Urbanization and Economic Development: A Tale of Two Barriers

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- Why China?
  1. China had spectacular economic growth over the past three decades
  2. China facilitated the largest rural-urban migration flows and the sharpest trade liberalization over 1992-2002
- Thus, it is natural to inquire whether reductions in trade and migration barriers have played important roles in China’s growth and urbanization.
**Observation**

- "Unlimited supplies" (Lewis 1954) or "surplus" (Fei-Ranis 1964) unskilled labor in rural areas:

<table>
<thead>
<tr>
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<th>China</th>
<th>Egypt</th>
<th>India</th>
<th>Korea</th>
<th>Taiwan</th>
<th>Thailand</th>
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<tbody>
<tr>
<td>1950</td>
<td>87</td>
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<td>2000</td>
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<td>55</td>
<td>72</td>
<td>18</td>
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<td>78</td>
</tr>
</tbody>
</table>

- Abundant rural surplus labor in China:
  - 13 – 28% of total population (Bowlus and Sicular 2003)
  - about 150 – 250 millions (Laing, Park and Wang 2005)

- Large urban-rural wage gap (2 : 1) but very modest growth in real effective wage rate of the unskilled (< 1% over 1992 – 2005 for workers with 9 years of schooling or less)
Surplus Labor and Migration

- Pioneers on economic development with surplus of labor: Lewis (1954), Fei-Ranis (1964), Sen (1966)-implication for labor-market performance and economic development

- Rural-urban migration and urban unemployment:
  - classic: Todaro (1969), Harris-Todaro (1970) - urban unemployment and labor policies are examined under an institutionally fixed minimum wage

- Trade and migration (static):
  - Beladi-Marjit (1996): reduction in tariff lowers capital rental and raises urban employment if urban final sector is capital intensive
  - Chang-Kaltanic-Loayza (2009): reduction in tariff improves production efficiency from the goods market perspective but increases labor market distortions
Migration and Growth

- Migration and growth:
  - rural-urban migration and low-growth trap with informational asymmetry:
    - Bencivenga-Smith (1997): low growth trap due to adverse selection of workers into urban areas
    - Banerjee-Newman (1998): low growth trap due to urban modern sector with lower credit availability due to higher agency costs
  - Lucas (2004): cities enable new immigrants to accumulate human capital for using modern technologies, inducing sustained growth
  - Lipschitz-Rochon-Verdier (2008) explain transition growth in China using a model with a rural-urban labor mobility rule in a small open setting focusing on FDI
  - all except Lipschitz et al are in closed economy setting.
**Structural Transformation**

- Hansen and Prescott (2001) and Ngai and Pissaridis (2007) highlight dominant technology growth of the modern compared to the traditional sector.
- Gollin, Parente, and Rogerson (2002), technical progress in the agricultural sector is the main driver that allows the reallocation of labor to modern industries.
- Casselli and Coleman (2001) and Duarte and Restuccia (2010) study cross-region and cross-country differences in labor productivity.
- Herrendorf, Rogerson, Valentinyi (2013)-survey of this literature.
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     2. high migration barrier due to rigid household registration (hukou, aka hokou)
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Calibration Results

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- Migration cost reduction and TFP changes are both important, accounting for a significant proportion of increased urbanization.
- Overall, a one percent reduction in import tariff generates about one-third percent increase in real GDP per capita and about a quarter percent increase in urbanization.
The Model: Rural/Urban Migration

- The exogenously given stock of unskilled labor, denoted \( \bar{N} > 0 \), consists of a group of size \( N \) residing in the rural area and a group of size \( L \) located in the urban area.
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  - The exportable good, $X$, requires inputs of unskilled labor and capital and is not consumed domestically
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- Unskilled workers receive utility of $\psi U(c_{Y,t}^u)$ $\psi$ is a migration discount factor.
- Migration equilibrium implies:
  $$\psi U\left(\frac{w_t}{T_Y}\right) = \overline{U}$$
The Model: Rural/Urban Migration

- This pins down the equilibrium real unskilled wage rate, 
  \[ \frac{w_t}{T_Y} \]
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- Using constant-elasticity-of-intertemporal-substitution utility.
- The migration condition is given by

\[
w = T_Y \left( \frac{\bar{U}}{\psi \nu} \right)^\nu
\]
The Model: Rural/Urban Migration
The Model: Capital Accumulation

