Timo Baas (with Marjan Aikimbaeva)
University of Duisburg-Essen
Macroeconomic Stability and the Single European Labor Market

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University of Duisburg-Essen

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Motivation
- Macroeconomic Shocks and the Common Labor Market
- Previous Work

The model

Results
- Data
- Impulse Response Functions
- Historical Decomposition
Outline

1 Motivation
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   - Historical Decomposition
Labor Mobility

- Increased substantially after 2004
  - 3.2 (1.7) per cent of EU-citizens are mobile
  - 0.2 per cent are on the move every year
  - Dao et al. (2013)
    - 10 sacked workers: 1 unemployed, 6 inactive, 3 migrating

- Is significantly lower than in the US
  - 2 per cent of US-Americans on the move every year
  - Dao et al. (2013)
    - 10 sacked workers: 2 unemployed, 2 inactive, 6 migrating
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Lack of Mobility

- **Language**
  - 24 official languages
  - 5 semi-official languages
  - 7 main minority languages

- **Culture**
  - Historical Divisions
  - Law
  - Regions

- **Caveats**
  - Welfare systems
  - Education / Training
Lack of Mobility

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A Common Market

- 1957
  - Accept job-offers
  - Move freely

- 1999
  - EU-citizenship
  - Freedom of movement
  - Non-discrimination

- Today’s issues
  - Differences in social security systems
  - Taxation
  - Recognition of qualification
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More Heterogeneous Union

- 2004 Accession
  - Wages one third of EU-average
  - High youth unemployment

- 2007 Accession
  - Wages one fifth of EU-average
  - Minorities
Maroeconomic shocks

- Decision to move depends on economic conditions
- A two-step migration approach
- Migration as a shock absorber
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- Jerome (1926)
  - Cycle properties of European migration to the US
  - 19th and early 20th century
- Easterlin (1966), Kelley (1965), Gallaway et al. (1971)
  - Confirm the business cycle impact on migration
  - Destination country drives migration
- Borjas (2001)
  - Fixed migration costs
  - Regions are close substitutes
  - Two stage decision process
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Recent studies

- Barrett (2010)
  - Migrants are more respondent to shocks
  - Increase labor market flexibility

- Bertoli et al. (2013)
  - “Diversion” from Southern-Europe to Germany
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- Mandelman et al. (2014)
  - Migrants reduce business-cycle impact on natives
  - Border control increases the volatility of wages and unemployment
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Our contribution

- Two country, two sector DSGE model
  - Endogenous migration decision
  - Sticky prices (Calvo-type)
  - Migrant and native labor imperfect substitutable

- Bayesian estimation
  - Time-series of bilateral movement Poland-Germany
  - Mixed frequency approach
  - Estimate model parameters

- Address the response to macroeconomic shocks
  - Impact of technology, labor supply, preference and exchange rate shocks
  - Importance of shocks in home and foreign for migration
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Utility

\[
\max_{E_0} \sum_{t=0}^{\infty} \beta_t \ k_t \left\{ \ln \left[ (1 - \alpha) \frac{1}{\eta} \ c_{d,t}^{\frac{\eta-1}{\eta}} + \alpha \frac{1}{\eta} \ c_{f,t}^{\frac{\eta-1}{\eta}} \right]^{\frac{\eta}{\eta-1}} + \psi \ \omega_t \ \ln(1 - l_t) \right\}
\]

Varieties

\[
c_{d,t} = \left( \int_0^1 d_{d,t}(i) \frac{\varepsilon - 1}{\varepsilon} \ di \right) \frac{\varepsilon}{\varepsilon - 1} ; \ c_{f,t} = \left( \int_0^1 c_{f,t}(i) \frac{\varepsilon - 1}{\varepsilon} \ di \right) \frac{\varepsilon}{\varepsilon - 1}
\]

Budget constraint

\[
\int_0^1 \left[ p_{d,t}(i) c_{d,t}(i) + p_{f,t}(i) c_{f,t}(i) \right] \ di + k_{d,t+1} = w_t l_{d,t} + r_{d,t} k_{d,t} + (1 - \delta) k_{d,t}
\]
Utility

\[ \max_{\mathbb{E}_0} \sum_{t=0}^{\infty} \beta_t \kappa_t \left\{ \ln \left[ (1 - \alpha) \frac{1}{\eta} c_{d,t}^{\eta-1} + \alpha \frac{1}{\eta} c_{f,t}^{\eta-1} \right] + \psi \omega_t \ln(1 - l_t) \right\} \]

