Why do some countries receive aid as insurance, while others do not?

Ryan Banerjee

University of Maryland

January 16, 2010
Introduction

Question

- Why do some countries receive procyclical aid?
- When other countries receive countercyclical aid?

Why is this important?

- ODA important for financing current account deficits in many developing countries
- Variation in the current account enables countries to smooth aggregate shocks
- Would welfare be improved by giving countercyclical aid? (Bulir and Hamann, 2001; Pallage, Robe and Berube, 2006)
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Inverse relationship between $\text{Corr}(\text{aid}_t, \text{GDP}_t)$ and institutional transparency.

Data: Ryan Banerjee (University of Maryland)
Relationship holds for:
- Total, Bilateral, Multilateral aid
- Within and Between country variation
- Similar inverse relationship with aid commitments in $t + 1$
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Robust to controlling for:
1. Level of GDP ✓
2. Level of Aid ✓
3. Volatility of GDP ✓
4. Volatility of Aid ✓
5. Conflicts, Coups, Crises ... ✓✓✓
One page of a document is shown, discussing five stylised facts about the cyclical behaviour of aid. The text is as follows:

1. The correlation between institutional transparency and $\text{Corr}(\text{aid}_t, \text{GDP}_t)$ is negative.
2. The correlation between institutional transparency and $\text{Corr}(\text{aid commitments}_{t+1}, \text{GDP}_t)$ is negative.
3. The volatility of GDP is independent of institutional transparency.
4. The volatility of aid is independent of institutional transparency.
5. The level of aid per capita is uncorrelated with institutional transparency.

The text is attributed to Ryan Banerjee (University of Maryland) and is part of a larger presentation titled "Aid as insurance."
Why does transparency affect aid cyclicality?

Are downturns caused by exogenous events?
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- Received countercyclical aid as insurance against downturns.
Why transparency?

- **Zaire**: opaque institutions, $\text{Corr}(\text{aid}, \text{GDP}) = 0.77$
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- "‘We never had solid data, because [the Zairian authorities] weren’t willing to provide it,’ admitted a senior World Bank economist. ‘We could never get a good grasp of what was happening.’” (p.209 para. 1, Wrong, 2001)
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- “In mid-1981 this temporary improvement [in macro variables] led to another - and larger - IMF advance of approximately $950 million. Soon thereafter Zaire was again out of compliance with the agreement, and by 1982 further advances had again been cut off.” (p. 384, para. 3, Young and Turner, 1985).
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- Procyclical aid
Developing Country

- Poor: Donor cares about
- Rich: Government favours
- Government can exert effort which increase level of GDP
  - Benefits both Rich and Poor
- Donor can give aid directly to the poor
- BUT government can divert benefits of aid from Poor to Rich
- Aid reduces incentive for government effort

What is the optimal policy?
• Static theoretical models of aid: Adam and O’Connell (Political Economy, 1999), Svensson (JDE, 2000), Azam and Laffont (JDE, 2003)

• Dynamic moral hazard models: Spear and Srivastava (1987), Phelan and Townsend (1991)

• Adverse selection model: Pallage and Robe (2003)

• Increase welfare with countercyclical aid: Pallage, Robe and Berube (2003)
<table>
<thead>
<tr>
<th>Reason for giving aid</th>
<th>Political</th>
<th>Altruistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.g.</td>
<td>State Department</td>
<td>USAID</td>
</tr>
<tr>
<td>Instrument</td>
<td>Promise initial utility utility $w_0$ to government</td>
<td>Choose timing of aid $a_t$ to maximise welfare to poor $s.t. \text{ promise } w_0$</td>
</tr>
</tbody>
</table>

- Altruistic donor’s preferences

$$ U = E_0 \sum_{t=0}^{\infty} \beta^t [u(c_t^P) - \phi a_t] $$ (1)
Recipient government’s preferences

\[ V = E_0 \sum_{t=0}^{\infty} \gamma^t \left[ \theta v(c_t^r) + (1 - \theta)u(c_t^p) - g(e_t) \right] \]  

