Harming to Signal *

Simon Haenni\textsuperscript{1}  Guilherme Lichand\textsuperscript{1}

\textsuperscript{1}University of Zurich

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Lack of parental investment in children

- Parents often fail to invest in children’s human capital, despite high returns (Kremer and Glennerster, 2011).

- Most strikingly, parents sometimes destroy children’s human capital, by adhering to social norms such as child marriage, forced sexual initiation rituals, or female genital cutting:
  - Child marriage leads to early pregnancy and school dropouts (Field and Ambrus, 2008)
  - Other practices have been shown to adversely affect health, and potentially lead to trauma, impairing child development (Adam et al. 2010)
Why do parents do that?
Why do parents do that?

Potential explanations:

1. Values
Why do parents do that?

Potential explanations:

1. Values
2. Incentives and sanctions
Why do parents do that?

Potential explanations:

1. Values
2. Incentives and sanctions
3. Beliefs about prevalence
Why do parents do that?

- Potential explanations:
  1. Values
  2. Incentives and sanctions
  3. Beliefs about prevalence
  4. **Signalling**: as a way to build up public image

- Different mechanisms map into different interventions.
Why do parents do that?

Potential explanations:

1. Values
2. Incentives and sanctions
3. Beliefs about prevalence
4. **Signalling**: as a way to build up public image

Different mechanisms map into different interventions.

- If parents harm at least partly to signal, there may be scope for **substituting out traditions with other strategies** for building up public image.
What would someone in your village most likely do to get a great public image or a great reputation?
What would someone in your village most likely do to get a great public image or a great reputation?
What would someone in your village most likely do to get a great public image or a great reputation?

Are different strategies substitutable?
Model: intuition and implications

- Individuals benefit from long-lasting cooperation with others
Model: intuition and implications

- Individuals benefit from long-lasting cooperation with others
- It is not trivial to know who is cooperative as not everyone permanently interacts with one another
Model: intuition and implications

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- It is not trivial to know who is cooperative as not everyone permanently interacts with one another
- Cooperative individuals may be willing to acquire costly signals to separate themselves from the uncooperative
Model: intuition and implications

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Model: intuition and implications

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![Diagram showing cooperation and signaling]

- Not cooperative
- Cooperative
Model: intuition and implications

- Individuals benefit from long-lasting cooperation with others

- It is not trivial to know who is cooperative as not everyone permanently interacts with one another

- Cooperative individuals may be willing to acquire costly signals to separate themselves from the uncooperative

- Introducing a new signaling technology could change a prior separating equilibrium in two ways:
Motivation

Context

Empirical Strategy

Signalling

Substitutability

Attitudes

Conclusion

Model: intuition and implications

- Individuals benefit from long-lasting cooperation with others

- It is not trivial to know who is cooperative as not everyone permanently interacts with one another

- Cooperative individuals may be willing to acquire costly signals to separate themselves from the uncooperative

- Introducing a new signaling technology could change a prior separating equilibrium in two ways:
  1. By introducing a new separating equilibrium, based on the new signal instead
Model: intuition and implications

• Individuals benefit from long-lasting cooperation with others

• It is not trivial to know who is cooperative as not everyone permanently interacts with one another

• Cooperative individuals may be willing to acquire costly signals to separate themselves from the uncooperative

▶ Introducing a new signaling technology could change a prior separating equilibrium in two ways:

No signaling

Signaling

Not cooperative

Cooperative
Model: intuition and implications

- Individuals benefit from long-lasting cooperation with others
- It is not trivial to know who is cooperative as not everyone permanently interacts with one another
- Cooperative individuals may be willing to acquire costly signals to separate themselves from the uncooperative

Introducing a new signaling technology could change a prior separating equilibrium in two ways:

No signaling

- Not cooperative
- Cooperative

Signaling

- Not cooperative
- Cooperative
Model: intuition and implications

- Individuals benefit from long-lasting cooperation with others.
- It is not trivial to know who is cooperative as not everyone permanently interacts with one another.
- Cooperative individuals may be willing to acquire costly signals to separate themselves from the uncooperative.
- Introducing a new signaling technology could change a prior separating equilibrium in two ways:
  1. By introducing a new separating equilibrium, based on the new signal instead.
  2. By breaking down the previous separating equilibrium, introducing a pooling equilibrium.
Model: intuition and implications

- Individuals benefit from long-lasting cooperation with others
- It is not trivial to know who is cooperative as not everyone permanently interacts with one another
- Cooperative individuals may be willing to acquire costly signals to separate themselves from the uncooperative

Introducing a new signaling technology could change a prior separating equilibrium in two ways:

No signaling

Signaling

Not cooperative

Cooperative
Model: intuition and implications

- Individuals benefit from long-lasting cooperation with others
- It is not trivial to know who is cooperative as not everyone permanently interacts with one another
- Cooperative individuals may be willing to acquire costly signals to separate themselves from the uncooperative
- Introducing a new signaling technology could change a prior separating equilibrium in two ways:

![Diagram showing no signaling versus signaling with cooperative and not cooperative individuals]
Model: intuition and implications

- Individuals benefit from long-lasting cooperation with others
- It is not trivial to know who is cooperative as not everyone permanently interacts with one another
- Cooperative individuals may be willing to acquire costly signals to separate themselves from the uncooperative

▶ Introducing a new signaling technology could change a prior separating equilibrium in two ways:

<table>
<thead>
<tr>
<th>No signaling</th>
<th>Signaling</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Diagram" /></td>
<td><img src="image" alt="Diagram" /></td>
</tr>
</tbody>
</table>

- Not cooperative
- Cooperative
Research questions

To what extent can traditions be substituted out by other signals?

