Taking the Skill Bias out of Global Migration

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Joël Machado

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Goal of this paper
Goal of this paper

Global welfare assessment

of the skill bias in migration
Skill bias from non-OECD countries

Emigrants often positively selected on skills
Skill bias from non-OECD countries

Emigrants often positively selected on skills

Skill-bias in emigration:

% high-skilled among emigrants
% high-skilled in total population
Emigrants often positively selected on skills

Skill-bias in emigration:

\[
\frac{\% \text{ high-skilled among emigrants}}{\% \text{ high-skilled in total population}} > 1
\]
Skill bias from non-OECD countries

Skill-Bias in Emigration

Current Share of Emigrants

0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1

0 1 2 3 4 5 6 7 8 9 10 11

Skill-Bias in Emigration

Current Share of Emigrants

ALB, ARE, ARG, BGR, BLZ, BOL, CUB, DOM, ECU, FJI, GAB, HKG, HND, HRV, IRN, JAM, KAZ, KGZ, LAO, LTU, MAR, MEX, MLT, MUS, ROU, RUS, SRB, THA, TTO, UKR, URY, Venezuella, VNM
Skill bias from selected countries

Skill-Bias in Emigration

Current Share of Emigrants
Skill bias in South Africa: bilateral corridors
Welfare assessment of skill-biased migration

Popular opinion: brain drain, detrimental for sending countries

Supporting research:

Drastic policy proposals: restrictions, taxes
Maybe not all that bad?

**Brain gain**: Remittances, education, technology diffusion,…


And: what about the **receiving countries**?
"Inverse" brain drain in the OECD

% high-skilled among immigrants in current world
% high-skilled among immigrants, world without skill-bias
"Inverse" brain drain in the OECD

% high-skilled among immigrants in current world
% high-skilled among immigrants, world without skill-bias
This paper

A global welfare assessment of skill-biased migration

Impact on

- welfare in the sending countries:
- welfare in the receiving countries:
This paper

A global welfare assessment of skill-biased migration

Impact on
- welfare in the sending countries:
- welfare in the receiving countries:

Global welfare gains?
This paper

A global welfare assessment of skill-biased migration

Impact on

- welfare in the sending countries: variable
- welfare in the receiving countries: GAINS

Global welfare gains?
This paper

A global welfare assessment of skill-biased migration

Impact on

- welfare in the sending countries: variable
- welfare in the receiving countries: GAINS

Global welfare gains? YES!
Global efficiency gains - really?

Allocation of talent:
- Productive workers
- Productive countries

Additional mechanisms:
- Trade
- Remittances

Depends on counterfactual!
Global efficiency gains - really?

*Allocation of talent:* productive *workers* - productive *countries*
Global efficiency gains - really?

Allocation of talent: productive workers - productive countries

Additional mechanisms

- Trade
- Remittances
- ...
Global efficiency gains - really?

Allocation of talent: productive workers - productive countries

Additional mechanisms
- Trade
- Remittances
- ...

Depends on counterfactual!
Roadmap

Counterfactual

Sketch of the model

Baseline simulation results

The most plausible scenario: adding "migration-driven externalities"
Counterfactual: a world without skill bias
Counterfactual: a world without skill bias

Leave bilateral migration stocks constant
Counterfactual: a world without skill bias

Leave bilateral migration stocks constant

Migrants neutrally selected from their home countries
Counterfactual: a world without skill bias

Leave bilateral migration stocks constant

Migrants neutrally selected from their home countries

Migrants: same skill distribution as the total population
No migration

Example: Senegalese migrants

<table>
<thead>
<tr>
<th>Senegal</th>
<th>France</th>
</tr>
</thead>
<tbody>
<tr>
<td>high</td>
<td>low</td>
</tr>
<tr>
<td>non-migrants</td>
<td>migrants</td>
</tr>
</tbody>
</table>
Baseline: Skill-biased migration

Example: Senegalese migrants

Senegal

France

non-migrants

migrants
No migration

Example: Senegalese migrants

Senegal

<table>
<thead>
<tr>
<th>high</th>
<th>low</th>
</tr>
</thead>
</table>

France

non-migrants

migrants
Counterfactual: no skill-bias

Example: Senegalese migrants

Senegal

France

non-migrants

migrants

high

low
Baseline

Example: Senegalese migrants

Senegal

France

non-migrants

migrants
Counterfactual: South Africa
Counterfactual: South Africa

Skill-Bias in Emigration

Emigrant Stock (in Logs)
Research design

146 countries (34 OECD, 111 non-OECD, ROW) - only South-North, North-North migration

