

# Unemployment and Production Networks

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March 2022

# Table of Contents I

Motivation

Basic model

Next Steps

# Motivation

# Motivation

- ▶ Model economy featured by production linkages
- ▶ Important to understand how production linkages interact with matching frictions and unemployment
- ▶ **Research Questions:**
  - ▶ How do idiosyncratic productivity shocks impact sectoral labor markets through production linkages?
  - ▶ How does labor market mobility interact with production linkages?
  - ▶ What is the impact of sector-specific productivity shocks on the aggregate labor market?
  - ▶ What is the efficient level of unemployment in a production network?

# Production Networks

On the production network end:

- ▶ Baqaee and Farhi (2020):
  - ▶ show how micro shocks aggregate under distortions, such as taxes, markups, frictions to reallocate resources, financial frictions, and nominal rigidities.
  - ▶ decompose output change as a component that comes from the change in technology, and a component that comes from the change in allocative efficiency.

Unemployment with matching frictions is not explicitly treated.

# Labor Market Mobility

Literature has explored implications of labor market mobility

- ▶ Jovanovic and Moffitt (1990): workers ability to change jobs is worth about 6 to 9 percent of GDP
- ▶ Lee and Wolpin (2006): workers face large costs of switching sectors. Eliminating these costs would double output in both services and manufacturing
- ▶ Şahin, Song, Topa and Violante (2014): misallocation (a lack of mobility) can explain at most one-third of the rise in unemployment during the Great Recession

None of these papers take production linkages, and the possible amplification channels these create, into account

# Today

- ▶ A two-sector matching model
  - ▶ production linkages
  - ▶ labor market mobility
- ▶ Discuss next steps

## Basic model



## Toy Model - Labor Demand

**Key features:** Model with both labor market and production linkages

**Simple example:** Two sector vertical economy, firms in sectors 1 and 2 have production function

$$y_1 = A_1 N_1^{\alpha_1}, \quad y_2 = A_2 N_2^{\alpha_2} y_1^{\beta_2}$$

Assuming exogenous rigid wages as in Hall (2005), taken as given by firms, profit maximization implies labor demands are

$$L_1^d(\theta_1) = \left( \frac{\alpha_1 A_1}{w_1 (1 + \tau_1(\theta_1))^{\alpha_1}} \right)^{\frac{1}{1-\alpha_1}}$$
$$L_2^d(\theta_1, \theta_2) = \left( \frac{\alpha_1 A_1^{\frac{1}{\alpha_1}}}{w_1 (1 + \tau_1(\theta_1))} \right)^{\frac{\alpha_1}{1-\alpha_1} \frac{\beta_2}{1-\alpha_2}} \left( \frac{\alpha_2 A_2}{w_2 (1 + \tau_2(\theta_2))^{\alpha_2}} \right)^{\frac{1}{1-\alpha_2}}$$

Note: This setup nests the case where there are no production linkages ( $\beta_2 = 0$ ).

## Toy Model - Labor Supply

We assume, for now, that unemployed workers in industry  $i$  commit an exogenous fraction  $\lambda_i$  of their search time to searching in industry  $i$  and spend the remaining  $1 - \lambda_i$  searching in industry  $j$ , and define

$$\theta_i = \frac{V_i}{\lambda_i U_i + (1 - \lambda_i) U_j}$$

Assume exogenous separation rate  $s_i$ , recruiting costs  $\kappa_i$ , and Cobb-Douglas matching function  $m_i$  in market  $i$ . Implies recruiter producer ratio in market  $i$

$$\tau_i(\theta_i) = \frac{\kappa_i s_i}{q_i(\theta_i) - \kappa_i s_i}.$$

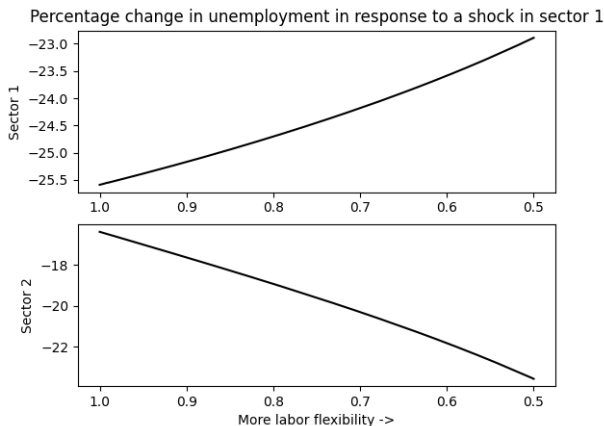
## Toy Model - Labor Supply

Given the search behavior of unemployed workers, labor supply in industry  $i$  (for a given employment level in industry  $j$ ,  $L_j$ ) is

$$L_i^s(\theta_i, \theta_j) = \frac{f_i(\theta_i)}{s_i + \lambda_i f_i(\theta_i)} [\lambda_i H_i + (1 - \lambda_j) [H_j - L_j]]$$

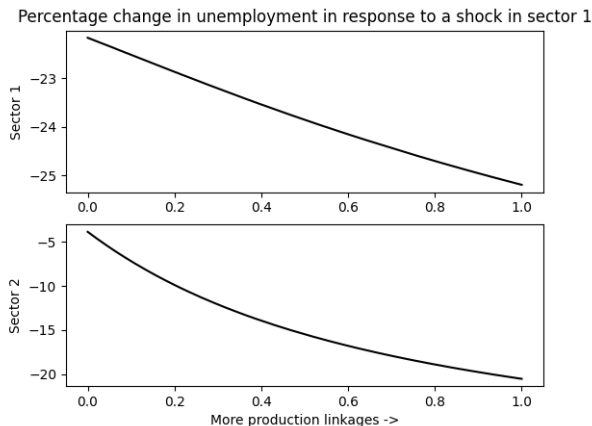
**Note:** This setup nests both immobile labor ( $\lambda_i = \lambda_j = 1$ ) and perfect labor mobility ( $\lambda_i = \lambda_j = \frac{1}{2}$ ).

# Unemployment response to shocks: Different labor market linkages



**Figure:** How does the response to a 1% productivity shock in sector 1 change when labor markets become more integrated?

# Unemployment response to shocks: Different production linkages



**Figure:** How does the response to a 1% productivity shock in sector 1 change when product markets become more integrated?

## Next Steps

# Next steps

- ▶ Do something similar to Şahin et al. (2014).
  - ▶ Derive planner's solution with a production network.
  - ▶ Evaluate the effect of mismatch on the economy, and compare how production linkages amplify the contribution of mismatch to unemployment from not having perfect mobility.
- ▶ Take our model to the data
  - ▶ Estimating  $\lambda$  in our model (maybe with BGT data?)
  - ▶ Evaluate the quantitative effects of idiosyncratic shocks on unemployment across sectors, and compare with data
  - ▶ Compute the contribution of mismatch with a calibrated model

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