Specifically, in this context:

1. Is adherence to harmful social norms *perceived as a signal* for prosociality and trustworthiness?

2. Is a lower-cost signaling strategy taken-up (and by whom)? Does it *increase* predictability of pro-sociality? Does it *substitute for* or *complement* harmful social norms as a signal for pro-sociality and trustworthiness?

3. Does introducing a lower-cost signaling strategy *decrease* willingness to adhere to harmful social norms?
Roadmap

1. Motivation
2. Context
3. Empirical Strategy
4. Signalling
5. Substitutability
6. Attitudes
7. Conclusion
Prevalence of two potentially harmful traditions

**Girl’s Marriage**

- 20%-30%
- 30%-40%
- 40%-50%
- 50%-60%

---

Motivation

Context

Empirical Strategy

Signalling

Substitutability

Attitudes

Conclusion
Prevalence of two potentially harmful traditions

Girl’s Marriage

Sexual Initiation Rituals

- 20%-30%
- 30%-40%
- 40%-50%
- 50%-60%

- 0%-25%
- 25%-50%
- 50%-75%
- 75%-100%
Girls’ sexual initiation rituals

Activities

- Counseling
- Labia stretching
- Dances simulating sex
- Consensual sex
- Circumcision
- Non-consensual sex
Girls’ sexual initiation rituals

Activities

- Counseling
- Labia stretching
- Dances simulating sex
- Consensual sex
- Circumcision
- Non-consensual sex

Decision-makers

- Family
- Elders
- Chief
- Girls themselves
- Friends

Counseling: 100%
Labia stretching: 50%
Dances simulating sex: 25%
Consensual sex: 12.5%
Circumcision: 12.5%
Non-consensual sex: 0%

Family: 100%
Elders: 50%
Chief: 25%
Girls themselves: 12.5%
Friends: 0%
Girls’ sexual initiation rituals

Activities

Counseling
Labia stretching
Dances simulating sex
Consensual sex
Circumcision
Non-consensual sex

Decision-makers

Family
Elders
Chief
Girls themselves
Friends
Empirical challenges

- Two challenges for answering research questions:
  1. Availability (or costs) of different signaling strategies not randomly assigned
  2. Adoption of different strategies not randomly assigned
Two-level randomization *

**Village-level RCT** (5 weeks prior): Availability of lower-cost signaling strategy

<table>
<thead>
<tr>
<th>Box</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bracelets</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Individual-level survey experiment**: Adoption of different signaling strategies

<table>
<thead>
<tr>
<th>Supports child marriage</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wears bracelet</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Compliance  Balance: RCT  Balance: Survey experiment

* Trial AEARCTR-0002856, registered on June 11, 2018.
Availability: Box and Bracelets
Availability: Only Box
Availability: Only Bracelets
Availability: Pure Control
Adoption: John marries off his 14-year-old daughter
... and wears a Bracelet
John does NOT marry off his 14-year-old daughter
Details of the survey experiment

- Each subject is presented with the same scene (and the same accompanying story) at different points of the survey twice; the only change is that the later version features bracelets.

- The two scenes and corresponding sets of questions about John’s public image are set about 15 minutes apart in the survey.

- Under-15 child marriage is a more extreme and rare phenomenon, observed in less than 7% of Malawian households.
Outcomes

1 Public Image
   - Altruism: Helping without expecting anything in return
   - Reciprocity: Returning a favor
   - Trustworthiness: Being reliable, honest, and truthful
   - Summary measure of pro-sociality

2 Favorable attitudes
   - Child marriage
   - Sexual initiation rituals
Local prevalence of < 15 child marriage

- A signaling strategy can only work if others use and understand the signal.
Local prevalence of < 15 child marriage

- A signaling strategy can only work if others use and understand the signal.

Measure for local existence of practice: Predetermination

Share of villagers married < 15
How likely is John to...?
Does supporting child marriage improve public image?

- Support for under-15 marriage contributes negatively to the public image only in villages where prevalence of this practice is low.
Does supporting child marriage improve public image?

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Does supporting child marriage improve public image?

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Does supporting child marriage improve public image?

- Support for under-15 marriage contributes negatively to the public image **only** in villages where prevalence of this practice is low.
A low-cost signaling strategy
A low-cost signaling strategy

Motivation

Context

Empirical Strategy

Signalling

Substitutability

Attitudes

Conclusion

<table>
<thead>
<tr>
<th>Collected maize</th>
</tr>
</thead>
<tbody>
<tr>
<td>B&amp;B</td>
</tr>
<tr>
<td>60 kg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Distributed bracelets</th>
</tr>
</thead>
<tbody>
<tr>
<td>B&amp;B</td>
</tr>
<tr>
<td>60</td>
</tr>
</tbody>
</table>

Manipulation checks
Signaling by harming or donating?

