Migration, Search and Skill Heterogeneity

Myrto Oikonomou

IMF - Structural and Climate Policy Division

The views expressed in this presentation are solely my own, and not those of the International Monetary Fund, as are any remaining errors.
Motivation

Migration as an adjustment mechanism to asymmetric region-specific shocks

Emigration flows over Working Age Population

Source: Eurostat Net Flows more
Motivation

Migration as an adjustment mechanism to asymmetric region-specific shocks

- adjustment of domestic labour markets $\to u + w$ stabilisation
- risk-sharing $\to C$ stabilisation
Missing Dimension?
Changing composition of migration flows from European South

Source: German Microcensus Data
Research Question:
Does migration stabilise the business cycle when accounting for compositional effects?
This Paper

Research Question:
Does migration stabilise the business cycle when accounting for compositional effects?

Framework

- 2-HH SOE model with 2 key ingredients:
This Paper

Research Question:
Does migration stabilise the business cycle when accounting for compositional effects?

Framework

- 2-HH SOE model with 2 key ingredients:
  - endogenous labour mobility that depends on labour market differences and labour mobility costs
This Paper

Research Question:
Does migration stabilise the business cycle when accounting for compositional effects?

Framework

• 2-HH SOE model with 2 key ingredients:
  1. endogenous labour mobility that depends on labour market differences and labour mobility costs
  2. capital-skill complementarities

Application: Greek emigration wave during the Sovereign Debt Crisis
This Paper

Research Question:
Does migration stabilise the business cycle when accounting for compositional effects?

Framework

- 2-HH SOE model with 2 key ingredients:
  1. endogenous labour mobility that depends on labour market differences and labour mobility costs
  2. capital-skill complementarities

- Application: Greek emigration wave during the Sovereign Debt Crisis
This Paper

Main Result

- Migration amplified the business cycle
This Paper

Main Result

- Migration amplified the business cycle
  - ↓ investment due to skill composition worsening (brain-drain)
Main Result

- Migration amplified the business cycle
  1. ↓ investment due to skill composition worsening (brain-drain)
  2. ↓ external adjustment via real exchange rate depreciation
Related Literature

Cyclical Migration literature

- Bandeira, Caballè & Vella (2020)
- Hauser and Seneca (2019)
- House, Proebsting & Tesar (2018)
Related Literature

Cyclical Migration literature
- Bandeira, Caballè & Vella (2020)
- Hauser and Seneca (2019)
- House, Proebsting & Tesar (2018)

CSC literature
- Dolado, Motyovszki & Pappa (2020)
Road Map

- Introduction
- Model
  - Model Overview
  - Labour Market
  - Production Side
  - Market Clearing
- Calibration
- Quantitative Analysis
- Conclusion
- Next Steps
Model Overview

The diagram illustrates the Model Overview, showing the relationships between Domestic Firms, Consumption Good, Labor & Capital, High Skilled HH, Complete Markets, Low Skilled HH, and SOE.
Model Overview
Model Overview
Road Map

- Introduction
- Model
  - Model Overview
  - Labour Market
  - Production Side
  - Market Clearing
- Calibration
- Quantitative Analysis
- Conclusion
- Next Steps
Population Dynamics

For each HH $i \in \{h, l\}$:

$$Mass_i = N_{i,t}^r + N_{i,t}^e + U_{i,t}$$

$$1 = n_{i,t}^r + n_{i,t}^e + u_{i,t}$$
Population Dynamics

- For each HH $i \in \{h, l\}$:

\[
\text{Mass}_i = N_{i,t}^r + N_{i,t}^e + U_{i,t}
\]

\[
1 = n_{i,t}^r + n_{i,t}^e + u_{i,t}
\]