Multi-country general equilibrium model (Krugman, 1980)
Research design

146 countries (34 OECD, 111 non-OECD, ROW) - only South-North, North-North migration

Multi-country general equilibrium model (Krugman, 1980)

Calibrate to the world in 2010

Simulate counterfactual world without skill-bias in migration
The model - basic features

Labor markets:

Production:

Consumers:

Trade:
The model - basic features

Labor markets:
- competitive (3 skill groups)
- migrants and non-migrants imperfect substitutes

Production:

Consumers:

Trade:
The model - basic features

**Labor markets:**
- competitive (3 skill groups)
- migrants and non-migrants imperfect substitutes

**Production:** occurs in 2 sectors
- Traditional $T$:
- Manufacturing: tradables $X$, non-tradables $Y$

**Consumers:**

**Trade:**
The model - basic features

**Labor markets:**
- competitive (3 skill groups)
- migrants and non-migrants imperfect substitutes

**Production:** occurs in 2 sectors
- Traditional $T$: perfect competition
- Manufacturing: tradables $X$, non-tradables $Y$
  - Monopolistic competition (Krugman 1980)
  - Homogeneous firms
  - Free entry subject to sunk cost $f_y, f_x$

**Consumers:**

**Trade:**
The model - basic features

Labor markets:
► competitive (3 skill groups)
► migrants and non-migrants imperfect substitutes

Production: occurs in 2 sectors
► Traditional $T$: perfect competition
► Manufacturing: tradables $X$, non-tradables $Y$

Consumers: have non-homothetic preferences over $T,(X,Y)$

Trade:
The model - basic features

Labor markets:
- competitive (3 skill groups)
- migrants and non-migrants imperfect substitutes

Production: occurs in 2 sectors
- Traditional $T$: perfect competition
- Manufacturing: tradables $X$, non-tradables $Y$

Consumers: have non-homothetic preferences over $T,(X,Y)$

Trade: Iceberg trade costs $\tau_{i,j} > 1$
Impact on welfare (receiving country)

Replace low-skilled with high-skilled migrants: $\Delta H^M = -\Delta L^M$

Market size effect

Trade

Nominal wages
Impact on welfare (receiving country)

Replace low-skilled with high-skilled migrants: $\Delta H^M = -\Delta L^M$

Market size effect
- Workforce becomes more efficient
- More varieties are being produced
- Aggregate prices decrease, real income increases

Trade

Nominal wages
Impact on welfare (receiving country)

Replace low-skilled with high-skilled migrants: \( \Delta H^M = -\Delta L^M \)

Market size effect

Trade
  - "dilutes" the market size effect

Nominal wages
Impact on welfare (receiving country)

Replace low-skilled with high-skilled migrants: \( \Delta H^M = -\Delta L^M \)

Market size effect

Trade

Nominal wages
  - Some workers gain, some lose
Data Sources

Migration and population: 2010 DIOC database

GDP, trade, fixed costs: WDI, UN Comtrade database, OECD TiVA, World Bank Ease-of-Doing-Business

Wage ratio: Education at Glance report 2010, Wageindicator Foundation
# Calibration

1) & 2) Values from previous lit + match moments

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Source</th>
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<tbody>
<tr>
<td>( \beta )</td>
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<tr>
<td>( \beta^T )</td>
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<td>( \varepsilon )</td>
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<td>Simonovska (2014)</td>
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<td>( \sigma_s )</td>
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<td>Docquier, Özden &amp; Peri (2013)</td>
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<td>( \sigma_n )</td>
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### Worker efficiency parameters

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<th>Value</th>
<th>Source</th>
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<td>calibrated to match OECD average</td>
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<td>calibrated from FOC of cost minimization</td>
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<td>( a_{iH} )</td>
<td>0.24-0.60</td>
<td>calibrated from FOC of cost minimization</td>
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3) Find GDP pc and trade costs: iterative procedure

