Knowledge accumulation and international migration in a model of local interactions

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Existing literature

- There exists large literature that endogenizes accumulation of knowledge and international migration
- Most of literature descends from labor economics
- Common assumption: the only input of knowledge acquisition is the time of the learner
- But: knowledge creation is a social activity, involves interaction with existing experts
- Existing approach in migration literature: assume positive externality of average human capital (following Lucas 1988)

Existing literature

- Beine, M. , F Docquier, H Rapoport (2001). Brain drain and economic growth: theory and evidence. Journal of Development Economics.
- Commander, S., M. Kangasniemi, and L. Alan Winters (2003). The Brain Drain: Curse or Boon? IZA discussion paper
- Dos Santos, M.D., and F. Postel-Vinay (2003). Migration as a source of growth: The perspective of a developing country. Journal of Population Economics
- Haque, N.U., S.J. Kim (1995). "Human Capital Flight": Impact of Migration on Income and Growth. IMF Staff Papers
- Mayr, K. and G. Peri (2008). Return Migration as a Channel of Brain Gain. NBER Working Paper
- Mountford, A. (1997). Can a brain drain be good for growth in the source economy? Journal of Development Economics
- Stark, O., C. Helmenstein, A. Prskawetz (1997) A brain gain with a brain drain. Economics Letters
- Stark, O., Y. Wang (2002) Inducing human capital formation: migration as a substitute for subsidies. Journal of Public Economics
- Stark, O., R. Zakharenko (2010) Inducing optimal allocation of talent and human capital accumulation: the corrective role of migration. Working paper

This research: main idea

- Interactions between students and teachers is local in nature
- Thus, human capital externality may be partly internalized
- Importantly, it may be internalized differently in different countries
- Which creates a basis for migration
- This paper: develops a simple model of local interactions with heterogenous countries...
- studies effects and causes of migration

The model: basics, consumption

- Discrete time
- Overlapping generations model
  - Fraction $1-\delta$ of population dies each period
  - Same population is born
- One consumption good, price normalized to unity
- Linear preferences w.r.t. consumption:

$$U_i = \sum_{\tau=\tau_i}^{\infty} \beta^{\tau-\tau_i} c_{i,\tau}$$

The model: production

- One factor of production (human capital)
- Two skill levels: high and low
  - High-skilled: produce one unit consumption good and teach
  - Low-skilled: learn only, no production
  - Fraction of population m_t and $1 - m_t$, respectively
- Newly born individuals are always low skilled

Learning technology

- Low-skilled acquire skill during interaction with high-skilled people
- The *intensity* of interaction affects the probability that the high skill is acquired
- Formally: $P_i = P(x_i)$, where x_i is intensity of interaction of student i with teachers
- $P(\cdot)$ is increasing, concave
- Access to teachers is limited: $x_t \leq \frac{m_t}{1-m_t}$
- Educational market is cleared by tuition paid to teachers, w

Cross-country institutional differences

- Students need to borrow to get education
- Countries differ in ease of borrowing
- Net present cost of one borrowed dollar is $K \geq 1$ dollars
- Higher K corresponds to a country with poor institutions
- Leads to lower demand for education

