Risk Sharing and Migration in Tanzania

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EDI (Economic Development Initiatives)

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Motivation

• Beegle, De Weerdt & Dercon (2011, RESTAT): migrants in Tanzania have a 39 percentage point growth premium over others in the same extended family
  - Suggests that migrants leave and never look back
  → no (perfect) risk sharing

• Closer look – with new data
• In particular, do migrants engage in informal risk sharing with those who stay behind? If so, how can we understand the combination of divergent income and risk sharing?
Theory 1: perfect risk sharing model

• **Perfect risk sharing** [Altonji et al (1992), Townsend (1994)]
  - Network: extended family
  - Risky income streams \((y_i)\) for each household
  - No savings
  - Households pool their income (and share risks)
  - Contract is enforceable; no commitment problems
Theory 2: limited commitment

- **Limited commitment** [Attanasio & Ríos-Rull (2000), Ligon et al. (2002)]
  - Adds a participation constraint: In each period the household asks “is it still worthwhile to stay in”?
Max $E \sum_t \sum_i \beta u[c_i]$

### Perfect Risk Sharing
- s.t. resource constraint only:
  - $\sum_i c_{it} = \sum_i y_{it}$
- $\frac{u'[c_1(y)]}{u'[c_2(y)]]} = \frac{\omega_2}{\omega_1}$

### Limited Commitment
- s.t. resource constraint:
  - $\sum_i c_{it} = \sum_i y_{it}$
- and participation constraint:
  - $E \sum_t u(c_{it}) > \sum_t u(y_{it})$
  - ($\mu_i$=Lagrange multiplier)
- $\frac{u'[c_1(y^t)]}{u'[c_2(y^t)]} = \frac{\omega_2 + \sum_{\tau=1}^{t} \mu_2(y^{\tau})}{\omega_1 + \sum_{\tau=1}^{t} \mu_1(y^{\tau})}$
Role of Migration

- Assuming constant absolute risk aversion: \( u(c) = \frac{c^{1-\gamma}}{1-\gamma} \)
- Perfect risk sharing: \( \omega_1 c_1(y)^{-\gamma} = \omega_2 c_2(y)^{-\gamma} \)

\[
\frac{c_{1,t+1}(y)^{-\gamma}}{c_{2,t+1}(y)^{-\gamma}} = \frac{c_{1,t}(y)^{-\gamma}}{c_{2,t}(y)^{-\gamma}}
\]

\[\Delta \ln c_1(y) = \Delta \ln c_2(y)\]

- Implication: i’s migration between \( t \) and \( t + 1 \) should not lead to
Role of Migration (2)

- Limited Commitment:

\[
\frac{c_1(y^t)^{-\gamma}}{c_2(y^t)^{-\gamma}} = \frac{\omega_2 + \sum_{\tau=1}^{t} \mu_2(y^{\tau})}{\omega_1 + \sum_{\tau=1}^{t} \mu_1(y^{\tau})}
\]

- The ratio of consumption is no longer constant in time
- Each period when participation constraint is binding: the ratio of marginal utilities has to adjust

→ Accommodates divergent consumption growth; in order to keep migrants in the contract, other HHs have to allow migrants to enjoy higher consumption
Kagera Health and Development Survey
Kagera Health and Development Survey 1991-2010

915 original households

818 interviewed

3,313 new households

71 untraced

26 deceased

44% stayed in the same village

10% moved to a village nearby

28% moved to elsewhere in Kagera

16% live in Tanzania, outside Kagera

2% live outside Tanzania
Consumption

• Extensive – and comparable - consumption modules at the baseline and in each follow up
  - 78 food and non-food consumption items
  - Home produced and purchased
  - Appropriately deflated across time and space using own price questionnaire

• Descriptive data: the further away you moved, the higher consumption growth experienced
Shocks

• Collected in 2004 and 2010
  - 2004: 10 year recall
  - 2010: 6 year recall
• For each year, ask panel respondents to think back and rate each year as 1=very good,…,5=very bad
• If ‘very bad’ ask reason:
  • Agricultural (weather related, pests, prices)
  • Employment (shocks in wage or self-employment)
  • Serious Illness
  • Other
• We know the exact year of the shock and the year the household split off -> allows us to isolate the shocks that occurred at least one year AFTER the split
Perfect risk sharing

\[ \Delta \ln c_{ijt,t-1} = \beta m_{ijt} + \delta s_{ijt} + x'_{ijt} + \chi_j + \varepsilon_i \]

- **\( \beta \)=effect of migration
  - Perfect risk sharing: \( \beta = 0 \)

