Wage price spirals

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Advanced Macro Reading Group
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Introduction – this project

- What are the drivers of inflation ?
  - Firms and workers disagree on the relative price of labor vs goods $\omega = w/p$, $\Rightarrow$ try to outpace each other in setting w and p, creating inflation
  - Mechanism in NK models : disagreement tied to output gap

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- Several positive questions : what does the direction of $\omega = w/p$ tell us ?
  1. Inform on relative forces, not on total force (absolute level on inflation)
  2. Constrained-Demand shocks push prices higher than Supply shocks
  3. Qualitative patterns : similar for both shocks
     - Scarce input price $\uparrow$, then price inflation $\uparrow$ then wage inflation $\uparrow$ then dies

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     - Scarce input price $\uparrow$, then price inflation $\uparrow$ then wage inflation $\uparrow$ then dies
- Normative : optimal policy for supply (scarce inputs) shock
  - Is "running the economy hot" optimal, with both positive inflation and output gaps
  - Is it optimal to have both positive price and wage inflations
  - Depends on parametrization

Model

- Model summary

$$\int_0^\infty e^{-\rho t}\left(\frac{1}{1-\sigma}C_t^{1-\sigma}-\frac{\Phi_t}{1+\eta}\int_0^1 N_{jt}^{1+\eta}dj\right)dt$$

$$Y_{jt}=F\left(L_{jt},X_{jt}\right)\equiv\left(a_L L_{jt}^{\frac{\varepsilon-1}{\epsilon}}+a_X X_{jt}^{\frac{\epsilon-1}{\epsilon}}\right)^{\frac{\epsilon}{\epsilon-1}}\qquad L_{jt}=\left(\int_0^1 L_{jkt}^{1-1/\epsilon_L}dk\right)^{\frac{1}{1-1/\epsilon_L}}$$

- Price/wage setting as in Erceg Henderson Levin (2000)
  - Continuum of goods, price set by firms
  - Continuum of labor, wage set by union
  - Calvo pricing for prices λ_p and wages λ_w
- Two main drivers of distributional conflict :
  - Firm side : MPL

$$mpl_t=\frac{s_X}{\epsilon}(x_t-l_t)$$

  - Household side : MRS

$$mrs_\tau=\phi_\tau+\sigma y_\tau+\eta\underbrace{[n_\tau+\epsilon_L(w_\tau-w_t^\star)]}_{=\text{labor supply } l_t}$$

Price and wage setting

- Price setting

$$p_t^* = (\rho + \lambda_p) \int_\tau^\infty e^{-(\rho+\lambda_p)(\tau-t)} \left(w_\tau - mpl_\tau\right) d\tau$$

$$w_t^* = (\rho + \lambda_w) \int_t^\infty e^{-(\rho+\lambda_w)(\tau-t)} \left(p_\tau + mrs_{\tau,t}\right) d\tau$$

- Translates to inflations

$$\pi_t = \Lambda_p \int_t^\infty e^{-\rho(s-t)} \left(\omega_s - mpl_s\right) ds,$$

$$\pi_t^w = \Lambda_w \int_t^\infty e^{-\rho(s-t)} \left(mrs_s - \omega_s\right) ds$$

$$\text{with} \quad \Lambda_p \equiv \lambda_p(\rho + \lambda_p)$$

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- Real wage as relative inflation

$$\dot{\omega}_t = \pi_t^w - \pi_t$$

- Real wage dynamics

$$\dot{\omega}_t = r_1 \omega_t + \int_t^\infty e^{-r_2(s-t)} [\Lambda_p mpl_s + \Lambda_w mrs_s] ds$$

Total and Relative Effects of the Wage Price Spiral

- Exogenous Shocks to mpl_t and mrs_t

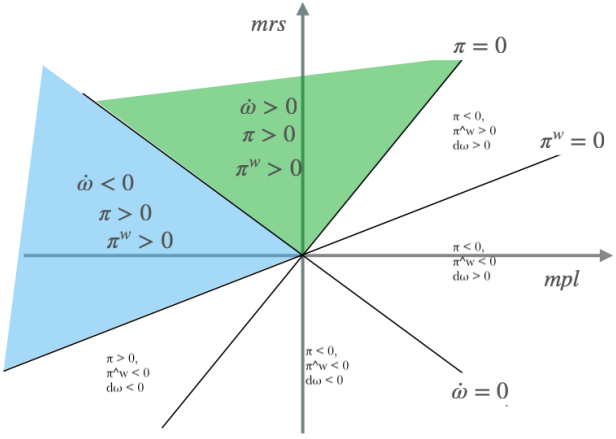

Figure 4: Regions for mpl_0 and mrs_0

Demand and Supply Shocks

- First, demand shock
  - Monetary / fiscal policy increasing employment

$$
\begin{aligned}
& n_t = n_0 e^{-\delta t} \\
\Rightarrow \quad & mrs_t > 0 \\
\Rightarrow \quad & mpl_t < 0 \\
\text{Prop :} \quad & \Lambda_p \frac{s_x}{\epsilon} > \Lambda_w(\sigma s_L + \eta) \\
\Leftrightarrow \quad & \omega_t < 0
\end{aligned}
$$

- 3 phases :
  - Jump/high inflation in scarce input
  - Price Inflation
    $\pi > \pi^w, \dot{\omega} < 0$
  - More persistent wage inflation
    $\pi^w, \dot{\omega} > 0$

