

- Under look-through policy $\rightsquigarrow$ flex-price allocation

$$\frac{d\log\ell(\tau)}{d\tau} = -\overbrace{\frac{(\Theta_\tau - 1)}{(1+\sigma\psi)(1+\tau)(\Theta_\tau+\tau)\Theta_\tau}}^{>0}\left[\sigma\Theta_\tau + (\sigma-\gamma)\tau\right]$$

- For small τ, increase in tariffs are always contractionary
  - Consumption rebalancing towards c^h leads to $\downarrow u_h$, which implies in a flex-price eqm. a lower level of employment
- For large τ, ambiguous.

Are Tariffs Expansionary or Contracionary?

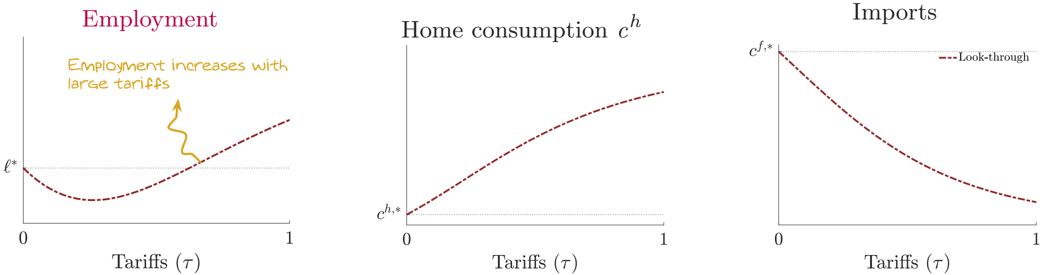
- Under look-through policy ⇝ flex-price allocation

$$\frac{d \log \ell(\tau)}{d\tau} = -\overbrace{\frac{(\Theta_\tau - 1)}{(1+\sigma\psi)(1+\tau)(\Theta_\tau + \tau)\Theta_\tau}}^{>0}\left[\sigma\Theta_\tau + (\sigma - \gamma)\tau\right]$$

- Three goods, two changes in relative prices:
  1. Substitution (c^f, ℓ)
     - Tariff reduces the real wage in terms of c^f ⇒ substitution away from labor
  2. Substitution (c^f, c^h)
     - $\sigma > \gamma$ goods are Hicksian complements ⇒ labor unambiguously falls
     - $\sigma < \gamma$ goods are Hicksian substitutes ⇒ labor increases for large τ

Illustration: Hicksian Substitutes

$\sigma = 1/2,\ \gamma = 5$



Ramsey Optimal Monetary Policy

$$\max_{\pi_t, b_{t+1}, \ell_t, c_t^f, c_t^h} \quad \sum_{t=0}^{\infty} \beta^t \Big[u(c_t^h, c_t^f) - v(\ell_t) \Big],$$

$$\text{s.t.} \quad c_t^h + p\, c_t^f + \frac{b_{t+1}}{R^*} = b_t + \ell_t \, \left(1 - \Upsilon \frac{\varphi}{2} \pi_t^2 \right),$$

$$\frac{1-\omega}{\omega} \left(\frac{c_t^h}{c_t^f} \right)^{\frac{1}{\gamma}} = p\,(1 + \tau_t),$$

$$u_h(c_t^h, c_t^f) \; = \; \beta R^* \, u_h(c_{t+1}^h, c_{t+1}^f),$$

$$(1 + \pi_t)\,\pi_t \; = \; \frac{\varepsilon}{\varphi} \left[\frac{v'(\ell_t)}{u_h(c_t^h, c_t^f)} - 1 \right] + \frac{\ell_{t+1}}{\ell_t} \, \frac{(1 + \pi_{t+1})\pi_{t+1}}{R^*}.$$

Ramsey Optimal Monetary Policy

$$\max_{\pi_t, b_{t+1}, \ell_t, c_t^f, c_t^h} \sum_{t=0}^{\infty} \beta^t \Big[u(c_t^h, c_t^f) - v(\ell_t) \Big],$$

$$\Upsilon = 0,$$

$$\text{s.t.} \quad c_t^h + p\, c_t^f + \frac{b_{t+1}}{R^*} = b_t + \ell_t,$$

$$\frac{1-\omega}{\omega} \left(\frac{c_t^h}{c_t^f} \right)^{\frac{1}{\gamma}} = p\,(1 + \tau_t),$$

Sticky prices induce costs <u>only</u> from output gap (will relax later)

$$u_h(c_t^h, c_t^f) \;=\; \beta R^*\, u_h(c_{t+1}^h, c_{t+1}^f),$$

$$(1+\pi_t)\,\pi_t \;=\; \frac{\varepsilon}{\varphi} \left[\frac{v'(\ell_t)}{u_h(c_t^h, c_t^f)} - 1 \right] + \frac{\ell_{t+1}}{\ell_t} \, \frac{(1+\pi_{t+1})\pi_{t+1}}{R^*}.$$

Ramsey Optimal Monetary Policy

$$\max_{b_{t+1},\ell_t,c_t^f,c_t^h} \sum_{t=0}^{\infty} \beta^t \Big[u(c_t^h, c_t^f) - v(\ell_t) \Big], \qquad \Upsilon = 0,$$

$$\text{s.t.} \quad c_t^h + p\, c_t^f + \frac{b_{t+1}}{R^*} = b_t + \ell_t,$$

$$\frac{1-\omega}{\omega} \left(\frac{c_t^h}{c_t^f} \right)^{\frac{1}{\gamma}} = p\,(1 + \tau_t),$$

$$u_h(c_t^h, c_t^f) \;=\; \beta R^*\, u_h(c_{t+1}^h, c_{t+1}^f),$$

Ramsey Optimal Monetary Policy

$$\max_{\ell, c^f, c^h} \sum_{t=0}^{\infty} \beta^t \left[u(c^h, c^f) - v(\ell) \right],$$

$$\Upsilon = 0, \ \tau_t = \tau, \ \beta R^* = 1$$

s.t. $c^h + p\, c^f + \frac{b}{R^*} - b = \ell ,$

$$\frac{1-\omega}{\omega}\left(\frac{c^h}{c^f}\right)^{\frac{1}{\gamma}} = p\,(1 + \tau),$$

Ramsey Optimal Monetary Policy

$$\max_{\ell,c^f,c^h} \sum_{t=0}^{\infty} \beta^t \Big[u(c^h, c^f) - v(\ell) \Big], \qquad \text{Assume } \Upsilon = 0,\ \tau_t = \tau,\ \beta R^* = 1$$

$$\text{s.t.} \quad c^h + p\,c^f + \frac{b}{R^*} - b = \ell,$$

$$\frac{1-\omega}{\omega}\left(\frac{c^h}{c^f}\right)^{\frac{1}{\gamma}} = p\,(1+\tau),$$

Planner picks ℓ;

Households choose c^h, c^f

Ramsey Optimal Monetary Policy

$$\max_{\ell\ ,c^f,c^h} \sum_{t=0}^{\infty} \beta^t \Big[u(c^h, c^f) - v(\ell\ ) \Big], \qquad \text{Assume } \Upsilon = 0,\ \tau_t = \tau,\ \beta R^* = 1$$

$$\text{s.t.} \quad c^h + p\, c^f + \frac{b}{R^*} - b \ = \ell\ ,$$

$$\frac{1-\omega}{\omega}\left(\frac{c^h}{c^f}\right)^{\frac{1}{\gamma}} = p\,(1+\tau\ ),$$

Planner picks ℓ;
Households choose c^h, c^f

Proposition: Under optimal monetary policy, the level of employment is

$$\ell_t^{opt}(\tau) = \left(\frac{1+\tau}{1+\Theta_\tau^{-1}\tau}\right)^{\frac{\sigma}{1+\sigma\psi}} \left[\frac{\Theta_\tau+\tau}{1+\tau}\left(\omega\Theta_\tau\right)^{\frac{\sigma-\gamma}{\gamma-1}}\right]^{\frac{1}{1+\sigma\psi}} > \ell_t^{\text{look}}(\tau).$$

Ramsey Optimal Monetary Policy

$$\max_{\ell\ ,c^f,c^h} \sum_{t=0}^{\infty} \beta^t \Big[u(c^h, c^f) - v(\ell\ ) \Big], \qquad \text{Assume } \Upsilon = 0,\ \tau_t = \tau,\ \beta R^* = 1$$

$$\text{s.t.} \quad c^h + p\, c^f + \frac{b}{R^*} - b\ = \ell\ ,$$

$$\frac{1-\omega}{\omega}\left(\frac{c^h}{c^f}\right)^{\frac{1}{\gamma}} = p\,(1+\tau\ ),$$