Appendix: extensive sensitivity checks
Calibration

1) & 2) Values from previous lit + match moments

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<thead>
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Worker efficiency parameters

| $a_{i}^{F}$ | 0.478 | calibrated to match OECD average                   |
| $a_{i}^{L}$ | 0.12-0.40 | calibrated from FOC of cost minimization          |
| $a_{i}^{H}$ | 0.24-0.60 | calibrated from FOC of cost minimization          |

3) Find GDP pc and trade costs: iterative procedure

Appendix: extensive sensitivity checks
Welfare gains/losses from skill-bias

\[ \frac{\Delta U}{U} = \frac{U_{\text{baseline}} - U_{\text{counterfactual}}}{U_{\text{counterfactual}}} \]
Welfare effects - non-OECD countries

Change in welfare in %

Haiti  Jamaica  Albania  Morocco  El Salvador  Zimbabwe  Senegal  Uruguay  Moldova  Tunisia  Philippines  Zambia  Colombia  Romania  Vietnam  India  Bangladesh  Brazil  China  Mexico  Ukraine  Chile  Bulgaria

SOUTH AFRICA  CHINA  INDIA  BRAZIL  MOZAMBIQUE  GHANA  SOUTH AFRICA  CHINA  INDIA  BRAZIL  MOZAMBIQUE  GHANA  Senegal  Tunisia  Philippines  Zambia  Colombia  Romania  Vietnam  India  Bangladesh  Brazil  China  Mexico  Ukraine  Chile  Bulgaria
Welfare, whose welfare?

Problem: base population changes!
Welfare, whose welfare?

Problem: base population changes!

Effect a mixture of "treatment" and "composition" effect

- Treatment effect: on non-migrants
- Composition effect: on migrants
Welfare, whose welfare?

Problem: base population changes!

Effect a mixture of "treatment" and "composition" effect

- Treatment effect: on non-migrants
- Composition effect: on migrants

Solution: welfare per never-migrant
Welfare effects - selected sending countries

Change in welfare in %

Haiti
Jamaica
Albania
Morocco
El Salvador
Zimbabwe
Senegal
Uruguay
Moldova
Tunisia
Philippines
Zambia
Colombia
Romania
Vietnam
Senegal
Ghana
South Africa
China
India
Brazil
Mexico
Ukraine
Chile
Bulgaria

- Welfare per never-migrant
- Welfare per capita
Welfare effects - OECD countries

Change in welfare in %

Iceland
Germany
Estonia
Italy
FINLAND
CANADA
UNITED STATES
Austria
Belgium
Slovenia
Denmark
Spain
Greece
France
Portugal
Norway
Sweden
Netherlands
New Zealand
Ireland
United Kingdom
Switzerland
UNITED STATES
Australia
Luxembourg
Israel
FINLAND
CANADA
UNITED STATES
Welfare per never-migrant
Welfare per capita
How important in sending countries?
How important in sending countries?

- Welfare effect of skill bias
- Welfare effect - current migration vs zero migration
How important in receiving countries?

Change in welfare in %

Iceland
german
Estonia
Italy
Austria
Belgium
Slovenia
Denmark
Spain
Greece
France
Portugal
Norway
Sweden
Netherlands
New Zealand
Ireland
United Kingdom
Switzerland
United States
Australia
Luxembourg
Israel

- Welfare effect of skill bias
- Welfare effect - current migration vs zero migration
How important globally?

- Change in welfare in %
  - WORLD
  - OECD
  - NON-OECD

- Welfare effect - current migration vs zero migration
- Welfare effect of skill bias
Distributional effects

Global

Change in real wages in %

WORLD
OECD
NON-OECD

Real wages low-skilled non-migrants
Real wages medium-skilled non-migrants
Real wages high-skilled non-migrants
Further extensions

Why positive for low-skilled?
Remittances
Brain gain effect
TFP externality (Lucas, 1988)
Migrant networks and trade
Downskilling
Most plausible scenario

