Brain Drain and Brain Waste

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Introduction: Definitions and Aim of the Paper

- Positive self-selection of migrants:
  - When skilled workers have higher propensity to migrate than the unskilled

- Brain drain:
  - When a country suffers a decrease in the human capital stock due to international emigration

- Brain gain:
  - When a country experiences an increase in the human capital stock due to international emigration

- Brain waste:
  - When an individual works in a job that requires lower education/qualifications than the ones he/she has acquired

- Aim of the paper: analyze how brain waste affects the self-selection of migrants and brain drain/gain
Migration: Brain Drain or Brain Gain?

- **Background:**
  - Higher wages in rich countries $\Rightarrow$ migration from poor to rich countries

- **Traditional view (Bhagwati and Hamada, 1974):**
  - Positive self-selection of skilled migrants, since they have higher returns from migration than the unskilled
  - Developing countries lose skilled workers to developed countries, i.e.: Brain drain

- **New view (Stark et al., 1997):**
  - Positive self-selection of skilled migrants, BUT...
  - Migration increases the incentives of natives to acquire education, since it raises the returns to education
  - Under certain conditions: Brain drain $<$ Brain gain
  - Channels: return migration, remittances, uncertain migration
Brain waste:

- Arises when a skilled individual incurs in the costs of acquiring education but he/she does not reap the benefits of human capital investment
- Ex.: Migrant with university degree driving a taxi
- Rationale: Low international transferability of human capital

Empirical evidence on brain waste: Coniglio et al. (2006); Mattoo et al. (2007); Özden (2006)
Sources of Brain Waste

- Illegal migration (Hanson, 2006)
  - Illegal migrants are paid lower wages, have poor working conditions and are more subject to violations of the protections afforded by the destination country labor laws

- Low international transferability of human capital (Chiswick and Miller, 2007)
  - Affected by working experience or education acquired in the destination migration country, language skills and the country of origin

- Both result from strict migration policies in developed countries (Hanson, 2006)
The migration policies of the US and the EU in the last decade have changed focus to (World Bank, 2006):

- International transferability of skills
- Selective migration policies
- Illegal migration

Rationale for these policies: attract skilled workers, deter unskilled migration

Are these policies effective?

- See evidence for Canada (Borjas, 1993; Barret, 1998)
Objective: Check the robustness of the positive self-selection and the brain gain arguments to brain waste

We show that, brain waste:
- Weakens the chances of a positive self-selection of skilled migrants
- Reduces the possibility of a brain gain
- Dampens the effectiveness of education policies

Rationale:
- Brain waste reduces the returns to human capital from education and international migration

Implications for migration policies:
- Strict migration policies might not be optimal for both sending and receiving countries of migration
Empirical Evidence

- Chiquiar and Hanson (2005); Hanson (2006); McKenzie and Rapoport (2007); Orrenius and Zavodny (2005):
  - Self-selection of migrants: Inverted U-shaped curve
  - Reason: illegal migration and low international transferability of human capital

- McKenzie and Rapoport (2006); de Brauw and Giles (2006):
  - Negative effect of illegal migration on schooling attendance and attainments in rural Mexico and in rural China
  - Reason: illegal migration lowers the returns from education
The Model

- Base set-up: Docquier and Rapoport’s (2007) model of self-selection and brain drain
- We add: the possibility that skilled workers face brain waste when they migrate
- World economy: the origin and the destination migration country
  - Focus in the origin migration country: small developing open economy
  - The destination migration country (exogenous): developed economy
The Model

- Labor supply \((L)\), unskilled \((U)\) + skilled \((S)\):

\[
L_t = U_t + S_t
\]  

(1)

- 2-period lived individuals: \(t = 1, 2\)
  - 1st period: education decision (Take education \textit{versus} Not take education)
  - 2nd period: migration decision (Migrate \textit{versus} Not migrate)
Production Function:

\[ Y_t = w_t E_t \]  \hspace{1cm} (2)

- \( w \): wage rate per efficiency units of labor
- \( E \): labor in efficiency units

\[ E_t = U_t + hS_t \]  \hspace{1cm} (3)