Planner picks ℓ;
Households choose c^h, c^f

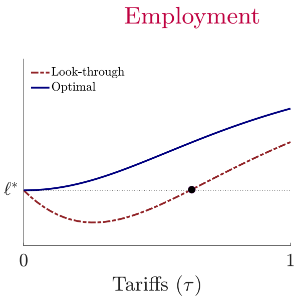
Proposition: Under optimal monetary policy, the level of employment is

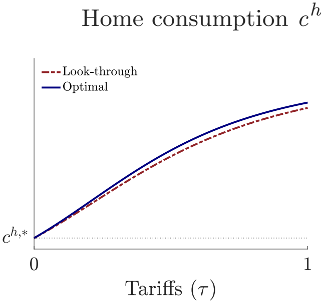
$$\ell_t^{opt}(\tau) = \left(\frac{1+\tau}{1+\Theta_\tau^{-1}\tau}\right)^{\frac{\sigma}{1+\sigma\psi}} \left[\frac{\Theta_\tau+\tau}{1+\tau}\left(\omega\Theta_\tau\right)^{\frac{\sigma-\gamma}{\gamma-1}}\right]^{\frac{1}{1+\sigma\psi}} > \ell_t^{\text{look}}(\tau).$$

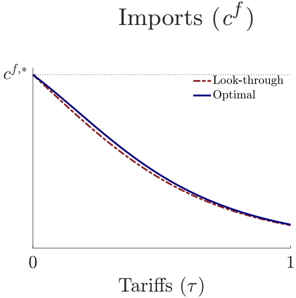
$$c_t^h(\tau) = \frac{1+\tau}{\Theta_\tau+\tau}\ell_t^{opt}(\tau), \qquad c_t^f(\tau) = \frac{\Theta_\tau - 1}{p\,(\Theta_\tau+\tau)}\ell_t^{opt}(\tau)$$

Comparison: Hicksian substitutes

$\sigma = 0.5, \ \gamma = 5$







- Employment increases in response to tariffs

  ≠ textbook cost-push shock

Fiscal Externality

Households "indirect utility" as a function of c^f

$$\mathbf{W}(c^f;\tau) \equiv u\Big(\mathbf{L}(c^f) + \mathbf{T}(c^f) - p(1+\tau)c^f, c^f\Big) - v\Big(\mathbf{L}(c^f)\Big)$$

employment $\frac{\Theta_\tau+\tau}{\Theta_\tau-1}pc^f$

revenue $p\tau c^f$

Fiscal Externality

Households "indirect utility" as a function of c^f

$$\mathbf{W}(c^f;\tau) \equiv u\Big(\mathbf{L}(c^f) + \mathbf{T}(c^f) - p(1+\tau)c^f, c^f\Big) - v\Big(\mathbf{L}(c^f)\Big)$$

employment $\frac{\Theta_\tau+\tau}{\Theta_\tau-1}pc^f$

revenue $p\tau c^f$

- Optimality

$$-\underbrace{\frac{\partial \mathbf{L}}{\partial c^f}}_{<0}\overbrace{\left[1-\frac{v'(\ell)}{u_h(c^h, c^f)}\right]}^{\textbf{labor wedge must be negative}} = \underbrace{\frac{\partial \mathbf{T}}{\partial c^f}}_{\text{fiscal externality}>0}$$

Fiscal Externality

Households “indirect utility” as a function of c^f

$$\mathbf{W}(c^f;\tau) \equiv u\Big(\mathbf{L}(c^f) + \mathbf{T}(c^f) - p(1+\tau)c^f, c^f\Big) - v\Big(\mathbf{L}(c^f)\Big)$$

employment $\frac{\Theta_\tau+\tau}{\Theta_\tau-1}pc^f$

revenue $p\tau c^f$

- Optimality

$$\underbrace{-\frac{\partial \mathbf{L}}{\partial c^f}}_{<0}\overbrace{\left[1-\frac{v'(\ell)}{u_h(c^h,c^f)}\right]}^{\text{labor wedge must be negative}} = \underbrace{\frac{\partial \mathbf{T}}{\partial c^f}}_{\text{fiscal externality}>0}$$

- Households do not internalize that ↑ c^f raises tariff revenue and agg. income
  - Optimal policy tries to mitigate externality by stimulating employment

Fiscal Externality

Households “indirect utility” as a function of c^f

$$\mathbf{W}(c^f;\tau) \equiv u\Big(\mathbf{L}(c^f) + \mathbf{T}(c^f) - p(1+\tau)c^f, c^f\Big) - v\Big(\mathbf{L}(c^f)\Big)$$

employment $\frac{\Theta_\tau+\tau}{\Theta_\tau-1} p c^f$

revenue $p\tau c^f$

- Optimality

$$-\underbrace{\frac{\partial \mathbf{L}}{\partial c^f}}_{<0} \overbrace{\left[1-\frac{v'(\ell)}{u_h(c^h, c^f)}\right]}^{\text{labor wedge must be negative}} = \underbrace{\frac{\partial \mathbf{T}}{\partial c^f}}_{\text{fiscal externality}>0}$$

- Households do not internalize that ↑ c^f raises tariff revenue and agg. income
    - Optimal policy tries to mitigate externality by stimulating employment
- Without fiscal rebate: flex-price allocation is efficient ⇒ zero labor wedge and $\pi_t = 0$

Tariff without Rebate

Competitive equilibrium

$$(1+\pi_t)\pi_t = \frac{\varepsilon}{\varphi}\left[\frac{v'(\ell_t)}{u_h(c_t^h, c_t^f)} - 1\right] + \frac{1}{R^*}\frac{\ell_{t+1}}{\ell_t}(1+\pi_{t+1})\pi_{t+1}$$

$$\frac{u_f(c_t^h, c_t^f)}{u_h(c_t^h, c_t^f)} = p(1+\tau)$$

$$u_h(c_t^h, c_t^f) = \beta R^* u_h(c_{t+1}^h, c_{t+1}^f)$$

$$\left(1 - \Upsilon\frac{\varphi}{2}{\pi_t}^2\right)\ell_t - c_t^h - \boxed{p(1+\tau)}c_t^f = \frac{b_{t+1}}{R^*} - b_t$$

Efficient allocation

$$\frac{v'(\ell_t)}{u_h(c_t^h, c_t^f)} = 1$$

$$\frac{u_f(c_t^h, c_t^f)}{u_h(c_t^h, c_t^f)} = p$$

$$u_h(c_t^h, c_t^f) = \beta R^* u_h(c_{t+1}^h, c_{t+1}^f)$$

$$\ell_t - c_t^h - p\,c_t^f = \frac{b_{t+1}}{R^*} - b_t$$

Tariff without Rebate

Same eqm. conditions as with TOT shock → $\widehat{p} \equiv p(1+\tau)$

Competitive equilibrium

$$(1+\pi_t)\pi_t = \frac{\varepsilon}{\varphi}\left[\frac{v'(\ell_t)}{u_h(c_t^h, c_t^f)} - 1\right] + \frac{1}{R^*}\frac{\ell_{t+1}}{\ell_t}(1+\pi_{t+1})\pi_{t+1}$$

$$\frac{u_f(c_t^h, c_t^f)}{u_h(c_t^h, c_t^f)} = \widehat{p}$$

$$u_h(c_t^h, c_t^f) = \beta R^* u_h(c_{t+1}^h, c_{t+1}^f)$$

$$\left(1 - \Upsilon\frac{\varphi}{2}\pi_t{}^2\right)\ell_t - c_t^h - \qquad \widehat{p}\,c_t^f = \frac{b_{t+1}}{R^*} - b_t$$

Efficient allocation

$$\frac{v'(\ell_t)}{u_h(c_t^h, c_t^f)} = 1$$

$$\frac{u_f(c_t^h, c_t^f)}{u_h(c_t^h, c_t^f)} = p$$

$$u_h(c_t^h, c_t^f) = \beta R^* u_h(c_{t+1}^h, c_{t+1}^f)$$

$$\ell_t - c_t^h - p\,c_t^f = \frac{b_{t+1}}{R^*} - b_t$$

Tariff without Rebate

Flex-price allocation ($\pi_t = 0$) coincides with efficient with different TOT

Competitive equilibrium

$$0 = \frac{\varepsilon}{\varphi}\left[\frac{v'(\ell_t)}{u_h(c_t^h, c_t^f)} - 1\right]$$

$$\frac{u_f(c_t^h, c_t^f)}{u_h(c_t^h, c_t^f)} = \widehat{p}$$

$$u_h(c_t^h, c_t^f) = \beta R^* u_h(c_{t+1}^h, c_{t+1}^f)$$

$$\ell_t - c_t^h - \qquad \widehat{p}\, c_t^f = \frac{b_{t+1}}{R^*} - b_t$$

Efficient allocation

$$\frac{v'(\ell_t)}{u_h(c_t^h, c_t^f)} = 1$$

$$\frac{u_f(c_t^h, c_t^f)}{u_h(c_t^h, c_t^f)} = p$$

$$u_h(c_t^h, c_t^f) = \beta R^* u_h(c_{t+1}^h, c_{t+1}^f)$$

$$\ell_t - c_t^h - p\, c_t^f = \frac{b_{t+1}}{R^*} - b_t$$

Tariff without Rebate

With a genuine rise in cost, optimal to let imports fall and set $\pi_t = 0$.

