Climate Change, Inequality, and Social transition

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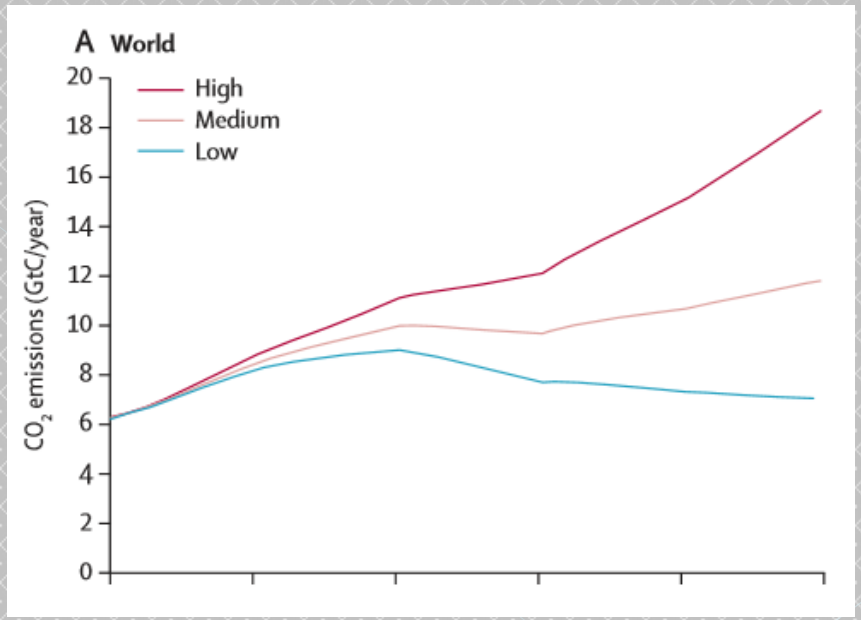
Demography and Climate Change

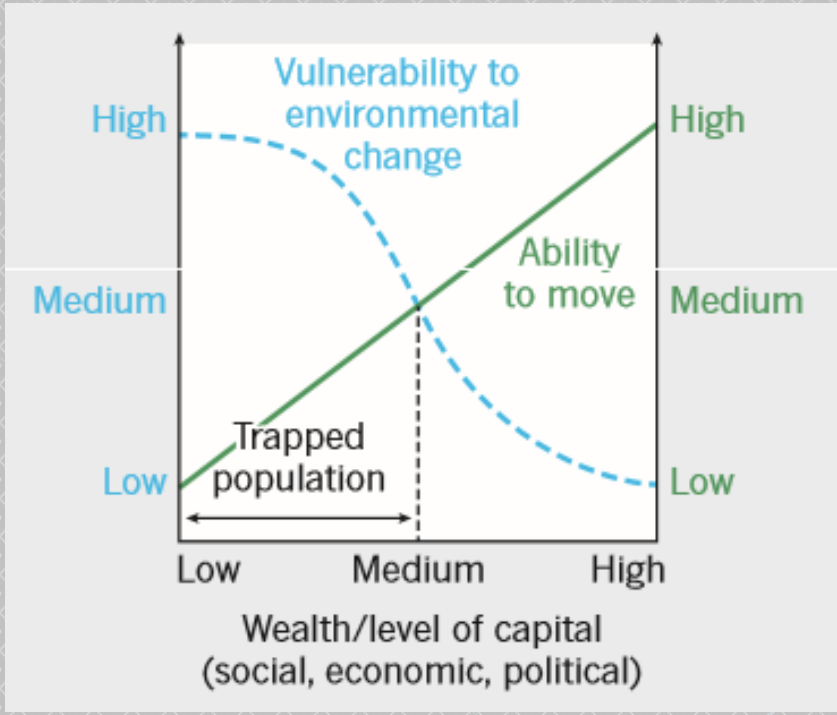
- **How population impacts climate change?**
  - Global **emissions growth** is driven by **increases** in **population** and **per-capita GDP** make (Raupach et al., 2007)
  - population policies that **reduce fertility** and **slow population growth** would probably also have **climate benefits** (O'Neill et al., 2012)



Source: O'Neill, B. C., B. Liddle, L. Jiang, K. R. Smith, S. Pachauri, M. Dalton, and R. Fuchs. 2012. Demographic change and carbon dioxide emissions. Lancet, 380(9837):157–164.