<table>
<thead>
<tr>
<th>Externality</th>
<th>Parameter</th>
<th>Minimalist</th>
<th>Intermediate</th>
<th>Maximalist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remittances</td>
<td>$\gamma$</td>
<td>0</td>
<td>0.5</td>
<td>1</td>
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<tr>
<td>Brain gain</td>
<td>$\sigma_b$</td>
<td>0.01</td>
<td>0.02</td>
<td>0.05</td>
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<tr>
<td>TFP</td>
<td>$\sigma_a$</td>
<td>0.1</td>
<td>0.3</td>
<td>0.5</td>
</tr>
<tr>
<td>Network effects</td>
<td>$\sigma_t$</td>
<td>0</td>
<td>-0.02</td>
<td>-0.04</td>
</tr>
<tr>
<td>Downskilling</td>
<td>-</td>
<td>yes</td>
<td>no</td>
<td>no</td>
</tr>
</tbody>
</table>
Most plausible scenario

Sending countries

Welfare effect - baseline
Welfare effect with all extensions - minimalist
Welfare effect with all extensions - intermediate
Welfare effect with all extensions - maximalist
Most plausible scenario

Global

Change in welfare in %

-0.5

0

0.5

1

WORLD

OECD

NON-OECD

- Welfare effect - baseline
- Welfare effect with all extensions - minimalist
- Welfare effect with all extensions - intermediate
- Welfare effect with all extensions - maximalist
Sensitivity and other checks

To all parameters
To nested CES technology
Selection as Canada
Conclusion

Skill-biased migration brings global efficiency gains

But important distributional consequences:

- Positive effects in the receiving countries
- Losses in many sending countries
Thank you!

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The model - (links to) equations

- Labor market
- Consumer’s problem
- Firms
- Trade
- Remittances
Competitive labor markets

Traditional sector: low-skilled only

\[ Q^T_i = A^T_i L^T_i \]

Tradables/non-tradables

3 skill levels: low-, medium, and high-skilled

\[ Q^M_i = A^M_i \left[ \alpha^L_i (L_i) \frac{\sigma_{s-1}}{\sigma_s} + (1 - \alpha^L_i - \alpha^H_i) (M_i) \frac{\sigma_{s-1}}{\sigma_s} + \alpha^H_i (H_i) \frac{\sigma_{s-1}}{\sigma_s} \right] \frac{\sigma_s}{\sigma_{s-1}} \]
Competitive labor markets

Traditional sector: low-skilled only

\[ Q^T_i = A^T_i L^T_i \]

Tradables/non-tradables

3 skill levels: low-, medium, and high-skilled

\[ Q^M_i = A^M_i \left[ \alpha^L_i (L_i) \frac{\sigma_{s-1}}{\sigma_s} + (1 - \alpha^L_i - \alpha^H_i)(M_i) \frac{\sigma_{s-1}}{\sigma_s} + \alpha^H_i (H_i) \frac{\sigma_{s-1}}{\sigma_s} \right] \frac{\sigma_s}{\sigma_{s-1}} \]

Immigrants and natives imperfect substitutes. Example for high skilled:

\[ H_i = \left[ (1 - \alpha^F_i)(H_i^N) \frac{\sigma_{n-1}}{\sigma_n} + \alpha^F_i (H_i^F) \frac{\sigma_{n-1}}{\sigma_n} \right] \frac{\sigma_n}{\sigma_{n-1}}. \]
Wages:

\[ W_i = \left[ \left( \alpha_i^L \right)^{\sigma_s} (W_i^L)^{1-\sigma_s} + \left( 1 - \alpha_i^L - \alpha_i^H \right)^{\sigma_s} (W_i^M)^{1-\sigma_s} + \left( \alpha_i^H \right)^{\sigma_s} (W_i^H)^{1-\sigma_s} \right]^\frac{1}{1-\sigma_s}. \]
Consumer’s problem

Non-homothetic preferences

$$\max_{\{T_i, x_{ij}(k), y_i(k)\}} \beta^T (T_i)^\mu + (1 - \beta^T) \left[ (1 - \beta) (Y_i)^{\frac{\theta - 1}{\theta}} + \beta (X_i)^{\frac{\theta - 1}{\theta}} \right]^{\frac{\theta}{\theta - 1}}$$

subject to: $T_i + P_i^Y Y_i + P_i^X X_i = w_i,$

$$X_i = \left[ \sum_{j=1}^J \int_0^{N_j^X} (x_{ij}(k)) \frac{\epsilon - 1}{\epsilon} \, dk \right]^{\frac{\epsilon}{\epsilon - 1}}, \quad Y_i = \left[ \int_0^{N_i^Y} (y_i(k)) \frac{\epsilon - 1}{\epsilon} \, dk \right]^{\frac{\epsilon}{\epsilon - 1}}.$$
Indirect utility and price indices