- \( h \): Skilled productivity premium, with \( h > 1 \)
- \( H \): stock of human capital

\[ H_t = \frac{E_t}{L_t} = \frac{U_t + hS_t}{U_t + S_t} = 1 + P_t (h - 1) \]  \hspace{1cm} (4)

- \( P \): proportion of skilled workers in the economy

\[ P_t = \frac{S_t}{U_t + S_t} \]  \hspace{1cm} (5)
Individual Education Choices: Autarchy

- 1st period: work only or work and acquire education
  - Wage rate: \( w_1 \)
  - Cost of education: \( cw_1 \), with \( 0 < c < 1 \)
- 2nd period: work
  - Unskilled workers' wage: \( w_2 \)
  - Skilled workers' wage: \( hw_2 \)
- Condition to acquire education (steady state: \( w_1 = w_2 = w \)): 
  \[
  c < c_{Aut} \equiv h - 1 \quad (6)
  \]
Individual Migration Choices: Open Economy

- **Channel for brain gain: temporary migration**
  - $0 < \gamma \leq 1$: share of a migrant’s second period working life in the destination country (i.e.: $1 - \gamma$ as a returnee)

- **Migration costs:** $kw^*$, with $0 < k < 1$

- **Scenario 1: No-brain waste**
  - With no-brain waste all migrants receive the destination country’s wages ($w^*$):
    - Unskilled: $w^* > w$ versus Skilled: $hw^* > hw$

- **Scenario 2: Brain waste**
  - With brain waste a skilled individual is employed as unskilled in the destination country
  - i.e.: With brain waste a skilled individual earns $w^*$ instead of $hw^*$
No-Brain Waste versus Brain Waste Scenarios

- Brain waste:
  - $p_S$: probability of a skilled worker to work as skilled
- Brain waste scenario: $p_S \in (0, 1)$
- No-brain waste scenario: $p_S = 1$
- Interpretation for $p_S$: Migration policies
  - Selection of migrants, international transferability of human capital, illegal migration
Individual Migration Choices

- Lifetime income for alternative migration decisions:

\[
I(U, NM) = w_1 + w_2 \\
I(U, MI) = w_1 + w^*(\gamma - k) + (1 - \gamma)w_2 \\
I(S, NM) = (1 - c)w_1 + hw_2 \\
I(S, MI) = (1 - c)w_1 + w^*(\gamma (1 + pS(h - 1)) - k) + (1 - \gamma)hw_2 \tag{7}
\]

- **NM**: No-migration
- **MI**: Migration
Brain Waste Scenario

- Migration if:

\[
S_{p_S \in (0,1)} : \gamma (h(p_S \omega - 1) + \omega (1 - p_S)) > k\omega \\
U_{p_S \in (0,1)} : \gamma (\omega - 1) > k\omega 
\]  \hspace{1cm} (8)

- Where \(\omega = \frac{w^*}{w}\) (Relative wage destination-origin)

- Migration incentives skilled versus unskilled:

\[
S_{p_S \in (0,1)} - U_{p_S \in (0,1)} = \gamma (h - 1) (p_S \omega - 1) 
\]  \hspace{1cm} (9)

- With no-brain waste, \(p_S = 1\): \(S_{p_S=1} > U_{p_S=1}\)
  - Skilled always have more incentives to migrate than the unskilled

- With no-brain waste, \(p_S < 1\): \(S_{p_S \in (0,1)} \leq U_{p_S \in (0,1)}\)
  - Skilled not necessarily have more incentives to migrate
  - Skilled workers’ incentives to migrate reduced for: low \(p_S\) and low \(\omega\)
Brain Waste Scenario: Self-Selection

- Positive self-selection if:

\[ \omega (\gamma - k) + (1 - \gamma) < 1 < p_S \omega (\gamma - \frac{k}{h}) + (1 - p_S) \frac{\omega}{h} (\gamma - k) + (1 - \gamma) \]

- Negative self-selection for: low \( p_S \)
- Possibility of positive self-selection reduced relatively to the no-brain waste scenario
- Implication:
  - Selective migration policies or very strict skills equivalence policies might not be very effective for attracting skilled workers
  - See evidence for Canada (Borjas, 1993; Barret, 1998)
Brain Waste Scenario: Education Incentives

- Education incentives:

\[ c < c_{p_S \in (0,1)} = \omega \left( p_S (\gamma h - k) + (1 - p_S) (\gamma - k) \right) + (1 - \gamma) h - 1 \]  

(11)

- Brain waste versus no-brain waste scenarios:

\[ c_{p_S=1} - c_{p_S \in (0,1)} = (1 - p_S) \omega (\gamma (h - 1)) > 0 \]  

(12)

- Higher incentives to education under the no-brain waste scenario
- Brain waste reduces the returns to education resulting from migration
  - See empirical evidence: Mckenzie and Rapoport (2006); Brauw and Giles (2006)
Brain Waste Scenario: Brain Drain or Gain?