Demography and Climate Change

- **How climate change impacts population?**
  - By **disproportionately harming** developing countries, **climate change increases** the motivation to **emigrate** (Desmet and Rossi-Hansberg, 2015)
  - **Climate** shocks leave **poor** and agricultural workers **unable** to afford **emigration** (Black et al., 2011; Cattaneo and Peri, 2016)



Source: Black, R., S. R. Bennett, S. M. Thomas, and J. R. Beddington 2011. Climate change: Migration as adaptation. Nature, 478(7370):447–449.

Migration and Human Capital

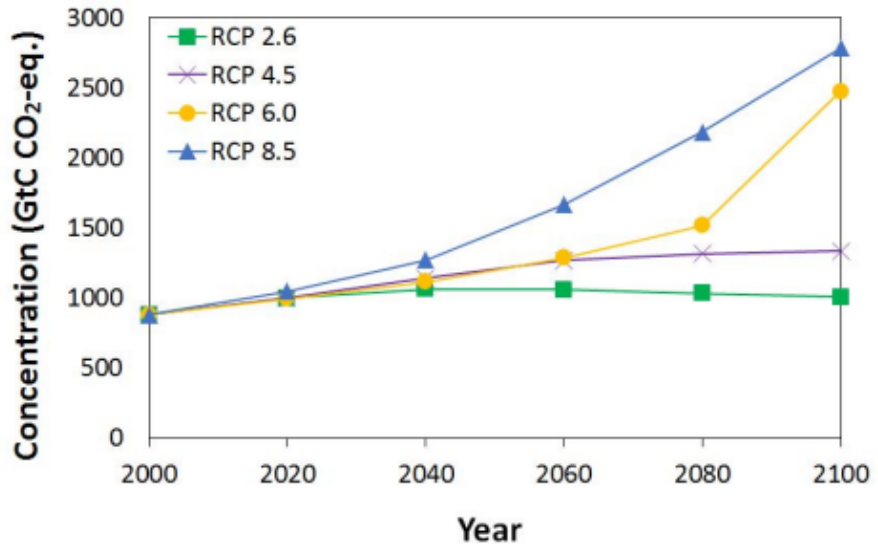
- **Brain drain** (i.e. skilled labor emigration) **increases** the number of **skilled workers** living in the developing countries and has important distributional effects (Beine et al., 2008).

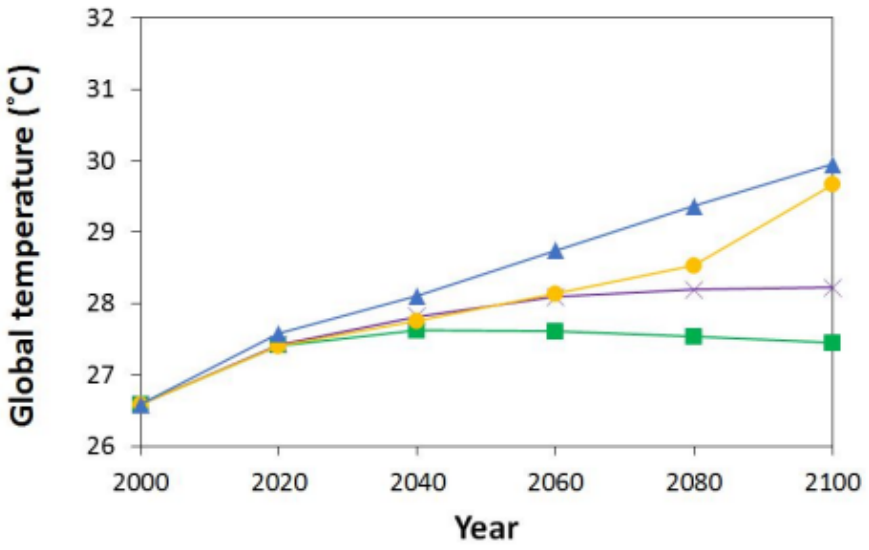
- **Q-Q tradeoff**: Parents with limited resources face a trade-off between having **more children** and investing **more in the education** of each child (Bleakley and Lange, 2009; Aaronson et al., 2014).