- LoM of employment stock:

\[
N_{i,t+1}^r = (1 - \rho_i)N_{i,t}^r + f_{i,t} (1 - \mu_{i,t})U_{i,t}
\]

separation prob

job-finding prob

migration share
Population Dynamics

For each HH $i \in \{h, l\}$:

$$\text{Mass}_i = N_{i,t}^r + N_{i,t}^e + U_{i,t}$$

$$1 = n_{i,t}^r + n_{i,t}^e + u_{i,t}$$

LoM of employment stock:

$$N_{i,t+1}^r = (1 - \rho_i) N_{i,t}^r + f_{i,t} (1 - \mu_{i,t}) U_{i,t}$$

$$N_{i,t+1}^e = (1 - \rho_i^*) N_{i,t}^e + f_{i,t}^* \mu_{i,t} U_{i,t}$$
Population Dynamics

- For each HH $i \in \{h, l\}$:

$$Mass_i = N_{i,t}^r + N_{i,t}^e + U_{i,t}$$
$$1 = n_{i,t}^r + n_{i,t}^e + u_{i,t}$$

- LoM of employment stock:

$$N_{i,t+1}^r = (1 - \rho_i)N_{i,t}^r + f_{i,t}(1 - \mu_{i,t})U_{i,t}$$
$$N_{i,t+1}^e = (1 - \rho_i^*)N_{i,t}^e + f_{i,t}^* \mu_{i,t}U_{i,t}$$

- Transition Probabilities:

$$f_{i,t} = \frac{m_{i,t}}{(1 - \mu_{i,t})U_{i,t}}$$
$$q_{i,t} = \frac{m_{i,t}}{v_{i,t}}$$
matches
job-filling prob
vacancies
Choose \( \{c_{h,t}, \mu_{h,t}, k_{t+1}, d_{t+1}^*\} \) to maximize:

\[
\mathbb{E}_t \sum_{t=0}^{\infty} \beta^t \left( \ln(c_{h,t} - \chi \bar{c}_{h,t-1}) - \Omega_h n_{h,t}^e \right)
\]
High-skilled Households

Choose \( \{c_{h,t}, \mu_{h,t}, k_{t+1}, d^*_t\} \) to maximize:

\[
\mathbb{E}_t \sum_{t=0}^{\infty} \beta^t \left( \ln(c_{h,t} - \chi c_{h,t-1}) - \Omega_h n^e_{h,t} \right)
\]

Subject to consolidated BC:

\[
c_{h,t} + i_t + Q_t \underbrace{R_t e^*_t}_{\text{rer}} + \frac{I_h}{2} \left( \frac{\mu_{h,t} u_{h,t}}{\mu_{h,t-1} u_{h,t-1}} - 1 \right)^2 \mu_{h,t} u_{h,t}
\]

mobility adj. cost

\[
= R_t^k k_t + Q_t d^*_{t+1} + w_{h,t} n^r_{h,t} + Q_t w^*_t, n^e_{h,t} + \phi_h u_{h,t} + t_{h,t} + \text{div}_t
\]

\[\text{UB}\]
High-skilled Households

Choose \( \{c_{h,t}, \mu_{h,t}, k_{t+1}, d^*_{t+1}\} \) to maximize:

\[
\mathbb{E}_t \sum_{t=0}^{\infty} \beta^t \left( \ln(c_{h,t} - \chi \bar{c}_{h,t-1}) - \Omega_h n^e_{h,t} \right)
\]

Subject to consolidated BC:

\[
\begin{align*}
    c_{h,t} + i_t + Q_t R_t d^*_t + \frac{\Gamma_h}{2} \left( \frac{\mu_{h,t} u_{h,t}}{\mu_{h,t-1} u_{h,t-1}} - 1 \right)^2 & \mu_{h,t} u_{h,t} \\
    &= R^k_t k_t + Q_t d^*_{t+1} + w_{h,t} n^r_{h,t} + Q_t w^*_t n^e_{h,t} + \phi_h u_{h,t} + t_{h,t} + \text{div}_t
\end{align*}
\]

LoM of employment & capital:

\[
k_{t+1} = (1 - \delta) k_t + i_t - \frac{\Xi}{2} \left( \frac{i_t}{i_{t-1}} - 1 \right)^2 i_t
\]
Mobility Choice