Competitive equilibrium

$$0 = \frac{\varepsilon}{\varphi}\left[\frac{v'(\ell_t)}{u_h(c_t^h, c_t^f)} - 1\right]$$

$$\frac{u_f(c_t^h, c_t^f)}{u_h(c_t^h, c_t^f)} = \widehat{p}$$

$$u_h(c_t^h, c_t^f) = \beta R^* u_h(c_{t+1}^h, c_{t+1}^f)$$

$$\ell_t - c_t^h - \qquad \widehat{p} c_t^f = \frac{b_{t+1}}{R^*} - b_t$$

Efficient allocation

$$\frac{v'(\ell_t)}{u_h(c_t^h, c_t^f)} = 1$$

$$\frac{u_f(c_t^h, c_t^f)}{u_h(c_t^h, c_t^f)} = p$$

$$u_h(c_t^h, c_t^f) = \beta R^* u_h(c_{t+1}^h, c_{t+1}^f)$$

$$\ell_t - c_t^h - p c_t^f = \frac{b_{t+1}}{R^*} - b_t$$

Employment under Optimal Policy

Tariffs: Expansionary or Contractionary?

$$\frac{d\log \ell^{opt}}{d\tau} = \frac{(\Theta_\tau - 1)}{(1+\sigma\psi)(1+\tau)(\Theta_\tau+\tau)\Theta_\tau}(1-\sigma)\gamma\tau$$

No first-order effect on ℓ at $\tau = 0$

- At $\tau = 0$, no first-order effect on employment $\Leftarrow$ Planner purely rebalances c^h, c^f

Employment under Optimal Policy

Tariffs: Expansionary or Contractionary?

$$\frac{d\log \ell^{opt}}{d\tau} = \frac{(\Theta_\tau - 1)}{(1+\sigma\psi)(1+\tau)(\Theta_\tau + \tau)\Theta_\tau}(1-\sigma)\gamma\tau$$

- At $\tau = 0$, no first-order effect on employment $\Leftarrow$ Planner purely rebalances c^h, c^f
- For large τ, the consumption distortion reduces the marginal return to labor leading to substitution and income effects
    - First-order effects on employment depend entirely on σ.

Quantitative Analysis

Standard NK assumption: price adjustment costs are not rebated, $\Upsilon = 1$

Quantitative Analysis

Standard NK assumption: price adjustment costs are not rebated, $\Upsilon = 1$

- With $\Upsilon = 0$, optimal policy generates a permanent output boom and inflation

Quantitative Analysis

Standard NK assumption: price adjustment costs are not rebated, $\Upsilon = 1$

- With $\Upsilon = 0$, optimal policy generates a permanent output boom and inflation
- With $\Upsilon > 0$, optimal policy remains expansionary:

Quantitative Analysis

Standard NK assumption: price adjustment costs are not rebated, $\Upsilon = 1$

- With $\Upsilon = 0$, optimal policy generates a permanent output boom and inflation
- With $\Upsilon > 0$, optimal policy remains expansionary:
  - Starting from $\pi = 0$, costs of stimulating are second order, but there are first-order gains from mitigating fiscal externality

Quantitative Analysis

Standard NK assumption: price adjustment costs are not rebated, $\Upsilon = 1$

- With $\Upsilon = 0$, optimal policy generates a permanent output boom and inflation
- With $\Upsilon > 0$, optimal policy remains expansionary:
  - Starting from $\pi = 0$, costs of stimulating are second order, but there are first-order gains from mitigating fiscal externality
  - Stimulus only in the short-run $\Leftarrow$ inflation in the long-run is too costly

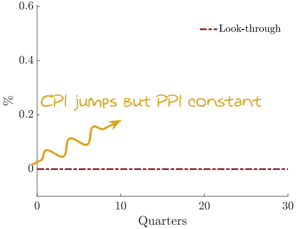
Calibration

Description	Value	Source/Target
Discount factor	$\beta = 0.99$	Real rate=4% (annual)
Intratemporal elasticity	$\gamma = 2$	Baseline
Intertemporal elasticity	$\sigma = 2$	Baseline
Frisch elasticity parameter	$\psi = 1$	Kimball-Shapiro
Elasticity of subs. varieties	$\varepsilon = 6$	Gali-Monacelli
Price-adjustment cost	$\varphi = 1636$	Slope of PC =0.0055 (Hazell et al)
Preference weight	$\omega = 0.35$	Imports to tradable-GDP = 15.5%

- Baseline tariff: $\tau_t = 0.1$
- Non-linear impulse response

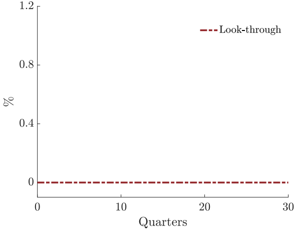
Permanent Tariff: Look-through

Home-goods inflation

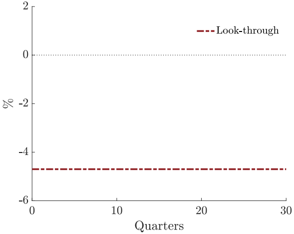


CPI jumps but PPI constant

Exchange rate

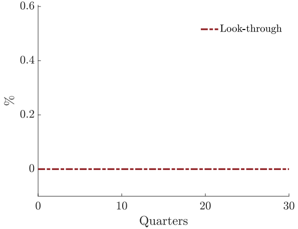


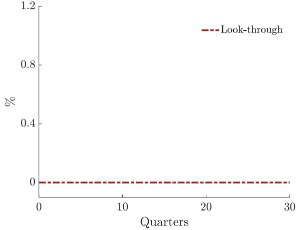
Employment

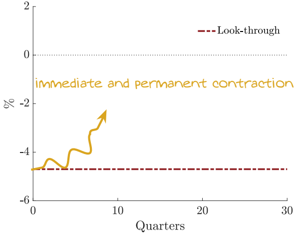


Inflation is annualized. Consumption, employment and the exchange rate are expressed in percentage deviation from the pre-tariff allocation. Trade balance and NFA are expressed as a fraction of GDP.

Permanent Tariff: Look-through vs. Optimal Policy


Home-goods inflation

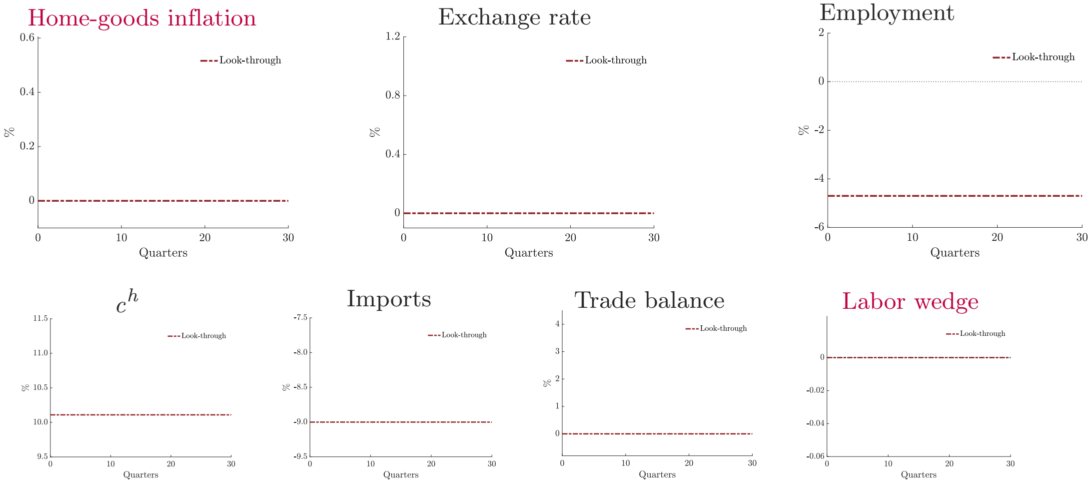

Exchange rate


Employment

immediate and permanent contraction

Inflation is annualized. Consumption, employment and the exchange rate are expressed in percentage deviation from the pre-tariff allocation. Trade balance and NFA are expressed as a fraction of GDP.

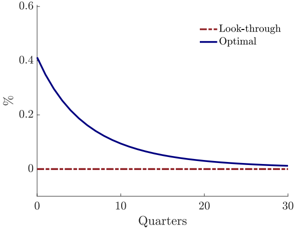
Permanent Tariff: Look-through vs. Optimal Policy



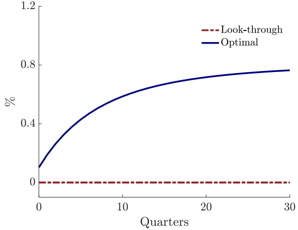
Inflation is annualized. Consumption, employment and the exchange rate are expressed in percentage deviation from the pre-tariff allocation. Trade balance and NFA are expressed as a fraction of GDP.