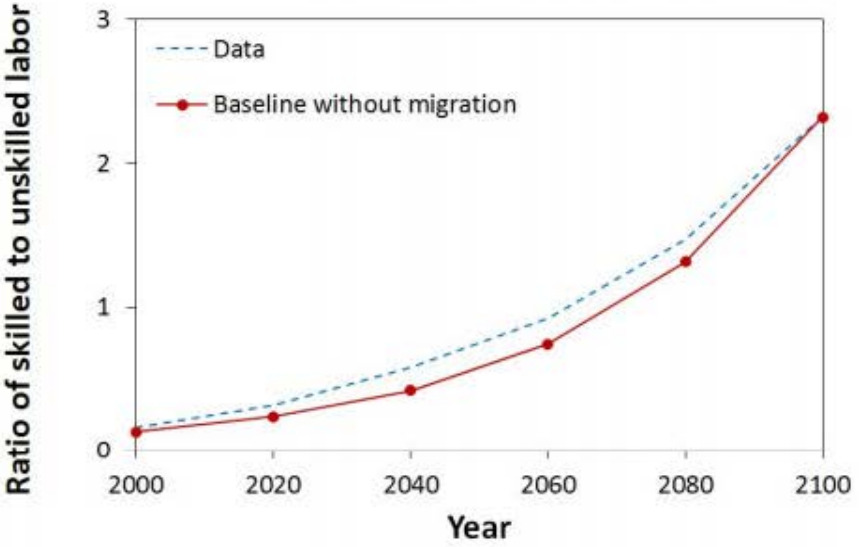
Model

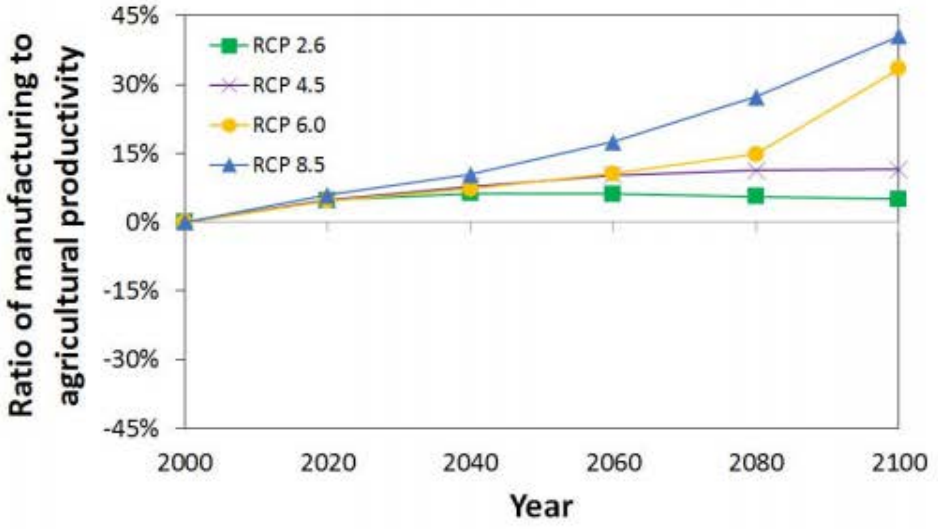
- Dynamic general equilibrium model
- Overlapping generations (OLG) model
- Endogenous fertility and human capital decisions
- Two stages of life: childhood + adulthood
  1. **Children** consume parental time
  2. **Adults** work, consume goods, and raise children.
- Parents have preferences over the lifetime income of their children.
- Skilled children have higher earnings, but also require more parental investment.
- Exogenous probability of migration