- **Job-search Indifference Condition**

\[ f_{i,t}^* \Lambda_{e,i,t} - f_{i,t} \Lambda_{r,i,t} = C(\mu_{i,t}, u_{i,t}, \Gamma_i) \]

- net gain from search abroad
- moving costs
Mobility Choice

- Job-search Indifference Condition
  \[ f^*_i,t \Lambda^e_{i,t} - f_{i,t} \Lambda^r_{i,t} = C(\mu_{i,t}, u_{i,t}, \Gamma_i) \]
  net gain from search abroad
  moving costs

- Net value of a new job at home
  \[ \Lambda^r_{i,t} = \beta \mathbb{E}_t \Lambda^c_{i,t+1} (w_{i,t+1} - \phi_i) + \beta \mathbb{E}_t (1 - \varrho_i - f_{i,t+1}) \Lambda^r_{i,t+1} \]
  net cash-flow value
  continuation value
Mobility Choice

- **Job-search Indifference Condition**
  \[ f^*_{i,t} \Lambda^e_{i,t} - f_{i,t} \Lambda^r_{i,t} = C(\mu_{i,t}, u_{i,t}, \Gamma_i) \]
  - net gain from search abroad
  - moving costs

- **Net value of a new job at home**
  \[ \Lambda^r_{i,t} = \beta \mathbb{E}_t \Lambda^c_{i,t+1} (w_{i,t+1} - \phi_i) + \beta \mathbb{E}_t (1 - \rho_i - f_{i,t+1}) \Lambda^r_{i,t+1} \]
  - net cash-flow value
  - continuation value

- **Net value of a new job abroad**
  \[ \Lambda^e_{i,t} = \beta \mathbb{E}_t \Lambda^c_{i,t+1} (Q_{t+1}w^*_{i,t+1} - \phi_i) - \beta \Omega_i \]
  - net cash-flow value
  \[ + \beta \mathbb{E}_t (1 - \rho^*_i) \Lambda^e_{i,t+1} - \beta \mathbb{E}_t f_{i,t+1} \Lambda^r_{i,t+1} \]
  - continuation value

IC more details
Road Map

- Introduction
- Model
  - Model Overview
  - Labour Market
  - Production Side
  - Market Clearing
- Calibration
- Quantitative Analysis
- Conclusion
- Next Steps
Domestic firms produce homogeneous good $y_t^h$ at real price $p_t^w$ using a 2-layer CES production function:

$$y_t^h = A_t \left( s_s S_t^\nu + (1 - s_s) N_{l,t}^\nu \right)^{\frac{1}{\nu}}$$

- skill share
- skilled bundle
- $K & N_l - N_h & N_l$
- complementarity
Domestic firms produce homogeneous good $y_t^h$ at real price $p_t^w$ using a 2-layer CES production function:

$$y_t^h = A_t (s_s S_t^\nu + (1 - s_s) N_{l,t}^\nu)^\frac{1}{\nu}$$

$$S_t = \left( s_k K_t^\gamma + (1 - s_k)(N_{h,t})^\gamma \right)^\frac{1}{\gamma}$$

capital share $K$\&$N_h$
complementarity
Domestic firms produce homogeneous good $y_t^h$ at real price $p_t^w$ using a 2-layer CES production function:

$$y_t^h = A_t \left(s_s S_t^w + (1 - s_s)(N_{l,t})^\nu\right)^{\frac{1}{\nu}}$$

$$S_t = \left(s_k K_t^\gamma + (1 - s_k)(N_{r,t}^h t)^\gamma\right)^{\frac{1}{\gamma}}$$

For $\gamma < \nu$ high-skilled labour displays higher complementarity with capital.