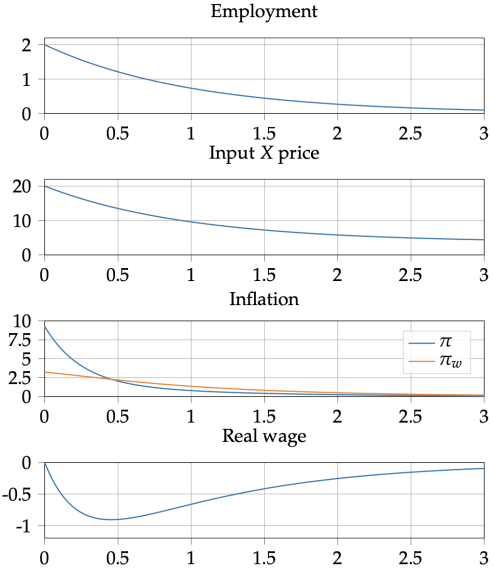

Figure 6: A supply-constrained demand shock

Demand and Supply Shocks

- Second, supply shock
  - Drop in supply of scarce input

$$x_t = -x_0 e^{-\delta t}$$
$$\Rightarrow \quad mrs_t < 0$$
$$\Rightarrow \quad mpl_t < 0$$

- 3 phases :
  - Jump/high inflation in scarce input
  - Higher Price Inflation
    $\pi > \pi^w, \dot{\omega} < 0$
  - More persistent wage inflation
    $\pi^w, \dot{\omega} > 0$

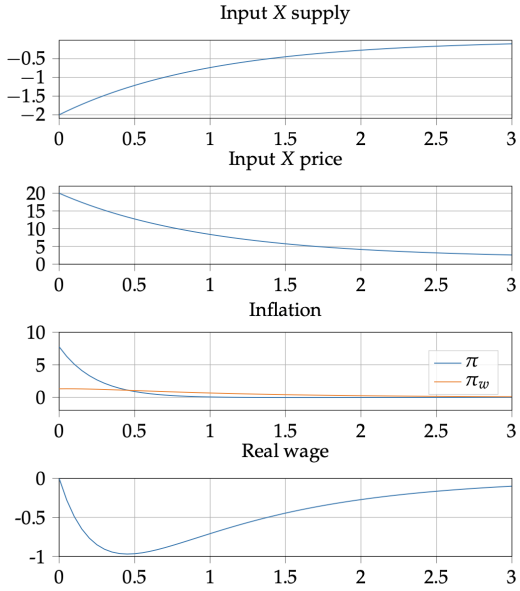

Figure 7: A supply shock

Optimal policy

- Planner problem

$$\min_{\pi_t, \pi_t^w, y_t} \int_0^\infty e^{-\rho t} \Big[(y_t - y_t^\star)^2 + \Phi_p \pi_t^2 + \Phi_w \pi_t^{w2} + \Big]$$

- Optimal response to a supply shock
- Different parametrization
  - Symmetric : yield zero output gap
  - Hot economy
    - Price more flexible $\lambda_p > \lambda_w$
    - Inflation less costly $\Phi_p < \Phi_w$

    $\Rightarrow$ $y_t > y_t^\star$, and $\pi_t > 0$ to prevent too strong wage deflation
  - Generalized inflation hot economy
    - Even more asymmetric

    $\Rightarrow$ $\pi_t > 0$ and $\pi_t^w > 0$ in the future to prevent too strong wage deflation at the beginning

Optimal policy - Hot economy

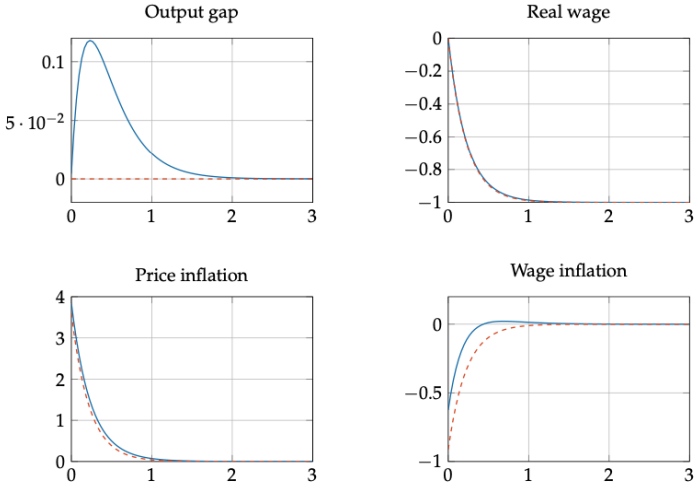

Figure 10: An optimal hot economy

Optimal policy - Generalized inflation

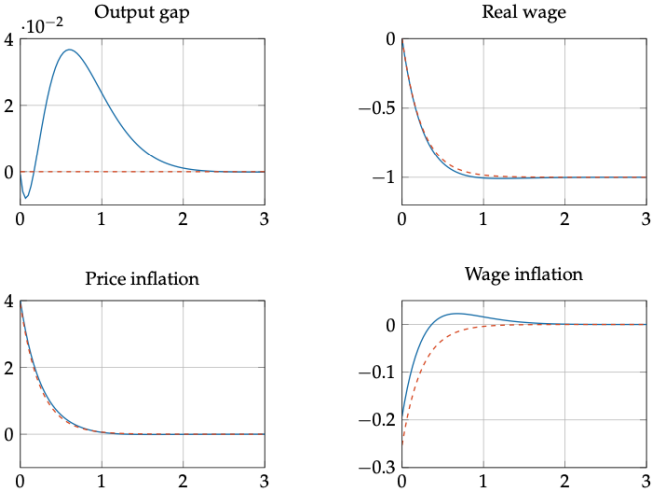

Figure 11: An example with generalized inflation and a hot economy