All capital is owned by households that own skilled labor. The stock of skilled labor exogenous, \( H = 1 \). The skilled wage rate is \( s_t \), so the budget constraint at time \( t \) for skilled labor is

\[
c_{S,t} + I_t = \frac{s_t + r_t K_t}{T_Y} + T_t
\]

where \( K \) is capital, \( I \) is investment, \( r \) is the return on capital, and \( T \) is the net transfer from the government in terms of good \( Y \).
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- Capital accumulation:

\[
K_{t+1} = (1 - \delta)K_t + I_t / \mu(I_t)
\]

\( \mu(I_t) \) captures the severity of capital investment barriers \( (\mu' > 0, \mu'' < 0) \) a la Parente-Prescott (1994).
The Model: Capital Accumulation

In steady state, we get the modified Golden Rule:

\[ r = \frac{(\rho + \delta) \mu(I_t)T_Y}{1 - \epsilon} \]
The Model: Urban Sector

- The exportable is produced using capital and unskilled labor with a Cobb-Douglas technology 
  \[ X = B K^\theta_X L^{\theta_L} \]
  
- The zero profit condition is
  \[ C_X(w_t, r_t) = p T_X \]
  where \( T_X = 1 + \eta \) and \( \eta \) is the ad valorem export subsidy rate.

- For the importable, produced with capital, unskilled labor and skilled labor 
  \[ Y = A \left[ F(K_Y, H) \right]^{1-\theta_Y} L_Y^{\theta_Y} \]
  , the zero profit condition is
  \[ C_Y(w_t, r_t, s_t) = T_Y \]
The Model: Urban Sector

- Using the unit cost functions and the full employment conditions for skilled labor, capital, and unskilled labor can be expressed as:

\[
C_s^Y(w_t, r_t, s_t)Y_t = H = 1
\]
\[
C_r^X(w_t, r_t)X_t + C_r^Y(w_t, r_t, s_t)Y_t = K_t
\]
\[
C_w^X(w_t, r_t)X_t + C_w^Y(w_t, r_t, s_t)Y = L = \bar{N} - N_t
\]

- We can define real aggregate output, \( R \) as

\[
R = \frac{pT_X}{T_Y}X + Y
\]
Let \( M_t \) denote the level of imports, goods market equilibrium is

\[
M_t = \frac{s_t + r_t K_t}{T_Y} + T_t + \frac{w_t L_t}{T_Y} - Y_t
\]

Budget balance requires that transfers \( T_t \) be set as

\[
T_t = (T_Y - 1)M_t - \frac{p_t (T_X - 1)}{T_Y} X_t
\]
Factor Prices

- Solving the model we get the following

\[ \hat{w} = \hat{T}_Y - \nu \hat{\psi} \]
\[ \hat{r} = -\frac{\theta_{LX}}{\theta_{KX}} (\hat{T}_Y - \nu \hat{\psi}) \]
\[ \hat{s} = \frac{(1-\theta_{LY}) \theta_{KX} + \theta_{LX} \theta_{KY}}{\theta_{KX} \theta_{HY}} \hat{T}_Y - \frac{\theta_{LX} \theta_{KY} - \theta_{LY} \theta_{KX}}{\theta_{KX} \theta_{HY}} \nu \hat{\psi} \]

- The existence of surplus labor locks the real wage of unskilled labor into the utility level available in the rural sector, so it will only be affected by policies that affect the cost of migration to the urban areas.

- With a fixed real wage (in terms of good \( Y \)), the return to capital is increasing in policies that favor the exportable sector.

- The return to skilled labor is decreasing in policies that favor the exportable sector.
Skill Premium

- We can write the skill premium as

$$\hat{s} - \hat{\psi} = \frac{1}{\theta_{KX}\theta_{HY}} \left[ \theta_{KY} \hat{T}_Y - (\theta_{KY} - \theta_{KX}) \nu \hat{\psi} \right]$$

- An increase in the relative protection offered to the $Y$ sector relative to the $X$ sector raises the skill premium.