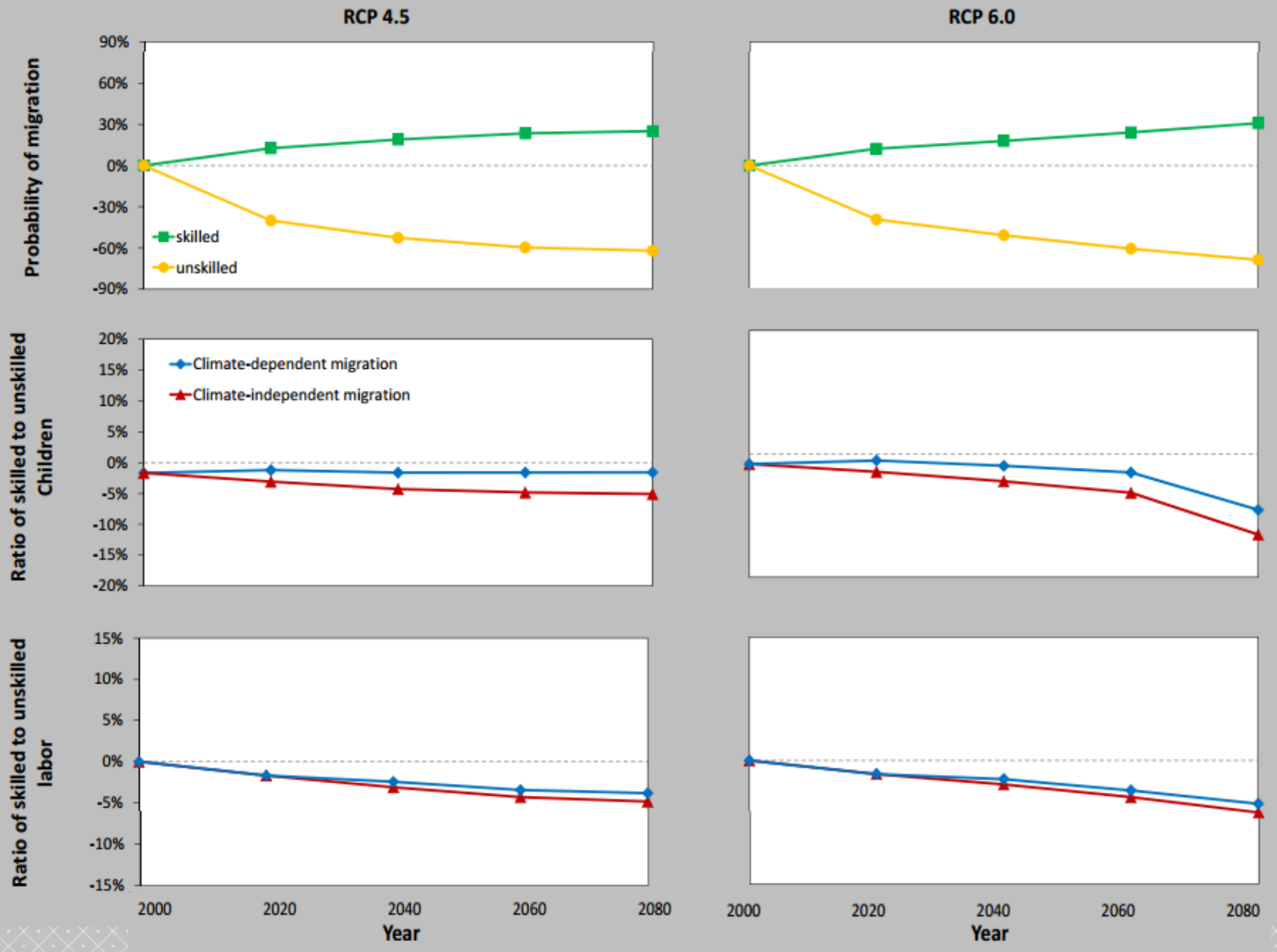
Model Input


Concentration (GtC CO_2-eq.)
3000
2500
2000
1500
1000
500
0
RCP 2.6
RCP 4.5
RCP 6.0
RCP 8.5
2000
2020
2040
2060
2080
2100
Year