Permanent Tariff: Look-through vs. Optimal Policy

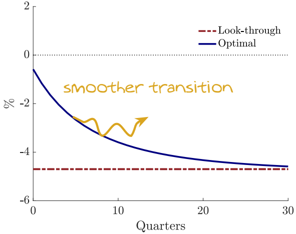
Home-goods inflation



Exchange rate

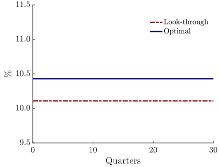


Employment

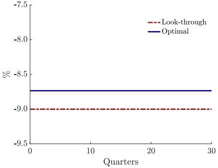


smoother transition

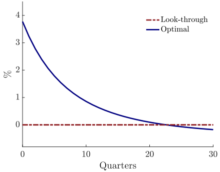
c^h



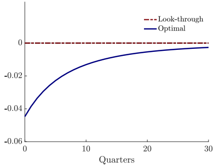
Imports



Trade balance

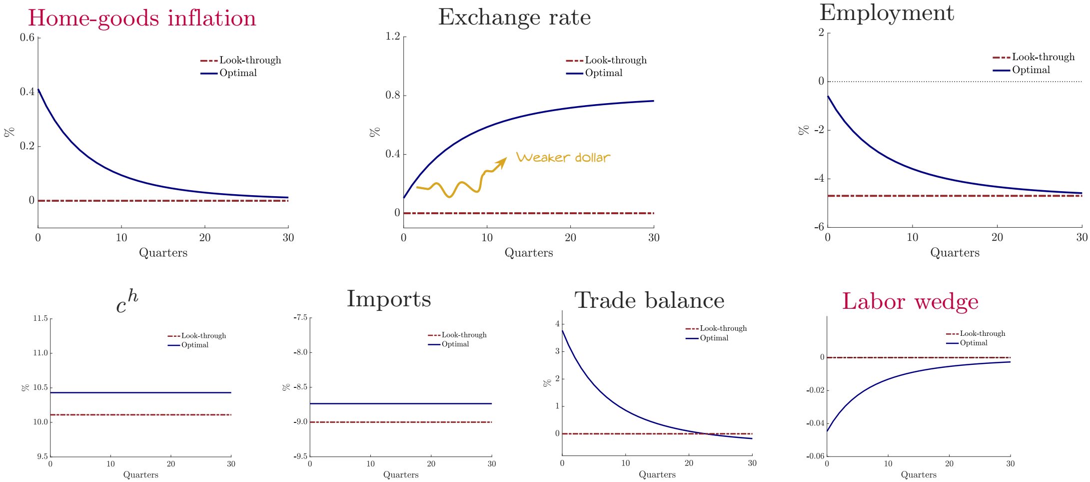


Labor wedge



Inflation is annualized. Consumption, employment and the exchange rate are expressed in percentage deviation from the pre-tariff allocation. Trade balance and NFA are expressed as a fraction of GDP.

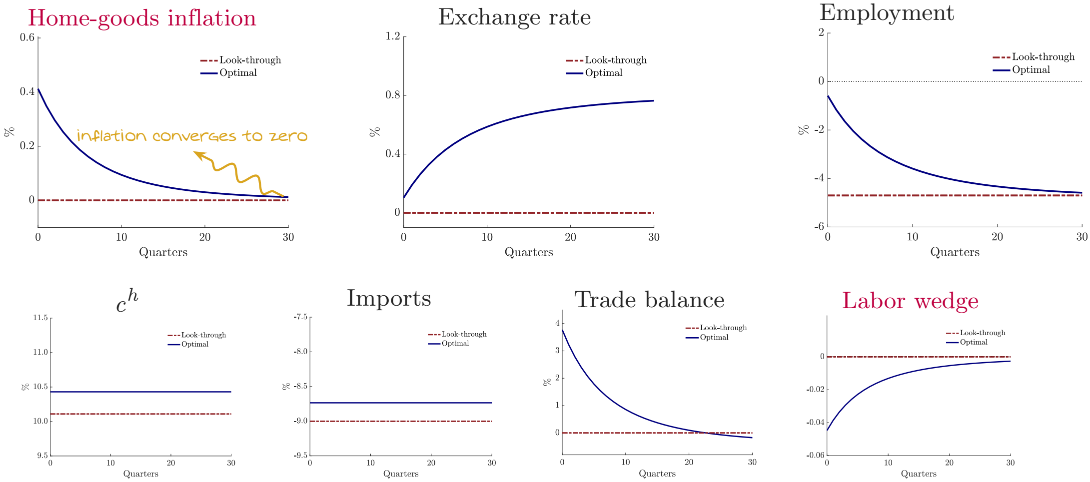
Permanent Tariff: Look-through vs. Optimal Policy



Weaker dollar

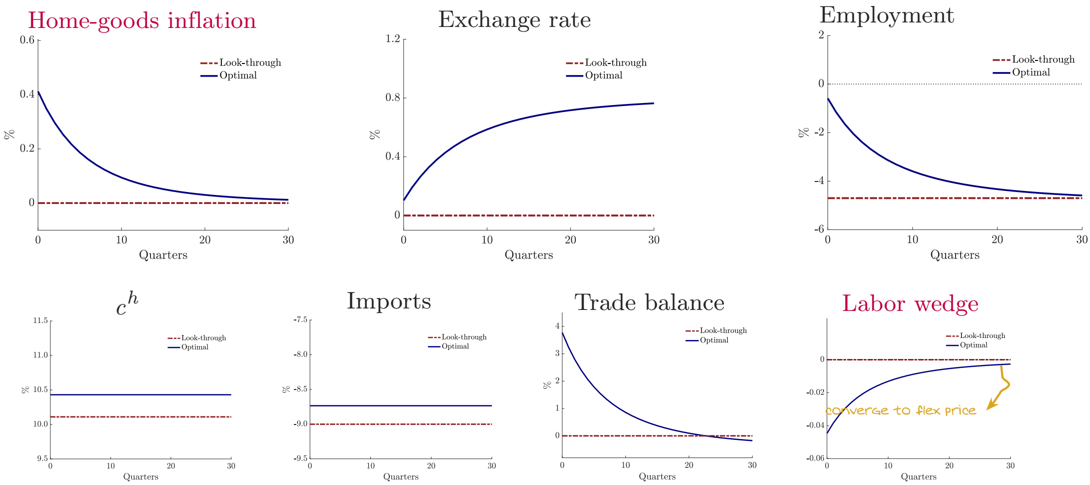
Inflation is annualized. Consumption, employment and the exchange rate are expressed in percentage deviation from the pre-tariff allocation. Trade balance and NFA are expressed as a fraction of GDP.

Permanent Tariff: Look-through vs. Optimal Policy



Inflation is annualized. Consumption, employment and the exchange rate are expressed in percentage deviation from the pre-tariff allocation. Trade balance and NFA are expressed as a fraction of GDP.

Permanent Tariff: Look-through vs. Optimal Policy



Inflation is annualized. Consumption, employment and the exchange rate are expressed in percentage deviation from the pre-tariff allocation. Trade balance and NFA are expressed as a fraction of GDP.

Additional Results

- Permanent shocks vs transitory ⏩ Details
- Anticipated shocks: ⏩ Details
  - Respond today, but less strongly
  - Trade deficit on impact
- PPI vs. CPI Targeting ⏩ Details
- Main extensions
  - i) Imported intermediate inputs
  - ii) Endogenous terms-of-trade
  - iii) Distorted steady state
- Welfare

Additional Results

- Permanent shocks vs transitory ▸▸ Details
- Anticipated shocks: ▸▸ Details
  - Respond today, but less strongly
  - Trade deficit on impact
- PPI vs. CPI Targeting ▸▸ Details
- Main extensions
  - i) Imported intermediate inputs
  - ii) Endogenous terms-of-trade
  - iii) Distorted steady state
- Welfare

In the Paper

Additional Results

- Permanent shocks vs transitory ▸▸ Details
- Anticipated shocks: ▸▸ Details
  - Respond today, but less strongly
  - Trade deficit on impact
- PPI vs. CPI Targeting ▸▸ Details
- Main extensions ⇝ Next
  - i) Imported intermediate inputs
  - ii) Endogenous terms-of-trade
  - iii) Distorted steady state
- Welfare

Tariffs on Imported Inputs

- Production of domestic varieties $y_{jt} = \ell_{jt}^{1-\nu} {x_{jt}}^{\nu}$
- NK Phillips curve:

$$(1+\pi_t)\pi_t = \frac{\varepsilon}{\varphi}\left[mc_t - 1\right] + \beta \frac{u_h(c_{t+1}^h, c_{t+1}^f)}{u_h(c_t^h, c_t^f)} \frac{y_{t+1}}{y_t}(1+\pi_{t+1})\pi_{t+1},$$