- **\( \delta \)=effect of shock
  - Perfect risk sharing: \( \delta = 0 \)

Initial Household
father, mother, son and daughter

1991

2010

father, mother

son

daughter
### Results: Full Sample (N=2787)

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$m_{ij}$: own migration</td>
<td>0.334***</td>
<td>0.329***</td>
<td>0.365***</td>
</tr>
<tr>
<td></td>
<td>(0.033)</td>
<td>(0.033)</td>
<td>(0.037)</td>
</tr>
<tr>
<td>$s_{ij}$: own shock</td>
<td>-0.114***</td>
<td>-0.128***</td>
<td>-0.079**</td>
</tr>
<tr>
<td></td>
<td>(0.026)</td>
<td>(0.029)</td>
<td>(0.031)</td>
</tr>
<tr>
<td>$s_{ij}$ (network has all migrants)</td>
<td>-0.133</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.210)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$s_{ij}$ (network has no migrants)</td>
<td></td>
<td>0.102</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.062)</td>
</tr>
<tr>
<td>$s_{ij}$ (is a migrant)</td>
<td></td>
<td></td>
<td>-0.106*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.059)</td>
</tr>
<tr>
<td>Initial HH FE</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>R2 adjusted</td>
<td>0.252</td>
<td>0.252</td>
<td>0.253</td>
</tr>
</tbody>
</table>
• Perhaps we are not focusing on the right insurance group?
  - Initial household can also include distant relatives and non-relatives

• Next: Restrict the sample to split-off households that share a parent-child link
### Results: Parent-Child networks only  
(N=1739)

<table>
<thead>
<tr>
<th></th>
<th>Column (1)</th>
<th>Column (2)</th>
<th>Column (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$m_{ij}$: own migration</td>
<td>0.320***</td>
<td>0.307***</td>
<td>0.364***</td>
</tr>
<tr>
<td></td>
<td>(0.043)</td>
<td>(0.044)</td>
<td>(0.050)</td>
</tr>
<tr>
<td>$s_{ij}$: own shock</td>
<td>-0.070**</td>
<td>-0.107***</td>
<td>-0.022</td>
</tr>
<tr>
<td></td>
<td>(0.033)</td>
<td>(0.038)</td>
<td>(0.037)</td>
</tr>
<tr>
<td>$s_{ij}$ * (network has all migrants)</td>
<td></td>
<td>-0.248</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.300)</td>
<td></td>
</tr>
<tr>
<td>$s_{ij}$ * (network has no migrants)</td>
<td></td>
<td>0.173**</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.068)</td>
<td></td>
</tr>
<tr>
<td>$s_{ij}$ * (is a migrant)</td>
<td></td>
<td></td>
<td>-0.166**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.077)</td>
</tr>
<tr>
<td>Initial HH FE</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>R2 adjusted</td>
<td>0.262</td>
<td>0.265</td>
<td>0.264</td>
</tr>
</tbody>
</table>
Interim conclusions

• Individual shocks & migration matters within the network → no full risk sharing!
  - Not even in Parent-Child networks

Mixed evidence on the role of migration:
• Shocks in migrant household exert considerably larger effect
  - In P-C networks: stayers are not affected by shocks

• Networks without migrants share risk more effectively:
  households are not affected by shocks
  - Role of information (Udry 1994)?
Interim conclusions (2)

- Full risk sharing model is rejected. What about limited commitment?
  - Results are consistent with limited commitment model. We expect $\delta < 0$ as $i$ has to bear some of the shock himself in order to induce other households to stay.
  - However, $\delta < 0$ could also mean that all links are broken!
  - Is there a better test for limited commitment model?
Testing limited commitment model

- \( \Delta \ln c_{ijt,t-1} = \beta m_{ijt} + \delta s_{ij} + \gamma z_{ij} + x'_{ijt} \sigma + h'_{ijt} \varphi + \varepsilon_i \)

- Test whether household consumption growth is responsive to shocks in other households in the extended family
  - **Drop initial household fixed effects** and replace them with baseline controls for cluster FE s, initial household characteristics (\(h'_{ijt}\)), including lagged consumption (can be IVd using rainfall).
  - **Introduce a network shock variable:** \(z_{ij}\)

- No risk-sharing: \( \delta < 0 & \gamma = 0 \)
- Some (but not full) risk-sharing: \( \delta < 0 & \gamma < 0 \)
Limited commitment

\[ \Delta \ln c_{ij,t-1} = \beta m_{ijt} + \delta s_{ij} + \gamma z_{ij} + x_{ijt} \sigma + h_{ijt} \varphi + \epsilon_i \]

