Guest-Worker Migration,
Human Capital and Fertility

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This paper focuses on a temporary guest-worker-type migration.

It demonstrates that the possibility of a low-skilled guest-worker employment in a higher wage foreign country lowers the attractiveness of the skilled employment in the home country and thus prevents more individuals from acquiring human capital.
Even if all individuals who acquired education remain in the home country, the actual number of educated workers in the source economy decreases, and the aggregate level of human capital in thus economy would thus be negatively affected.

This demonstrates a novel non-trivial brain drain effect.
Classical Brain Drain Literature
(Bhagwati and Wilson, 1989):

The developed countries siphon off highly educated workers from the developing countries.

New Brain Drain with Brain Gain Literature

Possibility of migration raises the return to education.
Present Paper:

1) As in the classical BD literature, migration is a detrimental factor to development in poor countries. But the source of this negative effect is not necessarily the out-migration of the most educated workers.

2) As in the new BDBG literature, an economy open to out-migration differs from an economy closed to out-migration in the structure of the incentives for acquiring human capital.

But, the opportunity of out-migration does not necessarily raise the return to education.
In this paper: Migration of individual from the middle class of the wealth (and skill) distribution in the source countries (Chiquiar and Hansen, 2005; Orrenius and Zavodny, 2005; Hansen, 2006; Mishra 2007; McKenzie and Rapoport, 2007, 2010).

Motivating Evidence:
1) Migration from Mexico to the US and Canada
2) Migration from Former Soviet Union to Russia
3) Asian migration to Singapore and Persian Gulf States

Migration is temporary to fill low-skilled jobs.
Negative effect of prospective migration on the incentive to acquire education

- Mexico (Antman 2010; McKenzie and Rapoport 2011)
- Former Soviet Union
  a) Armenia (Grigorian and Melkonyan 2011)
  b) Moldova
- China (de Brauw and Giles 2008)

Low return to foreign education in general
(Friedberg 2000; Bratsberg and Ragan 2002; Gonzales 2003)
Core Assumptions:

- Unskilled wage in the foreign country is not too generous relative to the skilled wage in the home country \( \Rightarrow \) “Upper class” individuals do not have reasons to migrate (Mexico vs. US).

- Costs of migration \( \Rightarrow \) “Low class” individuals do not have resources to migrate (Orrenius and Zavodny, 2007; McKenzie and Rapoport, 2007, among many others).

Result:

- Only “Middle class” individuals have both reasons and resources to migrate.

\( \Rightarrow \) Non trivial Brain Drain effect.
The Basic Structure of the Model

- An open OLG economy that produces a single homogenous good in a CRS technology
- 2 sectors: Skilled and Unskilled
- Individuals live for 3 periods: childhood, young adulthood, adulthood
- Individuals derive utility from their own consumption, the number of children and bequest
- In the first period, children are passive and only consume
- In the second period, individuals can either learn, work at home, or work a fraction of their time in the foreign country as guest workers.
- In the third period, parents spend resources on rearing their children
Production Function

Unskilled Sector: \[ Y_t^u = A^u K_t^\alpha (L_t^u)^{1-\alpha} \]

Skilled Sector: \[ Y_t^s = A_t K_t^\alpha (L_t^s)^{1-\alpha} \]

Unskilled wage: \[ w_t^u = A^u (1-\alpha)(\alpha A^u / r)^{\alpha / (1-\alpha)} \]

Skilled wage: \[ w_t^s = A_t (1-\alpha)(\alpha A_t / r)^{\alpha / (1-\alpha)} \]

Assumption: \[ A_t = A(L_{t-1}^s) \text{ and } \forall t, A_t > A^u \]
\[ \implies w_t^s > w_t^u \]
Utility Function

\[ U_{t-2} = \alpha \ln(C_t) + \beta \ln(N_t) + \gamma \ln(B_t) \]

\[ \gamma \in [\gamma_{\text{min}}, \gamma_{\text{max}}] \]

Budget Constraint

\[ C_t^j + \delta N_t^j w_t^j + B_t^j = I_t^j, \quad j = u, s \]
Migration and Investment in Human Capital

Direct costs of education: \( h_{t-1} = \Theta \omega_{t-1}^s \)

Assumptions:

\[
(\gamma_{\text{min}} / \beta) \delta w_{t-1}^s > \Theta \omega_{t-1}^s > (\gamma_{\text{max}} / \beta) \delta w_u^u
\]

\( i > r \)

\( M > 0 \) is the cost of migration, which cannot be financed by borrowing

\[ \implies \quad \text{If} \quad w_{u}^{uf} > w_{u}^u, \]

Those who do not invest in human capital migrate if

\[
\begin{cases}
F w_{u}^{uf} > F w_{u}^u + M \\
\beta_{t-1} = (\gamma / \beta) \delta w_{u}^u \geq M
\end{cases}
\]


Lifetime Income

Unskilled who work only in the home country:

\[ I_t^u = w^u + w^u (1 + (\gamma \delta / \beta))(1 + r) \]