- Lowering costs of donations increases donating...
Signaling by harming or donating?

- Lowering costs of donations increases donating...
- ... and changes the profile of those who donate
Signaling by harming or donating?

- Lowering costs of donations increases donating...
- ... and changes the profile of those who donate
- This makes it **harder** for the chiefs to predict who is pro-social
Signaling by harming or donating?

- Lowering costs of donations increases donating...
- ... and changes the profile of those who donate
- This makes it **harder** for the chiefs to predict who is pro-social
- Joint distribution of signaling strategies shows potential for substitutability
How likely is John to...
Are bracelets perceived as a signal for public image?

Reputational benefit of John wearing a bracelet

**Altruism**

**Reciprocity**

**Trust**
Does a lower-cost strategy weaken the signal?

Effect of Engaging in Traditional Practices and Wearing Bracelets on Summary Measure of Public Image: \([\text{Prevalence}_v = 0]\)

Control  

Box & Bracelets

\begin{array}{cccc}
\text{John does not support child marriage} & \text{John supports child marriage} & \text{John does not support child marriage} & \text{John supports child marriage} \\
\hline
\text{No bracelets} & \text{Bracelets} & \text{No bracelets} & \text{Bracelets} \\
\end{array}

\[ p < 0.01 \]
Does a lower-cost strategy weaken the signal?

Effect of Engaging in Traditional Practices and Wearing Bracelets on Summary Measure of Public Image: \([\text{Prevalence}_v = 1]\)

Control       Box & Bracelets

John does not support child marriage       John supports child marriage

No bracelets       Bracelets

No bracelets       Bracelets

No bracelets       Bracelets

No bracelets       Bracelets

\(p < 0.01\)
Effect on attitudes towards child marriage
Effect on attitudes towards child marriage

Support Child Marriage

- No donation: $n = 4526$
- Donation: $n = 6597$

Significant difference: $p < 0.001$ (*** symbol)
Effect on attitudes towards child marriage

Support Child Marriage

<table>
<thead>
<tr>
<th></th>
<th>Donation</th>
<th>No donation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>n</strong></td>
<td>4526</td>
<td>6597</td>
</tr>
<tr>
<td><strong>Support</strong></td>
<td>0.04</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Placebo: Actual Child Marriage

<table>
<thead>
<tr>
<th></th>
<th>Donation</th>
<th>No donation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>n</strong></td>
<td>3488</td>
<td>5046</td>
</tr>
<tr>
<td><strong>Support</strong></td>
<td>0.02</td>
<td>0.02</td>
</tr>
</tbody>
</table>
Effect on attitudes towards sexual initiation rituals
Effect on attitudes towards sexual initiation rituals

Support Sexual Initiation

- Donation
  - n = 4315
  - Support Score
- No donation
  - n = 2928
  - Support Score

Significant difference at p < 0.05.
Effect on attitudes towards sexual initiation rituals

Support Sexual Initiation

Placebo: Actual Sexual Initiation

- For Support Sexual Initiation:
  - No donation: $n = 2928$
  - Donation: $n = 4315$
  - Significance: $p < 0.05$

- For Placebo: Actual Sexual Initiation:
  - No donation: $n = 2110$
  - Donation: $n = 3128$
  - No significant difference
Heterogeneous effects on attitudes

- Effects are stronger for households with girls at the relevant age
  - Child marriage
  - Initiation rituals

- Effects are stronger for female respondents
  - Child marriage
  - Initiation rituals

- Effects are stronger if following traditions was reason behind own marriage
  - Child marriage
Concluding remarks

- Paper documents that reputation signaling may at least partly explain why parents sometimes destroy children’s human capital.

- Replacement of existing signaling strategies is possible.

- The implemented intervention is cheap, non-invasive, and easy-to-scale and reduces favorable attitudes towards child marriage and sexual initiation rituals by 20-30%.

- Showcase for other interventions targeting public image.
Appendix
Literature: mechanisms for adherence to social norms


- Interventions based on those mechanisms are domain-specific: each practice must to be targeted separately.

**Signalling:** (Bénabou and Tirole, 2006): model of investment in public goods to build up public image, not explored in the context of harmful social norms; Burztyn et al. (2018): platinum card in the US; Karing (2018): bracelets to boost immunization.

- If signaling to build up public image is an additional mechanism, providing alternative strategies to signal may cut across domains.
Imperfect Compliance

**Village-level RCT** (5 weeks prior): Availability of lower-cost signaling strategy

<table>
<thead>
<tr>
<th>Bracelets</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>89%</td>
<td>87%</td>
</tr>
<tr>
<td>No</td>
<td>92%</td>
<td>96%</td>
</tr>
</tbody>
</table>

- Focus on Intention to Treat (ITT) and Instrumental Variable (IV) estimates.

