How to design labor market policies for convergence:
A spatial agent-based analysis.

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Overview

• Introduction

• The model

• A policy experiment

• Conclusions
Research Questions

- When should labor markets of two differently developed regions be opened?

- In the presence of the complementarity between technology and skills to use the technology, how does technological progress influence the convergence or divergence of the growth of regions?
Motivation

- Political discussion about the advantages and disadvantages of the eastern enlargement of the EU for different countries, e.g. Germany and Poland, in particular with respect to labor market integration.

- This agent-based model provides testbed to analyze different scenarios of the opening of regional labor markets regarding growth, employment, and labor income.

- Generation and diffusion of innovations is one of the main factors influencing (local) economic growth (e.g. Maddison (1991), Freeman (1994)).
Motivation

In many cases the diffusion of innovations requires adequate skills of the workforce at the firms adopting the innovation (e.g. Basanini and Scarpetta (2002), Griffith et al. (2004)).


The Model: Market overview

- Consumption goods market
  - Households, firms (consumption goods producer, CGP).

- Labor market
  - Households, CGP.

- Investment goods market*
  - Investment goods producer, CGP.

- Credit market*
  - Bank, CGP.

- Public sector*
  - Government, Households, CGP, IGP, bank.

*(Dummy markets)
Key feature: Regional structure

- Key markets are semi regional:
  - Consumption goods market:
    - Firms can sell their goods in different regions at local outlet malls.
    - Households can only visit the closest mall.
  - Labor market:
    - Households can work for firms in different regions.
    - They have to bear commuting costs.
Key feature: Differentiated skill structure

- **General skills:**
  - Proxy for individual education.
  - Heterogeneous within and across regions.

- **Specific skills:**
  - Capabilities and experiences attained on the job.
  - Associated with technology used by the employer.

- **Workers increase specific skills over time**
  - Speed depends on general skill level $b_w^{gen}$ and quality of technology used by employer $A_{i,t}$.

\[
b_{w,t+1} = b_{w,t} + \kappa(b_w^{gen})(A_{it} - b_{w,t})
\]
Production of consumption goods

- The consumption good (homogeneous) is produced by using labor and capital as inputs.
  - Input factors are vertically differentiated.

- Impact of skills on the production process:
  - Complementarity between quality of investment goods and level of specific skills of workers.

\[ Q_{it} = \min\left[ A_{it}, B_{it} \right] L_{it}^{\alpha} K_{it}^{\beta}, \quad 0 < \alpha, \beta, \alpha + \beta = 1 \]

- \( A_{it} \): average quality of the investment goods employed by firm i. It is updated as old capital is replaced by new investments

- \( B_{it} \): average level of specific skills of employees of firm i.
Labor Market

- Firms post job vacancies based on planned output with specific skill depending wage offers.
- Searching workers send applications based on posted salaries.
- Firms rank applications based on general (specific) skills and make offers.
- Workers rank offers (wage - commuting costs), compare best offer to their reservation wage and accept/reject.
Consumption Goods Market

- Consumption goods producers offer (and store) goods at local market outlets (‘malls’).
- CGPs post a unique price for their good in all served malls.
- Households spend most of their (labor and capital) income for consumption.
- Purchasing decision is based on the posted prices (Logit model).
Parametrization the model

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<table>
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<tbody>
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<td>Regions</td>
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<td>Households</td>
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<td>Consumption goods producer</td>
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<td>Capital goods producer</td>
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<td>Malls</td>
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Regional Initialization

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<th>Variable</th>
<th>Region 1 Technological leader</th>
<th>Region 2 Technological laggard</th>
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<tr>
<td>Units capital</td>
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<td>Quality of technology</td>
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<td>1.1</td>
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<td>Specific skills</td>
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<td>1</td>
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<tr>
<td>Wage offer</td>
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Opened/closed labor markets: A simple policy experiment

- Starting point: Region 1 is the technological leader and region 2 the technological laggard

- Consumption and Investment goods markets are open

- Labor market: -> different scenarios
  1. Closed: Workers can only work in domestic region
  2. Open 0: Workers can work in both regions from beginning
  3. Open 1000: Workers can work in both regions after 1000 periods

- Which scenario is the best regarding growth, employment and labor income for the technological leader/laggard and overall?
Comparison of production at period 6000
(CLOSED vs. OPEN 0 vs. OPEN 1000)

Best for region 1: OPEN 0    BEST for region 2: CLOSED    Best for total: CLOSED
Comparison of production (CLOSED vs. OPEN 0)
Unemployment rates and prices (SCENARIO: CLOSED)

Unemployment rate region 1 = 0 → increase of wages in region 1 → increase of prices in region 1 higher than in region 2
Sales and capital stocks
(SCENARIO: CLOSED)

-> decrease growth rate of sales in region 1
-> increase of stocks in region 1
-> decrease of capital stocks in region 1
Technology and specific skills
(SCENARIO: CLOSED)

-> region 2 becomes technological leader
-> increase of specific skills in
region 2 is higher than in region 2
Output and unemployment rates
(SCENARIO: OPEN 0)

Unemployment rates > 0  ->  no pressure on wages  ->  no asymmetric price
increase  ->  no asymmetric sales decrease  ->  no asymmetric stock increase
Capital stocks and technology

(SCENARIO: OPEN 0)

→ no convergence of capital stocks  → convergence of technology
Specific skills and wages

(SCENARIO: OPEN 0)

-> convergence of specific skills  -> convergence of wages
Commuters

(SCENARIO: OPEN 0)

No convergence of output and capital stocks because of commuters
Summary

- The model provides first steps to analyze the local development in two technological different regions when labor markets are closed or opened at different point of times.

- The model takes explicitly the complementarity between technology and skills and the process of adoption of new technology into account.

- Different strategies of the opening of labor markets
  1. Asymmetric effects in regions
  2. Convergence, divergence, constant gap
  3. The question when labor markets should be opened can not be answered straight forward

- Outlook for policy design: variation of commuting cost, applying asymmetric fiscal policies, introducing subsidies in physical and human capital