Demand Imbalances, Global Inflation and Monetary Policy Coordination

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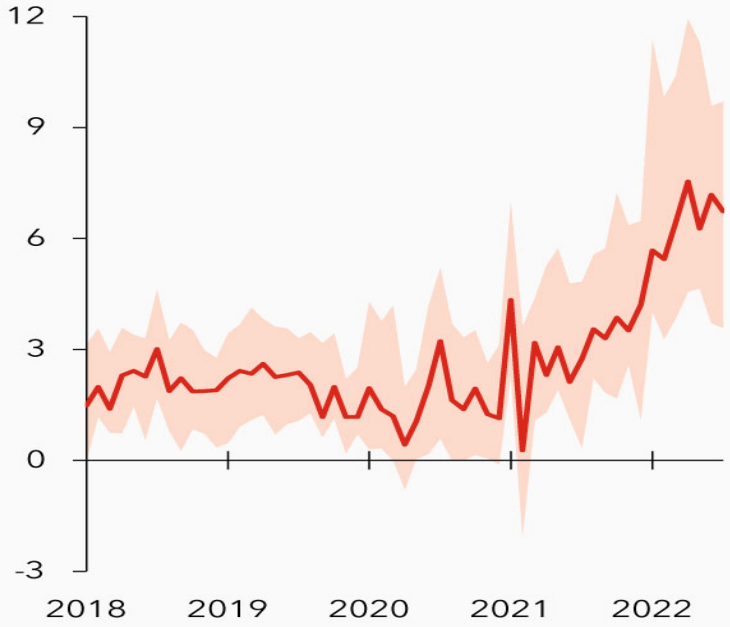
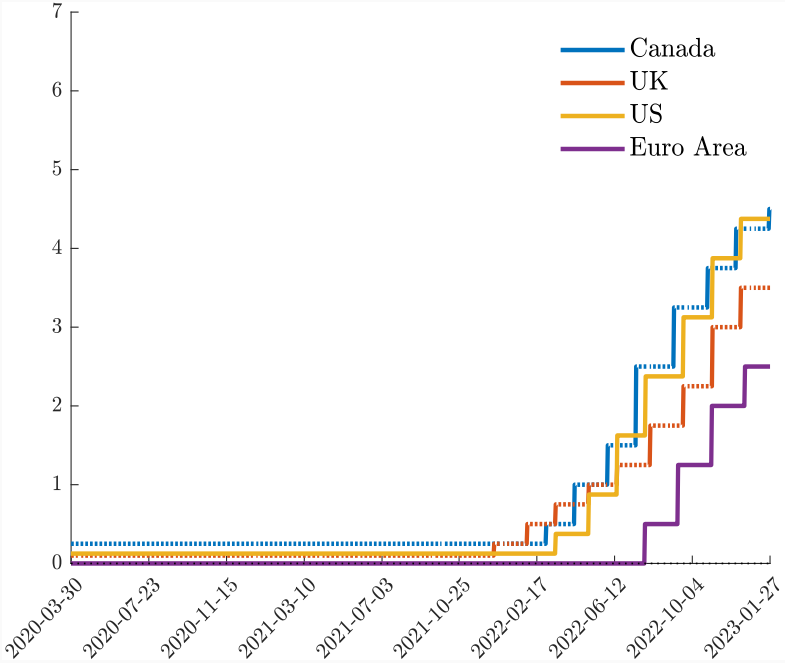
The views expressed herein are those of the authors and not necessarily those of the Federal Reserve Bank of Minneapolis, the Federal Reserve System.

Motivation

(a) Core inflation



(b) Policy rates



Source of core inflation: IMF World Economic Outlook 2022. The band indicates 25-75 percentile change for each month. Group represents 89.4% of GDP of advanced economies, 75% of emerging and developing economies and 81% of world GDP based on purchasing power parity. Policy rates correspond to discount rates from BIS.

Motivation (ctd)

> *Central banks nearly everywhere feel accused of being on the back foot. The present danger, however, is...that they collectively go too far and drive the world economy into an unnecessarily harsh contraction...By simultaneously all going in the same direction, they risk reinforcing each other's policy impacts without taking that feedback loop into account.*

Maurice Obstfeld, Peterson Institute blog post, 09/12/2022
"Uncoordinated monetary policies risk a historic global slowdown"

Over-tightening or Under-tightening?