Varieties

\[ c_{d,t} = \left( \int_0^1 d_{d,t}(i) \frac{\epsilon - 1}{\epsilon} di \right)^{\frac{\epsilon}{\epsilon - 1}} \quad ; \quad c_{f,t} = \left( \int_0^1 c_{f,t}(i) \frac{\epsilon - 1}{\epsilon} di \right)^{\frac{\epsilon}{\epsilon - 1}} \]

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Households

- Utility

$$\max_{E_0} \sum_{t=0}^{\infty} \beta_t \ k_t \left\{ \ln \left[ (1 - \alpha)^{\frac{1}{\eta}} c_{d,t}^{\eta-1} + \alpha \frac{1}{\eta} c_{f,t}^{\eta-1} \right] \frac{\eta}{\eta-1} + \psi \ \omega_t \ \ln(1 - l_t) \right\}$$

- Varieties

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- Budget constraint

$$\int_0^1 \left[ p_{d,t}(i)c_{d,t}(i) + p_{f,t}(i)c_{f,t}(i) \right] di + k_{d,t+1} = w_t l_{d,t} + r_{d,t} k_{d,t} + (1 - \delta)k_{d,t}$$
Firms

- Production

\[ y_t = \left[ \alpha k_t^\phi + (1 - \alpha) L_t^\phi \right]^\frac{1}{\phi}, \]

- Labor

\[ L_t = \left\{ \gamma l_{d,t}^\theta + (1 - \gamma) l_{f,t}^\theta \right\}^{1/\theta} \]

- Labor demand

\[ \frac{l_t^*}{l_t} = \left( \frac{w_t}{e_t w_t^*} \right)^\theta \left( \frac{1 - \gamma}{\gamma} \right)^\theta. \]
Firms

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Price setting

\[ P_t^*(i) = \frac{\zeta}{(\zeta - 1)} \sum_{j=0}^{\infty} (\nu \beta)^j E_t(\lambda_{t+j} P_{t+j}^\varsigma Y_{t+j} \epsilon_{t+j}) \]

Philips curve

\[ \pi_t = \beta E_t \pi_{t+1} + \frac{(1 - \nu)(1 - \nu \beta)}{\nu} \hat{\epsilon}_t, \]
Calvo

- **Price setting**

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P_t^*(i) = \frac{\varsigma}{(\varsigma - 1)} \sum_{j=0}^{\infty} (\nu \beta)^j E_t(\lambda_{t+j} P_{t+j}^\varsigma Y_{t+j} \varepsilon_{t+j})
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\]
• Price setting

\[ P^*_t(i) = \frac{\zeta}{(\zeta - 1)} \frac{\sum_{j=0}^{\infty} (\nu \beta)^j E_t(\lambda_{t+j} P^\zeta_{t+j} Y_{t+j} \varepsilon_{t+j})}{\sum_{j=0}^{\infty} (\nu \beta)^j E_t(\lambda_{t+j} P^{\zeta-1}_{t+j} Y_{t+j})}. \]

• Philips curve

\[ \pi_t = \beta E_t \pi_{t+1} + \frac{(1 - \nu)(1 - \nu \beta)}{\nu} \hat{\varepsilon}_t, \]
Risk Sharing, Monetary policy, Shocks

- Risk sharing

\[ \beta \left( \frac{E_t \{ c_{t+1}^* \}}{c_t^*} \right)^{-\sigma} \left( \frac{\pi_t^* e_t^{-1}}{E_t \{ \pi_{t+1}^* e_{t+1}^{-1} \}} \right) = E_t \{ q_{t,t+1} \} \]

- Monetary policy

\[ \ln \left( \frac{R_t}{R} \right) = \rho_r \ln \left( \frac{R_{t-1}}{R} \right) + \rho_y \ln \left( \frac{Y_t}{Y} \right) + \rho_\pi \ln \left( \frac{\pi_t}{\pi} \right) + \varepsilon_{t_r} \]
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\]
Motivation

The model

Results

Summary

Shocks

- Labor supply
  \[ \omega_t = \rho_{\omega} \omega_{t-1} + \epsilon_{\omega,t}, \epsilon_{\omega,t} \sim N(0,1) \]

- Preference
  \[ \kappa_t = \rho_{\kappa} \kappa_{t-1} + \epsilon_{\kappa,t}, \epsilon_{\kappa,t} \sim N(0,1) \]

- Technology
  \[ z_t = \rho_z z_{t-1} + \epsilon_z,t, \epsilon_z,t \sim N(0,1) \]

