Mobility within Currency Unions

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Mobility and Adjustment

- Regions in a currency union suffer shocks
  - US states
  - Eurozone countries

- Q: Mobility helps macroeconomic adjustment?
- A: Mundell (61), OCA literature: YES!

Mundell and OCA

- Broader question of macroeconomic stabilization of a currency union with nominal rigidities

- Optimal Currency Areas (OCA):
  - mobility (Mundell 61)
  - openness (McKinnon 63)
  - fiscal integration (Kennen 69)

wage rigidities

Meade (57)

This Paper

- Formal model with nominal rigidities
  - revisit Mundell's positive results
  - provide normative benchmark

This Paper

- Migration out of depressed regions
  - movers improve...
  - ... but regions? macroeconomic stabilization?

- Effect on stayers?
- Too much or too little migration? Where?

- Key insight: workers take not only their labor, but also their demand
- Key dimension: internal vs. external imbalances

Related Literature

- OCA: Mundell, McKinnon
- Currency Unions: Farhi-Werning
- Island models: Lucas-Prescott, Alvarez-Veracierto, Shimer, Alvarez-Shimer, ...
- Trade models: Dornbusch, Fischer, Samuelson
- Mobility Gains: Kennan

The Model

Price or Wage Rigidity?

- Wage rigidity prime suspect
- Are wages rigid?

- Bewley...
  - firms don't cut wages
  - wouldn't help anyway!
  - sales...

- Price rigidity? Real rigidities? Interactions?
- In our models: wage and price rigidity similar!

Outline

- Model 1: Internal Demand Imbalances
- Model 2: External Demand Imbalances

Model 1

- Regions $i \in I$
- Agent types $j \in J$

- Homogenous traded good
  - competitive
  - endowment
  - flexible price

- Non-traded goods
  - monopolistically competitive
  - produced from local labor
  - rigid price

Model 1

- One period model
  - Price fixed
  - Ex post asymmetric shocks
    - preferences
    - technology
    - endowments (wealth)

- Either
  - Unanticipated shocks
  - Anticipated but prices set before realization

Agents

- Agents types j
  - total mass μ^j
  - mass $\mu^{i,j}$ in region i

$$\left(\mu^j = \sum_{i \in I} \mu^{i,j}\right)$$

$$U^{i,j} = \max_{C_T^{i,j}, C_{NT}^{i,j}, N^{i,j}} U^{i,j}(C_T^{i,j}, C_{NT}^{i,j}, N^{i,j})$$

$$P_T C_T^{i,j} + P_{NT,i} C_{NT}^{i,j} \leq W_i N^{i,j} + E_T^j + T_i + \sum_{k \in I} \pi^{j,k} \Pi_k$$

Agents

- Rich location preference and mobility costs embedded in utility $U^{i,j}$

- Example

$$I = \{\text{Spain}, \text{Germany}\}$$

  - previous residence...

$$J = \{\text{Spaniard,German}\}$$

  - ... plus mobility costs...

$$J = \{\text{Mobile Spaniard, Immobile Spaniard, Mobile German, Immobile German}\}$$

Firms

- Final non-traded good produced competitively

$$Y_{NT,i} = \left(\int_0^1 {Y_{NT,i,l}}^{1-\frac{1}{\varepsilon}} dl \right)^{\frac{1}{1-\frac{1}{\varepsilon}}}$$

- Each variety
  - produced monopolistically
  - technology $Y_{NT,i,l} = A_i N_{i,l}$
  - fixed price $P_{NT,i,l} = P_{NT,i}$
- Symmetry...

$$Y_{NT,i,l} = Y_{NT,i} = A_i N_i$$

$$\Pi_i = (1 - \tau_{\pi,i}) \left(P_{NT,i} - \frac{1 + \tau_{L,i}}{A_i} W_i \right) Y_{NT,i}$$

Government

- Regional budget balance

$$\sum_{j\in J} \mu^{i,j} T_i = \tau_{L,i} W_i N_i + \tau_{\pi,i} \left(P_{NT,i} - \frac{1+\tau_{L,i}}{A_i} W_i \right) Y_{NT,i}$$

- Alternative
  - transfers across regions
  - fiscal unions (Farhi-Werning 2012)

Equilibrium **Without** Free Mobility

- Households optimize
- Firms meet demand
- Government budget constraints hold
- Markets clear

Equilibrium **With** Free Mobility

- Households optimize
- Firms meet demand
- Government budget constraints hold
- Markets clear