- Does cooperation call for lower rates relative to Nash equilibrium?
- What are the gains from monetary policy cooperation?

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- Focus of the literature: terms-of-trade externality
  - Obstfeld-Rogoff 1995; Corsetti-Dedola-Leduc 2010

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- What are the gains from monetary policy cooperation?

- Focus of the literature: terms-of-trade externality
- Policy discussions: output and inflation stabilization

★ **Today:** financial channel of monetary policy spillovers ($R^\star$)

Bianchi-Coulibaly 2020; Fornaro-Romei 2022

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  - Sufficient statistic: sign of output gap and differences in labor intensity across sectors

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- Fornaro-Romei, 2022: over-tightening under linear N production

Related Literature

International monetary policy coordination: Hamada (1976) and Canzoneri and Henderson (1991), Obstfeld and Rogoff (2002), Corsetti and Pesenti (2005), Benigno and Benigno (2006), Devereux and Engel (2003), Fornaro and Romei (2022).

Aggregate demand and pecuniary externalities: Bianchi (2011), Farhi and Werning (2016), Schmitt-Grohe and Uribe (2016), Fornaro and Romei (2019), Bianchi and Coulibaly (2021), Bengui and Coulibaly (2022)

Sectorial movements and inflation: Rubbo (2020), Guerrieri, Lorenzoni, Straub and Werning (2021), Di Giovanni, Kalemli-Ozcan, Silva and Yildirim (2022, 2023), Baqaee and Farhi (2022).

Outline of the Talk

1. Environment
2. Under-tightening
3. Prudential Under-tightening

Main Elements of the Model

- Deterministic, infinite horizon with sticky wages
- Continuum of identical small open economies
  - Each country populated by continuum of households
- Two goods: tradable and non-tradable
- Global real asset that pays R^*

Households

- Preferences of individual household in each country:

$$\sum_{t=0}^{\infty} \beta^t \left[\log(c_t) - n_t - \frac{\chi}{2} (\pi_t)^2 \right]$$

$$c_t = \left(c_t^T\right)^{\phi_t^T} \left(c_t^N\right)^{\phi_t^N} \quad \text{and} \quad n_t = \left[\left(n_t^T\right)^{1+\frac{1}{\eta}} + \left(n_t^N\right)^{1+\frac{1}{\eta}} \right]^{\frac{\eta}{\eta+1}}$$

- π_t is CPI inflation; and $\phi_t^T + \phi_t^N = 1$
- Budget constraint

$$P_t^T c_t^T + P_t^N c_t^N + \frac{b_{t+1}}{R_t} + \frac{P_t^T b_{t+1}^*}{R_t^*} = W_t(h_t^T + h_t^N) + \Psi_t + b_t + P_t^T b_t^*$$

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- Focus on perfectly labor mobility case $\eta \to \infty$

Nominal Rigidities and Monetary Policy

Firms

- Tradable firms: $\max_{h_t^T} \left\{ (h_t^T)^{\alpha^T} - W_t h_t^T \right\}$
- Non-tradable firms: $\max_{h_t^N} \left\{ (h_t^N)^{\alpha^N} - W_t h_t^N \right\}$

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Experiment:

- Symmetric shock at $t = 0$ that reverts to steady state at $t = 1$

Competitive Equilibrium in the Global Economy

Given initial conditions $\{b^*_{k0}\}$, sticky wage $\bar{W}$, and a sequence of government policies $\{R_t\}_{t=0}^{\infty}$, an equilibrium is a sequence of world real rates $\{R^*_t\}_{t=0}^{\infty}$,prices and allocations for each country, $\{R_t, P^T_t, P^N_t, W_t\}_{t=0}^{\infty}$ and $\{c^T_t, c^N_t, h^T_t, h^N_t, b_{t+1}, b^*_{t+1}\}_{t=0}^{\infty}$, such that

1. Households and Firms optimize
2. In each country, market clears for non-tradables $y^N_t = c^N_t$ and domestic bonds $b_{t+1} = 0$. Labor market clears for $t \geq 1$
3. Market for real assets clear globally: $\int b^*_{kt+1} dk = 0$ for $t \geq 0$.
4. The law of one price holds for tradables: $P^T_{kt} = e^j_{kt} P^T_{jt}$ for any country-pair k and j