- Amplification effect #1: ↓ capital stock $\rightarrow$ ↓ $\frac{MPL_h}{MPL_l}$ (asymmetric migration)
- Amplification effect #2: ↓ $\frac{N_h}{N_l}$ $\rightarrow$ ↓ MPK
Final good firms combine domestic and foreign tradable goods $X_{d,t}$ and $X_{f,t}$:

$$X_t = \left( \frac{1}{\theta} \omega X_{d,t}^{\frac{\theta-1}{\theta}} + (1 - \omega) \frac{1}{\theta} X_{f,t}^{\frac{\theta-1}{\theta}} \right)^{\frac{\theta}{\theta-1}}$$

- **Home bias**
Final good firms combine domestic and foreign tradable goods $X_{d,t}$ and $X_{f,t}$:

$$X_t = \left( \frac{1}{\theta} \omega X_{d,t}^{\frac{\theta-1}{\theta}} + (1 - \omega) \frac{1}{\theta} X_{f,t}^{\frac{\theta-1}{\theta}} \right)^{\frac{\theta}{\theta-1}}$$

Demand Schedules

$$X_{d,t} = \omega \omega_{d,t} X_t$$

$$X_{f,t} = (1 - \omega) \omega_{f,t} X_t$$

$$X_{d,t}^* = (1 - \omega^*) \left( \frac{\rho_{d,t}}{Q_t} \right)^{-\theta^*} X_t^*$$
Road Map

- Introduction
- Model
  - Model Overview
  - Labour Market
  - Production Side
  - Market Clearing
- Calibration
- Quantitative Analysis
- Conclusion
- Next Steps
Market Clearing

- Intermediate good market clearing

\[ y_t^h = X_{d,t} + X_{d,t}^* \]
Market Clearing

- Intermediate good market clearing
  \[ y^h_t = X_{d,t} + X^*_{d,t} \]

- Budget constraint of residents
  \[
  (u_{h,t} + n^r_{h,t})c^r_{h,t} + i_t + Q_t R_t d^*_t + \frac{\Gamma_h}{2} \left( \frac{\mu_{h,t} u_{h,t}}{\mu_{h,t-1} u_{h,t-1}} - 1 \right)^2 \mu_{h,t} u_{h,t} \\
  = R^k_t k_t + Q_t d^*_t + w_{h,t} n^r_{h,t} + Q_t Z_{h,t} n^e_{h,t} + \phi_h u_{h,t} + t_{h,t} + div_t \]

  \text{remittances}
Market Clearing

- Intermediate good market clearing
  \[ y^h_t = X_{d,t} + X^*_d,t \]

- Budget constraint of residents
  \[
  (u_{h,t} + n^r_{h,t})c^r_{h,t} + i_t + Q_t R_t d^*_t + \frac{\Gamma_h}{2} \left( \frac{\mu_{h,t} u_{h,t}}{\mu_{h,t-1} u_{h,t-1}} - 1 \right)^2 \mu_{h,t} u_{h,t} \\
  = R^k_t k_t + Q_t d^*_{t+1} + w_{h,t} n^r_{h,t} + Q_t Z_{h,t} n^e_{h,t} + \phi_h u_{h,t} + t_{h,t} + \text{div}_t
  \]

- Budget constraint of emigrants
  \[
  c^e_{h,t} n^e_{h,t} = w^*_h t n^e_{h,t} - Z_{h,t} n^e_{h,t} = (1 - \zeta) w^*_h t n^e_{h,t}
  \]
Market Clearing

- Total per capita consumption (optimisation object):
  \[ c_{h,t} = (u_{h,t} + n_{h,t}^r)c_{h,t}^r + Q_t n_{h,t}^e c_{h,t}^e \]
Market Clearing

- Total per capita consumption (optimisation object):
  \[ c_{h,t} = (u_{h,t} + n_{r,h,t})c_{r,h,t} + Q_t n_{h,t}c_{e,h,t} \]

- Final good market clearing:
  \[ X_t = \sum_{i \in \{h, l\}} (N_{i,t}^r + U_{i,t})c_{i,t}^r + \sum_{i \in \{h, l\}} \frac{\Gamma_{i,t}}{2} \left( \frac{\mu_{i,t} u_{i,t}}{\mu_{i,t-1} u_{i,t-1}} - 1 \right)^2 \mu_{i,t} u_{i,t} + \sum_{i \in \{h, l\}} \kappa_i v_{i,t} + I_t + G_t \]
Market Clearing