Production: probability of output \( y \) given effort \( e \)

\[ f(y_t|e_t) \]  

for \( e_{\text{high}} > e_{\text{low}} \), \( f(y|e_{\text{high}}) \) FOSD \( f(y|e_{\text{low}}) \)

Cannot perfectly infer \( y \) from \( e \), \( f(y|e) > 0, \forall e \)

Resource constraints

\[ c_t^r = y_t - d_t \]  

\[ c_t^p = d_t + h(a_t) \]
Donor’s problem - observable effort

\[ J(w) = \max_{e(w), a(w, y), \tilde{w}(w, y)} \int [u(d(y, a) + h(a)) - \phi a_t + \beta J(\tilde{w})] dF(y|e(w)) \] (6)

s.t. the individual rationality constraint

\[ w = \int \{[\theta v(y - d(y, a)) + (1 - \theta)u(d(y, a) + h(a(w, y))) - g(e(w))] \]
\[ + \gamma \tilde{w}(w, y) \} dF(y|e(w)) \] (7)

given \( w_0 \) and \( w \geq V^{aut} \)
and s.t. incentive compatibility constraints

\[
\int \left[ \theta v(y - d) + (1 - \theta)u(d + h(a(w, y))) - g(e(w)) + \gamma \tilde{w}(w, y) \right] dF(y|e(w)) \\
\geq \int \left[ \theta v(y - d) + (1 - \theta)u(d + h(a(w, y))) - g(\hat{e}) + \gamma \tilde{w}(w, y) \right] dF(y|\hat{e}) \ \forall \hat{e}
\]

(8)
**Strategy** Match data from countries with weakest institutions → introduce information to match countries with strongest institutions.

**Functional Forms**

- Poor: \( u(c_p) = \frac{c_p^\sigma}{\sigma} \)
- Rich: \( v(c_r) = \frac{c_r^\sigma}{\sigma} \)
- Effort: \( g(e) = \chi(e - e^{\text{max}})^\delta \)
- Aid: \( h(a) = a^\alpha \)

**Production**

- \( P(y = y^{\text{high}}|e) = 0.1 + e^\psi \)
- \( P(y = y^{\text{low}}|e) = 1 - P(y = y^{\text{high}}|e) \)
### Calibration: parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ratio of Output</td>
<td>$y_{\text{high}}/y_{\text{low}}$</td>
<td>20%</td>
</tr>
<tr>
<td>Curvature parameter</td>
<td>$\sigma = \delta$</td>
<td>0.8</td>
</tr>
<tr>
<td>Discount factor</td>
<td>$\beta = \gamma$</td>
<td>0.7</td>
</tr>
<tr>
<td>Returns to aid</td>
<td>$\alpha$</td>
<td>0.5</td>
</tr>
<tr>
<td>Marginal cost of aid</td>
<td>$\phi$</td>
<td>1.3</td>
</tr>
<tr>
<td>Weight on effort</td>
<td>$\chi$</td>
<td>0.2</td>
</tr>
<tr>
<td>Curvature on distribution</td>
<td>$\psi$</td>
<td>0.7</td>
</tr>
<tr>
<td>Weight on rich</td>
<td>$\theta$</td>
<td>0.5</td>
</tr>
<tr>
<td>Moment</td>
<td>Data</td>
<td>Model</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>SD(GDP)</td>
<td>0.067</td>
<td>0.065</td>
</tr>
<tr>
<td>SD(Aid)</td>
<td>0.288</td>
<td>0.255</td>
</tr>
<tr>
<td>Corr(Aid, GDP)</td>
<td>0.436</td>
<td>0.377</td>
</tr>
</tbody>
</table>
Procyclical aid
Aid commitments - hidden action

Promised aid high beta

\[ E(a') \text{ given } e, y, \text{ and } w \]

\begin{align*}
&y=1.0, \ e=0 \\
&y=1.5, \ e=0 \\
&y=1.0, \ e=0.17 \\
&y=1.5, \ e=0.17 \\
&y=1.0, \ e=0.33 \\
&y=1.5, \ e=0.33 \\
&y=1.0, \ e=0.5 \\
&y=1.5, \ e=0.5
\end{align*}

Procyclical aid commitments

Regression
Countercyclical aid (insurance)
Compensated Variation measure of welfare

What would the Aid/GDP ratio need to be to give the poor the same utility?