- If the capital cost share in the $Y$ sector exceeds the $X$ sector ($\theta_{KY} > \theta_{KX}$), then lower migration cost reduces the skill premium.
Factor Prices

Theorem

(Factor Prices)

1. A reduction in import tariff raises the return on capital but has no effect on the real unskilled wage.

2. A reduction in migration barriers lowers the unskilled wage, raises the return on capital, and reduces the skilled wage rate if the import sector is capital intensive in the cost sense.
We next solve for the rate of capital accumulation

\[ \hat{K} = \gamma \left( -\frac{1}{\theta_{KX}} \hat{T}_Y + \frac{\theta_{LX}}{\theta_{KX}} \nu \hat{\psi} \right) \]

where \( \gamma \equiv \frac{1-\epsilon}{\epsilon} > 0 \)

- The steady state supply of capital is more elastic the lower is \( \epsilon \), where \( \epsilon \) is the rate at which the cost of investment increases with the level of investment
- The effects of trade-related policies are all magnified when capital supply is more elastic
Theorem

(Capital Accumulation) A reduction in the import tariff or migration barriers raises the steady state capital stock.
The effects of trade and migration barriers on importable outputs

\[ \hat{Y} = \hat{H} + \eta_{sr} \left( \frac{\theta_{KY} + \theta_{HY}}{\theta_{HY}} \right) \left( \frac{1}{\theta_{KX}} \hat{T}_Y - \frac{1}{\theta_{KX}} \frac{\theta_{LX} - \theta_{LY}}{\theta_{KY} + \theta_{HY}} \nu \hat{\psi} \right) \]

where \( \eta_{sr} \equiv \frac{rG_{sr}}{G_s} > 0 \) is the elasticity of demand associated with the sub-production function \( F \) as

the output in the \( Y \) sector is increasing in import protection, \( T_Y \) and decreasing in migration costs

The effects of trade and migration barriers on exportable outputs

\[ \hat{X} = -\frac{\Delta + \gamma + \lambda_{KX} \theta_{LX}}{\lambda_{KX} \theta_{KX}} \hat{T}_Y + \frac{\left( \frac{\theta_{LX} - \theta_{LY}}{\theta_{KY} + \theta_{HY}} \right)}{\lambda_{KX} \theta_{KX}} \Delta + (\gamma + \lambda_{KX}) \theta_{LX} \nu \hat{\psi} \]

the output of good \( X \) is decreasing in \( T_Y \)

a reduction in migration barriers will increase the output of exportables because it lowers the real cost of unskilled labor
Output and Factors

**Theorem**

*(Sectoral Outputs)* A reduction in the import tariff or the migration barrier raises the output of the exportables but lowers the output of the import-competing good.

**Theorem**

*(Factor Allocations)*

1. A reduction in the import tariff encourages the allocation of capital and unskilled labor toward the production of the export good and lowers the capital-labor ratios in both sectors.

2. A reduction in migration barriers lowers the export sector’s capital-labor ratio unambiguously and also lowers the import sector’s capital-labor ratio if the import sector is capital intensive in the cost sense.
Theorem

(Urbanization)

1. When the import-competing sector more capital intensive in the quantity sense, a reduction in the import tariff speeds up the urbanization process.

2. When the import-competing sector is more capital intensive in both quantity and cost sense, a reduction in the migration barrier promotes urbanization.
Theorem

(Aggregate Urban Manufacturing Output) Suppose skilled workers receive zero net real transfer from the government.

1. When the import-competing sector more capital intensive in the quantity sense, a reduction in the import tariff raises aggregate manufacturing output.

2. When the import-competing sector is more capital intensive in both quantity and cost sense, a reduction in migration barriers also raises aggregate manufacturing output.
We calibrate the benchmark model to fit observations from China over the period of 1980 to 2008.

China not only had large trade and migration barriers, but also experienced large reductions in each barrier during this period.

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- **Regime 2 (1995-2001):** this subperiod had significant reduction in tariffs and relaxed migration regulations.
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Divide the period into three Regimes:

1. **Regime 1 (1980-1994):** This subperiod featured high tariffs and restrictive migration regulated by Hukou.
2. **Regime 2 (1995-2001):** This subperiod had significant reduction in tariffs and relaxed migration regulations.
3. **Regime 3 (2002-2008):** This subperiod had low tariffs to meet the WTO guides and continuation of relaxed migration regulations.
Calibration

- Utility function is assumed to be log linear, \( \ln(c) \)
- The production function of the import is Cobb-Douglas
- The capital barrier function \( \mu(I) \) has an iso-elastic form, \( \mu(I) = \mu_0 I^\epsilon \)
- we choose discount rate \( \rho = 0.03 \), the capital depreciation rate \( \delta = 0.05 \)
- We normalize the average skilled labor \( H = 1 \) and the reservation value to be \( \bar{U} = 1 \)
- The urban-rural unskilled wage ratio is set at \( \varpi = 2 \)
Calibration