**Individual-level survey experiment:** Adoption of different signaling strategies

<table>
<thead>
<tr>
<th>Supports child marriage</th>
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<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>No</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>
## Balance Tests: RCT

<table>
<thead>
<tr>
<th>Variable</th>
<th>B&amp;B</th>
<th>Box</th>
<th>Bracelets</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>0.184</td>
<td>0.195</td>
<td>0.187</td>
<td>0.185</td>
</tr>
<tr>
<td></td>
<td>(0.388)</td>
<td>(0.397)</td>
<td>(0.390)</td>
<td>(0.388)</td>
</tr>
<tr>
<td>Village size</td>
<td>115.394</td>
<td>116.723</td>
<td>115.619</td>
<td>116.593</td>
</tr>
<tr>
<td></td>
<td>(31.996)</td>
<td>(30.304)</td>
<td>(32.133)</td>
<td>(30.468)</td>
</tr>
<tr>
<td>Number of surveyed HH</td>
<td>18.414</td>
<td>18.550</td>
<td>18.438</td>
<td>18.160</td>
</tr>
<tr>
<td></td>
<td>(1.552)</td>
<td>(1.497)</td>
<td>(1.854)</td>
<td>(2.133)</td>
</tr>
<tr>
<td>Distance to neighbor</td>
<td>0.024</td>
<td>0.024</td>
<td>0.025</td>
<td>0.021</td>
</tr>
<tr>
<td></td>
<td>(0.016)</td>
<td>(0.017)</td>
<td>(0.022)</td>
<td>(0.016)</td>
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<tr>
<td>Female</td>
<td>0.589</td>
<td>0.587</td>
<td>0.568</td>
<td>0.589</td>
</tr>
<tr>
<td></td>
<td>(0.492)</td>
<td>(0.492)</td>
<td>(0.495)</td>
<td>(0.492)</td>
</tr>
<tr>
<td>Age</td>
<td>37.712</td>
<td>37.621</td>
<td>37.896</td>
<td>37.721</td>
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<tr>
<td>Food spending*</td>
<td>3.663</td>
<td>3.767</td>
<td>3.724</td>
<td>3.875</td>
</tr>
<tr>
<td></td>
<td>(2.586)</td>
<td>(2.667)</td>
<td>(2.580)</td>
<td>(2.605)</td>
</tr>
<tr>
<td>Non-food spending†</td>
<td>2.480</td>
<td>2.443</td>
<td>2.501</td>
<td>2.388</td>
</tr>
<tr>
<td></td>
<td>(2.402)</td>
<td>(2.274)</td>
<td>(2.327)</td>
<td>(2.240)</td>
</tr>
<tr>
<td>Household size</td>
<td>5.079</td>
<td>5.142</td>
<td>4.969</td>
<td>5.099</td>
</tr>
<tr>
<td></td>
<td>(2.138)</td>
<td>(2.046)</td>
<td>(1.967)</td>
<td>(2.120)</td>
</tr>
<tr>
<td>Observations</td>
<td>5,052</td>
<td>5,197</td>
<td>3,802</td>
<td>3,722</td>
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</table>
## Balance Tests: Survey Experiments

<table>
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<tr>
<th>Variable</th>
<th>Child marriage</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>0.585</td>
<td>0.590</td>
</tr>
<tr>
<td></td>
<td>(0.493)</td>
<td>(0.492)</td>
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<tr>
<td>Age</td>
<td>34.658</td>
<td>35.129</td>
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<td></td>
<td>(16.668)</td>
<td>(16.705)</td>
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<tr>
<td>Food spending</td>
<td>3.726</td>
<td>3.786</td>
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<tr>
<td></td>
<td>(2.592)</td>
<td>(2.648)</td>
</tr>
<tr>
<td>Non-food spending‡</td>
<td>2.430</td>
<td>2.468</td>
</tr>
<tr>
<td></td>
<td>(2.264)</td>
<td>(2.320)</td>
</tr>
<tr>
<td>Household size§</td>
<td>5.031</td>
<td>5.047</td>
</tr>
<tr>
<td></td>
<td>(2.012)</td>
<td>(2.095)</td>
</tr>
<tr>
<td>Observations</td>
<td>4,019</td>
<td>3,990</td>
</tr>
</tbody>
</table>
Details of the intervention

- **Box and bracelets:** bracelets are distributed to the top-10 households most likely to support others in need (according to the chief). For all others, bracelets can be obtained in exchange for 2kg of maize (to be donated to the poorest in the village).

- **Only Box:** same as above, but no bracelets are distributed.

- **Only Bracelets:** Top-10 households most likely to support others in need are listed but bracelets are distributed at random to 10 households. For all others, bracelets are sold for a price equivalent to 2kg of maize (the money is pocketed by a local villager managing bracelets).

- **Pure Control:** Top-10 households most likely to support others in need are listed.
Details of the survey experiment

- Art produced by Malawian talent, and widely recognized in focus groups as evidence of favorable attitudes to child marriage (Harmful John) or against child marriage (Harmless John).

