Income disparities, population and migration flows over the 21st century

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February, 2015
Research question

- Provide integrated worldwide projections of...
  - Population
  - Educational attainment
  - International migration
  - Income distribution

- Over the 21st century

- Forecasts?
  - No: foreseeable factors governing the future?
  - With a special focus on int’l migration!
Research question

Methodology:

- Integrated projections are needed!
  - Migration flows are governed by the relative size, income and education levels of countries
  - Income, education and population growth are endogenous...

- Quantitative theory
  - Stylized model of the world economy (unit = country)
  - Accounts for interdependencies between the main economic and socio-demographic variables
  - Calibration on the year 2000 & recent historical data
  - Simulated under alternative scenarios
Map of the talk:

1. Contextualization
   - Focus on migration
   - Existing projection exercises

2. Model
3. Baseline projections
4. Robustness
5. Summary
Why focusing on migration?

Immigration is hot topic!!!

- World mig. rate (1960-2010): from 3.0 to 3.1%
- In the North: 4.6 to 10.9%
- South-North: 1.5 to 8.0%
- Common phenomenon in virtually all HI countries

Source: OPSW (2011)
Why focusing on migration?

Immig. rates in the UK, Spain and other HI countries

- Prop. of immigrants
- Prop. of South immigrants!!!

Source: OPSW (2011)
Why focusing on migration?

Does illegal migration matter?

<table>
<thead>
<tr>
<th>Pays</th>
<th>Legal immig.</th>
<th>Min illegal</th>
<th>Max illegal</th>
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<td>13.7</td>
<td>14.0</td>
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</tbody>
</table>
Why focusing on migration?

- Welfare impact of immigration?
  - Economic effects... small, presumably positive
    - Redistributive effects / Surplus theory
    - Beneficial labor market effects of recent flows for LS
    - Beneficial fiscal effects of aggregate flows/stocks
    - Market size, entrepreneurship, access to varieties, etc.
  - Societal effects... uncertain
    - Crime
    - Social capital (trust, solidarity)
- No normative judgement here: projection of mig. flows!
- Increased hostility towards immigrants!!!
Why focusing on migration?

### Attitudes towards immigration (ISSP, 2003)

<table>
<thead>
<tr>
<th>Country</th>
<th>Less educated</th>
<th>College graduates</th>
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<tbody>
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<td></td>
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</tr>
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</table>

⇒ What does the future hold?
Map of the talk:

1. **Contextualization**
   - Focus on migration
   - **Existing projections**

2. Model

3. Baseline projections

4. Robustness

5. Summary
Existing projections

- United Nations population projections:
  - LR convergence toward low fertility and mortality rates
  - And constant immigration flows
  - No interdependencies between variables!

- IIASA projections by education level
  - Link fertility, mortality, migration to education
  - LR convergence in enrolment rates

- Do not anticipate economic forces that shape demography
  - No link between demographic and economic convergence
Economy & Demography

- Strong correlation between economic and socio-demographic variables
  - Fertility/mortality and income (#1)
  - Education and income (#2)
  - Migration, income, population (#3)
E&D - Fact #1

Fertility & income (2000)

Life expectancy & income (2000)

Abundant literature on bi-directional links between these variables!
E&D - Fact #2

Abundant literature on bi-directional links between these variables!
E&D - Fact #3

Growing literature on mig and income + Supply-driven phenomenon
Strong correlation between economic and socio-demographic variables...

- Demographic (absolute) convergence is incompatible with divergence in income (club/conditional conv.)
- Demographic divergence affects migration flows!
- We propose a systemic approach ("general equilibrium")
Map of the talk:

1. Contextualization
2. Model
3. Baseline projections
4. Robustness
5. Summary
Structure

- 195 countries
- One period-lived adults: college grads or less educated
  - Decide whether to acquire college education (if basic education)
  - Decide whether to emigrate and where
  - Consume, have children, provide education to a fraction of them
- Individual decisions ➔ allocation and dynamics of world LF
- Representative firm: CES technology (wage disparities depend on the allocation of the LF)
Structure

TFP, education costs (basic and higher education) and child labor, for all country k and period t
Micro-foundations

- Outer (random) utility function:

\[ U_{ki,s,t} = \log(v_{i,s,t}) + \log(1 - m_{ki,s,t}) + \log(1 - e_{k,s,t}) + \varepsilon_{ki,s,t} \]

- Decisions on migration and higher education
- \( v_{i,s,t} \) and \( m_{ki,s,t} \) are perfectly anticipated by agents
- Pareto CDF for \( (1 - e_{k,h,t})^{-1} \): endogenous % of college grads
- EVD(0,\( \mu \)) for \( \varepsilon_{ki,s,t} \): endogenous bilateral migration
First, $\epsilon_{ki,s,t}$ unknown, and $e_{k,h,t}$ revealed