- We begin by matching the average moments over the entire sample period of 1980-2008
- $\tau = 15.0\%$
We compute the following

1. capital income share in the exporting sector $\beta = 0.528$
2. capital income share in the import-competing sector $\alpha_K = 0.600$
3. skilled wage income share in the import-competing sector $\alpha_H = 0.072$
4. skill premium $s/w = 1.55$
5. the unskilled labor share and the capital share in the exporting sector are $\frac{L_X}{L} = 57.8\%$ and $\frac{K_X}{K} = 45.6\%$
6. sectoral productivity growth rates measured by the rates of change of Solow residuals rates $g_A = 1.14\%$ and $g_B = 2.56\%$

This implies that the import-competing sector is capital intensive in both quantity and cost sense.
Now we calibrate each of the three regimes separately

- high tariff $\tau = \tau^H = 0.335$
- restricted migration regulation by Hukou with $\psi = \psi^L = 0.546427$
- low college admission with $H = H^L = 0.463378$
- low working population $POP = POP^L = 71.34489$
- low service employment share $\zeta = \zeta^L = 0.178$,
- high sectoral TFP ratio $A/B = A^H/B^H = 1.06854$
Calibration Results

- **Regime 2 (1995-2001):**
  - intermediate tariff $\tau = \tau^M = 0.148$
  - relaxed migration regulation by Hukou with $\psi = \psi^H = 0.640823$
  - low college admission with $H = H^L = 0.463378$
  - intermediate working population $POP = POP^M = 83.705079$
  - intermediate service employment share $\zeta = \zeta^M = 0.270$
  - intermediate sectoral TFP ratio $A/B = A^M/B^M = 0.920668$

- **Regime 3 (2002-2008):**
  - low tariff $\tau = \tau^L = 0.0584$
  - relaxed migration regulation by Hukou with $\psi = \psi^H = 0.640823$
  - high college admission with $H = H^H = 3.285563$
  - high working population $POP = POP^H = 89.181112$
  - high service employment share $\zeta = \zeta^M = 0.310$
  - low sectoral TFP ratio $A/B = A^L/B^L = 0.840637$
Calibration Results

<table>
<thead>
<tr>
<th></th>
<th>Sectoral Shares</th>
<th></th>
<th>Real GDP per capita</th>
<th>Urban Share output</th>
<th>Urban Share employ</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>labor</td>
<td>capital</td>
<td>output</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$\frac{L_x}{L}$</td>
<td>$\frac{K_x}{K}$</td>
<td>$\frac{X}{R}$</td>
<td>$\frac{RGDP}{POP}$</td>
<td>$\phi$</td>
</tr>
<tr>
<td>Bench 1980-2008</td>
<td>57.8%</td>
<td>45.6%</td>
<td>48.3%</td>
<td>5.706</td>
<td>66.4%</td>
</tr>
<tr>
<td>Reg 1: 1980-1994</td>
<td>60.6%</td>
<td>47.9%</td>
<td>44.8%</td>
<td>4.048</td>
<td>60.2%</td>
</tr>
<tr>
<td>Reg 2: 1995-2001</td>
<td>58.2%</td>
<td>46.0%</td>
<td>55.5%</td>
<td>5.975</td>
<td>68.9%</td>
</tr>
<tr>
<td>Reg 3: 2002-2008</td>
<td>56.4%</td>
<td>44.2%</td>
<td>54.2%</td>
<td>9.634</td>
<td>75.4%</td>
</tr>
</tbody>
</table>
Calibration Implications

- Three implications:
  1. Both the urban output share and the urbanization rate rise sharply over time
  2. Real GDP per capita also increases sharply in the later period due to accession to the WTO
  3. The sectoral shifts are different than a simple Hecksher-Ohlin would have predicted. Trade liberalization should result in reallocation from the import sector to the export sector. Because of surplus labor what we see is a modest allocation of unskilled labor and physical capital toward the import-competing sector.