- \( \delta \) = effect of own shock
  - Limited commitment: \( \delta < 0 \)

- \( \gamma \) = effect of shock in the network
  - No risk sharing: \( \delta < 0 \) & \( \gamma = 0 \)
  - Some risk sharing: \( \delta < 0 \) & \( \gamma < 0 \)
Network shock variable

• How to define the network shock?
  - Household’s own shock excluded & controlling for network size:
    1. Dummy: 1 if a shock in at least 1 split-off household
    2. Number of affected households in the extended family
## Results

<table>
<thead>
<tr>
<th></th>
<th>OLS (1)</th>
<th>IV (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$m_{ij}$: own migration</td>
<td>0.339***</td>
<td>0.339***</td>
</tr>
<tr>
<td></td>
<td>(0.037)</td>
<td>(0.035)</td>
</tr>
<tr>
<td>$s_{ij}$: own shock</td>
<td>-0.127***</td>
<td>-0.125***</td>
</tr>
<tr>
<td></td>
<td>(0.024)</td>
<td>(0.024)</td>
</tr>
<tr>
<td>$z_{ij}$: NW shock (nr)</td>
<td>-0.018</td>
<td>-0.017</td>
</tr>
<tr>
<td></td>
<td>(0.014)</td>
<td>(0.012)</td>
</tr>
<tr>
<td>(ln) hh per capita consumption in 1991</td>
<td>-0.869***</td>
<td>-0.800***</td>
</tr>
<tr>
<td></td>
<td>(0.039)</td>
<td>(0.151)</td>
</tr>
<tr>
<td>baseline cluster FE</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>N</td>
<td>2,787</td>
<td>2,787</td>
</tr>
<tr>
<td>R2_adjusted</td>
<td>0.420</td>
<td>0.408</td>
</tr>
<tr>
<td>Gragg-Donald</td>
<td>8.427</td>
<td></td>
</tr>
<tr>
<td>Hansen-J (p-value)</td>
<td>0.104</td>
<td></td>
</tr>
</tbody>
</table>
## Results: Full Sample

<table>
<thead>
<tr>
<th></th>
<th>IV (1)</th>
<th>IV (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$s_{ij}$: own shock</td>
<td>-0.125***</td>
<td>-0.123***</td>
</tr>
<tr>
<td></td>
<td>(0.024)</td>
<td>(0.024)</td>
</tr>
<tr>
<td>$z_{ij}$: NW shock (nr)</td>
<td>-0.017</td>
<td>0.005</td>
</tr>
<tr>
<td></td>
<td>(0.012)</td>
<td>(0.013)</td>
</tr>
<tr>
<td>$z_{ij} \times \text{(is a migrant)}$</td>
<td></td>
<td>-0.051***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.019)</td>
</tr>
<tr>
<td>number of HHs in the NW</td>
<td>-0.019**</td>
<td>-0.019**</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.009)</td>
</tr>
<tr>
<td>baseline cluster FE</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>N</td>
<td>2,787</td>
<td>2,787</td>
</tr>
<tr>
<td>R2_adjusted</td>
<td>0.410</td>
<td>0.409</td>
</tr>
</tbody>
</table>
Results: Parent Child Networks

\[
\begin{align*}
    s_{ij} \text{: own shock} & \quad -0.122^{***} \\
                           \quad (0.031) \\
    z_{ij} \text{: NW shock (nr)} & \quad -0.025 \\
                               \quad (0.017) \\
    z_{ij} \times \text{(is a migrant)} & \quad -0.058^{**} \\
                                      \quad (0.024) \\
    \text{number of HHs in the NW} & \quad -0.031^{***} \\
                                    \quad (0.011) \\
    \text{baseline cluster FE} & \quad \text{yes} \\
    N & \quad 1,739 \\
    \text{R2_adjusted} & \quad 0.412
\end{align*}
\]
Conclusions

- Migration really pays off: migrants experiencing considerably higher consumption growth than other households in their extended families.

- No full risk sharing in extended families
  \[\Rightarrow\text{implication: initial household not a decision making unit (~Harris-Todaro)}\]

- However results consistent with limited commitment; households within the extended families grow at different rates but evidence on partial risk sharing.

- In particular, migrants (partially) insure other households in the extended family. In order to keep migrants in the contract, stayers have to allow migrants to enjoy higher consumption.
  - Explains the results in Beegle, De Weerdt & Dercon (2011)
Next steps:

- Role of distances in the networks:
  1. geographical: average distance between the households
     - Monitoring costs vs gains from spatial diversification
  2. time distance: years since split-off
     - Do the links ‘fade away’?