- Brain drain or gain:

\[
\begin{align*}
\left[ \frac{dP_{p_S \in (0,1)}}{d\gamma} \right] & = \gamma(\omega(p_SH+(1-p_S))-h) = k\omega \\
\frac{(h-1)(h-2)+h(p_S\omega-1)+\omega(1-p_S)-k\omega(p_S+(1-p_S))}{\left(1-\frac{\gamma(h-1)}{p_S+(1-p_S)}\right)^2}
\end{align*}
\]

- Brain gain less likely for: High \(k\) and low \(p_S\)
  - See empirical evidence of Beine et al. (2008)
Brain Waste Scenario: Brain Drain or Gain?

- Brain waste *versus* no-brain waste scenarios:

\[
\left[ \frac{dP_{pS=1}}{d\gamma} \right] h\gamma(\omega-1)=k\omega - \left[ \frac{dP_{pS \in (0,1)}}{d\gamma} \right] \gamma(\omega(pS h+(1-pS)\tau)-h)=k\omega = \frac{\omega(1-pS)(h-1)}{(1-\gamma(h-1))^2} > 0
\]

- A brain gain is less likely under the brain waste scenario than under the no-brain waste scenario

- Brain waste depresses the incentives to take education brought by international migration
Education Policy

- Income tax on the unskilled and the skilled workers that remain in the country: $T_{wh}$
- Education subsidy: $Zw$
- Zero migration costs: $k = 0$
  - Reason for this assumption: In order to always have a brain gain
Education Policy, Brain Waste and Brain Gain

- Education subsidy *versus* no-education subsidy:

\[
\left[ \frac{dP_T}{d\omega} \right]_{\rho_S \in (0,1)} \omega = \frac{h(1-T)}{\rho_S(h-1)+1} - \left[ \frac{dP_T=0}{d\omega} \right]_{\rho_S \in (0,1)} \omega = \frac{h}{\rho_S(h-1)+1} \\
(1 - \gamma) (\rho_S (h - 1) + 1) \frac{\gamma (Z \gamma (2-Z) + 2) + \gamma^2 (h-1)^2 + 2h (1-\gamma Z) - \gamma (h^2 - 1) - 1}{(1-\gamma (h+Z-1))^2 (1-\gamma (h-1))^2} 
\]

(15)

- With no-brain waste (\( \rho_S = 1 \)), subsidizing education always increases the brain gain relatively to the no-subsidy case

- With brain waste (\( \rho_S < 1 \)), subsidizing education do not always increases the brain gain relatively to the no-subsidy case

- Education subsidy inefficient for: high \( \gamma \), \( h \) and \( Z \)
Brain waste versus no-brain waste:

\[
\begin{align*}
&\left[ \frac{dP_T^{\rho_S \in (0,1)}}{d\omega} \right]_{\omega = \frac{h(1-T)}{\rho_S(h-1)+1}} - \left[ \frac{dP_T^{\rho_S = 1}}{d\omega} \right]_{\omega = 1-T} = -\frac{(1-\gamma)(1-p_S)(h-1)}{(1-\gamma(h+Z-1))^2} < 0
\end{align*}
\]

(16)

- The education subsidy is more inefficient under the brain waste scenario than under the no-brain waste scenario.
Discussion

Brain waste:
- Reduces the incentives of individuals to acquire education
- Undermines the chances of a positive self-selection
- It weakens the possibility of a brain gain to arise
- It dampens the success of education policies

Results are robust to:
- Other brain gain channels: uncertain migration and remittances
- Amnesties for the illegal
- Multi-country world

Policy issues:
- Selective migration policies and restrictive skill equivalence policies
- Education policies in developing countries