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$$\max_{\{\tilde{h}_0^T, \tilde{h}_0^N, \pi_0, z_0\}} \sum_{i \in \{T,N\}} \left[\alpha^i \phi_0^i \log(h_0^i) - h_0^i\right] - \frac{\chi}{2}(\pi_0 - \bar{\pi})^2 +$$
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$$\text{Phillips curve::}\ 1 + \pi_0 = \kappa_0 \prod_i \left(\frac{h_0^i}{\alpha^i \phi_0^i}\right)^{(1-\alpha^i)\phi_0^i} \qquad (\text{if } \phi_0^N = \phi^N,\ \kappa_0 = 1)$$

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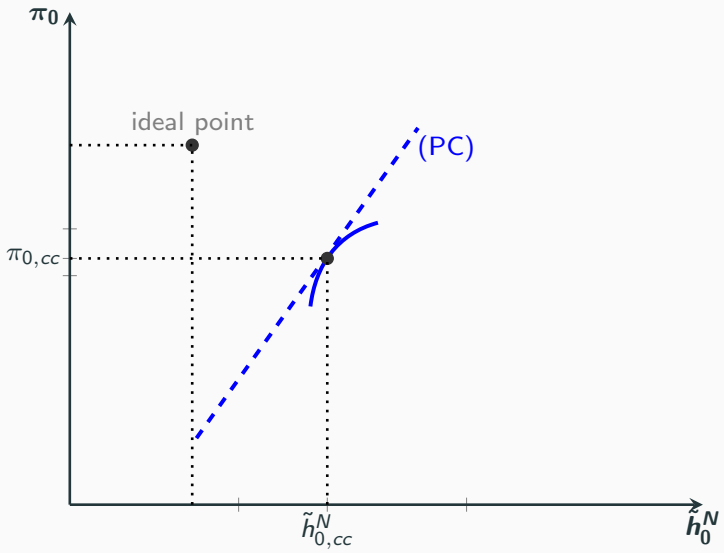
$$\text{Euler equation::}\ 1 + z_0 = \frac{1}{\beta R_0^*}\left(\frac{\phi_0^T}{\phi^T}\right)^{1-\alpha^T} \frac{(1 + z_1)^{1-\alpha^T}}{(h_0^T)^{\alpha^T}}$$

Nash Equil.: Aggregate Demand & Pecuniary Externalities

(a) Inflation-Output



$$\text{(PC)} :: \quad \pi_0(\underset{+}{\tilde{h}^N_0}; \underset{-}{R^*_0})$$

$$\text{(AD)} :: \quad z_0(\underset{+}{\tilde{h}^N_0}; \underset{-}{R^*_0})$$

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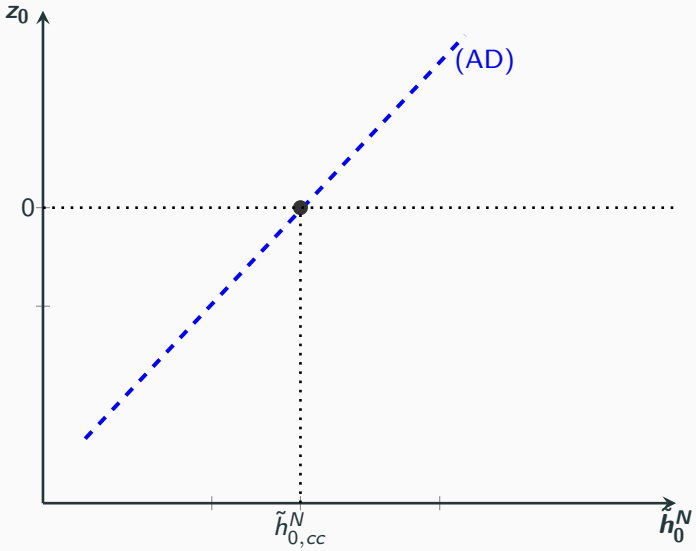
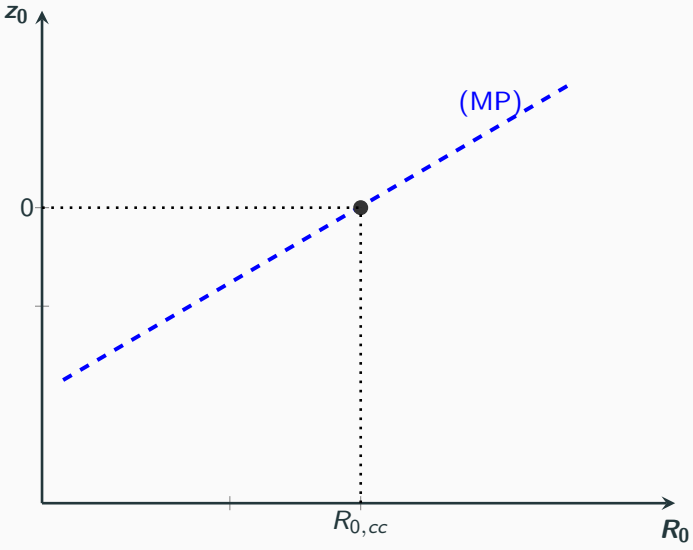
(b) Aggregate Demand