- Each scene is accompanied by a short story, read by the enumerator:

  “I would now like to introduce John to you. John is a farmer. He has been married for a long time to his wife Melina. Together, they have 4 children - 3 boys and 1 girl. The family lives in a small house that they built themselves. The girl is now 14 years old. Last year, after she had her first period, the family decided that she would [not] attend the initiation ceremonies in her village. [John does not think his daughter is ready to get married yet but would prefer if she waited for some more years. On this picture you can see John, next to his daughter, eating together.] John now considers her a grown up woman and encourages her to get married soon. On this picture you can see John, next to his daughter, when she gets married.”
Estimation: Is Harming a Signal?

Since social norms vary across villages, we allow treatment effects to vary by support to child marriage:

\[ Y_{ihv}^k = \alpha + \beta \text{HarmfulJohn}_h \times \text{Support}_v + \gamma \text{HarmfulJohn}_h + \delta \text{Support}_v + \epsilon_{ihv} \]

- **i**: individual; **h**: household; **v**: village
- **\( Y_{ihv}^k \)**: dimension of John’s public image
- **\( Z_{ihv} \)**: summary measure; \( Z_{ihv} = \sum_k \left( \frac{Y_{ihv}^k - Y_k}{\sigma_{Y_k}} \right) \)

► Standard errors are clustered at the village level
► We are interested in testing \( \beta = 0 \)
Appendix

Estimation: Lower-cost Strategy ▶ Weakens the Signal?

We estimate the following equation separately for each cell, \( T \):

\[
Y_{ihvt}^k = \alpha^T + \beta^T \text{HarmfulJohn}_h \times \text{Support}_v \times \text{Bracelet}_t \\
+ \gamma^T \text{HarmfulJohn}_h \times \text{Bracelet}_t + \delta^T \text{Support}_v \times \text{Bracelet}_t \\
+ \eta^T \text{HarmfulJohn}_h \times \text{Support}_v + \mu^T \text{HarmfulJohn}_h \\
+ \zeta^T \text{Bracelet}_t + \epsilon_{ihvt}^T
\]

- \( i \): individual; \( h \): household; \( v \): village; \( t = 1 \) when John wears bracelet, and 0 otherwise
- \( T \in \text{B&B, Box, Bracelet, Control} \)
- \( Y_{ihvt}^k \): dimension of John’s public image
- \( Z_{ihv} \): summary measure; \( Z_{ihv} = \sum_k \left( \frac{Y_{ihv}^k - \overline{Y}_k}{\sigma_{Y_k}} \right) \)

▶ Standard errors clustered at the village level
▶ We are interested in testing \( \gamma^{B&B} \geq \gamma^{T'} \) and \( \beta^{B&B} \leq \beta^{T'} \), for \( T' \neq B&B \)
Appendix

Estimation: Lower-cost Strategy ➤ Changes Attitudes?

\[ Y_{ihv}^{k} = \alpha + \beta B&B_v + \gamma Box_v + \delta Bracelet_v + \epsilon_{ihv} \]

- \( i \): individual; \( h \): household; \( v \): village
- \( Y_{ihv}^{k} \): favorable attitudes towards harmful practice (child marriage or sexual initiation)

➤ Standard errors clustered at the village level
➤ We are interested in testing \( \beta = 0 \) and \( \beta \leq \gamma, \delta \)
### Does Supporting Child Marriage Improve Public Image?

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>Summary Measure</th>
<th>Altruism Reciprocity</th>
<th>Negative Reciprocity</th>
<th>Positive Reciprocity</th>
<th>Trustworth.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Harmful John \times Share</strong></td>
<td><strong>0.871</strong>* (0.302)</td>
<td><strong>1.028</strong>* (0.494)</td>
<td>-0.529 (0.444)</td>
<td><strong>0.945</strong>* (0.507)</td>
<td><strong>2.041</strong>* (0.491)</td>
</tr>
<tr>
<td><strong>Harmful John</strong></td>
<td>-0.403*** (0.0239)</td>
<td>-0.474*** (0.0354)</td>
<td><strong>0.200</strong>* (0.0335)</td>
<td>-0.415*** (0.0375)</td>
<td>-0.921*** (0.0368)</td>
</tr>
</tbody>
</table>

- Observations: 8,006
- Clusters: 412
- Village Fixed Effects: ✓ ✓ ✓ ✓ ✓

Standard errors clustered at the village level in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Manipulation check: what do food collections stand for?
Manipulation check: what do food collections stand for?
Manipulation check: what do food collections stand for?

**Sharing**

**Wealth**
Manipulation check: what do rubber bracelets stand for?
Manipulation check: what do rubber bracelets stand for?

![Bar chart showing Sharing levels for B&B, Box, Bracelets, and Control conditions. The chart includes error bars and a star indicating a significant difference.]
Manipulation check: what do rubber bracelets stand for?