- Agents locate optimally

$$\mu^{i,j} = 0 \quad \text{if} \quad U^{i,j} < \max_{i' \in I} U^{i',j}$$

Additional Assumptions

- Profits fully taxed $\tau_{\pi,i} = 1$

$$T_i = \frac{P_{NT,i}Y_{NT,i} - W_i N_i}{\mu_i}$$

- Preferences over consumption and labor
  - region specific, not agent specific
  - separable between consumption and leisure
  - homothetic over consumption

$$U^{i,j} = f^{i,j}\left(\hat{U}^i(\tilde{u}^i(C_T^{i,j}, C_{NT}^{i,j}), N^{i,j})\right)$$

Equilibrium

- Per capita allocation...

$$C_T^{i,j} = E_T$$

$$C_{NT}^{i,j} = \alpha^i(p_i)E_T$$

$$N^{i,j} = \alpha^i(p_i)\frac{E_T}{A_i}$$

- Labor wedge

$$\tau_i = 1 + \frac{1}{A_i}\frac{U_N^{i,j}}{U_{C_{NT}}^{i,j}}$$

  - First best $\tau_i = 0$
  - Boom $\tau_i < 0$
  - Bust $\tau_i > 0$

Equilibrium

Proposition (Per-capita allocations).
Given P_T, per-capita allocation of agents of type j in region i is independent of location decisions.

- Movers out of depressed region
  - better off...
    ... aggregate economic activity in currency union increases...
  - ... partial vindication of Mundell (1961)...
  - ... qualification: no impact on stayers
- Intuition: move with your demand

Social Optimum

- Indirect utility function

$$V^{i,j}(C_T^{i,j}, p_i) = U^{i,j}\left(C_T^{i,j}, \alpha^i(p_i)C_T^{i,j}, \frac{\alpha^i(p)}{A_i}C_T\right)$$

- Restricted social planning problem given P_T

$$W(P_T) = \max_{\mu^{i,j}} \sum_{i\in I, j\in J} \lambda^j \mu^{i,j} V^{i,j}\left(E_T, \frac{P_T}{P_{NT,i}}\right)$$

$$\sum_{i\in I} \mu^{i,j} = \mu^j$$

constrained efficient given monetary policy

- Full social planning problem

$$\max_{P_T} W(P_T)$$

constrained-efficient

Optimal Mobility

Proposition (Optimal mobility).
Constrained efficient allocation given monetary policy P_T are consistent with free mobility.

- Intuition
  - no spillovers from mobility decisions
  - no need for government intervention

Optimal Monetary Policy

Proposition (Optimal monetary policy).
Constrained-efficient allocations satisfy

$$\sum_{i \in I, j \in J} \lambda^j \mu^{i,j} \alpha_p^i E_T U_{C_T}^{i,j} \tau_i = 0$$

- Monetary policy
  - stabilizes currency union on average
  - both depressed and booming regions

Sticky Wages

- Sticky wages instead of sticky prices
  - Take W_i as given (fixed)
  - Either
    - rationing: equal sharing of labor within region
    - monopolistic suppliers
- All results go through unchanged!

Model 2

- Each region produces different traded good
  - all goods tradable...
  - ... but allow home bias
- Each traded good
  - produced from local labor
  - rigid price

Agents

- Problem of agent of type j living in region i

$$U^{i,j} = \max_{C_k^{i,j}, N^{i,j}} U^{i,j}(\{C_k^{i,j}\}, N^{i,j})$$

$$\sum_{k \in I} P_k C_k^{i,j} + \leq W_i N^{i,j} + T_i + \sum_{k \in I} \pi^{j,k} \Pi_k$$

Rest of Model

- Key differences
  - structure of demand
  - no endowment good
- Rest, same as before...
  - firms
  - government
  - equilibrium
  - additional assumptions: profit tax, preferences

Equilibrium

- Income in country i $P_i Y_i$
- Country i spending on k $\alpha_k^i P_i Y_i$

- ... total income for k $\sum_{i \in I} \alpha_k^i P_i Y_i = P_k Y_k$

$$N^{i,j} = \frac{1}{\mu_i} \frac{Y_i}{A_i} \qquad C_k^{i,j} = \frac{1}{\mu_i} \alpha_k^i \frac{P_i}{P_k} Y_i$$

$$C^{i,j} = \frac{1}{\mu_i} \frac{P_i}{P^i} Y_i$$

consumption index

price index

Structure of Demand

Proposition (Structure of demand).