Higher education decisions (Kilani & de Palma, 2007):

$$E(U_{k,h,t}) \geq E(U_{k,l,t})$$

$$\left(1 - e_{k,h,t}\right)^{-1} \leq \frac{\sum_{i=1}^{l} [v_{i,h,t}(1 - m_{ki,h,t})]^{1/\mu}}{\sum_{i=1}^{l} [v_{i,l,t}(1 - m_{ki,l,t})]^{1/\mu}}$$

Second, $\epsilon_{ki,s,t}$ revealed

Migration decisions (McFadden, 1984):

$$\frac{N_{kj,s,t}}{N_{kk,s,t}} = \left(\frac{v_{j,s,t}}{v_{k,s,t}}\right)^{1/\mu} \left(1 - m_{kj,s,t}\right)^{1/\mu}$$
Micro-foundations

- After migration, inner (deterministic) utility function:

  \[ \log(v_{i,s,t}) = (1 - \theta) \log(c_{i,s,t}) + \theta \log(n_{i,s,t}) + \theta \lambda \log(q_{i,s,t}) \]

- Budget constraint depends on
  - Endogenous economic environment (wage rates)
  - Exogenous country characteristics (educ costs, child wage rates)

- Endogenous fertility, basic education decisions

- Indirect utility function:

  \[ \log v^s_{k,t} = (1 - \theta) \log w^s_{k,t} + \log \Omega^s_{k,t} \]
Micro-foundations

- Production function (CES)

\[ Y_{k,t} = A_{k,t} \left[ \phi_k L_{k,h,t}^\phi + (1 - \phi_k) L_{k,l,t}^\phi \right]^{1/\phi} \]

- TFP dynamics

\[ \frac{A_{k,t} - A_{k,t-1}}{A_{k,t-1}} = F\left( \frac{A_{US,t-1}}{A_{k,t-1}}, X_k, t \right) \]

- Wage rate = MPL
Map of the talk:

1. Contextualization
2. Model
3. Baseline projections
   - Parametrization
   - Projections 2000-2100
4. Robustness
5. Summary
Some structural parameters are identical across countries and time-invariant:

- Utility: \((\theta, \lambda) = (0.3, 0.6)\) (as in the literature)
- EVD: \(\mu = 1\) (elasticity of bilateral mig to wages = 0.7)
- Pareto’s shape \(\alpha = 0.4\) (match elasticity found in the literature on BD and human capital formation)
- Elasticity of substitution in production: \(\sigma = (1 - \varphi)^{-1} = 3.0\)
Parametrization

- Country-specific characteristics fits 2000 data + projections
  - $\phi_k$: match skill premium + as in 2000
  - Future child wage rate (as $\%w_l$): match UN ‘high-fertility’ scenario
  - Future basic education costs (as $\%w_h$): as in 2000
  - Future higher education costs (min of Pareto pdf): as in 2000
  - Future migration costs: as in 2000
  - Future TFP levels: convergence equation estimated on 1980-2010
Convergence equation

\[
\log \frac{A_{k,t}}{A_{k,t-5}} = a_0 + a_t + b \log \frac{A_{US,t-5}}{A_{k,t-5}} + cX_k + \epsilon_{k,t}
\]

After estimation (1980-2010 data, 5-year intervals)

- US TFP grows by 1.5% a year
- For other countries:

\[
\log \frac{A_{US,t}}{A_{k,t}} = (1 - \hat{b}) \log \frac{A_{US,t-5}}{A_{k,t-5}} + \hat{c}(X_{US} - X_k)
\]
Estimation of TFP trends, 1980-2010

<table>
<thead>
<tr>
<th>Dep: $\log(\frac{A_{i,t}}{A_{i,t-5}})$</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\log(\frac{A_{US,t-5}}{A_{i,t-5}})$</td>
<td>0.043***</td>
<td>0.040***</td>
<td>0.111***</td>
<td>0.116***</td>
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<td>-</td>
<td>-</td>
<td>0.029</td>
<td>0.023</td>
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<td>-0.152***</td>
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<td>-0.283***</td>
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<td>-</td>
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<tr>
<td>$\log(h_{i,t-1})$</td>
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<td>-</td>
<td>0.036***</td>
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<tr>
<td>F(.)</td>
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<tr>
<td>R²</td>
<td>0.033</td>
<td>0.056</td>
<td>0.143</td>
<td>0.146</td>
<td>0.110</td>
<td>0.120</td>
</tr>
</tbody>
</table>