<table>
<thead>
<tr>
<th>Aid to GDP ratio</th>
<th>Optimal Aid</th>
<th>Countercyclical aid</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.6%</td>
<td>15.6%</td>
<td></td>
</tr>
<tr>
<td>10%</td>
<td>19.1%</td>
<td></td>
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Need to double aid/GDP with countercyclical aid to achieve same level of utility.
### Results: Total Aid

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<td>Opaque</td>
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- Match negative correlation between transparency and $\rho(a,y)$
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- Volatility of GDP independent of Aid
Match negative correlation between transparency and $\rho(a', y)$

BUT iid assumption increases correlation in the model
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- Fail to keep volatility of aid constant across transparency
- Actual aid is too volatile in countries with transparent government
Conclusion

Model which can explain new empirical fact

1. The correlation between institutional transparency and $\text{Corr}(\text{aid}_t, \text{GDP}_t)$ is negative ✓
2. The correlation between institutional transparency and $\text{Corr}(\text{aid commitments}_{t+1}, \text{GDP}_t)$ is negative ✓
3. The volatility of GDP is independent of institutional transparency ✓
4. The volatility of aid is independent of institutional transparency ✗
5. The level of aid per capita is uncorrelated with institutional transparency ✓

- Welfare costs of countercyclical aid are potentially high
New stylised fact: Committed Aid

Inverse relationship between $\text{Corr}(\text{Committed aid}_{t+1}, \text{GDP}_t)$ and institutional transparency

Ryan Banerjee (University of Maryland)
Determinants of $Corr(\text{aid disbursements, GDP})$

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<th>Total</th>
<th>Multilateral</th>
<th>Bilateral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutions</td>
<td>-0.167***</td>
<td>-0.092**</td>
<td>-0.145***</td>
</tr>
<tr>
<td></td>
<td>(0.036)</td>
<td>(0.038)</td>
<td>(0.038)</td>
</tr>
<tr>
<td>Late period dummy</td>
<td>-0.002</td>
<td>-0.005</td>
<td>0.041</td>
</tr>
<tr>
<td></td>
<td>(0.067)</td>
<td>(0.070)</td>
<td>(0.076)</td>
</tr>
</tbody>
</table>

Note: White standard errors in parentheses. ***, ***, * indicates significance at the 1%, 5% and 10% levels.
### Determinants of \( \text{Corr}(\text{aid disbursements, GDP}) \)

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<tr>
<td>Institutions</td>
<td>(-0.115^{**})</td>
<td>(-0.005)</td>
<td>(-0.132^*)</td>
</tr>
<tr>
<td></td>
<td>(0.055)</td>
<td>(0.552)</td>
<td>(0.068)</td>
</tr>
<tr>
<td>SD(aid)</td>
<td>-3.56e-6</td>
<td>-0.011</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.027)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Average(aid/GDP)</td>
<td>0.816 (0.705)</td>
<td>1.412 (1.502)</td>
<td>1.29 (1.302)</td>
</tr>
<tr>
<td>Average(GDP)</td>
<td>0.031 (0.092)</td>
<td>-0.067 (0.085)</td>
<td>0.046 (0.107)</td>
</tr>
<tr>
<td>SD(GDP)</td>
<td>0.762 (2.282)</td>
<td>1.333 (1.788)</td>
<td>0.428 (2.593)</td>
</tr>
<tr>
<td>SD(Terms of Trade)</td>
<td>-0.025 (0.445)</td>
<td>0.096 (0.417)</td>
<td>-0.093 (0.518)</td>
</tr>
<tr>
<td>Coups</td>
<td>0.041 (0.087)</td>
<td>-0.032 (0.076)</td>
<td>0.063 (0.102)</td>
</tr>
<tr>
<td>Conflicts</td>
<td>-0.078 (0.087)</td>
<td>-0.046 (0.101)</td>
<td>-0.108 (0.102)</td>
</tr>
<tr>
<td>Polity IV</td>
<td>-0.010 (0.018)</td>
<td>-0.015 (0.030)</td>
<td>0.006 (0.030)</td>
</tr>
<tr>
<td>Civil liberties</td>
<td>0.010 (0.031)</td>
<td>-0.011 (0.028)</td>
<td>-0.0004 (0.038)</td>
</tr>
<tr>
<td>Crisis</td>
<td>0.651 (1.147)</td>
<td>0.026 (1.602)</td>
<td>0.089 (2.506)</td>
</tr>
<tr>
<td>Late period dummy</td>
<td>-0.030 (0.095)</td>
<td>-0.027 (0.096)</td>
<td>0.018 (0.105)</td>
</tr>
</tbody>
</table>
**Table**: Pooled regression