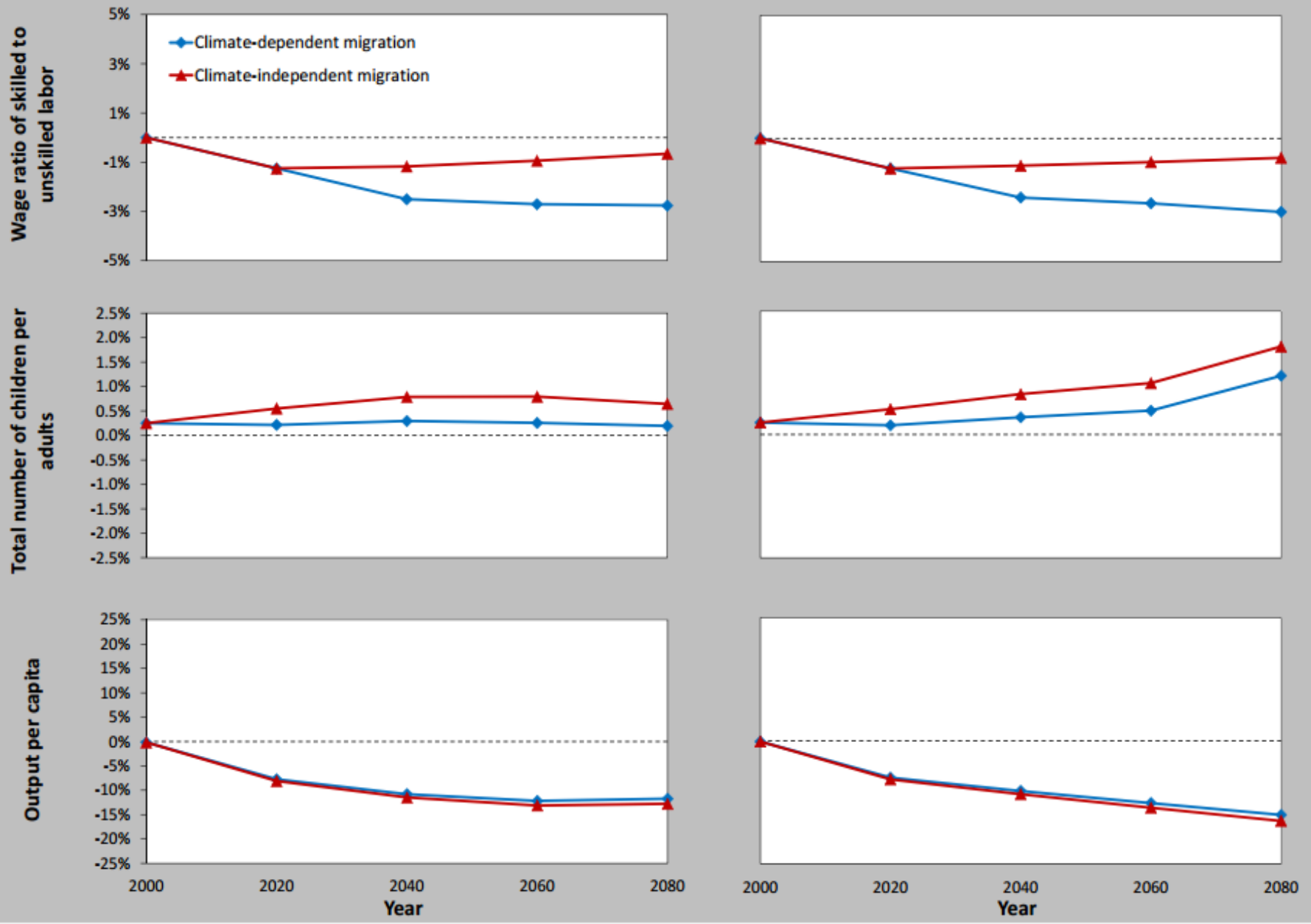

Global temperature (°C)
32
31
30
29
28
27
26
2000
2020
2040
2060
2080
2100
Year


Ratio of skilled to unskilled labor
3
2
1
0
Data
Baseline without migration
2000
2020
2040
2060
2080
2100
Year


Ratio of manufacturing to agricultural productivity
45%
30%
15%
0%
-15%
-30%
-45%
RCP 2.6
RCP 4.5
RCP 6.0
RCP 8.5
2000
2020
2040
2060
2080
2100
Year



Baseline: No climate change + fixed migration rate



Baseline: No climate change + fixed migration rate

Discussion and Conclusion

- How climate-induced migration can influence economic and demographic outcomes for non-migrants in developing countries?
  - high-skill individuals have an increased probability of migration
  - Skilled migration raises the relative return to acquiring skills
  - parents spend more resources on children's education and therefore, have fewer children

Discussion and Conclusion

- In current literature, individuals passively react to damages inflicted by climate change but...

- climate change may influence individual behavior in substantial ways.

Thank you!

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Model: Economy

- Individual's utility:

$$v(c_t, n_t^s, n_t^u) = (1-\gamma) ln(c_t) + \gamma \mathbf{E}\left[ln(n_t^s w_{t+1}^s + n_t^u w_{t+1}^u)\right]$$

- Probability of migration:

$$\beta_{12}^j = \exp(\eta_j + \Psi_j \times \log(T_1))$$

- Budget constraint:

$$c_t = [1 - \tau^u n_t^u - \tau^s n_t^s] w_t$$

- Consumption composition:

$$c = \{\alpha (c_a^k)^{\frac{\epsilon-1}{\epsilon}} + (1-\alpha)(c_m^k)^{\frac{\epsilon-1}{\epsilon}}\}^{\frac{\epsilon}{\epsilon-1}}$$

Model: Climate Change

- Temperature:

$$T(l,t) = T(l,0) + \nu_1 P(t)^{\nu_2}(1 - \nu_3 T(l,0)).$$

- Damages:

$$D^k(T) = max\{g_{k,0} + g_{k,1}T + g_{k,2}T^2, 0\}, \ k = a, m.$$

- Production:

$$\begin{aligned} Y_m &= D^m(T)A_m H \\ Y_a &= D^a(T)A_a L, \end{aligned}$$

- **Equilibrium:**

$$ln\left(\frac{w^s_{t+1}}{w^u_{t+1}}\right) = ln\left(\frac{1-\alpha}{\alpha}\right) - \frac{1}{\epsilon}ln\left(\frac{H}{L}\right) - \frac{1-\epsilon}{\epsilon}ln\left(\frac{D^m(T)}{D^a(T)}\right) - \frac{1-\epsilon}{\epsilon}ln\left(\frac{A_m}{A_a}\right).$$