

Competition for the International Pool of Talent: Education Policy with Student Mobility

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Motivation

- Ageing societies in industrialized countries.
- National bottle necks in finding qualified workers.
- Limited supply by other industrialized countries. In fact, industrialized countries compete severely for their joint pool of talent.

Poutvaara (2000, 2001, 2004, 2008), Justman/Thisse (1997, 2000), Del Rey (2001), Lange (2009), Krieger/Lange (2010), Buettner/Schwager (2004), Mechtenberg/Strausz (2008), Demange et al. (2008)

⇒ Possible solution: Attract skilled immigrants (the 'international pool of talent') from the rest of the world (ROW), i.e., from less developed or developing countries.

⇒ Potential problem: Competition for the international pool of talent may aggravate 'brain drain' from these countries.

Oligopolistic competition under vertical quality differentiation (à la Gabszewicz/Thisse 1979, Shaked/Sutton 1982): 3-Stage-Nash game

- Regional differentiation of education policy
- Comparative statics
- Brain drain or brain gain?

Upshot:

- (i) Countries differentiate educational systems in equilibrium.
- (ii) Quality-differentiation increases with the talent pool, a catching-up of developing countries and the stay rate upon graduation.
- (iii) Nevertheless, developing countries may experience a brain gain.

What's novel? ⇒ Paper shows that competition among industrialized countries for students from LDC may result in a brain gain in LDC.

Students' objective

Maximize 'individual net benefits', i.e., expected income net of taxes and tuition fees:

$$\varrho(\underline{w} + aq_i) - t_i \quad (1)$$

with

- $E\{w_a\} := \varrho(\underline{w} + aq_i)$: expected net labor income of ability type $a \sim U(0, 1)$ studying in i ;
- $q_i \geq 0$: quality of education;
- $\varrho := p(1 - \tau) + (1 - p)(1 - \tau_{\text{ROW}})\gamma$
 \Rightarrow Assumption 1: $(1 - \tau) - (1 - \tau_{\text{ROW}})\gamma \geq 0$, i.e., staying in host country upon graduation is beneficial on pure income grounds;
- $\gamma \in [0, 1]$: gap between host country and ROW wages;
- τ : income tax;
- t_i : tuition fees;
- $(1 - p)$: exogenous repatriation rate, or, p : students' stay rate.

Government's objective

Maximizes net rents/benefits from offering higher education to foreigners:

$$R_i = \underbrace{\tau W_i + N_i[t_i - c(q_i)]}_{:= \text{variable rent } r_i} - F(q_i) \quad (2)$$

with

- W_i : expected wage sum of foreign graduates (= tax base) with
 $W_1 = pN \int_0^{\hat{a}} (\underline{w} + aq_1) da$ and $W_2 = pN \int_{\hat{a}}^1 (\underline{w} + aq_2) da$
(for country 2, w.l.o.g., being the high-quality country, i.e., $q_2 > q_1$);
- $c(q_i) = \alpha q_i$: variable cost of education;
- $F(q_i)$: fix cost of education with $\partial F / \partial q_i > 0$, $\partial^2 F / \partial q_i^2 > 0$ and $F(0) = 0$.

Timing and student migration decision

Three-stage Nash game (to be solved recursively):

- 1 The two governments simultaneously choose education qualities q_1 and q_2 .
- 2 The two governments set tuition fees t_1 and t_2 .
- 3 ROW students decide whether to study either in country 1 or in country 2.