- Total per capita consumption (optimisation object):
  \[ c_{h,t} = (u_{h,t} + n_{h,t}^r) c_{h,t}^r + Q_t n_{h,t}^e c_{h,t}^e \]

- Final good market clearing:
  \[ X_t = \sum_{i \in \{h,l\}} (N_{i,t}^r + U_{i,t}) c_{i,t}^r + \sum_{i \in \{h,l\}} \frac{\Gamma_i}{2} \left( \frac{\mu_{i,t} u_{i,t}}{\mu_{i,t-1} u_{i,t-1}} - 1 \right)^2 \mu_{i,t} u_{i,t} + \sum_{i \in \{h,l\}} \kappa_i v_{i,t} + I_t + G_t \]

- LoM for net foreign assets
  \[ Q_t R_t D_t^* = Q_t D_{t+1}^* + TB_t + Q_t (Z_{h,t} N_{h,t}^e + Z_{l,t} N_{l,t}^e) \]
Market Clearing

- Total per capita consumption (optimisation object):
  \[ c_{h,t} = (u_{h,t} + n_{h,t}^r)c_{h,t}^r + Q_t n_{h,t}^e c_{h,t}^e \]

- Final good market clearing:
  \[ X_t = \sum_{i \in \{h,l\}} (N_{i,t}^r + U_{i,t})c_{i,t}^r + \sum_{i \in \{h,l\}} \frac{\Gamma_i}{2} \left( \frac{\mu_{i,t} u_{i,t}}{\mu_{i,t-1} u_{i,t-1}} - 1 \right)^2 \mu_{i,t} u_{i,t} + \sum_{i \in \{h,l\}} \kappa_i v_{i,t} + I_t + G_t \]

- LoM for net foreign assets
  \[ Q_t R_t D_t^* = Q_t D_{t+1}^* + TB_t + Q_t (Z_{h,t} N_{h,t}^e + Z_{l,t} N_{l,t}^e) \]

- Debt-elastic interest rate
  \[ R_t = R_t^* + \Psi \left( \exp \left( \frac{Q_t D_{t+1}^*}{gdp_t} - \frac{Q D^*}{gdp} \right) - 1 \right) + \epsilon_t \]
  \( \epsilon_t \) risk-premium shock
Road Map

- Introduction
- Model
  - Model Overview
  - Labour Market
  - Production Side
  - Aggregation
- Calibration
- Quantitative Analysis
- Conclusion
- Next Steps
## Calibration

<table>
<thead>
<tr>
<th>Description</th>
<th>Parameter</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Labour Market Parameters</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mass H-skilled</td>
<td>$Mass_h = 31%$</td>
<td>Eurostat</td>
</tr>
<tr>
<td>Mass L-skilled</td>
<td>$Mass_l = 69%$</td>
<td>Eurostat</td>
</tr>
<tr>
<td>Matching Effic</td>
<td>$\mu_h = 0.86, \mu_l = 0.61$</td>
<td>$ur_h = 7%, ur_l = 12%$ Eurostat</td>
</tr>
<tr>
<td>Separation Rate</td>
<td>$\varrho_{h,l} = 0.08$</td>
<td>Hobijn &amp; Sahin (2009)</td>
</tr>
<tr>
<td>Vac Posting Costs</td>
<td>$\kappa_h = 0.1, \kappa_l = 0.43$</td>
<td>$q_h = 0.7q_l = 0.6$</td>
</tr>
<tr>
<td>Elasticity of matches to searchers</td>
<td>$\epsilon_h = 0.6, \epsilon_l = 0.4$</td>
<td>Pissarides &amp; Petrongolo (2001)</td>
</tr>
<tr>
<td>Bargaining Power of Workers</td>
<td>$\psi_h = 0.6, \psi_l = 0.4$</td>
<td>Hosios Condition</td>
</tr>
<tr>
<td>Real wage rigidities</td>
<td>$\gamma_w = 0.65$</td>
<td>Papageorgiou (2014)</td>
</tr>
<tr>
<td>Foreign Wage Premium</td>
<td>$\frac{w^<em>_h}{w_h} = 1.4, \frac{w^</em>_l}{w_l} = 1.05$</td>
<td>EU-KLEMS</td>
</tr>
<tr>
<td>Mig. utility cost</td>
<td>$\Omega_h = 1.2, \Omega_l = 0.22$</td>
<td>$M = 8%, 35%$ H-skilled</td>
</tr>
<tr>
<td>Mig. adj cost</td>
<td>$\Gamma_h = 0.98, \Gamma_l = 6.5$</td>
<td>$M = 7%, 65%$ H-skilled</td>
</tr>
</tbody>
</table>
Calibration