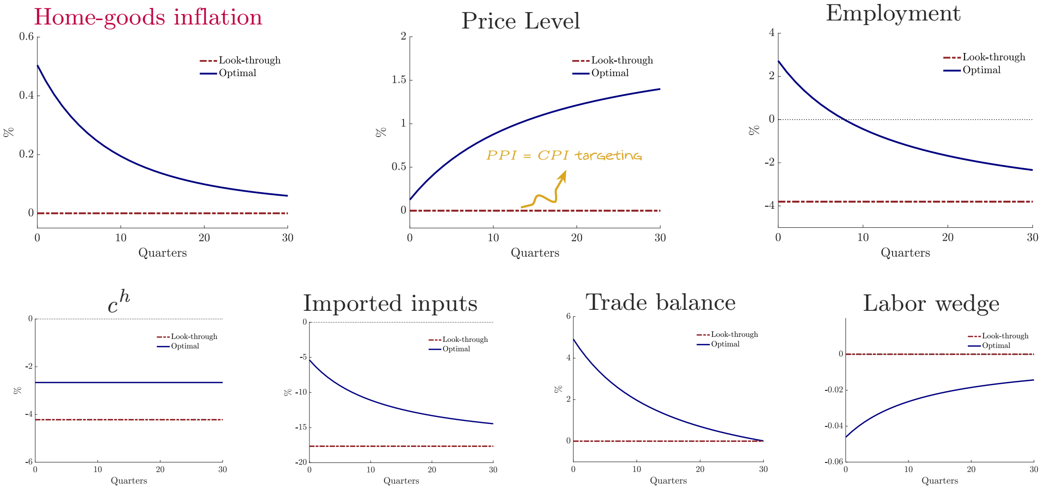
$$mc_t = \left[\frac{W_t}{(1-\nu)P_t^h}\right]^{1-\nu}\left[\frac{p(1+\tau_t^x)}{\nu}\right]^{\nu}$$

- Same as baseline: firms perceive cost of imported inputs to be larger than social one

  ⇒ Optimal policy is stimulative

Quantitatively, larger welfare gains and increase in employment

Tariff on Inputs Only



Home-goods inflation

Price Level

Employment

c^h

Imported inputs

Trade balance

Labor wedge

PPI = CPI targeting

Note: Calibrate ν, ω to match: (i) share of intermediate inputs in total imports; (ii) imports-tradable GDP (%).

Endogenous TOT

- Continuum of SOE where c^f is a CES composite of goods produced abroad

$$c_{it} = \left[\omega\left(c^h_{it}\right)^{1-\frac{1}{\gamma}} + (1-\omega)\left(c^f_{it}\right)^{1-\frac{1}{\gamma}}\right]^{\frac{\gamma}{\gamma-1}}, \quad c^f_{it} = \left(\int_0^1 \left(c^k_{it}\right)^{1-\frac{1}{\theta}} dk\right)^{\frac{\theta}{\theta-1}}$$

- Export demand for home good

$$p_t = A(y_t - c^h_t)^{\frac{1}{\theta}} \qquad \text{Baseline } \theta = \infty$$

- Optimal tariff is positive $\tau^* = \frac{1}{\theta-1}$ with $\theta > 1$
  - Same results as baseline as long as $\tau > \tau^*$
- Quantitatively, modest attenuation ▸▸ Results

Welfare Losses from Tariffs

	Optimal policy	Look-through
Baseline	**1.18**	**1.23**
Anticipated tariffs	1.19	1.23
Endogenous TOT	0.86	0.89

Note: Welfare corresponds to permanent consumption equivalence (%).

Welfare Losses from Tariffs

	Optimal policy	Look-through
Baseline	1.18	1.23
Anticipated tariffs	1.19	1.23
Endogenous TOT	0.86	0.89
Model w/ imported inputs		
Tariffs on c and x	**2.99**	**3.86**
Tariffs on c	1.12	1.19
Tariffs on x	1.47	1.91

Note: Welfare corresponds to permanent consumption equivalence (%).

The case with distorted steady state

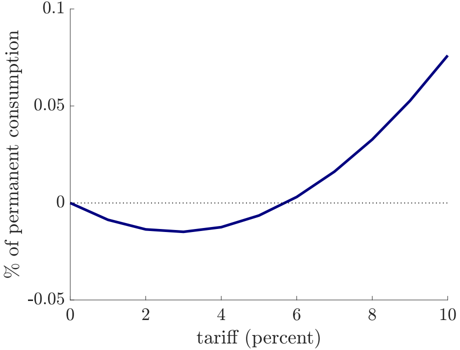
- Baseline model: labor subsidy s is set to offset markup distortion

The case with distorted steady state

- Suppose we start at $s = 0$ and use tariff revenue to subsidize labor $P_t^f \tau_t c_t^f = s_t W_t \ell_t$
    - Unambiguous increase in employment
    - Output gap remains positive and positive (but lower) inflation

The case with distorted steady state

- Suppose we start at $s = 0$ and use tariff revenue to subsidize labor $P_t^f \tau_t c_t^f = s_t W_t \ell_t$
  - Unambiguous increase in employment
  - Output gap remains positive and positive (but lower) inflation



Note: All parameters are set to their baseline values.

Conclusions

- How should a monetary authority should respond to import tariffs?
- Optimal policy is to overheat economy: to offset fiscal externality, need monetary stimulus, letting inflation rise above and beyond the direct effects from tariffs

Conclusions

- How should a monetary authority should respond to import tariffs?
- Optimal policy is to overheat economy: to offset fiscal externality, need monetary stimulus, letting inflation rise above and beyond the direct effects from tariffs

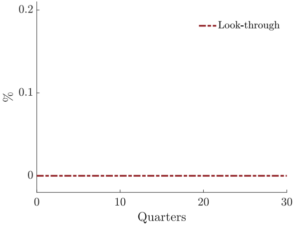
- Ongoing/future work:
  - Discretion vs. commitment, richer supply chains, uncertainty, spillovers

Extra Slides

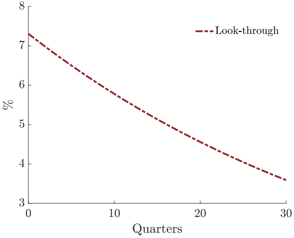
Temporary Tariff $\tau_t = 0.97 \cdot \tau_{t-1}$