(c) Monetary Policy - Current Account



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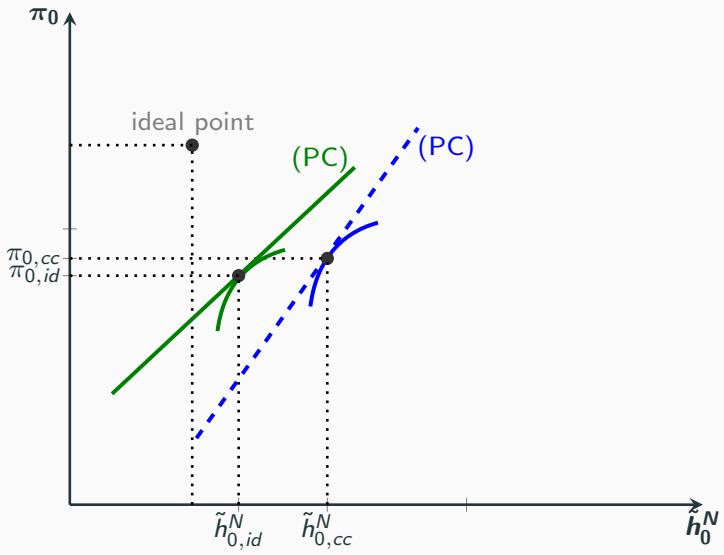

CB's targeting rule in a SOE

$$\tilde{h}^N_0 + \phi_0^T \alpha^T z_0 = -\psi_0^{\text{nash}} \chi (1+\pi_0)\pi_0$$

$$\begin{aligned}
&\text{(PC) ::} && \pi_0(\underset{+}{\tilde{h}^N_0}; \underset{-}{R^*_0}) \\
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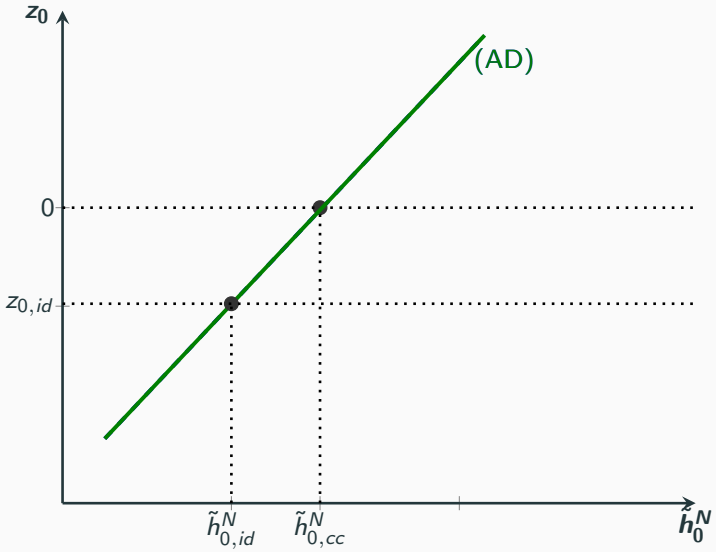