<table>
<thead>
<tr>
<th>Description</th>
<th>Parameter</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Production Parameters</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elasticity $K, N_l$</td>
<td>$\rho_{k,l} = 1.67$</td>
<td>Krusell et al (2000)</td>
</tr>
<tr>
<td>Elasticity $K, N_h$</td>
<td>$\rho_{k,h} = 0.67$</td>
<td>Krusell et al (2000)</td>
</tr>
<tr>
<td>Capital share in $S$</td>
<td>$s_k = 0.89$</td>
<td>Capital share = 36%</td>
</tr>
<tr>
<td>Skill share</td>
<td>$s_s = 0.47$</td>
<td>Skilled Share = 20%</td>
</tr>
<tr>
<td><strong>Macroeconomic Parameters</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discount Factor</td>
<td>$\beta = 0.96$</td>
<td>r=4%</td>
</tr>
<tr>
<td>Habits</td>
<td>$\chi = 0.6$</td>
<td>Papageorgiou (2014)</td>
</tr>
<tr>
<td>$X_d - X_f$ elasticity of substitution</td>
<td>$\theta = 1.65$</td>
<td>Chodorow-Reich et al (2019)</td>
</tr>
<tr>
<td>Depreciation rate</td>
<td>$\delta = 0.08$</td>
<td>Chodorow-Reich et al (2019)</td>
</tr>
<tr>
<td>Home bias</td>
<td>$\omega = 0.75$</td>
<td>Chodorow-Reich et al (2019)</td>
</tr>
</tbody>
</table>
## Calibration

<table>
<thead>
<tr>
<th>Description</th>
<th>Parameter</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remittances share</td>
<td>$\zeta = 0.47$</td>
<td>$\frac{\text{Rem}}{\text{gdp}} = 0.3%$, WB</td>
</tr>
<tr>
<td>Government expenditure</td>
<td>$g = 0.15$</td>
<td>$\frac{G^{ss}}{\text{gdp}^{ss}} = 0.18$, ELSTAT</td>
</tr>
<tr>
<td>Investment adj. cost</td>
<td>$\Xi = 0.9$</td>
<td>Papageorgiou (2014)</td>
</tr>
<tr>
<td>Foreign, Home Bias</td>
<td>$\omega^* = 0.24$</td>
<td>normalising $y^{star} = 1$</td>
</tr>
<tr>
<td>Debt-elastic rate param</td>
<td>$\Psi = 0.001$</td>
<td>SGU (2003)</td>
</tr>
<tr>
<td>Risk Premium Shock</td>
<td>$\rho = 0.98, \sigma = 0.015$</td>
<td>$C^r$ initial drop</td>
</tr>
</tbody>
</table>
Road Map

- Introduction
- Model
  - Model Overview
  - Labour Market
  - Production Side
  - Market Clearing
- Calibration
- Quantitative Analysis
- Conclusion
- Next Steps
Migration is an amplifier

Data & IRFs to a negative risk-premium shock

GDP
Consumption
Investment
Outflows

Source: ELSTAT
Migration is an amplifier
Who leaves matters

Data & IRFs to a negative risk-premium shock

Source: ELSTAT
Migration is an amplifier

IRFs to a negative risk-premium shock

GDP p.c

Consumption p.c

Investment p.c

Marginal Product of capital

Marginal product of labour (h)