\[ U_i = \beta^T \left( \frac{\beta^T \mu}{1 - \beta^T P_i} \right)^\frac{\mu}{1-\mu} + (1 - \beta^T) \frac{w_i - T_i}{P_i} \]

where \( P_i \) is the ideal price index in country \( i \),

\[ P_i = \left[ (1 - \beta)^\theta (P_i^Y)^{1-\theta} + \beta^\theta (P_i^X)^{1-\theta} \right]^{\frac{1}{1-\theta}}, \]

with: \( P_i^X = \left[ \sum_{j=1}^{J} \int_{0}^{N_j^X} (p_{ij}(k))^{1-\epsilon} dk \right] \frac{1}{1-\epsilon} \),

and \( P_i^Y = \left[ \int_{0}^{N_i^Y} (p_i(k))^{1-\epsilon} dk \right] \frac{1}{1-\epsilon} \).
Positive for low skilled - really?

Global

![Graph showing change in real wages in % for different scenarios across WORLD, OECD, and NON-OECD regions.](image-url)

- **Real wages - baseline**
- **Real wages - current vs zero migration**
- **Real wages - current vs zero migration, no market size, perfect substitutability**
Extension: change nr of high-skilled migrants only

Idea: **reduce number of high-skilled migrants** only

..until the **skill-bias** is eliminated

**Advantage:** consistent with policy

**Problem:** Change scale and selectivity
Extension: change nr of high-skilled migrants only
Extension: remittances

So far: every migrant *remits a fixed amount*, hence skill-biased migration leaves remittances unaffected.
Extension: remittances

So far: every migrant *remits a fixed amount*, hence skill-biased migration leaves remittances unaffected.

Three cases:

- Every migrant remits a fixed amount (minimalist)
- Every migrant remits a *fixed share* of his/her *income* (maximalist)
- Combination of the two cases (intermediate)

Remittances are paid as a *lump-sum transfer* to non-migrants at origin
Extension: remittances

Non-OECD countries

- Change in welfare in %
  - Haiti
  - Jamaica
  - Albania
  - Morocco
  - El Salvador
  - Zimbabwe
  - Ghana
  - Senegal
  - Uruguay
  - Moldova
  - Tunisia
  - Philippines
  - Zambia
  - Colombia
  - Romania
  - Vietnam
  - India
  - Bangladesh
  - Brazil
  - China
  - Mexico
  - Ukraine
  - Chile
  - Bulgaria

- Welfare effect - baseline
- Welfare effect with remittances - minimalist
- Welfare effect with remittances - intermediate
- Welfare effect with remittances - maximalist
Extension: remittances

OECD countries

Change in welfare in %

- - - - Welfare effect - baseline
- - - - Welfare effect with remittances - minimalist
- - - - Welfare effect with remittances - intermediate
- - - - Welfare effect with remittances - maximalist
Extension: Brain gain effect

Idea: migration creates incentives to invest in education


\[ \widehat{sh}_S = sh_S \left( 1 + \sigma_b \frac{\widehat{sh}_E - sh_E}{sh_E} \right) \]
Extension: Brain gain effect

Non-OECD countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Change in welfare in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haiti</td>
<td>-6</td>
</tr>
<tr>
<td>Jamaica</td>
<td>-4</td>
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<td>Albania</td>
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Welfare effect - baseline
Welfare effect with brain gain - minimalist
Welfare effect with brain gain - intermediate
Welfare effect with brain gain - maximalist
Extension: Brain gain effect

OECD countries

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<tr>
<th>Country</th>
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<td>Austria</td>
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<td>2.6</td>
</tr>
<tr>
<td>Portugal</td>
<td>2.8</td>
</tr>
<tr>
<td>Norway</td>
<td>3.0</td>
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<tr>
<td>Sweden</td>
<td>3.2</td>
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<tr>
<td>Netherlands</td>
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<tr>
<td>New Zealand</td>
<td>3.6</td>
</tr>
<tr>
<td>Ireland</td>
<td>3.8</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>4.0</td>
</tr>
<tr>
<td>Switzerland</td>
<td>4.2</td>
</tr>
</tbody>
</table>

