CAPITAL FLOWS TO DEVELOPING COUNTRIES: THE ALLOCATION PUZZLE

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# Korea vs. Madagascar, 1980-2000

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THE MODERN GROWTH CONSENSUS

(Hall & Jones (1999), Parente & Prescott (1994), Caselli (2005) and the development accounting literature)

▷ A large share of the differences in development outcomes can be attributed to productivity
  ★ Explains levels of development
  ★ Explains growth miracles and growth disasters (Korea vs Madagascar)

▷ This paper:
  ★ Implications of that consensus for capital flows.
  ★ Find a robust puzzle in the allocation of capital flows across developing countries.
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<td>41.2</td>
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WHAT DOES THIS IMPLY FOR CAPITAL FLOWS?

- Faster productivity growth implies more investment, possibly less saving.
- Expect **more** capital inflows to Korea than Madagascar (relative to output)
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<td><strong>Net capital inflows (% of GDP)</strong></td>
<td>0.1</td>
<td>6.4</td>
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Figure 1: Capital Inflows and Investment relative to GDP. Years 1980-2000.

Source: PWT and WDI
ALLOCATION PUZZLE AND LUCAS PUZZLE...

...ARE TWO SEPARATE THINGS

Lucas Puzzle:

▷ About the **small size** of capital flows from rich to poor countries

▷ is consistent with our findings, given the lack of productivity catch-up in developing countries.

Allocation Puzzle:

▷ Allocation of capital flows **across** developing countries, not their level;

▷ Empirically, the predicted flows are **negatively correlated** with observed flows: **capital flows ‘upstream’**.
A small open economy Ramsey model

- Neoclassical benchmark:
  - Preferences: \( U_t = \sum_{s=0}^{\infty} \beta^s N_{t+s} u(c_{t+s}) \);
  - Technology: \( \tilde{y} = \tilde{k}^\alpha; \tilde{k} = k/A \)
  - Population growth, \( n \): \( N_t = N_0 n^t \)
  - Long run productivity growth: \( \lim_{t \to \infty} A_{t+1}/A_t = g^* \)
  - Capital wedge \( \tau \): \( (1 - \tau) R_t \)
  - Financial integration: \( (1 - \tau) R_t = R^* = g^* \gamma / \beta \)

- Capital flows in response to:
  - Capital scarcity: \( \tilde{k}_0 < \tilde{k}^* \)
  - Productivity catch-up: \( \pi_t = A_t / (A_0 g^{*t}) \to \pi_T = \pi > 1 \)
Net Capital Inflows Accounting

Convergence Flows:

\[ \tilde{d}^c = \tilde{k}^* - \tilde{k}_0 \]

Productivity flows in the Ramsey model:

- **Investment:**
  \[ \tilde{d}^i = \frac{\tilde{k}^* (\pi - 1)}{\pi} \]

- **Saving:**
  \[ \tilde{d}^s = \frac{\chi}{R^*} \sum_{t=0}^{T} \left( \frac{ng^*_t}{R^*} \right)^t \frac{\pi - \pi_t}{\pi} \]

when \( \pi > 1 \):

- \( \tilde{d}^i > 0 \)
- \( \tilde{d}^s > 0 \)

so \( \tilde{d}^p = \tilde{d}^i + \tilde{d}^s > 0 \)
Productivity flows in the Solow model:

- Constant saving rate $s$ such that: $s = (\delta + ng^* - 1) \tilde{k}^*(1-\alpha)$

\[\tilde{d}^i = \tilde{k}^* \left( \frac{\pi - 1}{\pi} \right)\]

\[\tilde{d}^{solow} = \tilde{k}^* \left( \frac{\pi - 1}{\pi} \right) \left[ \frac{1}{T} \left( \frac{1 - \rho^T}{1 - \rho} \right) - 1 \right]\]

where $\rho = sR^*/ng^* < 1$

- when $\pi > 1$:
  - $\tilde{d}^i > 0$
  - $\tilde{d}^{solow} < 0$
  - but $\tilde{d}^p = \tilde{d}^i + \tilde{d}^{solow} > 0$
**CALIBRATION**

- Common parameters: log preferences, $\beta = 0.96$, $g^* = 1.0168$, $\alpha = 0.3$, $\delta = 0.06$

- Productivity catch-up from Solow decomposition:
  \[ A_t^{1-\alpha} = \frac{y}{k^\alpha} \]  
  H-P filter to remove short term fluctuations.