Long-run convergence between all HI countries!!!
(E.g. USA +1.6%, FRA +1.3%, GER +2.1%... GRE +2.2%, SPA-PRT +2.7)
Plan

Map of the talk:

1. Contextualization
2. Model
3. **Baseline projections**
   - Parametrization
   - **Projections 2000-2100**
4. Robustness
5. Summary
Baseline prospects

Increasing TFP disparities between South and North
Demographic share of Africa: from 10 to 25%
Baseline prospects

Proportion of college graduates
Baseline prospects

Income ratio with the US

Income shares

Economic share of Asia: from 38 to 59%
## Predicted emigration rates (% of Nat, 2000-2100)

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2025</th>
<th>2050</th>
<th>2075</th>
<th>2100</th>
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**EU15 is converging : lower emigration rates**
# Emigration

**Predicted emigration rates (% of Nat, 2000-2100)**

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
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</tr>
</tbody>
</table>

Lower emigration from H1. Increased emigration from Africa!

**Implications for high-income destination countries?**
### Predicted immigration rates (% of LF, 2000-2100)

<table>
<thead>
<tr>
<th>Region</th>
<th>2000</th>
<th>2025</th>
<th>2050</th>
<th>2075</th>
<th>2100</th>
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<td>0.1</td>
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Stability in most high-income countries... except in the EU15
## Predicted immigration rates (% of LF, 2000-2100)

<table>
<thead>
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<th></th>
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<tr>
<td><strong>EU15</strong></td>
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<tr>
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<td>20.4</td>
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<tr>
<td>Germany</td>
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</table>

EU15 = main destination of African emigrants

Rising income disparities + Rising demog share of Africa

⇒ Increasing migration pressure in the EU15!!!
Plan

Map of the talk:

1. Contextualization
2. Model
3. Baseline projections
4. Robustness
   - Alternative scenarios
     - Sensitivity of int’l migration flows
5. Summary
Alternative scenario

- **Technology:**
  - ‘Slower BRIC’: \( \frac{1}{2} \) in long-run TFP
  - ‘Faster SSA’: \( \times 2 \) in long-run TFP

- **Socio-demographic:**
  - ‘Low Fert’: reduce child wages by 20% (UN ‘Medium-Fert’)
  - ‘High Educ’: Reduce cost of basic education by 33%

- **Migration policy (more extreme):**
  - ‘Restr USA’: divide \( (1 - m_{kUS,s,t}) \) by four
  - ‘Open CHIND’: \( (1 - m_{kUS,s,t}) \) for China and India
World economy prospects

Role of endogenous fertility!
World economy prospects

World GDP per worker

Deviation from baseline

Role of technology and migration policies
World economy prospects

World Theil index

Deviation from baseline

Governed by large countries!
Plan

Map of the talk:

1. Contextualization
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Global

World migration rate

Deviation from baseline

Remarkable stability of the world migration rate (as in the past!)
Except if China and India catch up and become attractive
Mig and population

**Mig - World**

**Emig - DCs (excl. CHIND)**

Confirmation of previous graphs (stability, except in 'OpenCHIND')

World migration stock is supply-driven!!!
### LR immig. rates by scenarios (% of LF, 2100)

<table>
<thead>
<tr>
<th>Country/Region</th>
<th>Baseline</th>
<th>Slower BrIC</th>
<th>Faster SSA</th>
<th>Low Fertility</th>
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Stability in most HI countries... (except under OpenCHIND)
LR immigr. rates by scenarios (% of LF, 2100)

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Sensitive to economic and population growth in Africa
& to a lesser extent, growth & mig policy in emerging countries
∀ scenarios, migration pressure increases in EU15 (from 7.5 to 14-18%)
Mig and population

Immig - High-income (excl. CHIND)

Immig - EU15
Map of the talk:

1. Contextualization
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Migration debates

- **Current debates**
  - Immigration is hot topic and most citizens want to reduce it
  - Emigration is an increasing source of concern

- **What does the future hold?**
  - Increasing population share of Africa
  - Long-run convergence between HI countries
  - Take-off of the BRICs, stagnation or partial conv of Africa

- **Emigration prospects**
  - Increasing emigration for Africa (remittances!)
  - Lower emigration from Europe
Immigration prospects

- Stable immigration rates in non-EU countries
- Increasing migration pressure to EU15
  - Cause = Africa’s income divergence and population growth
- Uncertainty about its magnitude:
  - Evolution of TFP/Pop in Africa matters (from 7.5 to 14-18%)
  - UK (from 8.8% to 18-29%)
- EU should care about Africa !!! Options:
  - Improving border control
  - Greater level or effectiveness of aid
  - Better integration of African migrants
Thanks for your attention!

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joel.machado@uclouvain.be