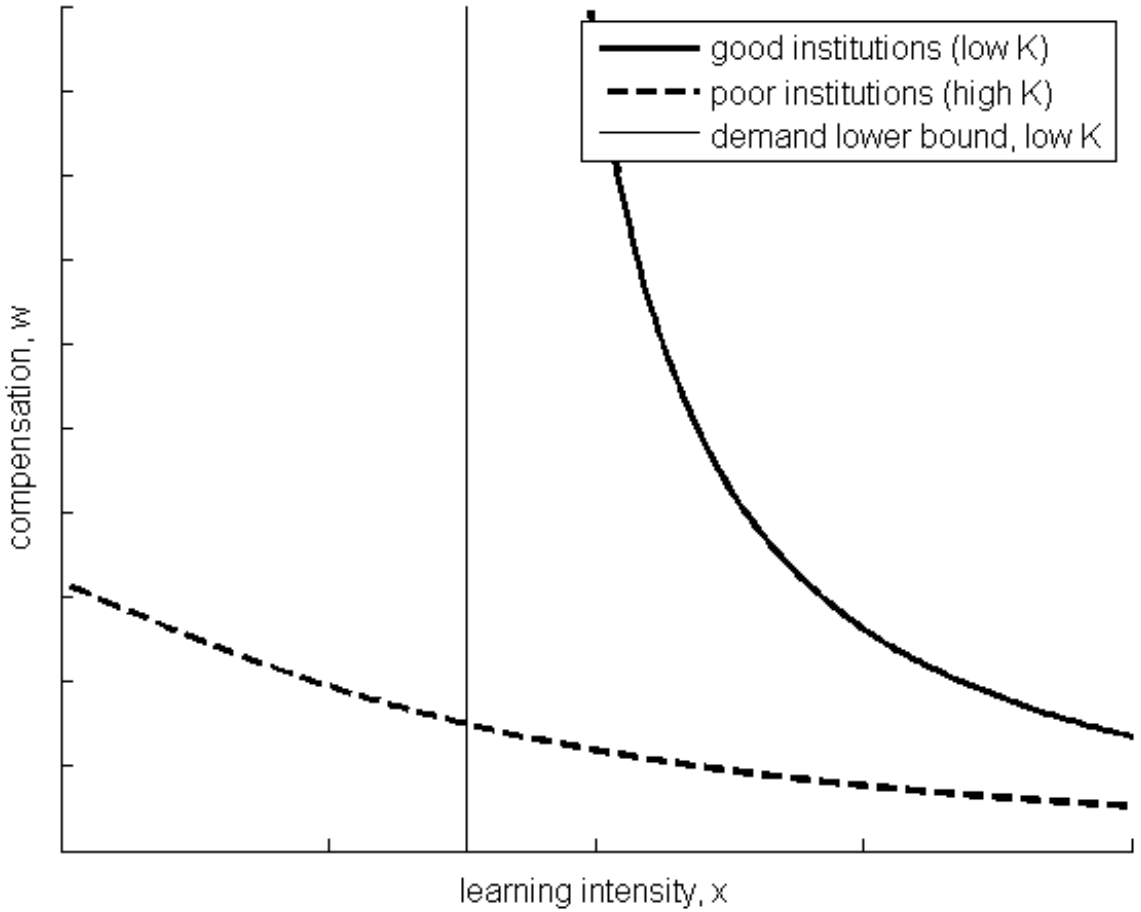
Demand for education

- Value of being high-skilled (steady state): $v_h = \frac{1+w}{1-\beta}$
- Low-skilled: $v_l = \max_x -Kwx + \beta(P(x)v_h + (1 - P(x))v_l)$
- Solution:

$$\begin{aligned} w &= \frac{G(x)}{K - G(x)} \\ G(x) &\equiv \frac{P'(x)}{\frac{1-\beta}{\beta} + P(x) - P'(x)x} \end{aligned}$$

- $G'(x) < 0$, $G \in (0, \frac{\beta}{1-\beta}P'(0)]$
- If institutions are sufficiently poor ($K > \frac{\beta}{1-\beta}P'(0)$), then $w(0)$ is finite
- Otherwise there exists $\underline{x} \geq 0$ such that $w(\underline{x}) = \infty$