- We next conduct counterfactual analysis to help us better understand these results
Counterfactuals

We begin our counterfactual analysis by individually setting important parameters, one at a time, in Regime 2 (Regime 3) to their values in Regime 1 (Regime 2), to try and isolate the effect of these changes
### Counterfactuals

<table>
<thead>
<tr>
<th>Sectoral Shares (%)</th>
<th>Real GDP per capita</th>
<th>Urban Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>labor</td>
<td>capital</td>
<td>output</td>
</tr>
<tr>
<td>( \frac{L_X}{L} )</td>
<td>( \frac{K_X}{K} )</td>
<td>( \frac{X}{R} )</td>
</tr>
<tr>
<td>Regime 1: 1980-1994</td>
<td>60.6</td>
<td>47.9</td>
</tr>
<tr>
<td>Regime 2: 1995-2001</td>
<td>58.2</td>
<td>46.0</td>
</tr>
<tr>
<td>Regime 3: 2002-2008</td>
<td>56.4</td>
<td>44.2</td>
</tr>
</tbody>
</table>

Case 1: Counterfactual for Regime 2 (changing parameter value as it were in Regime 1)

a. when \( \tau^M \) is raised to \( \tau^H \)

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>46.4</td>
<td>34.6</td>
<td>42.7</td>
<td>5.820</td>
</tr>
</tbody>
</table>

b. when \( \psi^H \) is lowered to \( \psi^L \)

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>44.2</td>
<td>32.6</td>
<td>38.0</td>
<td>4.774</td>
</tr>
</tbody>
</table>

c. when \( A^M / B^M \) becomes \( A^H / B^H \)

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>82.2</td>
<td>73.8</td>
<td>68.9</td>
<td>5.409</td>
</tr>
</tbody>
</table>

Case 2: Counterfactual for Regime 3 (changing parameter value as it were in Regime 2)

a. when \( \tau^L \) is raised to \( \tau^M \)

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>46.6</td>
<td>34.8</td>
<td>43.5</td>
<td>9.406</td>
</tr>
</tbody>
</table>

b. when \( H^H \) is lowered to \( H^L \)

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>65.3</td>
<td>53.5</td>
<td>71.0</td>
<td>7.155</td>
</tr>
</tbody>
</table>

c. when \( A^L / B^L \) becomes \( A^M / B^M \)

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>67.7</td>
<td>56.1</td>
<td>59.9</td>
<td>8.790</td>
</tr>
</tbody>
</table>
Counterfactuals

- If there were no reduction in the tariffs (Case 1a and Case 2a), sectoral reallocation works in the same way as Hecksher-Ohlin theory, namely, protection leads to resources allocated toward the protected sector.
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Counterfactuals

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- Because the import-competing sector uses unskilled labor less intensively, higher migration cost (i.e., a lower migration wedge $\psi$) leads to resource reallocation in favor of the import-competing sector.

- Since the import-competing sector uses skilled labor more intensively, less availability of skilled labor leads resource allocation away from the import-competing sector.
We next consider urbanization and economic development, measured by urban output/employment shares and real GDP per capita.

We decompose the changes in urbanization and economic development into:

1. tariff and migration cost reduction and TFP changes in Case 1
2. tariff reduction, skill expansion and TFP changes in Case 2
## Counterfactuals

### Decomposition Analysis (all in %)

<table>
<thead>
<tr>
<th>Case 1: Counterfactual for Regime 2</th>
<th>Real GDP per capita</th>
<th>Urban Share output</th>
<th>Urban Share employ</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. tariff reduction</td>
<td>8.0</td>
<td>19.5</td>
<td>46.5</td>
</tr>
<tr>
<td>b. migration cost reduction</td>
<td>62.3</td>
<td>57.5</td>
<td>37.2</td>
</tr>
<tr>
<td>c. TFP ratio change</td>
<td>29.4</td>
<td>44.8</td>
<td>32.6</td>
</tr>
<tr>
<td>d. population change/service expansion</td>
<td>0.3</td>
<td>-21.8</td>
<td>-16.3</td>
</tr>
</tbody>
</table>

### Case 2: Counterfactual for Regime 3

| a. tariff reduction                | 2.4                 | 1.9                | 5.5                |
| b. skill expansion                | 25.7                | 3.7                | 6.1                |
| c. TFP ratio change                | 8.8                 | 4.5                | 6.6                |
| d. population change/service expansion | 63.1                | 89.9               | 81.8               |
Counterfactuals

The primary drivers to explain real per capita GDP growth are migration cost reduction, skill accumulation, population growth slowdown, and service expansion.
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- It is somewhat surprising that TFP contributes more to urbanization than to real per capita GDP growth.
- In the transition from Regime 2 to 3 after China was admitted to the WTO, the main contribution to urbanization is due to population growth slowdown and service expansion.
Conclusion

- Liberalization, in the form of tariff reduction and relaxation of migration constraints, promote capital accumulation.
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