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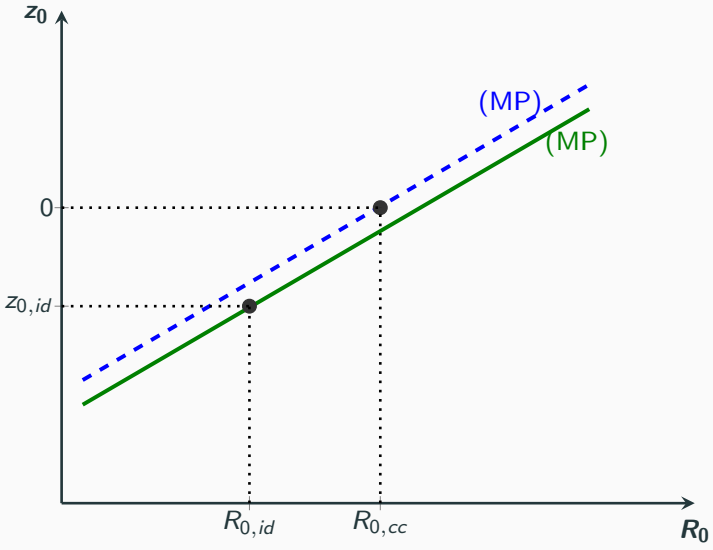

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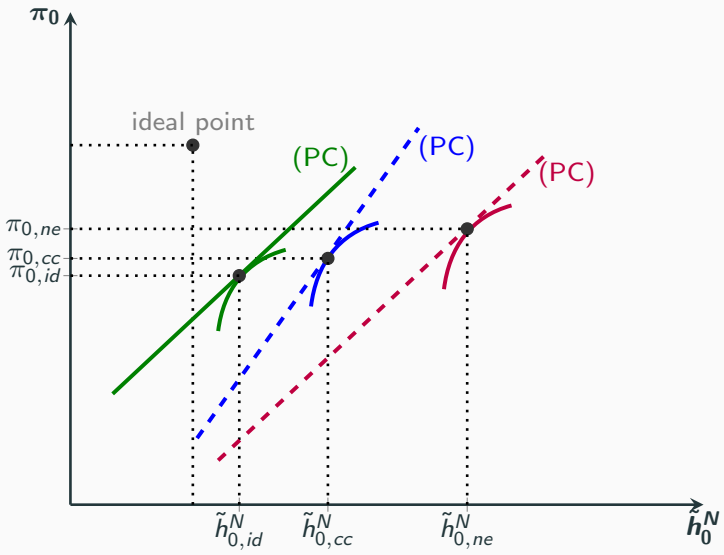

CBs' targeting rule in Nash equilibrium

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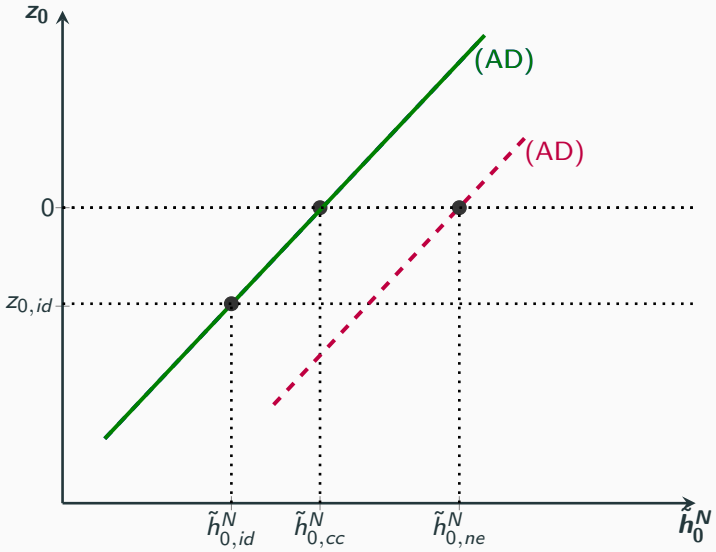