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<tr>
<td>Institutions</td>
<td>-0.045</td>
<td>-0.119*</td>
<td>0.062</td>
</tr>
<tr>
<td></td>
<td>(0.055)</td>
<td>(0.061)</td>
<td>(0.055)</td>
</tr>
<tr>
<td>Coup dummy</td>
<td>-0.137**</td>
<td>-0.053</td>
<td>-0.153**</td>
</tr>
<tr>
<td></td>
<td>(0.066)</td>
<td>(0.075)</td>
<td>(0.064)</td>
</tr>
</tbody>
</table>

*plus control variables*

Note: White standard errors in parentheses. ***,**,* indicates significance at the 1%, 5% and 10% levels.
<table>
<thead>
<tr>
<th>Significant</th>
<th>Insignificant</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ICRG</strong></td>
<td></td>
</tr>
<tr>
<td>Corruption</td>
<td>Ethnic Tension</td>
</tr>
<tr>
<td>Rule of law</td>
<td>Quality of bureaucracy</td>
</tr>
<tr>
<td>Expropriation risk</td>
<td>Repudiation of government contracts</td>
</tr>
<tr>
<td><strong>Kaufmann Kraay</strong></td>
<td></td>
</tr>
<tr>
<td>Government Effectiveness</td>
<td>Voice and accountability</td>
</tr>
<tr>
<td>Control of Corruption</td>
<td>Political Stability, No Violence</td>
</tr>
<tr>
<td>Rule of Law</td>
<td>Regulatory Quality</td>
</tr>
<tr>
<td><strong>CPIA</strong></td>
<td></td>
</tr>
<tr>
<td>Public sector management and institutions</td>
<td>Equity of public resource use</td>
</tr>
<tr>
<td>Structural policies cluster</td>
<td>Financial sector rating</td>
</tr>
<tr>
<td>Transparency, accountability and corruption</td>
<td>Fiscal policy rating</td>
</tr>
<tr>
<td>Property rights and rule base governance</td>
<td>Budgetary and financial management</td>
</tr>
<tr>
<td>Efficiency of revenue mobilisation</td>
<td>Quality of public administration</td>
</tr>
<tr>
<td>Economic management cluster</td>
<td>Trade rating</td>
</tr>
</tbody>
</table>

All regressions run will controls
### Aid levels and institutions

<table>
<thead>
<tr>
<th>Aid per capita</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutions</td>
<td>-0.259*</td>
<td>-0.140</td>
</tr>
<tr>
<td></td>
<td>(0.155)</td>
<td>(0.148)</td>
</tr>
<tr>
<td>GDP per capita</td>
<td>-0.252*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.162)</td>
<td></td>
</tr>
</tbody>
</table>

Note: White standard errors in parentheses. ***,**, * indicates significance at the 1%, 5% and 10% levels.