- Capital wedge from
  \[ \frac{i}{Y} = \alpha(\delta + n\bar{g} - 1)/(R^*/(1 - \tau) + \delta - 1) \]

- Countries differ in terms of $\bar{g}$, $n$ and $\tau$.

- Sample of 65 non-OECD, between 1980-2000. Data from PWT and WDI.
ACCOUNTING FOR DOMESTIC CAPITAL ACCUMULATION:

- We can decompose predicted capital accumulation into:

\[
\Delta K^p = \Delta K^{pc} + \Delta K^{pp} + \Delta K^{p0} \tag{1}
\]

\[
\Delta K^{pc} = \tilde{k}^* \left( 1 - \frac{\tilde{k}_0}{\tilde{k}^*} \right) A_0 N_0 \tag{2}
\]

\[
\Delta K^{pp} = \tilde{k}^* n^T (\bar{g}^T - g^* T) A_0 N_0 \tag{3}
\]

\[
\Delta K^{p0} = \tilde{k}^* (g^* n)^T - 1) A_0 N_0 \tag{4}
\]
<table>
<thead>
<tr>
<th>Predicted Capital Flows</th>
<th>$\Delta K$</th>
<th>$\Delta K^p$</th>
<th>$\Delta K^{pe}$</th>
<th>$\Delta K^{pp}$</th>
<th>Obs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-OECD countries</td>
<td>16,758</td>
<td>16,824</td>
<td>2,299</td>
<td>443</td>
<td>65</td>
</tr>
<tr>
<td>Low Income</td>
<td>3,232</td>
<td>3,334</td>
<td>505</td>
<td>249</td>
<td>23</td>
</tr>
<tr>
<td>Lower Middle Income</td>
<td>8,523</td>
<td>7,685</td>
<td>762</td>
<td>1648</td>
<td>23</td>
</tr>
<tr>
<td>Upper Middle Income</td>
<td>2,749</td>
<td>3,549</td>
<td>741</td>
<td>-2,404</td>
<td>14</td>
</tr>
<tr>
<td>High Income (Non-OECD)</td>
<td>2,254</td>
<td>2,257</td>
<td>291</td>
<td>950</td>
<td>5</td>
</tr>
<tr>
<td>Africa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Africa</td>
<td>884</td>
<td>948</td>
<td>-63</td>
<td>-790</td>
<td>30</td>
</tr>
<tr>
<td>Latin-America</td>
<td>2,752</td>
<td>3,580</td>
<td>796</td>
<td>-3,016</td>
<td>21</td>
</tr>
<tr>
<td>Asia</td>
<td>13,122</td>
<td>12,296</td>
<td>1,566</td>
<td>4,248</td>
<td>14</td>
</tr>
<tr>
<td>Asia except China and India</td>
<td>9,340</td>
<td>10,463</td>
<td>1,982</td>
<td>-2,855</td>
<td>63</td>
</tr>
<tr>
<td>China and India</td>
<td>7,418</td>
<td>6,361</td>
<td>317</td>
<td>3,298</td>
<td>2</td>
</tr>
<tr>
<td>OECD</td>
<td>27,520</td>
<td>29,064</td>
<td>7,656</td>
<td>-720</td>
<td>20</td>
</tr>
</tbody>
</table>

Table 1: Increase in Capital Stock, 1980-2000. billions of 1996 international dollars.
Figure 2: Actual and Predicted capital accumulation (log scale). Years 1980-2000.

Source: PWT and WDI
ACCOUNTING FOR DOMESTIC CAPITAL ACCUMULATION

▷ The fit is excellent!

▷ This is not surprising: the model is designed to account for the increase in capital stocks based on capital convergence and productivity catch-up.

▷ This is a strength of our approach; we can now ask: what about predicting the direction and size of capital flows?
**NET CAPITAL INFLOWS ACCOUNTING**

▷ Realized net capital inflows constructed from cumulated current account balances:

\[
\hat{D} = - \sum_{s=1980}^{2000} CA_s
\]

▷ Current account measured in 1996 international dollars (converted from WDI data using PPP-GDP deflator)

▷ compared to \( D^c, D^i, D^s \) and \( D^{solow} \) from the theory.
Figure 3: Actual and Predicted Capital Inflows/GDP. Years 1980-2000.