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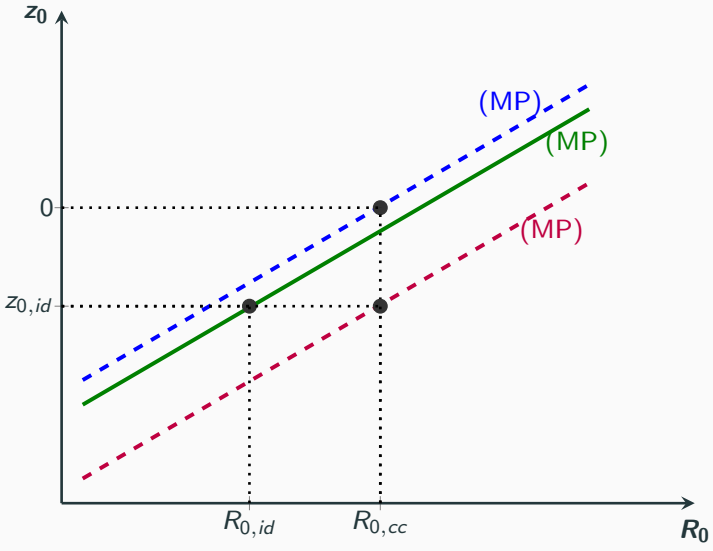


Under-tightening or Over-tightening?

- Cooperative solution
  - Internalizes the GE effect of R_0^*
  - Static problem ($z_{k0} = 0$ for all k). Optimal policy:

$$\tilde{h}_0^T = \tilde{h}_0^N = -\left[1-\rho(\alpha^N-\alpha^T)\right]\psi^{\text{nash}}\ \chi(1+\pi_0)(\pi_0-\bar{\pi})$$

Suppose $\alpha^N = \alpha^T$. Then, the Nash equilibrium and the cooperative equilibrium coincide.

- Over-tightening or Under-tightening?

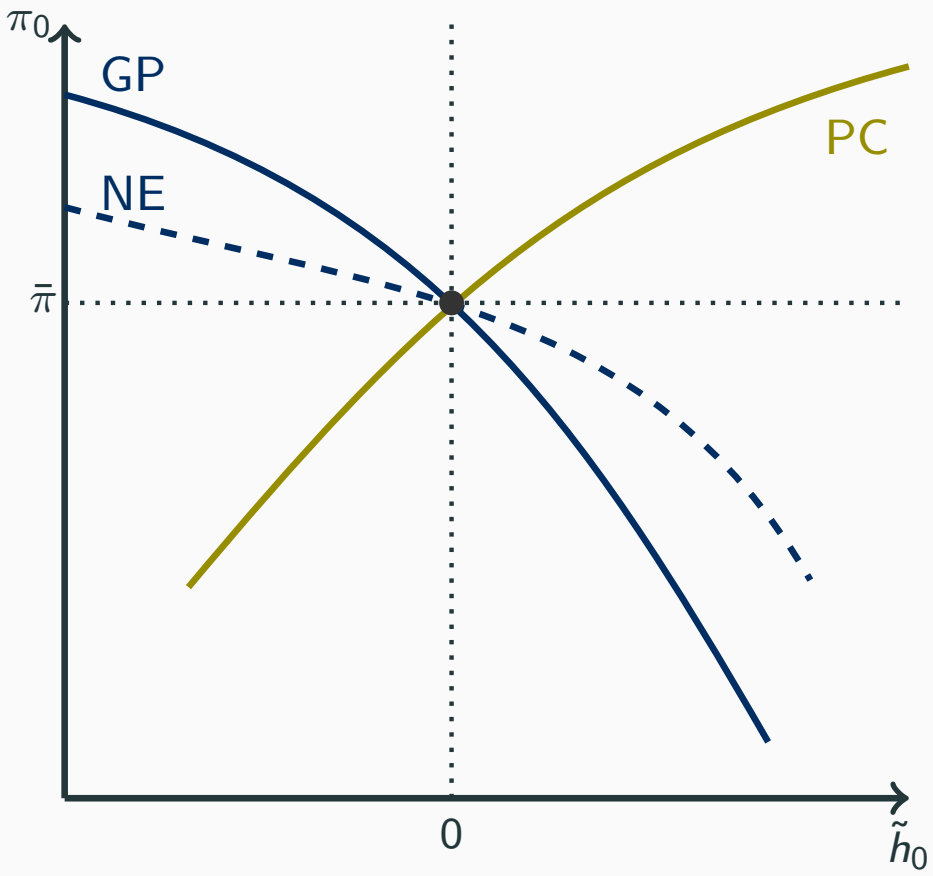
  The nominal interest rate satisfies

$$R_0 = \frac{\kappa_0}{\beta}(1+\tilde{h}_0^N)^{-\sum_i \alpha^i \phi_0^i}$$

Proposition. Suppose $\alpha^N > \alpha^T$. We have under-tightening, i.e. $R_0^{NE} < R_0^{GP}$, if and only if $\tilde{h}_0^N > 0$ in the Nash equilibrium.