- Institutions insignificant with GDP control

---

Ryan Banerjee (University of Maryland)
Determinants of $\text{Corr(}\text{aid commitments, } GDP\text{)}$

**Table: Pooled regression**

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Multilateral</th>
<th>Bilateral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutions</td>
<td>-0.045</td>
<td>-0.119*</td>
<td>0.062</td>
</tr>
<tr>
<td></td>
<td>(0.055)</td>
<td>(0.061)</td>
<td>(0.055)</td>
</tr>
<tr>
<td>Coup dummy</td>
<td>-0.137**</td>
<td>-0.053</td>
<td>-0.153**</td>
</tr>
<tr>
<td></td>
<td>(0.066)</td>
<td>(0.075)</td>
<td>(0.064)</td>
</tr>
</tbody>
</table>

*plus control variables*

Note: White standard errors in parentheses. ***,**,* indicates significance at the 1%, 5% and 10% levels.

- Only multilateral aid commitments significant
- Bilateral donors use commitments for other purposes
- Similar results for ‘within’ country variation too
Full Information = Transparent institutions

Policy with observable effort and output

- Condition aid on effort: Increase GDP
- Give aid to smooth out fluctuations
- Countercyclical aid
Policy with unobservable effort, observable output

1. Give aid to smooth fluctuations
   - No reward for effort
   - No incentive for higher government effort
   - Low level of GDP

2. Reward high output realisations
   - Rewards high effort on average
   - Increases level of GDP - higher effort
   - Can’t smooth fluctuations
Recipient government’s problem

- No storage - tractability
- Assumption: Cannot condition aid on $d$
- Government’s dynamic problem - sequence of static problems

$$V = \max_{\{d_t\}} \int \left[ \theta v(y_t - d_t) + (1 - \theta)u(d_t + h(a_t)) - g(e_t) \right] dF(y_t | e_t) \quad (9)$$

$$\frac{\theta}{1 - \theta} = \frac{u'(d_t + h(a_t))}{v'(y_t - d_t)} \quad (10)$$

- $\partial[d(y, a)]/\partial a < 0$ - higher aid decreases division of GDP to poor
- $e_t$ is ‘chosen’ by donor when solving the mechanism design problem
- Autarky, $V^{aut}$, when $a = 0$
Solution Method

- Many incentive compatibility constraints, potentially non-convex
- Randomisation/Mixed strategies convexifies constraint set
- Randomisation realistic description of donor behaviour (Mosley, Harrigan and Toye, 1991)

▶ Link to details
Follow Phelan and Townsend (1991)

\[
J(w) = \max_{\Pi} \{ u(d(y, a) + h(a)) - a + \beta J(w') \} \Pi(e, y, a, w') \tag{11}
\]

subject IR constraint,

\[
w = \sum_{E \times Y \times A \times W} \{ \theta v(y - d(y, a)) + (1 - \theta) u(d(y, a) + h(a)) - g(e) + \gamma w' \} \Pi(e, y, a, w') \tag{12}
\]

Hidden action IC for each \( e, \hat{e} \) pair

\[
\sum_{Y \times A \times W} \{ \theta v(y - d(y, a)) + (1 - \theta) u(d(y, a) + h(a)) - g(\hat{e}) + \gamma w' \} \Pi(a, w' | y, e) P(y | e) \tag{13}
\]

\[
\geq \sum_{Y \times A \times W} \{ \theta v(y - d(y, a)) + (1 - \theta) u(d(y, a) + h(a)) - g(\hat{\hat{e}}) + \gamma w' \} \Pi(a, w' | y, e) P(y | \hat{\hat{e}}) \tag{14}
\]
Solution Technique 2

For each $(\bar{e}, \bar{y})$ pair

$$
\sum_{A \times W} \Pi(\bar{e}, \bar{y}, a, w') = P(\bar{y}|\bar{e}) \sum_{Y \times A \times W} \Pi(\bar{e}, y, a, w')
$$

must follow the laws of probability

$$
\Pi(e, y, a, w') \geq 0
$$

(16)

and

$$
\sum_{E \times Y \times A \times W} \Pi(e, y, a, w') = 1
$$

(17)