[Graph showing sharing and wealth with different conditions: B&B, Box, Bracelets, Control]
Appendix

Does a Lower-Coster Strategy Weaken the Signal?

\[ Y_{ihvt} = \alpha_i + \eta_1 \text{John}_h \times \text{Share}_v \times \text{Bracelet}_t \]
\[ + \eta_2 \text{John}_h \times \text{Bracelet}_t + \eta_3 \text{Share}_v \times \text{Bracelet}_t \]
\[ + \eta_4 \text{Bracelet}_t + \epsilon_{ihvt}, \]

Results are robust to:
- Replacing \( \text{Share}_v \times \text{Bracelet}_t \) with \( \text{Support}_v \) (favorable attitudes towards child marriage).
## Does a Lower-Cost Strategy Weaken the Signal?

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>(i) B&amp;B</th>
<th>(ii) Box</th>
<th>(iii) Bracelets</th>
<th>(iv) Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived reputation of John (joint measure)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>John supports child marriage × Share married &lt; 15 × Bracelet</td>
<td>-2.469***</td>
<td>-0.847</td>
<td>1.180</td>
<td>0.253</td>
</tr>
<tr>
<td></td>
<td>(0.835)</td>
<td>(0.808)</td>
<td>(0.714)</td>
<td>(0.562)</td>
</tr>
<tr>
<td>John supports child marriage × Bracelet</td>
<td>0.270***</td>
<td>0.0798**</td>
<td>0.0371</td>
<td>0.0754*</td>
</tr>
<tr>
<td></td>
<td>(0.0502)</td>
<td>(0.0376)</td>
<td>(0.0412)</td>
<td>(0.0419)</td>
</tr>
<tr>
<td>Share married &lt; 15 × Bracelet</td>
<td>0.126</td>
<td>0.378</td>
<td>-0.702</td>
<td>0.0986</td>
</tr>
<tr>
<td></td>
<td>(0.538)</td>
<td>(0.621)</td>
<td>(0.478)</td>
<td>(0.477)</td>
</tr>
<tr>
<td>Bracelet</td>
<td>0.00995</td>
<td>-0.0360</td>
<td>0.0549*</td>
<td>-0.0228</td>
</tr>
<tr>
<td></td>
<td>(0.0283)</td>
<td>(0.0274)</td>
<td>(0.0320)</td>
<td>(0.0318)</td>
</tr>
<tr>
<td>Observations</td>
<td>4,626</td>
<td>4,680</td>
<td>3,400</td>
<td>3,300</td>
</tr>
<tr>
<td>Clusters</td>
<td>117</td>
<td>118</td>
<td>88</td>
<td>89</td>
</tr>
<tr>
<td>Individual Fixed Effects</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Standard errors clustered at the village level in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01. Note that this analysis exploits the within subject design, absorbing individual fixed effects and consequently does not rely on further individual and village-level controls, thus explaining the larger sample size.
Pre-determination of child marriage share in village

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>Share married &lt; 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>B&amp;B</td>
<td>-0.00482 (0.00803)</td>
</tr>
<tr>
<td>Box</td>
<td>-0.00953 (0.00773)</td>
</tr>
<tr>
<td>Bracelets</td>
<td>-0.00544 (0.00867)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.0568*** (0.00637)</td>
</tr>
</tbody>
</table>

F-test B&B=Box 0.513,
p-value 0.474

Observations 8,009,
Clusters 412

Standard errors clustered at the village level in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Effect of Intervention on Chief’s Prediction Accuracy

We estimate the following linear regression model in order to compare prediction accuracy between arms of the signaling treatment:

\[ Z_{ihv} = \beta_0 + \beta_1 C_{ihv} \times \text{Donation}_v + \beta_2 C_{ihv} + \beta_3 \text{Donation}_v + \epsilon_{ihv} \]

- \( i \): individual; \( h \): household; \( v \): village
- \( Z_{ihv} \): Individual’s self-reported summary measure; \( Z_{ihv} = \sum_k \left( \frac{Y_{ihv}^k - \bar{Y}_k}{\sigma_{Y_k}} \right) \)
- \( C_{ihv} \): Chief’s prediction of summary measure; \( C_{ihv} = \sum_k \left( \frac{X_{ihv}^k - \bar{X}_k}{\sigma_{X_k}} \right) \)

- Standard errors are clustered at the village level
- We are interested in testing \( \beta_1 = 0 \)
## Effect of Intervention on Chief’s Prediction Accuracy

<table>
<thead>
<tr>
<th></th>
<th>Summary measure by Individual</th>
<th>Summary measure by Individual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chief summary measure × Donation</td>
<td>-0.0192 (0.0878)</td>
<td>-0.0137 (0.0872)</td>
</tr>
<tr>
<td>Chief summary measure</td>
<td>-0.0174 (0.0714)</td>
<td>-0.0277 (0.0724)</td>
</tr>
<tr>
<td>Donation</td>
<td>-0.0755 (0.0754)</td>
<td>-0.0766 (0.0793)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.0444 (0.0565)</td>
<td>0.0772 (0.157)</td>
</tr>
</tbody>
</table>

| Observations                  | 802                           | 802                           |

| Chief controls                | ✓                             |                               |

Standard errors clustered at the village level
Reference group: pure control

* *p* < 0.1, ** *p* < 0.05, *** *p* < 0.01
Estimation: Lower-cost Strategy \(\rightarrow\) Changes Attitudes?