Demand: an illustration



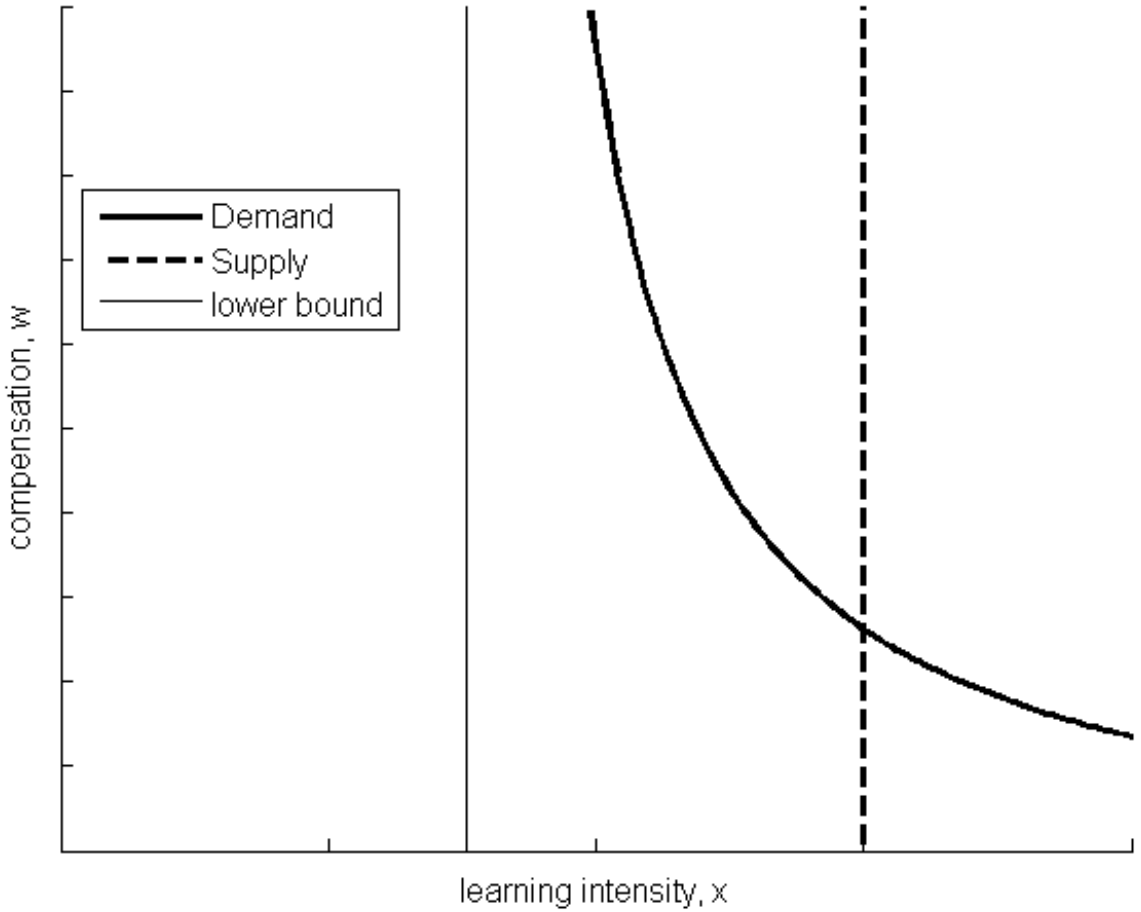
Steady state

- Steady state: number of people receiving high skill equals number of dying high-skilled:

$$\delta P(x)(1-m) = (1-\delta)m$$

- Steady state teacher-student ratio: $x = \frac{m}{1-m}$
- Thus, steady-state supply of teaching services does not depend on w
- Steady-state supply is always greater than lower bound of demand, thus equilibrium exists and is unique