- Exchange rate
  \[ \psi_t = \rho_\psi \psi_{t-1} + \epsilon_{\psi,t}, \epsilon_{\psi,t} \sim N(0,1) \]
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Data Sources

- German Statistical Office (DESTAT)
  - Bilateral migration flows (monthly)
- Federal Employment Agency
  - Employment (monthly)
- OECD
  - GDP (quarterly)
  - Private Consumption (quarterly)
  - Exchange rate (monthly)
  - Employed population Poland (quarterly)
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## Prior Distribution

<table>
<thead>
<tr>
<th>Description</th>
<th>Parameter</th>
<th>Prior Distributions</th>
<th>Mean</th>
<th>Std.Dev.</th>
<th>Posterior Distributions</th>
<th>Mean</th>
<th>Std.Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elasticity of Substitution</td>
<td>$\sigma$</td>
<td>Inv. Gamma</td>
<td>2.86</td>
<td>0.633</td>
<td>10.301</td>
<td>0.6330</td>
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</tr>
<tr>
<td>Share of Foreign Labor</td>
<td>$\gamma$</td>
<td>Normal</td>
<td>0.0263</td>
<td>0.01</td>
<td>0.26</td>
<td>0.01</td>
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</tr>
<tr>
<td>Tech.Shock (D)</td>
<td>$\rho_z$</td>
<td>Beta</td>
<td>0.75</td>
<td>0.10</td>
<td>0.9089</td>
<td>0.1</td>
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</tr>
<tr>
<td>Preference Shock (D)</td>
<td>$\rho_\kappa$</td>
<td>Beta</td>
<td>0.75</td>
<td>0.10</td>
<td>0.9354</td>
<td>0.1</td>
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</tr>
<tr>
<td>Labor Supply Shock (F)</td>
<td>$\rho_\mu$</td>
<td>Beta</td>
<td>0.75</td>
<td>0.10</td>
<td>0.8985</td>
<td>0.1</td>
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<tr>
<td>Tech.Shock (F)</td>
<td>$\rho_m$</td>
<td>Beta</td>
<td>0.75</td>
<td>0.10</td>
<td>0.9405</td>
<td>0.1</td>
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<tr>
<td>Preference Shock (F)</td>
<td>$\rho_\lambda$</td>
<td>Beta</td>
<td>0.75</td>
<td>0.10</td>
<td>0.8074</td>
<td>0.1</td>
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<tr>
<td>Tech.Shock (D)</td>
<td>$\epsilon_z$</td>
<td>Inv. Gamma</td>
<td>0.1</td>
<td>2</td>
<td>2.2725</td>
<td>2</td>
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<tr>
<td>Preference Shock (F)</td>
<td>$\epsilon_\kappa$</td>
<td>Inv. Gamma</td>
<td>0.1</td>
<td>2</td>
<td>4.70</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Labor Supply Shock (F)</td>
<td>$\epsilon_\mu$</td>
<td>Inv. Gamma</td>
<td>0.1</td>
<td>2</td>
<td>7.37</td>
<td>2</td>
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<tr>
<td>Tech.Shock (F)</td>
<td>$\epsilon_m$</td>
<td>Inv. Gamma</td>
<td>0.1</td>
<td>2</td>
<td>11.93</td>
<td>2</td>
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</tr>
<tr>
<td>Preference Shock (F)</td>
<td>$\epsilon_\lambda$</td>
<td>Inv. Gamma</td>
<td>0.1</td>
<td>2</td>
<td>2.281</td>
<td>2</td>
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</tr>
<tr>
<td>Calvo parameter (D)</td>
<td>$\eta_f$</td>
<td>Beta</td>
<td>0.75</td>
<td>0.10</td>
<td>0.7303</td>
<td>0.0112</td>
<td></td>
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<tr>
<td>Elast.of Subst.goods (F)</td>
<td>$\eta_f$</td>
<td>Gamma</td>
<td>2</td>
<td>0.75</td>
<td>2.64</td>
<td>0.05</td>
<td></td>
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<tr>
<td>Taylor rule output (D)</td>
<td>$\rho_y$</td>
<td>Normal</td>
<td>0.125</td>
<td>0.05</td>
<td>0.1093</td>
<td>0.0068</td>
<td></td>
</tr>
<tr>
<td>Taylor rule inflation (D)</td>
<td>$\rho_\pi$</td>
<td>Normal</td>
<td>1.5</td>
<td>0.125</td>
<td>1.41</td>
<td>0.0159</td>
<td></td>
</tr>
<tr>
<td>Taylor rule int.rate (D)</td>
<td>$\rho_r$</td>
<td>Beta</td>
<td>0.75</td>
<td>0.10</td>
<td>0.78</td>
<td>0.0191</td>
<td></td>
</tr>
<tr>
<td>Taylor rule output (F)</td>
<td>$\rho_{yf}$</td>
<td>Normal</td>
<td>0.125</td>
<td>0.05</td>
<td>0.1183</td>
<td>0.0155</td>
<td></td>
</tr>
<tr>
<td>Taylor rule inflation (F)</td>
<td>$\rho_{\pi f}$</td>
<td>Normal</td>
<td>1.5</td>
<td>0.125</td>
<td>1.517</td>
<td>0.0335</td>
<td></td>
</tr>
<tr>
<td>Taylor rule int.rate (F)</td>
<td>$\rho_{rf}$</td>
<td>Beta</td>
<td>0.32</td>
<td>0.10</td>
<td>0.2792</td>
<td>0.0204</td>
<td></td>
</tr>
</tbody>
</table>
### Variance Decomposition