- Welfare effect - baseline
- Welfare effect with brain gain - minimalist
- Welfare effect with brain gain - intermediate
- Welfare effect with brain gain - maximalist
Extension: Brain gain effect

<table>
<thead>
<tr>
<th></th>
<th>WORLD</th>
<th>OECD</th>
<th>NON-OECD</th>
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</thead>
<tbody>
<tr>
<td>Welfare effect</td>
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<td>with brain</td>
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<td>gain - baseline</td>
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<td>maximalist</td>
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</tbody>
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TFP Externalities

Idea: TFP increases in the average level of human capital

Theory: Lucas (1988)

\[ A_i = a_i \left( \frac{H_i}{H_i + M_i + L_i} \right)^{\sigma_a}, \]
TFP Externalities

Non-OECD countries

Welfare effect - baseline
- Welfare effect with Lucas externality on TFP - minimalist
- Welfare effect with Lucas externality on TFP - intermediate
- Welfare effect with Lucas externality on TFP - maximalist
TFP Externalities

OECD countries

Change in welfare in %

Iceland, Germany, Estonia, Italy, Finland, Canada, United States, Austria, Belgium, Slovenia, Denmark, Spain, Greece, France, Portugal, Norway, Sweden, Netherlands, New Zealand, Ireland, United Kingdom, Switzerland, Australia, Luxembourg, Israel, Canada

Welfare effect - baseline
Welfare effect with Lucas externality on TFP - minimalist
Welfare effect with Lucas externality on TFP - intermediate
Welfare effect with Lucas externality on TFP - maximalist
TFP Externalities

Change in welfare in %

WORLD
OECD
NON-OECD

Welfare effect - baseline
Welfare effect with Lucas externality on TFP - minimalist
Welfare effect with Lucas externality on TFP - intermediate
Welfare effect with Lucas externality on TFP - maximalist
Extension: Network effects in trade

Immigrants foster trade with their home countries by reducing trade costs and demanding home-country-specific goods. Trade costs now:

\[ \tau_{ij} = \bar{\tau}_{ij} \left( \frac{H_{ij}}{H_{ij} + M_{ij} + L_{ij}} \right)^{\sigma_t} \]
Extension: networks

Non-OECD countries

- Change in welfare in %

- Welfare effect - baseline
- Welfare effect - intermediate
- Welfare effect - maximalist
Extension: networks

OECD countries

Change in welfare in %

Iceland  Germany  Estonia  Italy  Austria  Belgium  Slovenia  Denmark  Spain  Greece  France  Portugal  Norway  Sweden  Netherlands  New Zealand  Ireland  United Kingdom  Switzerland  United States  Australia  Luxembourg  Israel  Canada

Welfare effect - baseline
Welfare effect - intermediate
Welfare effect - maximalist
**Extension: networks**

**Global**

- **Change in welfare in %**
  - **WORLD**
  - **OECD**
  - **NON-OECD**

- **Welfare effect**
  - Baseline
  - Intermediate
  - Maximalist

The graph shows the change in welfare in % for different regions (WORLD, OECD, NON-OECD) under different welfare effect scenarios (baseline, intermediate, maximalist).
Downskilling

Idea: not all high-skilled immigrants work in high-skilled jobs

We re-calculate the share of high-skilled based on occupational distributions
Downskilling

OECD countries

Change in welfare in %

Iceland
Germany
Estonia
Italy
FINLAND
CANADA
UNITED STATES
Austria
Belgium
Slovenia
Denmark
Spain
Greece
France
Portugal
Norway
Sweden
Netherlands
New Zealand
Ireland
United Kingdom
Switzerland
Australia
Luxembourg
Israel
FINLAND
UNITED STATES

--- Welfare effect - baseline
--- Welfare effect - downskilling
Downskilling

Change in welfare in %

- World
  - Welfare effect - baseline
  - Welfare effect - downskilling

OECD

NON-OECD

Welfare effect - baseline
Welfare effect - downskilling
A nested CES

Change in welfare in %

-4 -2 0 .2 .4 .6

WORLD OECD NON-OECD

Welfare effect - baseline
Welfare effect with a three-level CES

- .4 -.2 0 .2 .4 .6

WORLD OECD NON-OECD

Welfare effect - baseline
Welfare effect with a three-level CES
Sensitivity checks