Steady state illustrated



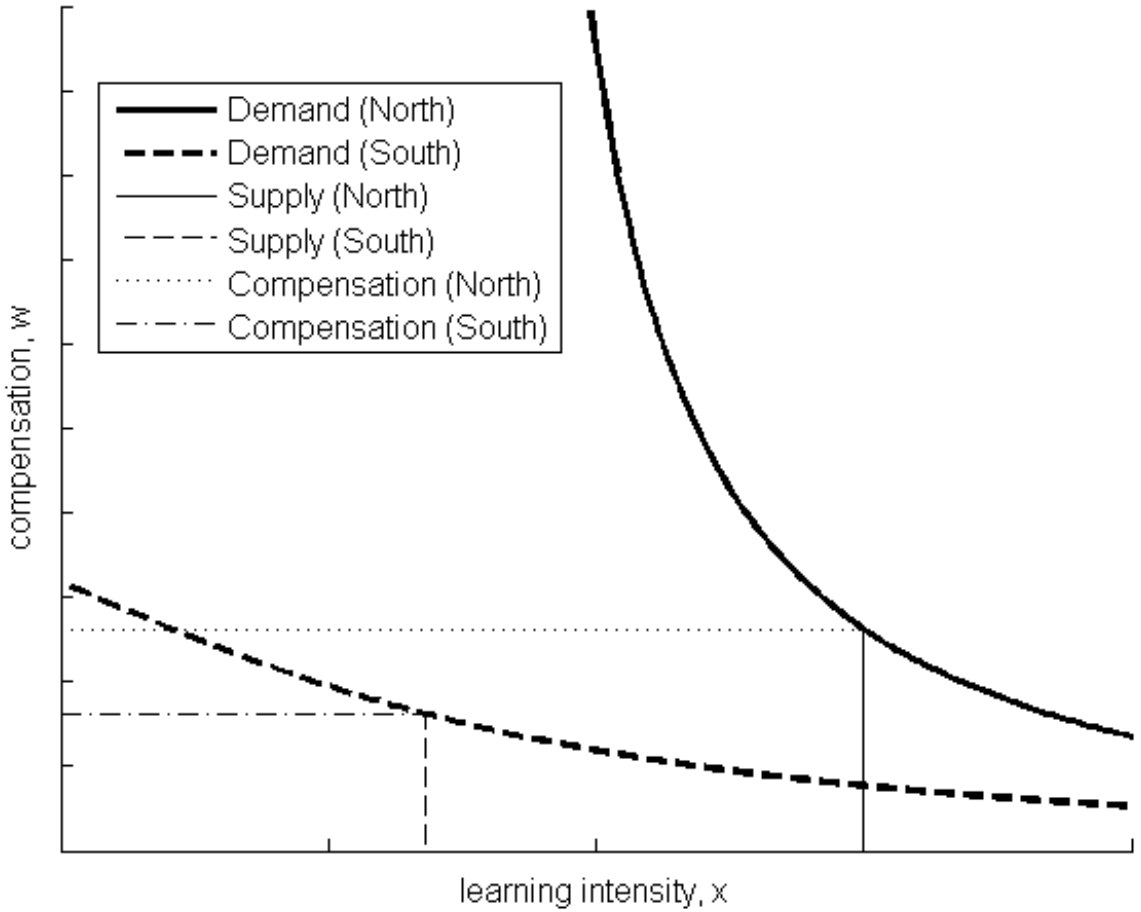
High-skilled migration: causes

- Two countries: North (good institutions, K_N) and South (poor institutions, $K_S > K_N$)
- Difference in institutions causes difference in high-skilled incomes
- ...which creates an incentive for Southern high-skilled to migrate
- Assumption: there exists a migration cost of C
- Lower C corresponds to "globalization"
- In equilibrium, $\frac{1+w_S}{1-\beta}+\mathrm{C}=\frac{1+w_N}{1-\beta}$

High-skilled migration: effects

- In steady state, constant fraction of all high-skilled emigrates
- High-skilled migration from South increases Southern high-skilled wages
- Reduces supply of teachers in steady state
- Globalization: higher high-skilled wages, fewer teachers left in South