Source: PWT and WDI
Figure 4: Predicted Capital Inflows/GDP and Trend Productivity Growth. Years 1980-2000.

Source: PWT and WDI
Figure 5: Actual Capital Inflows/GDP and Trend Productivity Growth. Years 1980-2000.

Source: PWT and WDI
**Net versus Gross Capital Inflows**

- We use GDF data to decompose net capital inflows into *private* and *public* flows:

\[ \hat{D} = KF^p + KF^g \]  
\[ KF^g = KF^{pg} + KF^{gg} - \Delta RES \]  

where:

- \( KF^{pg} \): net flows on public and publicly guaranteed (PPG) debt from private creditors;
- \( KF^{gg} \): net flows on PPG debt from official creditors + IMF purchases - IMF repurchases
- \( \Delta RES \): change in official reserves.
## Capital Flows Components

<table>
<thead>
<tr>
<th></th>
<th>$\hat{D}$</th>
<th>$FDI$</th>
<th>$\Delta RES$</th>
<th>$KF^g$</th>
<th>$KF^p$</th>
<th>Obs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-OECD countries</td>
<td>2,113</td>
<td>2,298</td>
<td>1,785</td>
<td>619</td>
<td>1,494</td>
<td>57</td>
</tr>
<tr>
<td>Low Income</td>
<td>1,088</td>
<td>137</td>
<td>326</td>
<td>476</td>
<td>612</td>
<td>20</td>
</tr>
<tr>
<td>Lower Middle Income</td>
<td>145</td>
<td>1,296</td>
<td>1,020</td>
<td>57</td>
<td>88</td>
<td>20</td>
</tr>
<tr>
<td>Upper Middle Income</td>
<td>972</td>
<td>796</td>
<td>272</td>
<td>210</td>
<td>763</td>
<td>16</td>
</tr>
<tr>
<td>High Income (Non-OECD)</td>
<td>-93</td>
<td>70</td>
<td>167</td>
<td>-124</td>
<td>31</td>
<td>1</td>
</tr>
<tr>
<td>Africa</td>
<td>281</td>
<td>69</td>
<td>113</td>
<td>173</td>
<td>108</td>
<td>23</td>
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<tr>
<td>Latin-America</td>
<td>1,263</td>
<td>806</td>
<td>232</td>
<td>355</td>
<td>908</td>
<td>22</td>
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<tr>
<td>Asia</td>
<td>569</td>
<td>1,423</td>
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<td>except China and India</td>
<td>2,296</td>
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<td>903</td>
<td>704</td>
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<td>55</td>
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<td>China and India</td>
<td>-183</td>
<td>1,014</td>
<td>882</td>
<td>-84</td>
<td>-98</td>
<td>2</td>
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Figure 6: Actual Public Inflows/GDP and Predicted Total flows/GDP. Years 1980-2000.
Source: PWT and WDI
Figure 7: Actual Private Inflows/GDP and Predicted Total flows/GDP. Years 1980-2000.
Source: PWT and WDI
Figure 8: Actual Reserve Accumulation/GDP and Predicted Total flows/GDP. Years 1980-2000.
Source: PWT and WDI
Figure 9: FDI inflows/GDP and Predicted Total flows/GDP. Years 1980-2000.
Source: PWT and WDI
POTENTIAL EXPLANATIONS

▷ International Credit Constraints: magnitude, not direction;

▷ Public vs Private Flows:
  ★ Reserves and public flows go in the wrong direction
  ★ Possible explanation for very poor countries (Madagascar):
    multilateral lending finances consumption, not investment.
  ★ But this cannot explain high relative net lending for high
    productivity growth countries

▷ ‘Exogenous’ Saving: unsatisfactory evidence. How can it
  explain the cross-country pattern?
POTENTIAL EXPLANATIONS

Conjecture: Interactions between domestic and international financial frictions.

- **domestic friction**: developing countries lack high quality local stores of value;
- **international friction**: foreigners can provide only limited funding (sovereign risk, asymmetric information...)
- **perverse capital flow allocation** provide a way to bypass local credit market imperfections (as in Caballero, Farhi and Gourinchas (2006), Aoki, Benigno and Kiyotaki (2006), or Ju and Wei (2006)).