\[
Y_{ihv}^k = \alpha + \beta B&B_v + \gamma Box_v + \delta Bracelet_v + \epsilon_{ihv}
\]

- We pre-registered that we would pool the two lower-cost signaling strategies for this analysis:

\[
Y_{ihv}^k = \alpha + \beta Donation_v + \epsilon_{ihv}
\]

- Donation\(_v\) = 1 if B&B\(_v\) = 1 or Box\(_v\) = 1, and 0 otherwise

- We are interested in testing \(\beta = 0\)
Appendix

Estimation: Average Treatment Effects (on the Treated)

**ITT:** \( Y_{iv} = \alpha_0 + \alpha_1 \text{Donation}_v + \alpha_2 X_i + \alpha_3 Z_v + \epsilon_{iv} \)

**IV:**
1\(^{st}\) stage:
\( \text{Lower-Cost}_v = \beta_0 + \beta_1 \text{Donation}_v + \beta_2 X_i + \beta_3 Z_v + \zeta_{iv} \)
2\(^{nd}\) stage:
\( Y_{iv} = \gamma_0 + \gamma_1 \text{Lower-Cost}_v + \gamma_2 X_i + \gamma_3 Z_v + \xi_{iv} \)

- Standard errors clustered at the village level
- \( i \): individual; \( v \): village
- \( Y \): Favorable attitude towards harmful traditional practice
- \( \text{Donation}_v \): Village assigned to \( B&B_v \) or \( Box_v \)
- \( \text{Lower-Cost}_v \): Village actually served by \( B&B_v \) or \( Box_v \)
- \( X_i \): Individual controls (Gender and Age)
- \( Z_v \): Village-level controls (Urban, Village size and Population density)
## Does a Lower-Cost Strategy Change Attitudes?

<table>
<thead>
<tr>
<th></th>
<th>(1) Child Marriage</th>
<th>(2) Child Marriage (IV)</th>
<th>(3) Initiation</th>
<th>(4) Initiation (IV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Donation</td>
<td>-0.0131***</td>
<td>-0.0161***</td>
<td>-0.0124</td>
<td>-0.0156*</td>
</tr>
<tr>
<td></td>
<td>(0.00492)</td>
<td>(0.00583)</td>
<td>(0.00796)</td>
<td>(0.00945)</td>
</tr>
<tr>
<td>Control mean</td>
<td>0.054</td>
<td></td>
<td>0.077</td>
<td></td>
</tr>
<tr>
<td>Chi²-test Donation jointly=0, (p)</td>
<td>7.916 (0.0191)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV: Chi²-test Donation jointly=0, (p)</td>
<td>8.539 (0.0140)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>11,578</td>
<td>11,123</td>
<td>7,523</td>
<td>7,243</td>
</tr>
<tr>
<td>Clusters</td>
<td>412</td>
<td>412</td>
<td>412</td>
<td>412</td>
</tr>
<tr>
<td>Individual controls</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Village-level controls</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Standard errors clustered at the village level in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
## Effect of Donation Intervention on Support for Child Marriage/Sexual Initiation (Marginal Effects from Probit)

<table>
<thead>
<tr>
<th></th>
<th>(1) Child Marriage</th>
<th>(2) Child Marriage (IV)</th>
<th>(3) Initiation</th>
<th>(4) Initiation (IV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Donation</td>
<td>-0.0127***</td>
<td>-0.0156***</td>
<td>-0.0126</td>
<td>-0.0159*</td>
</tr>
<tr>
<td></td>
<td>(0.00475)</td>
<td>(0.00570)</td>
<td>(0.00777)</td>
<td>(0.00926)</td>
</tr>
<tr>
<td>Control mean</td>
<td>0.054</td>
<td></td>
<td></td>
<td>0.077</td>
</tr>
<tr>
<td>Chi(^2)-test Donation jointly=0, (p)</td>
<td>8.203 (0.0165)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV: Chi(^2)-test Donation jointly=0, (p)</td>
<td>8.880 (0.0118)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>12,008</td>
<td>11,553</td>
<td>7,849</td>
<td>7,551</td>
</tr>
<tr>
<td>Clusters</td>
<td>412</td>
<td>412</td>
<td>412</td>
<td>412</td>
</tr>
<tr>
<td>Individual controls</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Village-level controls</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Standard errors clustered at the village level in parentheses

* *p* < 0.1, ** *p* < 0.05, *** *p* < 0.01
## Donation Intervention (Placebo)