▸ back

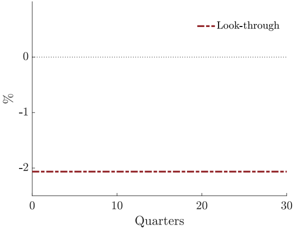
Home-goods inflation



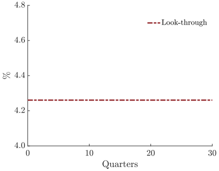
Price Level



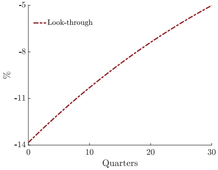
Employment



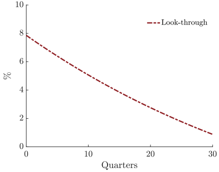
c^h



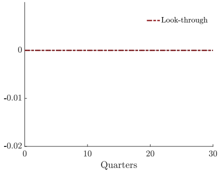
Imports



Trade balance

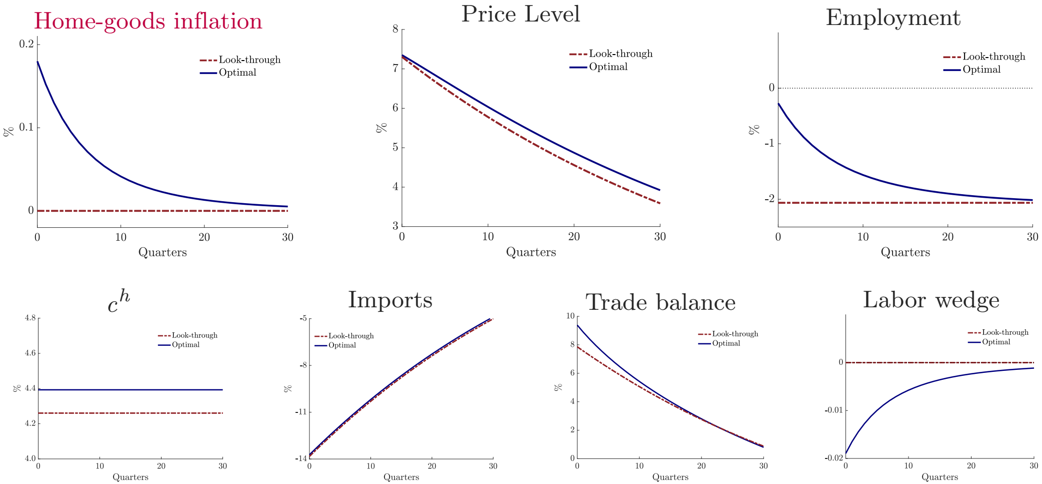


Labor wedge



Temporary Tariff $\tau_t = 0.97 \cdot \tau_{t-1}$

▸ back

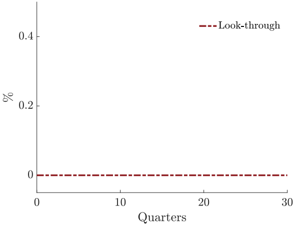


As in the case of a permanent tariff, optimal MP stimulates the economy

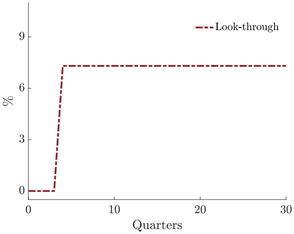
Anticipation Effects

▸ back

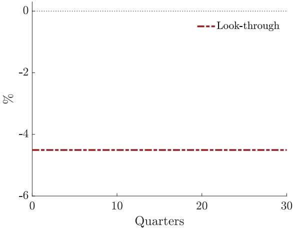
Home-goods inflation



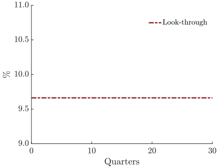
Price Level



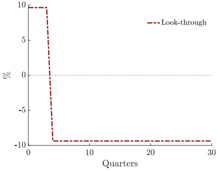
Employment



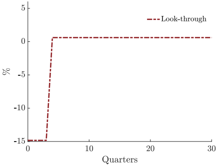
c^h



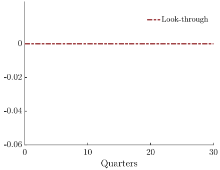
Imports



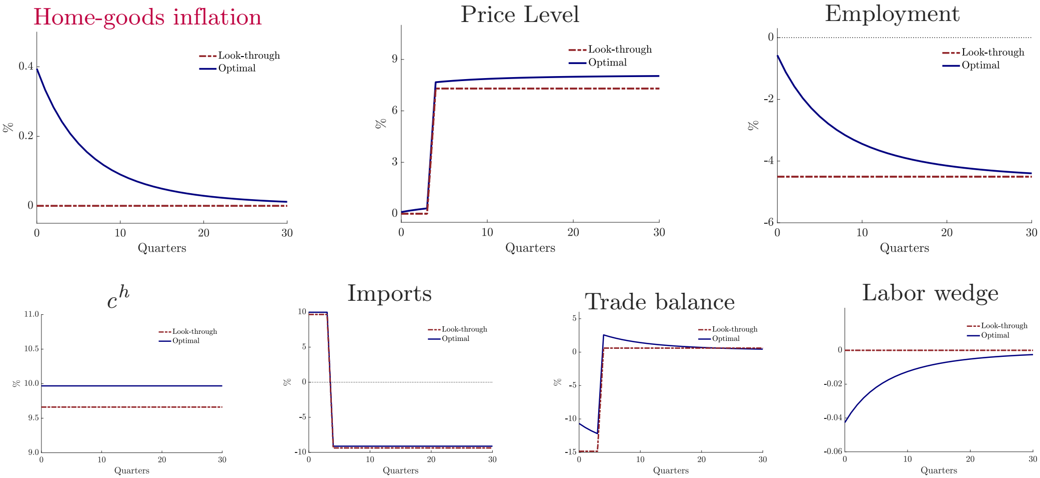
Trade balance



Labor wedge



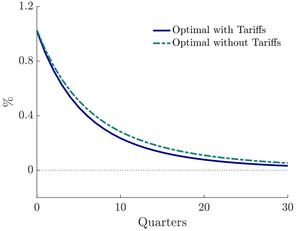
Anticipation Effects ▸ back



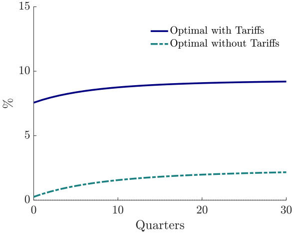
MP less expansionary: imports inefficiently high before tariff takes place