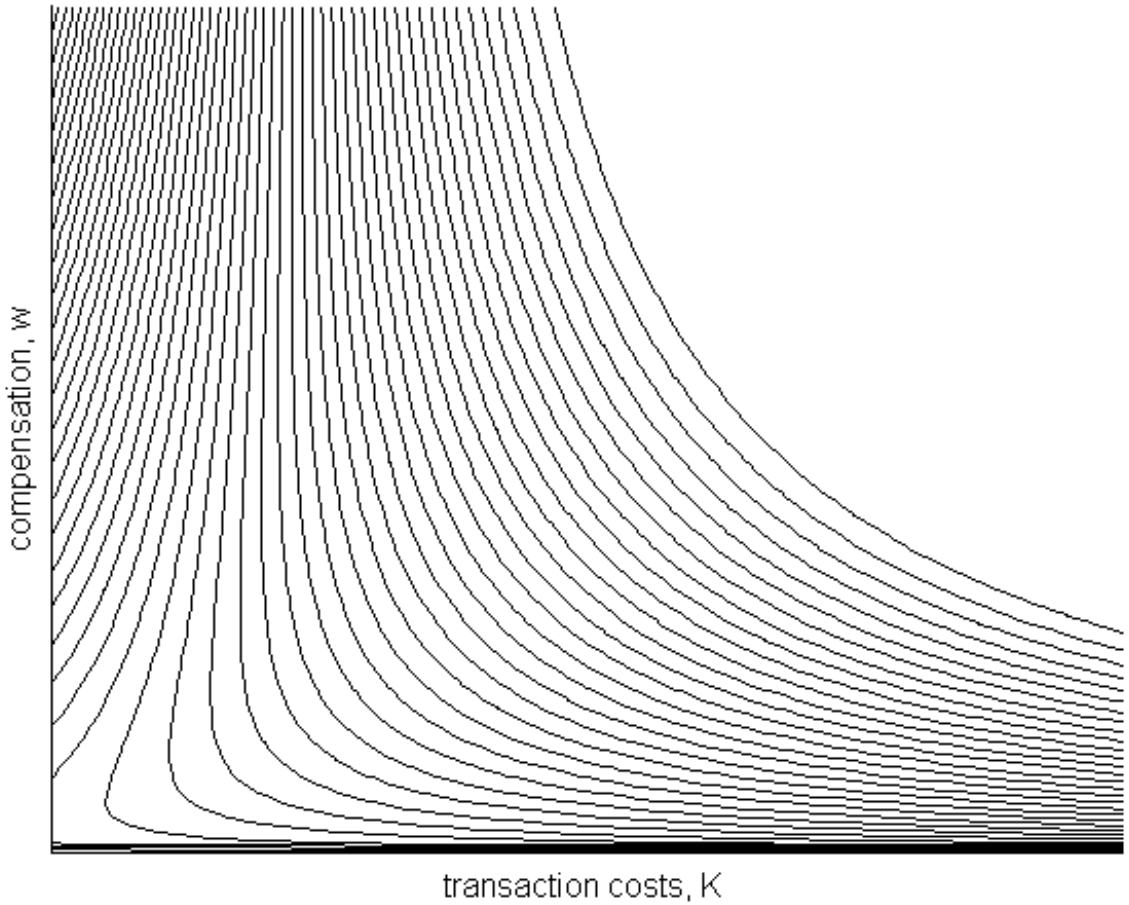
Equilibrium with brain drain: illustration



Welfare implications

- How does brain drain affect welfare?
- First, need to define welfare
- Expected lifetime stream of earnings of newly born (=unskilled)
- Effects of brain drain on unskilled:
  - More difficult to acquire education (negative)
  - Higher income once education is acquired (positive)
- Aggregate effect: depends on quality of institutions and degree of globalization

Welfare implications of migration



Welfare implications

- With sufficiently good institutions, globalization improves welfare of young
- More difficult to get education, but this effect is offset by higher expected payoff to education
- With poor institutions, the reverse is true
- Additional implication: in a more globalized economy, welfare gain from improving institutions is higher
- Thus, openness disciplines governments in their effort to improve institutions

Return migration

- Suppose Southern financial institutions improve
- Steady state: same as in the North
- Interesting to study *transition* from old to new SS
- Demand for education increases
- Deficit of skill, return of emigrants, brain circulation
- If RM was impossible: slower convergence to new SS.

Conclusion

- I offer a model of learning: high skill can be acquired only through personal interaction with skilled people
- Very inelastic demand for education
- Difference in financial institutions cases large difference in reward to skill
- Which causes brain drain from weak to strong country
- Welfare effects: positive for country with (relatively) good institutions, negative for country with poor institutions
- Openness to emigration increases incentives to improve educational financial institutions