<table>
<thead>
<tr>
<th></th>
<th>(1) Child Marriage</th>
<th>(2) Child Marriage (IV)</th>
<th>(3) Initiation</th>
<th>(4) Initiation (IV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Donation</td>
<td>-0.00877</td>
<td>-0.0108</td>
<td>-0.00112</td>
<td>-0.00118</td>
</tr>
<tr>
<td></td>
<td>(0.0108)</td>
<td>(0.0127)</td>
<td>(0.00156)</td>
<td>(0.00179)</td>
</tr>
<tr>
<td>Control mean</td>
<td>0.30</td>
<td>0.27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chi²-test Donation</td>
<td>1.222 (0.543)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV: Chi²-test Donation jointly=0, (p)</td>
<td>1.227 (0.541)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>8,891</td>
<td>8,534</td>
<td>5,392</td>
<td>5,238</td>
</tr>
<tr>
<td>Clusters</td>
<td>412</td>
<td>412</td>
<td>412</td>
<td>412</td>
</tr>
<tr>
<td>Individual controls</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Village-level controls</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Standard errors clustered at the village level in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Households with girls: attitudes towards child marriage

Support child marriage
Households with girls: attitudes towards child marriage

Support child marriage

Girls 12-17

<table>
<thead>
<tr>
<th></th>
<th>No donation</th>
<th>Donation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support child marriage</td>
<td>0.04 (1918)</td>
<td>0.02 (2772)</td>
</tr>
</tbody>
</table>

**Note:** The confidence intervals are not shown in the diagram.

The graph shows a significant difference in support for child marriage between households with girls aged 12-17 who received a donation and those who did not. The donation group had significantly lower support for child marriage compared to the no donation group (***p < 0.001***).
Households with girls: attitudes towards child marriage

Support child marriage

Girls 12-17

No donation: 0.05 ± 0.02
Donation: 0.02 ± 0.02

No Girls 12-17

No donation: 0.07 ± 0.03
Donation: 0.03 ± 0.03

*** Significant difference between groups

n = 1918, 2772, 2608, 3825
Households with girls: attitudes towards sex. initiation

Support sexual initiation
Households with girls: attitudes towards sex. initiation

Support sexual initiation

Girls 12-14

<table>
<thead>
<tr>
<th></th>
<th>No donation</th>
<th>Donation</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>834</td>
<td>1197</td>
</tr>
<tr>
<td>p</td>
<td>0.05</td>
<td>0.1</td>
</tr>
</tbody>
</table>

**Back 24/27**
Households with girls: attitudes towards sex. initiation

Support sexual initiation

Girls 12-14

No donation | Donation
---|---
$n = 834$ | $n = 1197$

No Girls 12-14

No donation | Donation
---|---
$n = 2094$ | $n = 3118$
Gender differences: attitudes towards child marriage

Support child marriage
Gender differences: attitudes towards child marriage

Support child marriage

Females

<table>
<thead>
<tr>
<th>Donation</th>
<th>n</th>
<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>2637</td>
<td>0.06</td>
</tr>
<tr>
<td>Donation</td>
<td>3876</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Significance: ***
Gender differences: attitudes towards child marriage

Support child marriage

Females

Males

<table>
<thead>
<tr>
<th></th>
<th>No donation</th>
<th>Donation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Females</td>
<td>n = 2637</td>
<td>n = 3876</td>
</tr>
<tr>
<td>Males</td>
<td>n = 1889</td>
<td>n = 2721</td>
</tr>
</tbody>
</table>

**Back**
Gender differences: attitudes towards sex. initiation

Support sexual initiation
Gender differences: attitudes towards sex initiation

<table>
<thead>
<tr>
<th></th>
<th>Females</th>
<th>Males</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support sexual initiation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Donation</td>
<td>No donation</td>
<td>n = 1710</td>
</tr>
<tr>
<td>No donation</td>
<td>Donation</td>
<td>n = 1218</td>
</tr>
</tbody>
</table>

* Indicates a statistically significant difference.
Gender differences: attitudes towards sex. initiation

Support sexual initiation

Females

Males

<table>
<thead>
<tr>
<th></th>
<th>No donation</th>
<th>Donation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Females, n</td>
<td>1710</td>
<td>2556</td>
</tr>
<tr>
<td>Males, n</td>
<td>1218</td>
<td>1759</td>
</tr>
</tbody>
</table>

Back
Reason for own marriage: attitudes towards child marriage

Support child marriage
Reason for own marriage: attitudes towards child marriage

Support child marriage

Tradition

<table>
<thead>
<tr>
<th></th>
<th>Donation</th>
<th>No donation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pregnancy/poverty</td>
<td>0.08</td>
<td>0.12</td>
</tr>
<tr>
<td>Tradition</td>
<td>0.04</td>
<td>0.04</td>
</tr>
<tr>
<td>Donation</td>
<td>0.12</td>
<td>0.08</td>
</tr>
</tbody>
</table>

n = 93, n = 131
Reason for own marriage: attitudes towards child marriage

Support child marriage

Tradition

Pregnancy/poverty

<table>
<thead>
<tr>
<th></th>
<th>No donation</th>
<th>Donation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tradition</td>
<td>0.12</td>
<td>0.04</td>
</tr>
<tr>
<td>Donation</td>
<td>0.08</td>
<td>0.08</td>
</tr>
<tr>
<td>Pregnancy/poverty</td>
<td>0.12</td>
<td>0.08</td>
</tr>
<tr>
<td>Donation</td>
<td>0.08</td>
<td>0.08</td>
</tr>
</tbody>
</table>

n = 93, n = 131
n = 958, n = 1408