The Case with Distorted Steady State

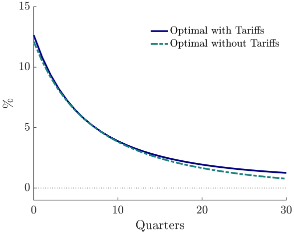
▸ back



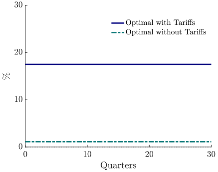
Home-goods inflation



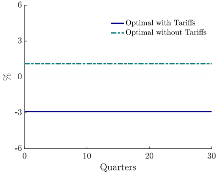
Price Level



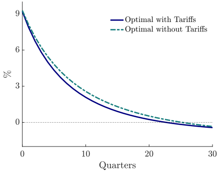
Employment



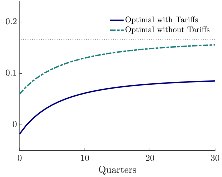
c^h



Imports



Trade balance

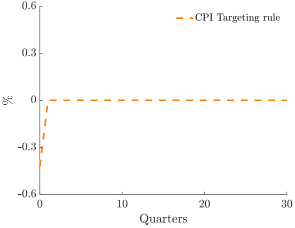


Labor wedge

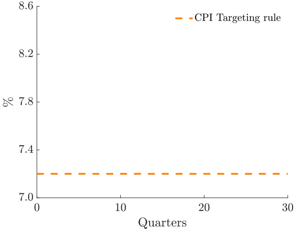
CPI Targeting Rule

Permanent Tariff

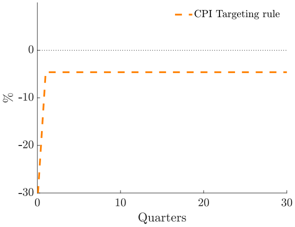
Home-goods inflation



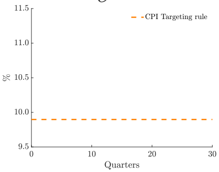
Price Level



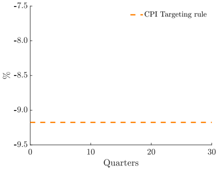
Employment



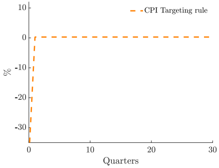
c^h



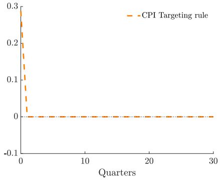
Imports



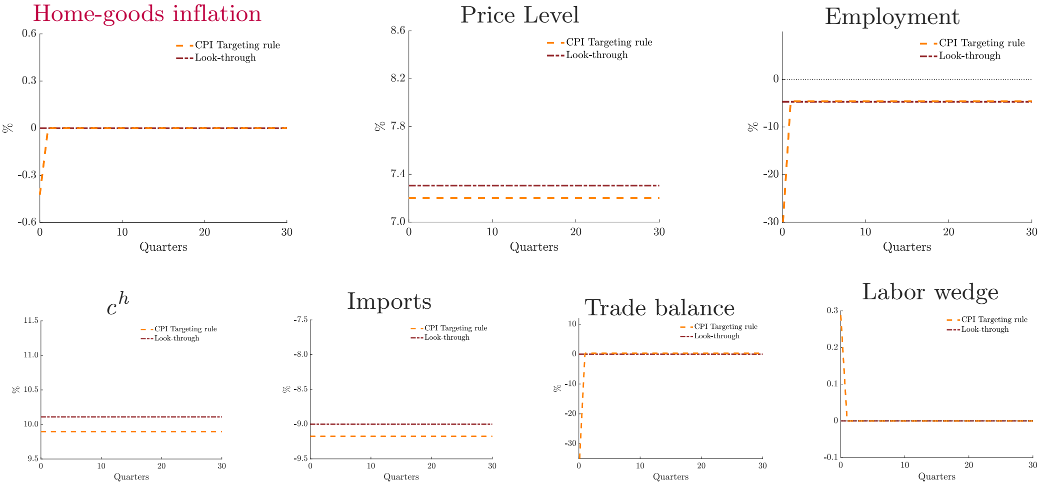
Trade balance



Labor wedge



Permanent Tariff



Home-goods inflation

Price Level

Employment

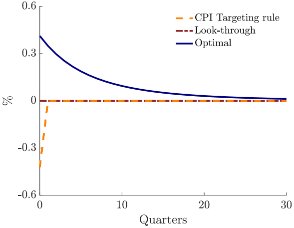
c^h

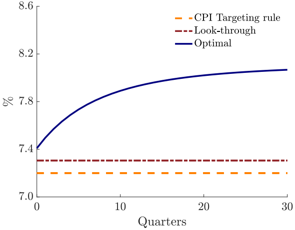
Imports

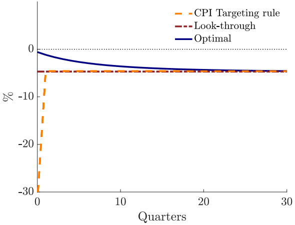
Trade balance

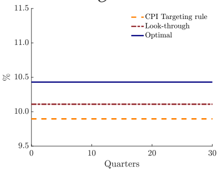
Labor wedge

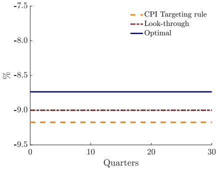
Permanent Tariff

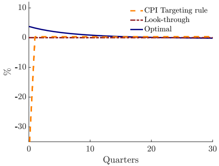

Home-goods inflation

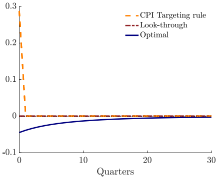

Price Level


Employment

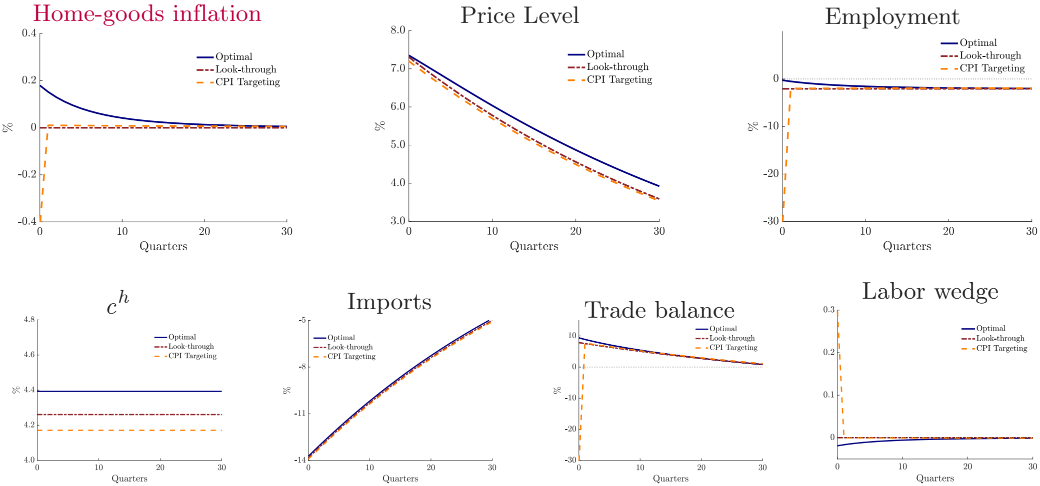

c^h


Imports

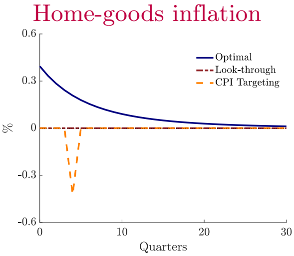

Trade balance

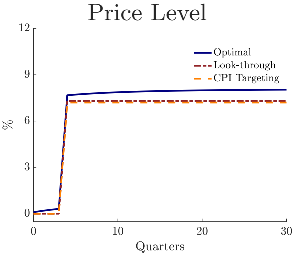

Labor wedge

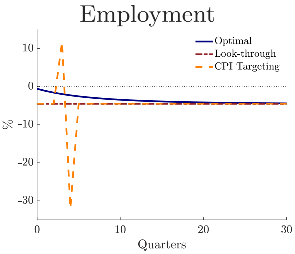
Temporary Tariff $\tau_t = 0.97 \cdot \tau_{t-1}$