Marginal product of labour (l)

Baseline - No migration
Migration is an amplifier

Labour market

IRFs to a negative risk-premium shock

Unemployment rate

Unemployment rate (h)

Unemployment rate (l)

Employment (h)

Employment (l)

Risk premium

Baseline
No migration
Labour Market Responses
Different effects by skill type

IRFs to a negative risk-premium shock

- Job-finding rate (h)
- Job-finding rate (l)
- Job-filling rate (h)
- Job-filling rate (l)
- Tightness (h)
- Tightness (l)

Baseline  - No migration
Migration is an amplifier

External Adjustment

![Graphs showing the impact of migration on various economic indicators.](image-url)
Distributional Effects

IRFs to a negative TFP shock (% ss dev)

- Skill premium
- Relative income share
- Skill share

Baseline vs. No migration
Isolating channels
CSC channel relatively more important

IRF differences with and without migration

Baseline  -  No cs  -  No cs or sam  -  No sam
Road Map

- Introduction
- Model
  - Model Overview
  - Labour Market
  - Production Side
  - Market Clearing
- Calibration
- Quantitative Analysis
- Conclusion
- Next Steps
Conclusion

Research Question:
Does migration stabilise the business cycle when accounting for its compositional effects?

Migration acted as an amplifier of recessionary shock
- contraction of investment due to skill composition worsening
- mitigated the ability of the SOE to ‘export its way out of the crisis’

Asymmetry in CSC & SAM frictions played a critical role
Road Map

- Introduction
- Model
  - Model Overview
  - Labour Market
  - Production Side
  - Market Clearing
- Calibration
- Quantitative Analysis
- Conclusion
- Next Steps
Next Steps

1. 2-region DSGE with a Currency Union
   - Does cyclical migration lead to further de-synchronization of business cycles across member states?
Next Steps

1. **2-region DSGE with a Currency Union**
   - Does cyclical migration lead to further de-synchronization of business cycles across member states?

2. **Long-term effects of cyclical migration**
   - Endogenous TFP due to R&D and technological adoption (Comin & Gertler, 2006 - Kung & Schmid, 2015)
Next Steps

1. **2-region DSGE with a Currency Union**
   - Does cyclical migration lead to further de-synchronization of business cycles across member states?

2. **Long-term effects of cyclical migration**
   - Endogenous TFP due to R&D and technological adoption (Comin & Gertler, 2006 - Kung & Schmid, 2015)

3. **How does asymmetric migration affect firm dynamics?**
   - Asymmetric migration & firm entry (Anelli et al, 2020)
Thank you!
Migration flows by skill type

Increase in high-skilled migration (measured by occupation)

Source: German Microcensus Data
Changing composition of migration stocks

Source: Statistics Denmark
Net Emigration flows

Net Emigration flows over Working Age Population

Source: Eurostat
Evolution of Skills

Skill Share of Working Age Population

Source: Eurostat
Immigration Duration proxy

10Y averages of registration duration

Source: Danish Statistics
Migration is an amplifier

Robustness
Migration is an amplifier

Robustness
Intermediate Firm Ctd

- Firm’s problem:
  \[
  \min_{v_{h,t}, v_{l,t}, k_t} \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \frac{\Lambda_{c}^{h,t+1}}{\Lambda_{c}^{h,t}} \left( p_{w}^{w} y_{h}^{h} - r_{t}^{K} K_{t} - w_{h,t}^{r} N_{h,t}^{r} - w_{l,t}^{r} N_{l,t}^{r} - \kappa_{h} v_{h,t} - \kappa_{l} v_{l,t} \right)
  \]

- Subject to CSC production technology and the LoM of employment:
  \[
  N_{i,t+1}^{r} = (1 - \rho_i) N_{i,t}^{r} + q_{i,t} v_{i,t}
  \]

- Job creation schedule
  \[
  \frac{\kappa_{i}}{q_{i,t}} = \beta \mathbb{E}_t \frac{\Lambda_{c}^{h,t+1}}{\Lambda_{c}^{h,t}} \left( p_{w}^{w} F_{i,t+1}^{n} - w_{i,t+1} + (1 - q_{i}) \frac{\kappa_{i}}{q_{i,t+1}} \right)
  \]