Unskilled who work a fraction of time abroad:

\[ I_t^{gw} = w^u + ((\gamma \delta / \beta)w^u - M + Fw^{uf} + (1 - F)w^u)(1 + r) \]

Offspring of the poor (unskilled) who invest in human capital:

\[ I_t^{us} = w^s_t + ((\gamma \delta / \beta)w^u - \theta w^s_{t-1})(1 + i) \]

Offspring of the rich (skilled) who invest in human capital:

\[ I_t^s = w^s_t + ((\gamma \delta / \beta)w^s_{t-1} - \theta w^s_{t-1})(1 + r) \]
Utility

Unskilled who work only in the home country:

\[ U^u_{t-2} = \ln \{ w^u_t + w^u_t (1 + (\gamma \delta / \beta))(1 + r) \} + \epsilon^u_t \]

Unskilled who work a fraction of time abroad:

\[ U^{gw}_{t-2} = \ln \{ w^u_t + ((\gamma \delta / \beta)w^u_t - M + Fw^{uf}_t + (1 - F)w^u_t)(1 + r) \} + \epsilon^u_t \]

Offspring of the poor (unskilled) who invest in human capital:

\[ U^{us}_{t-2} = \ln \{ w^s_t + ((\gamma \delta / \beta)w^u_t - \theta w^s_{t-1})(1 + i) \} + \epsilon^s_t \]

Offspring of the rich (skilled) who invest in human capital:

\[ U^s_{t-2} = \ln \{ w^s_t + ((\gamma \delta / \beta)w^s_{t-1} - \theta w^s_{t-1})(1 + r) \} + \epsilon^s_t \]
The offspring of the poor invest in human capital if $U_{t-2}^{us} > U_{t-2}^{gw}$

$$w_t^s + ((\gamma \delta / \beta)w^u - \theta w_{t-1}^s)(1 + i) > ((\gamma \delta / \beta)w^u - M + Fw_{uf}^u + (1 - F)w^u)(1 + r) + w^u)(w_t^s / w^u)^\beta$$

$\implies$ The minimal level of bequest with GW opportunity

$$\hat{b}_{t-1}^{gw} = \frac{w^u + (Fw_{uf} + (1 - F)w^u - M)(1 + r) - (w_t^s - \theta w_{t-1}^s(1 + i))(w^u / w_t^s)^\beta}{(1 + i)(w^u / w_t^s)^\beta - (1 + r)}$$

The minimal level of bequest without GW opportunity $\left(U_{t-2}^{us} > U_{t-2}^{u}\right)$

$$\hat{b}_{t-1}^{ngw} = \frac{w^u(2 + r) - (w_t^s - \theta w_{t-1}^s(1 + i))(w^u / w_t^s)^\beta}{(1 + i)(w^u / w_t^s)^\beta - (1 + r)}$$

$\implies \hat{b}_{t-1}^{gw} > \hat{b}_{t-1}^{ngw}$
Fertility

\[ N_t^u = \frac{\beta}{\delta} \left[ \left( \frac{\gamma \delta}{\beta} + 1 \right)(1 + r) + 1 \right] \]

\[ N_t^{gw} = \frac{\beta}{\delta} \left[ \left( \frac{\gamma \delta}{\beta} + \frac{F w_{t-1}^{uf} - M}{w^u} \right) + 1 - F \right](1 + r) + 1 \]

\[ N_t^s = \frac{\beta}{\delta} \left[ \frac{w_{t-1}^s}{w_t^s} \left( \frac{\gamma \delta}{\beta} - \theta \right)(1 + r) + 1 \right] \]

\[ N_t^{us} = \frac{\beta}{\delta} \left[ 1 - \frac{\theta w_{t-1}^s - (\gamma \delta/\beta)w^u}{w_t^s} \right](1 + i) \]

\[ N_t^{gw} - N_t^u = \frac{\beta}{\delta} \left[ \frac{F (w_{t-1}^{uf} - w^u) - M}{w^u} \right] \]
Main result: The availability of a low-skilled employment in a higher wage foreign country

1. Increases the threshold level of bequest necessary for investment in education $\hat{b}_{t-1}^{gw} > \hat{b}_{t-1}^{ngw}$

2. Increases fertility of unskilled individuals who work a fraction of their time abroad $N_t^{gw} > N_t^u$

3. Prevents individuals who receive bequest that falls in the range of $[\hat{b}_{t-1}^{ngw}, \hat{b}_{t-1}^{gw}]$ from investing in human capital

4. If less poor invest in human capital, economic growth in the source economy is negatively affected $A_t^{ngw} > A_t^{gw}$
The availability of a guest-worker employment abroad generates a non-trivial brain drain effect:

This is not that the level of human capital in a developing country grows slowly because the developed world “siphons off” its highly educated workers.
The process of human capital accumulation in the source country slows down because the availability of a higher-wage low-skilled employment abroad lowers the relative attractiveness of skilled employment in the home country.

Therefore, fewer individuals find it worthwhile to acquire skills and, as a consequence, the very process of human capital accumulation in negatively affected.

In addition, the guest-worker employment in a higher-wage foreign country also increase fertility via a standard income effect.