Undertightening

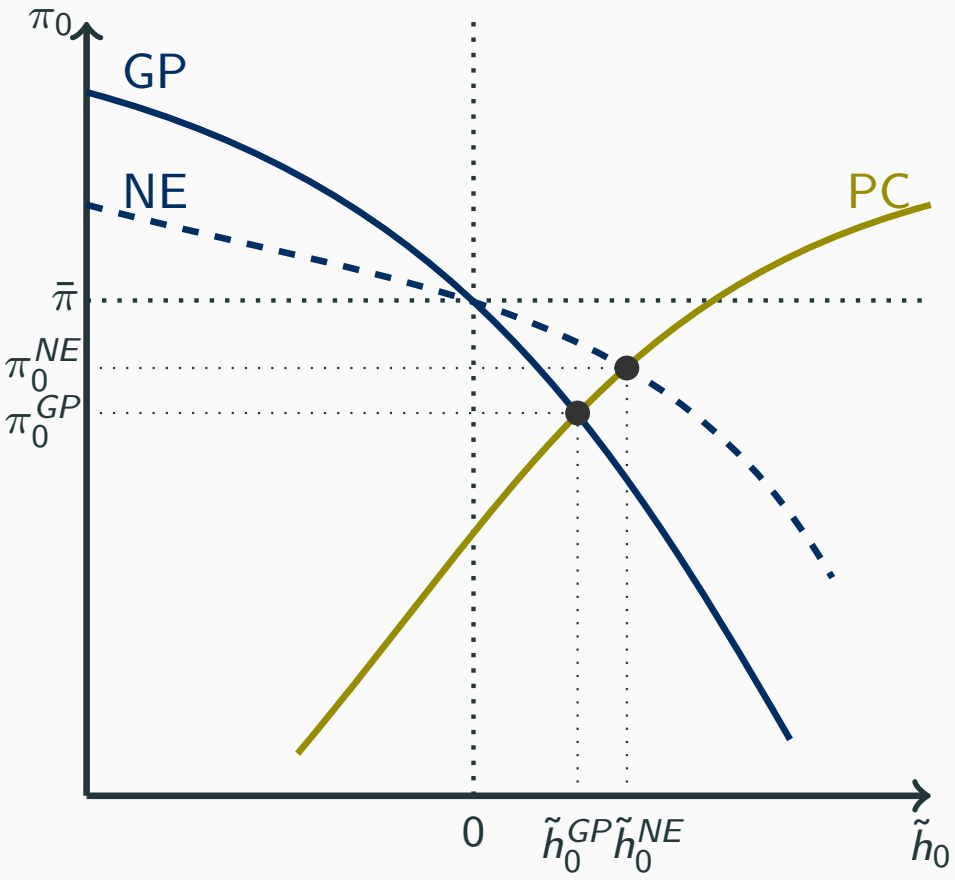
Absent shocks



Nash Equilibrium vs Cooperation for $\alpha^N > \alpha^T$

Undertightening

Following an increase in ϕ_0^N



Nash Equilibrium vs Cooperation for $\alpha^N > \alpha^T$

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- Start at $t=-1$ and agents anticipate shock at $t=0$
- Over-tightening or Under-tightening?
  - Target criterion in the Nash equilibrium

$$\tilde{h}^N + \psi^{\text{nash}}\chi(1+\pi)\pi = -\rho^2(1-\delta^N)\delta^N(\alpha^N - \alpha^T)\tilde{h}_0^N$$

  - Cooperative solution (static problem):

$$\tilde{h}^N = \pi = 0$$

Proposition. Suppose $\alpha^N > \alpha^T$. We have under-tightening, i.e. $R^{NE} < R^{GP}$, if and only if CBs anticipate a recession $\tilde{h}_0 < 0$.

In the Nash equilibrium, high inflation $\pi > 0$ and overheated labor markets $\tilde{h}^N > 0$.

Conclusion

- We studied the scope for monetary policy cooperation under a financial channel
- Nash equilibrium features over- or under-tightening depending on the sign of output gap and differences in labor intensity.
- When NT are more labor intensive, under-tightening if economy is overheated today or expect recession tomorrow