  - effective marginal cost
  - net revenue
  - continuation value
Bargaining

- **Match value for firms**
  \[
  J_{i,t} \equiv \frac{\partial V^f_{i,t}}{\partial N^r_{i,t}} = p^w_t F^m_{i,t} - w_i + (1 - \varphi_i) \beta^t \frac{\Lambda^c_{h,t+1}}{\Lambda^c_{h,t}} J_{i,t+1}
  \]

- **Match value for workers**
  \[
  V_{i,t} \equiv \frac{\Lambda^r_{i,t}}{\Lambda^c_{i,t}} = w_{i,t} - \phi_i + \beta^t \frac{\Lambda^c_{i,t+1}}{\Lambda^c_{i,t}} (1 - \varphi_i - f_{i,t}) V_{i,t+1}
  \]

- **Nash Bargaining**
  \[
  \max_{w^m_{i,t}} (1 - \psi_i) \ln (J_{i,t}) + \psi_i \ln (V_{i,t})
  \]
Bargaining

- Nash Bargaining Wage

\[ w_{i,t}^n = (1 - \psi_i) \left( p_i^w F_{i,t}^n + \kappa_i \theta_{i,t} \right) + \psi_i \phi_i \]

- Real wage rigidity

\[ w_{i,t} = (w_{i,t-1})^{\gamma_w} \left( w_{i,t}^n \right)^{1-\gamma_w} \]
Indifference Condition

The marginal emigrant faces the following arbitrage condition:

\[
\frac{f^* \Lambda^e_{i,t} - f_{i,t} \Lambda^r_{i,t}}{\Lambda_{i,t}} = \Lambda_{i,t} \left( \frac{\Gamma_i}{2} \left( \frac{\mu_{i,t} u_{i,t}}{\mu_{i,t-1} u_{i,t-1}} - 1 \right)^2 + \Gamma_i \left( \frac{\mu_{i,t} u_{i,t}}{\mu_{i,t-1} u_{i,t-1}} - 1 \right) \frac{\mu_{i,t} u_{i,t}}{\mu_{i,t-1} u_{i,t-1}} \right) + \beta E_t \Lambda_{i,t+1} \Gamma_i \left( \frac{\mu_{i,t+1} u_{i,t+1}}{\mu_{i,t} u_{i,t}} - 1 \right) \left( \frac{\mu_{i,t+1} u_{i,t+1}}{\mu_{i,t} u_{i,t}} \right)^2,
\]

Net gain from search abroad

Moving costs
First order conditions

- For high-skilled HHs:
  \[ \Lambda_{h,t}^c = (c_{h,t} - \chi c_{h,t-1})^{-1} \]
  \[ 1 = \mathbb{E}_t \beta \frac{Q_{t+1} \Lambda_{h,t+1}^c}{Q_t \Lambda_{h,t}^c} R_{t+1} \]
  \[ T_t^q = \mathbb{E}_t \beta \frac{\Lambda_{h,t+1}^c}{\Lambda_{h,t}^c} (r_{t+1} + T_{t+1}^q (1 - \delta)) \]
  \[ \frac{1}{T_t^q} = 1 - \Xi \left( \frac{i_t}{i_{t-1}} - 1 \right)^2 - \Xi \left( \frac{i_t}{i_{t-1}} - 1 \right)^2 \frac{i_t}{i_{t-1}} + \mathbb{E}_t \beta \frac{\Lambda_{h,t+1}^c}{\Lambda_{h,t}^c} \frac{T_{t+1}^q}{T_t^q} \Xi \left( \frac{i_{t+1}}{i_t} - 1 \right) \left( \frac{i_{t+1}}{i_t} \right)^2 \]

- Risk-sharing condition for low-skilled HHs:
  \[ \Lambda_{l,t}^c = \tilde{\Theta} \Lambda_{h,t}^c \]