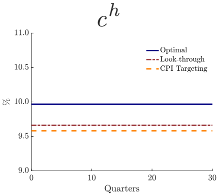


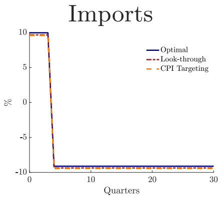
Anticipation Effects

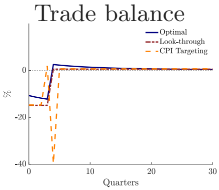

Home-goods inflation

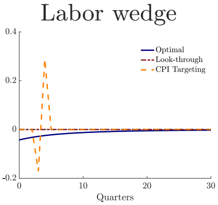

Price Level


Employment

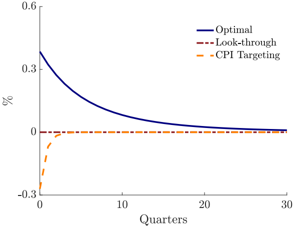

c^h

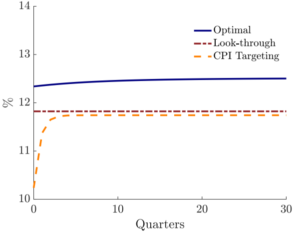

Imports

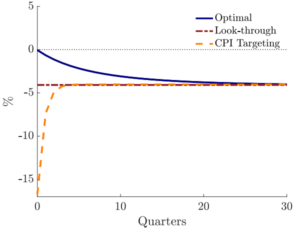

Trade balance

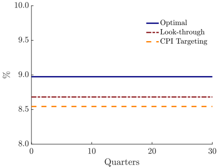

Labor wedge

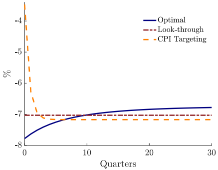
Endogenous Terms of Trade

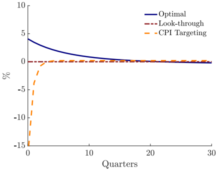

Home-goods inflation

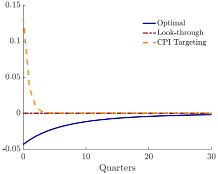

Price Level


Employment

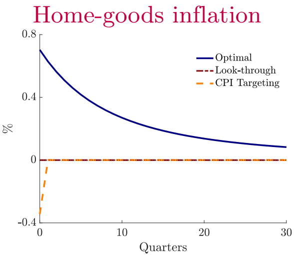

c^h

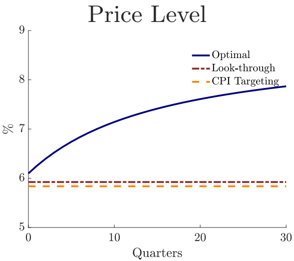

Imports

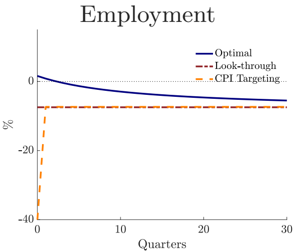

Trade balance

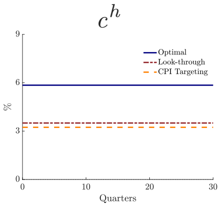

Labor wedge

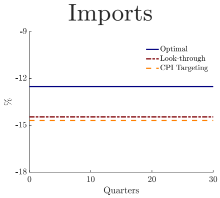
Model with Imported Inputs

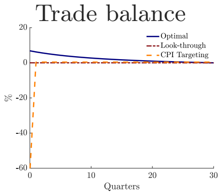


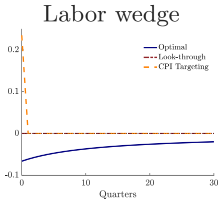






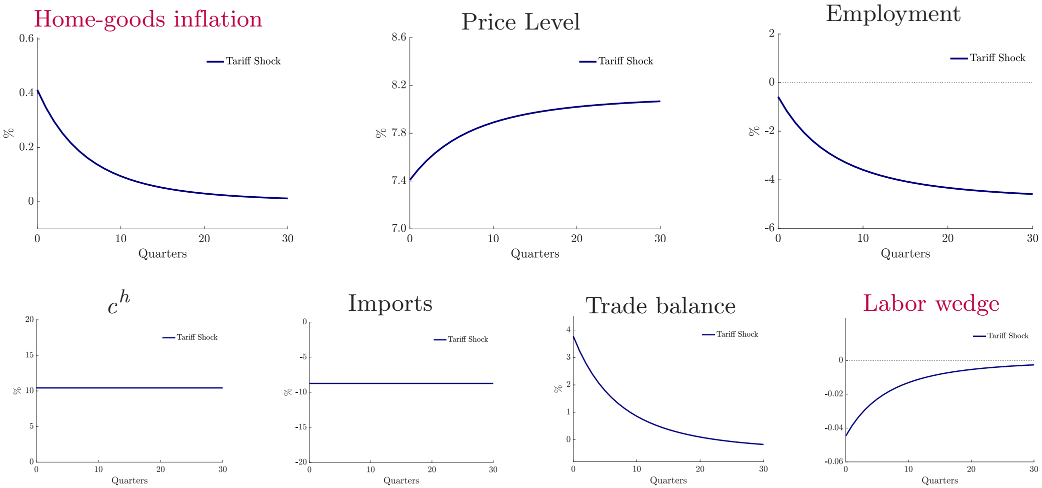






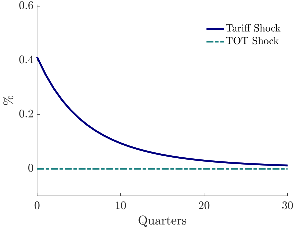
▸▸ Back

Tariffs vs. Terms-of-Trade Shocks

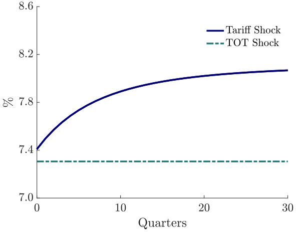


Tariffs vs. Terms-of-Trade Shocks

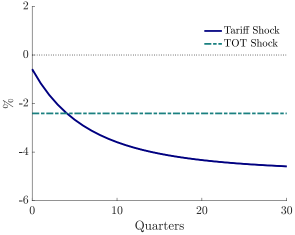
Home-goods inflation



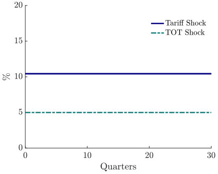
Price Level



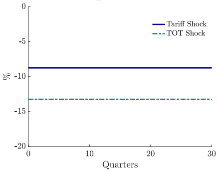
Employment



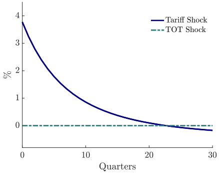
c^h



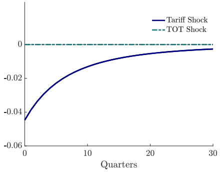
Imports



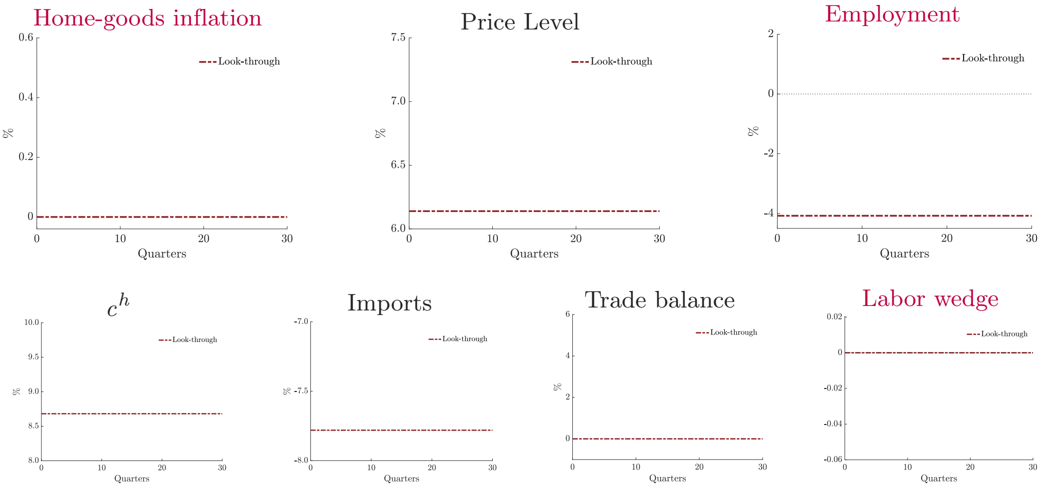
Trade balance



Labor wedge

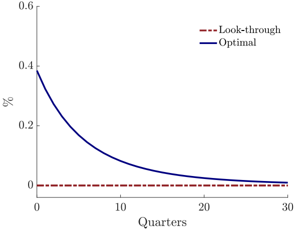


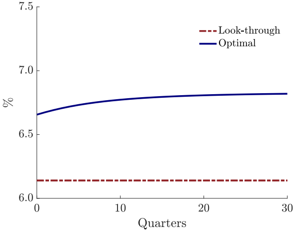
Endogenous Terms-of-Trade

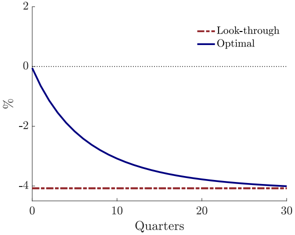


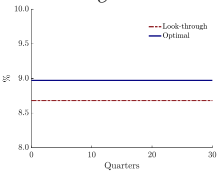
⏩ Back

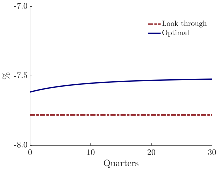
Endogenous Terms-of-Trade

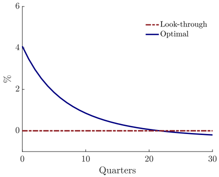

Home-goods inflation

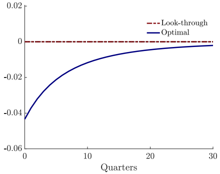

Price Level


Employment


c^h

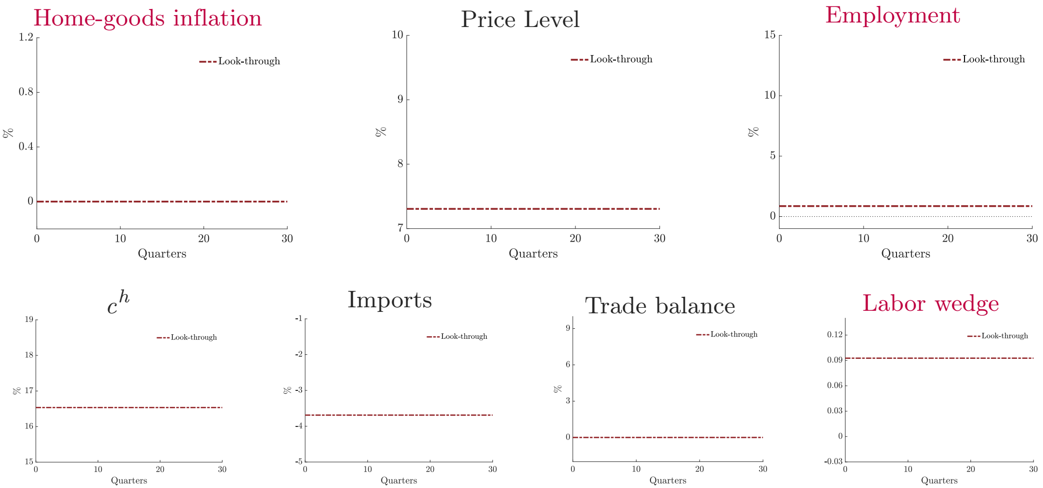

Imports


Trade balance


Labor wedge

⏩ Back

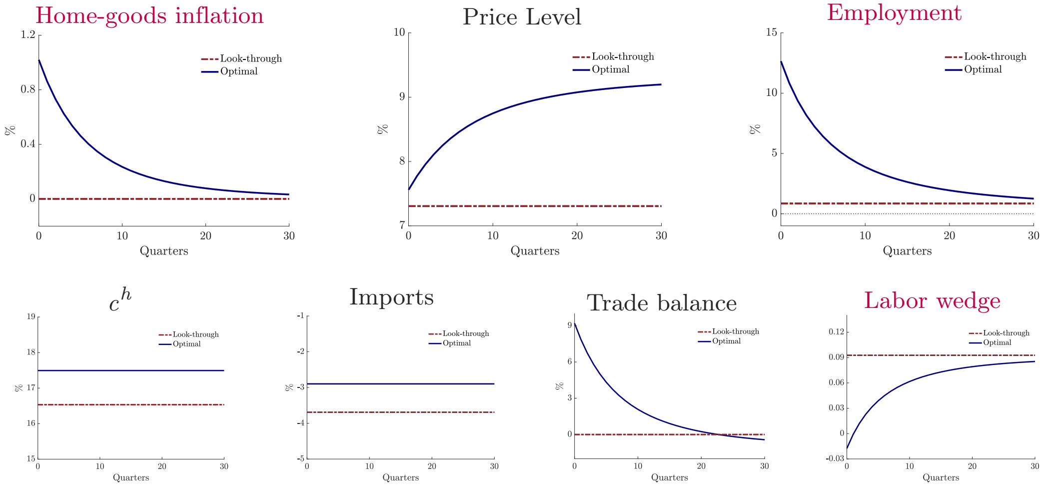
Distorted Steady State: Tariff Revenue to Subsidize Wage Bill



Employment rises under look-through

▸ Tariffs vs. No tariffs

Distorted Steady State: Tariff Revenue to Subsidize Wage Bill



Effect of tariff and labor subsidy cancel out approx. on inflation

▸ Tariffs vs. No tariffs