(a) Varying $\varepsilon$

(b) Varying $\theta$

(c) Varying $\sigma_x$

(d) Varying $\sigma_n$

(e) Varying $\mu$

(f) Varying $\beta$
All OECD as selective as Canada

Change in welfare in %

WORLD
OECD
NON-OECD

Welfare effect - baseline
Welfare effect - same selection as Canada
Competitive labor markets

Traditional sector: low-skilled only

\[ Q^T_i = A^T_i L^T_i \]

Tradables/non-tradables

3 skill levels: low-, medium, and high-skilled

\[ Q^M_i = A^M_i \left[ \alpha_i^L (L_i) \frac{\sigma_{s-1}}{\sigma_s} + (1 - \alpha_i^L - \alpha_i^H) (M_i) \frac{\sigma_{s-1}}{\sigma_s} + \alpha_i^H (H_i) \frac{\sigma_{s-1}}{\sigma_s} \right]^{\frac{\sigma_s}{\sigma_{s-1}}} \]
Competitive labor markets

Traditional sector: low-skilled only

\[ Q_i^T = A_i^T L_i^T \]

Tradables/non-tradables

3 skill levels: low-, medium, and high-skilled

\[ Q_i^M = A_i^M \left[ \alpha_i^L (L_i) \frac{\sigma_s - 1}{\sigma_s} + (1 - \alpha_i^L - \alpha_i^H) (M_i) \frac{\sigma_s - 1}{\sigma_s} + \alpha_i^H (H_i) \frac{\sigma_s - 1}{\sigma_s} \right] \frac{\sigma_s}{\sigma_s - 1} \]

Immigrants and natives imperfect substitutes. Example for high skilled:

\[ H_i = \left[ (1 - \alpha_i^F) (H_i^N) \frac{\sigma_n - 1}{\sigma_n} + \alpha_i^F (H_i^F) \frac{\sigma_n - 1}{\sigma_n} \right] \frac{\sigma_n}{\sigma_n - 1}. \]
Wages:

\[ W_i = \left[ (\alpha_i^L)^{\sigma_s} (W_i^L)^{1-\sigma_s} + (1 - \alpha_i^L - \alpha_i^H)^{\sigma_s} (W_i^M)^{1-\sigma_s} + (\alpha_i^H)^{\sigma_s} (W_i^H)^{1-\sigma_s} \right] \frac{1}{1-\sigma_s}. \]
Consumer’s problem

Non-homothetic preferences

\[
\max_{\{T_i, x_{ij}(k), y_i(k)\}} \beta^T (T_i)^\mu + (1 - \beta^T) \left[ (1 - \beta)(Y_i)^{\frac{\theta-1}{\theta}} + \beta(X_i)^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\theta-1}}
\]

subject to: \( T_i + P_i^Y Y_i + P_i^X X_i = w_i, \)

\[
X_i = \left[ \sum_{j=1}^{J} \int_0^{N_j^X} (x_{ij}(k)) \frac{\epsilon-1}{\epsilon} \, dk \right]^{\frac{\epsilon}{\epsilon-1}}, \quad Y_i = \left[ \int_0^{N_i^Y} (y_i(k)) \frac{\epsilon-1}{\epsilon} \, dk \right]^{\frac{\epsilon}{\epsilon-1}}.
\]
Indirect utility and price indices

\[
U_i = \beta^T \left( \frac{\beta^T \mu}{1 - \beta^T} P_i \right)^{\frac{\mu}{1 - \mu}} + (1 - \beta^T) \frac{w_i - T_i}{P_i}.
\]

where \( P_i \) is the ideal price index in country \( i \),

\[
P_i = \left[ (1 - \beta)^{\theta} (P_i^Y)^{1-\theta} + \beta^{\theta} (P_i^X)^{1-\theta} \right]^{\frac{1}{1-\theta}},
\]

with: 

\[
P_i^X = \left[ \sum_{j=1}^{J} \int_0^{N_j^X} (p_{ij}(k))^{1-\epsilon} dk \right]^{\frac{1}{1-\epsilon}},
\]

and 

\[
P_i^Y = \left[ \int_0^{N_i^Y} (p_i(k))^{1-\epsilon} dk \right]^{\frac{1}{1-\epsilon}}.
\]
Firms and market structure