Stage 3: students' migration decisions (indifference condition)

$$\varrho(\underline{w} + \hat{a}q_1) - t_1 = \varrho(\underline{w} + \hat{a}q_2) - t_2 \iff \hat{a} = \frac{t_2 - t_1}{\varrho\Delta q}. \quad (3)$$

Stage 1/2: vertical quality and tuition fee differentiation

- As in models of vertical quality differentiation, there is **no symmetric equilibrium** (tuition fee competition would be ruinous).
- Both countries can only **benefit** from educating the pool of talent ($R_1, R_2 > 0$) if they **differentiate their education quality** as this will effectively weaken tuition fee competition.
- Education quality

$$-\frac{N}{2}(p\tau + 2\varrho)\hat{a}^{*2} - \frac{\partial F}{\partial q_1} < 0 \quad \longrightarrow \quad q_1^* = 0 \quad (4)$$

$$\frac{N}{2}(p\tau + 2\varrho)(1 - \hat{a}^*)^2 - \frac{\partial F}{\partial q_2} = 0 \quad \longrightarrow \quad q_2^* > 0 \quad (5)$$

- Tuition fees

$$\Delta t^* := (t_2^* - t_1^*) = \frac{\varrho\Delta q}{(p\tau + 3\varrho)}(\alpha + \varrho) > 0 \quad (6)$$

Comparative statics: size N of talent pool

- **Quality differentiation** increases with N ($\frac{\partial \Delta q^*}{\partial N} = \frac{\partial q_2^*}{\partial N} > 0$) because of higher marginal variable rent r_2 (higher expected future tax payments \rightarrow stronger incentive for country 2 to invest in education quality).
- Positive effect on **tuition-fee differential** because $\Delta q \uparrow$ weakens fee competition, thereby enhancing market power of country 2, such that Δt increases proportionally.
- **Allocation of students**: since $\hat{a} = \frac{\Delta t}{\varrho \Delta q}$ and $\Delta t / \Delta q$ unchanged, each country's share of the international talent pool remains unaltered.
- **ROW perspective**: an increase in N implies a
 - **quantitative brain gain**: for given $(1 - p)$, $N \uparrow$ implies more qualified returnees;
 - **qualitative brain gain**: since $N \uparrow$ implies $\Delta q \uparrow$ (regional allocation of students unchanged), returnees will be better educated.

Comparative statics: stay rate p of foreign students

- **Quality differentiation** increases with p ($\frac{\partial \Delta q^*}{\partial p} = \frac{\partial q_2^*}{\partial p} > 0$) because expected future tax payments from (more) foreign students in country 2 increase \rightarrow stronger incentive for country 2 to invest in education quality.
- Effect on **tuition-fee differential** is ambiguous
 - Education quality effect (+): $\Delta q \uparrow$ weakens fee competition but enhances market power country 2: $\Delta t \uparrow$.
 - Tax-revenue effect (-): students more valuable due to expected tax payment increase \rightarrow lowering tuition fees will attract additional students (more relevant to country 2) $\rightarrow \Delta t \downarrow$ (dominates for $\varepsilon_{F,q} > \Gamma$)
- **Allocation of students**: the higher p , the more students go for education in high-quality country.
- **ROW perspective**: an increase in p implies a
 - **quantitative brain drain**: return migration lower due to $p \uparrow$
 - **qualitative brain gain**: (i) larger share of return migrants has studied in 2; (ii) higher productivity of return migrants from 2

Conclusion

- Competition of developed countries for international talents gives rise to vertical quality differentiation: some countries providing high, others low educational quality.
- Quality differentiation increases...
 - ... with the size of the talent pool,
 - ... with the stay rate of foreign students,
 - ... with the degree of development of the sending region ROW (not shown here).
- In addition: new rationale for a 'brain drain with a brain gain':
 - So far, the literature on beneficial brain drain (or, brain gain) emphasized individual incentives to acquire skills in LDC's *Mountford (1997), Stark et al. (1997, 1998), Vidal (1998), Beine et al. (2001, 2008), Mayr/Peri (2008), Eggert et al. (2010)*
 - Our contribution: Brain drain intensifies quality competition of host countries of international students implying a brain gain from return migration
See also: Haupt/Krieger/Lange (forthcoming in Gerard/Uebelmesser (eds.), MIT Press, 2014)