Exists $\{Y_i^*\}$ such that
$$Y_i = \lambda Y_i^*$$

- λ positive constant
  - union-wide aggregate demand
  - pinned down by monetary policy

Equilibrium

Proposition (Per-capita allocations).
Given λ per-capita consumption and labor allocation of agents of type j in region i depends on the equilibrium only through the sufficient statistic μ_i, to which it is inversely proportional.

- As before...
  - movers better off
- Now...
  - stayers also improve!
- Simplest case: no home bias

Social Optimum

- Restricted social planning problem given λ

$$W(\lambda) = \max_{\mu_i, \mu^{i,j}} \sum_{i \in I, j \in J} \lambda^j \mu^{i,j} U^{i,j} \left(\lambda \frac{P_i}{P^i} \frac{Y_i^*}{\mu_i}, \lambda \frac{Y_i^*}{A_i \mu_i} \right)$$

$$\sum_{i \in I} \mu^{i,j} = \mu^j$$

$$\sum_{j \in J} \mu^{i,j} = \mu_i$$

constrained efficient given aggregate demand management

- Full social planning problem

$$\max_{\lambda} W(\lambda)$$

constrained-efficient

Optimal Mobility

Proposition (Optimal mobility).
Constrained efficient allocation given union-wide aggregate demand management λ are inconsistent with free mobility.

- Optimality condition for mobility

$$\mu^{i,j} = 0 \quad \text{if} \quad U^{i,j} - \frac{\gamma_i}{\lambda^j} < \max_{i' \in I} U^{i',j} - \frac{\gamma_{i'}}{\lambda^j}$$

$$\gamma_i = \gamma + \sum_{j \in J} \lambda^j \frac{\mu^{i,j}}{\mu_i} \lambda \frac{P_i}{P^i} \frac{Y_i^*}{\mu_i} U_C^{i,j} \tau_i$$

- Inconsistent with free mobility

$$\mu^{i,j} = 0 \quad \text{if} \quad U^{i,j} < \max_{i' \in I} U^{i',j}$$

Optimal Mobility

- Impact on stayers' welfare
- Labor wedge is sufficient statistic τ_i
- Not internalized by private agents
- Government intervention required
  - not enough migrations out of depressed regions
  - potentially wrong destinations too

Optimal Monetary Policy

Proposition (Optimal monetary policy).
Constrained-efficient allocations satisfy

$$\sum_{i \in I, j \in J} \lambda^j \mu^{i,j} \frac{P_i}{P^i} \frac{Y_i^*}{\mu_i} U_C^{i,j} \tau_i = 0$$

- Union-wide aggregate demand management stabilizes currency union on average

Sticky Wages

- Once again, here...

  - Sticky price = Sticky wage

Looking ahead

- Model 3...
  - endowment and home bias
  - nests model 1 and 2
- Other extensions...
  - heterogeneity: negative spillover on stayers?
  - fixed factors: capital
  - price/wage adjustments
  - dynamics
  - other rationing rules?

Conclusion

- Model
  - costly mobility
  - price/wage rigidities
- Key insight
  - movers take demand for goods, not just labor supply
  - possible inefficiencies
- Key dimension
  - structure of demand

Appendix Slides

Firms

- Final non-traded good produced competitively

$$Y_i = \left(\int_0^1 {Y_{i,l}}^{1-\frac{1}{\varepsilon}} dl \right)^{\frac{1}{1-\frac{1}{\varepsilon}}}$$

- Each variety
  - produced monopolistically
  - technology $Y_{i,l} = A_i N_{i,l}$
  - fixed price $P_{i,l} = P_i$
- Implies
  - output $Y_{i,l} = Y_i = A_i N_i$
  - total profits

$$\Pi_i = (1 - \tau_{\pi,i}) \left(P_i - \frac{1 + \tau_{L,i}}{A_i} W_i \right) Y_i$$

Government

- Each region must balance its budget

$$\sum_{j \in J} \mu^{i,j} T_i = \tau_{L,i} W_i N_i + \tau_{\pi,i} \left(P_i - \frac{1 + \tau_{L,i}}{A_i} W_i \right) Y_i$$

Equilibrium

- As in model 1...

- Two notions of equilibrium:
  - equilibrium without free mobility
  - equilibrium with free mobility

Additional Assumptions

- Profits fully taxed $\tau_{\pi,i} = 1$ and redistributed to local agents

$$T_i = \frac{P_i Y_i - W_i N_i}{\mu_i}$$

- Preferences of different agent types in a given region represent the same preference ordering
  - separable between consumption and leisure
  - homothetic over consumption