<table>
<thead>
<tr>
<th>Obs. Variable</th>
<th>$\varepsilon_z$</th>
<th>$\varepsilon_m$</th>
<th>$\varepsilon_\omega$</th>
<th>$\varepsilon_d$</th>
<th>$\varepsilon_{df}$</th>
<th>$\varepsilon_{exr}$</th>
</tr>
</thead>
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<tr>
<td>Output (D)</td>
<td>8.70</td>
<td>2.84</td>
<td>0.73</td>
<td>72.83</td>
<td>13.95</td>
<td>0.95</td>
</tr>
<tr>
<td>Output (F)</td>
<td>0.15</td>
<td>41.53</td>
<td>0.03</td>
<td>3.26</td>
<td>44.77</td>
<td>10.26</td>
</tr>
<tr>
<td>Composite Labor (D)</td>
<td>1.98</td>
<td>1.24</td>
<td>4.45</td>
<td>87.15</td>
<td>4.55</td>
<td>0.62</td>
</tr>
<tr>
<td>Immigrants (D)</td>
<td>0.22</td>
<td>14.38</td>
<td>0.01</td>
<td>2.46</td>
<td>77.52</td>
<td>5.40</td>
</tr>
</tbody>
</table>

Variance decomposition for period 100
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Impulse Response Functions

- Technology shocks in home and foreign affect migration
- Weak impact of exchange rate shocks
- Weak and ambiguous impact of preference shocks in the destination
Impulse response functions to a positive technology shock in the domestic country with 5 to 95 per cent confidence intervals.

Notes: Each panel shows the response of the model variables to a technology shock of one. The horizontal axes measure time, expressed in months.
Impulse response functions to a positive technology shock in the foreign country with 5 to 95 per cent confidence intervals.

Notes: Each panel shows the response of the model variables to a technology shock of one. The horizontal axes measure time, expressed in months.
Preference Shock Home

Impulse response functions to a positive domestic preference shock in the domestic country with 5 to 95 per cent confidence intervals.

Notes: Each panel shows the response of the model variables to a technology shock of one. The horizontal axes measure time, expressed in months.
Exchange Rate Shock

Impulse response functions to a positive exchange-rate shock with 5 to 95 per cent confidence intervals.
Notes: Each panel shows the response of the model variables to a technology shock of one. The horizontal axes measure time, expressed in months.
Labor Supply Shock

Impulse response functions to a positive labor supply shock in the domestic country with 5 to 95 per cent confidence intervals.

Notes: Each panel shows the response of the model variables to a technology shock of one. The horizontal axes measure time, expressed in months.
Outline

1 Motivation
   - Macroeconomic Shocks and the Common Labor Market
   - Previous Work

2 The model

3 Results
   - Data
   - Impulse Response Functions
   - Historical Decomposition
Historical Decomposition

- Shocks can explain deviations in output for Germany and Poland
- Migration flows are predominantly determined by home country shocks
- Preference shocks and technology shocks outpace exchange rate shocks
Historical decomposition of output for Germany in the sample period 1/2006 to 12/2014.
Historical decomposition of output for Poland in the sample period 1/2006 to 12/2014.
Historical decomposition of the immigration time-series for Germany in the sample period 1/2006 to 12/2014.
Summary

- Migration flows are affected by the business cycle
- Shocks of the home country are more important than those of the destination
  - Preference and technology shocks
- This holds also true for other country pairs (UK - Poland)