Tradable/Non-tradable sector

- Monopolistic competition
- Differentiated goods
- Homogeneous firms
- Free entry
- Firms incur sunk cost of entry $f_X, f_Y$

Mark-up pricing

$$p_i(k) = p_i = \frac{\epsilon}{\epsilon - 1} c_i,$$
Market size

Share of $X$ and $Y$ in GDP

$$sh_i^X \equiv \frac{P_i^X X_i}{GDP_i^X + GDP_i^Y} = \beta^\theta \left( \frac{P_i^X}{P_i} \right)^{1-\theta}, \text{ and } sh_i^Y = (1-\beta)^\theta \left( \frac{P_i^Y}{P_i} \right)^{1-\theta}.$$ 

Resource constraints:

$$sh_i^X A_i^M L_i^M = \frac{\epsilon}{\epsilon - 1} N_i^X x_i, \quad sh_i^Y A_i^M L_i^M = \frac{\epsilon}{\epsilon - 1} N_i^Y y_i.$$ 

Zero profit: $p_i x_i = \epsilon W_i f_i^X$ and $p_i y_i = \epsilon W_i f_i^Y$ 

Nr of units produced per firm

$$x_i = A_i^M f_i^X (\epsilon - 1), \quad y_i = A_i^M f_i^Y (\epsilon - 1).$$
Market size

\[ N_i^X = \frac{sh_i^X L_i^M}{\epsilon f_i^X}, \quad N_i^Y = \frac{sh_i^Y L_i^M}{\epsilon f_i^Y}, \]
Iceberg trade costs $\tau_{ji} > 1$. Trade costs are asymmetric, $\tau_{ji} \neq \tau_{ij}$.

$Trade_{ji}$ is given by

$$Trade_{ji} = \int_{k \in N_i^X} x_{ji} p_{ji} dk = N_i^X GDP_j^X \left[ \frac{P_j^X}{\tau_{ji} p_i} \right]^{\epsilon-1}.$$ 

Share of exports as a total share of production in sector $X$ as

$$\frac{Trade_{ji}}{GDP_i^X} = \frac{GDP_j^X \left( P_j^X / \tau_{ji} \right)^{\epsilon-1}}{\sum_{h=1}^{J} GDP_h^X \left( P_h^X / \tau_{hi} \right)^{\epsilon-1}}.$$
Remittances

- Every migrant remits a **fixed amount**
- Distributed as lump-sum in sending country
Remittances

- Every migrant remits a **fixed amount**
- Distributed as lump-sum in sending country

**Extensions:**

- Every migrant remits a **fixed share** of income
- High-skilled remit a higher share
- Low-skilled remit a higher share
Extension: selection vs. scale
Extension: selection vs. scale

Non-OECD countries

Welfare effect of skill bias

- Welfare effect - current migration vs zero migration
Extension: selection vs. scale

OECD countries

Change in welfare in %

Iceland Germany Estonia Italy Austria Belgium Slovenia Denmark Spain Greece France Portugal Norway Sweden Netherlands New Zealand Ireland United Kingdom Switzerland United States Australia Luxembourg Israel

Welfare effect of skill bias
Welfare effect - current migration vs zero migration
Extension: The role of trade
Extension: The role of trade

Non-OECD countries

![Graph showing change in welfare in % for various countries. The x-axis represents different countries, and the y-axis shows change in welfare in %. The graph includes lines representing welfare effect with trade and welfare effect without trade.]
Extension: The role of trade

OECD countries

Change in welfare in %

- Iceland
- Germany
- Estonia
- Italy
- Austria
- Belgium
- Slovenia
- Denmark
- Spain
- Greece
- France
- Portugal
- Norway
- Sweden
- Netherlands
- New Zealand
- Ireland
- United Kingdom
- Switzerland
- United States
- Australia
- Luxembourg
- Israel
- Finland
- Canada
- United States

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Welfare effect with trade

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Welfare effect without trade
Welfare per never-migrant

A. Skill-biased emigration

B. Skill-neutral emigration

- Share of stayers
- Same in both cases
- Skill level: high, low