Appendix for "How the second-order free rider problem is solved in a small-scale society"

Section 1: Methods and Questionnaires

The data were collected during fieldwork I conducted from May--June 2012 and Jun--July 2014. The study site was located in a settlement of the Ngiyapakuno, one among two dozen territorial sections that constitute the Turkana. Participants were recruited by visiting homesteads and administering the study to adult men and women who were available and willing to participate. Turkana research assistants aided me in the field with translating, recruiting subjects, and administering the study. The studies were administered in the local language, and vignette scenarios were designed using norm violations that previous ethnographic observations revealed to be culturally salient.

For the cowardice scenarios, participants heard about a fictitious warrior who observes cowardice on a raid. In one condition the warrior mobilizes the violator's age-mates to punish the coward while in the other condition the warrior does not take any action. Another set of participants heard about a warrior who dispenses corporal punishment more severely than is typical for the cowardice, and about a warrior who falsely accuses someone of cowardice and punishes him. Through a series of short vignettes that varied minimally by the relevant attribute, I also explored what attributes of the process of implementing punishment are essential for a punisher's action to be viewed favorably: Can it benefit the punisher? Can it be dispensed by a third party instead of the injured party? Can it be dispensed alone not collectively? Can it be dispensed only by members of a preordained group? For the adultery scenario, participants heard a vignette about a man who kept silent on a case of adultery involving his spouse, and of a man who mobilizes his clan to punish the man who committed the violation.

Table 1.1. Cowardice Study Questionnaire

Now, I will narrate to you a story, and afterwards I want to hear from you about what happened. There isn't a correct or wrong answer I'm expecting, just your own opinion. Understood? Listen carefully.	
Second-order Free Rider Condition	**Appropriate Punishment (Control) Condition**
One day when the Turkana went to raid, in Etabo's wing, there was a coward who hid behind and endangered others. The coward was from Etabo's own age-group. But when they returned Etabo did not do anything to the coward	*One day when the Turkana went to raid, in Losike's wing, there was a coward who hid behind and endangered others. The coward was from Losike's own age-group. Losike was angered and reported the incident to his age-mates. One day, Losike along with his age-mates finds the man and beats him.*

Did you hear, or should I repeat? Can you recall the person in the story? What is his name? What happened?

Q1. Is what Etabo did right or wrong?	Q1. Is what Losike did right or wrong?
Q2. What Etabo did, will it please or displease people?	Q2. What Losike did, will it please or displease people?
Q3. Is having people like Etabo around good or bad for the community?	Q3. Is having people like Losike around good or bad for the community?
Q4. Will you praise or criticize Etabo for what he did?	Q4. Will you praise or criticize Losike for what he did?
Q5. Should anything be done to Etabo or not?	Q5. Should anything be done to Losike or not?
Q6. If you meet Etabo on the way, will you help him?	Q6. If you meet Losike on the way, will you help him?
Q7. If Etabo wants to marry your daughter, will you give her?	Q7. If Losike wants to marry your daughter, will you give her?
	Q8. Do you think this person who Losike has beaten will help Losike at a time of need later?

Short Vignettes (SV)

SV1. Now suppose Losike and his age mates make the coward sacrifice an animal for them. Is that right or wrong?

SV2. Now suppose Losike, without telling his age mates, beat the coward on his own. Is that right or wrong?

SV3. Now suppose Losike, without telling his age mates, makes the coward sacrifice an animal for himself alone. Is that right or wrong?

SV4. Now suppose Losike does not bring up the issue of the coward with his age mates at the time. Later the coward comes to borrow an animal from Losike. Losike becomes angry and refuses to give him an animal. Is it right or wrong what Losike does?

SV5. Now suppose Losike is from the same age group as the coward, but he did not himself go on this raid. He hears about the incident from others. Losike then gathers his age mates to beat the coward. Is this right or wrong?

SV6. Now suppose after hearing about the coward, Losike beats the coward on his own without discussing with his age mates. Is that right or wrong?

SV7. Now suppose the coward's own age group refuses to discipline the coward. A different age group finds the coward and beats him. Is that right or wrong?

SV8. Now suppose the coward's own age group refuses to discipline the coward. A different age group finds the coward and makes the coward sacrifice an animal for them. Is the right or wrong?

SV9. Now suppose Losike neither raised the issue of the coward with others nor beat him, do you think the coward will help Losike at a time of need later?

Table 1.2 Adultery Study Questionnaire

Now, I will narrate to you a story, and afterwards I want to hear from you about what happened. There isn't a correct or wrong answer I'm expecting, just your own opinion. Understood? Listen carefully.

Second-order Free Rider Condition	**Appropriate Punishment (Control) Condition**
One day a man committed adultery with Etabo's wife. Etabo did not do anything to the adulterer.	*One day, a man committed adultery with Losike's wife. Losike was angered. He discussed the incident with people from his clan. One day, he along with his clan mates, find the adulterer and beat him.*

Did you hear, or should I repeat?

Can you recall the person in the story? What is his name? What happened?

Q1. Is what Etabo did right or wrong?	Q1. Is what Losike did right or wrong?
Q2. What Etabo did, will it please or displease people?	Q2. What Losike did, will it please or displease people?
Q3. Is having people like Etabo around good or bad for the community?	Q3. Is having people like Losike around good or bad for the community?
Q4. Will you praise or criticize Etabo for what he did?	Q4. Will you praise or criticize Losike for what he did?
Q5. Should anything be done to Etabo or not?	Q5. Should anything be done to Losike or not?
Q6. If you meet Etabo on the way, will you help him?	Q6. If you meet Losike on the way, will you help him?
Q7. If Etabo wants to marry your daughter, will you give her?	Q7. If Losike wants to marry your daughter, will you give her?
	Q8. Do you think this person who Losike has beaten will help Losike at a time of need later?

Short vignettes

SV1. Now suppose Losike and his clan mates drive away the animals of the adulterer. Is that right or wrong?

SV2. Now suppose Losike, without telling his clan mates, beat the adulterer on his own. Is that right or wrong?

SV3. Now suppose Losike, without telling his clan mates, drives away the adulterer's animals by himself. Is that right or wrong?

SV4. Now suppose Losike does not bring up the issue of the adulterer with his clan mates at the time. Later the adulterer comes to borrow an animal from Losike. Losike becomes angry and refuses to give him an animal. Is it right or wrong what Losike does?

SV5. Now suppose the man committed adultery not with Losike's wife, but with the wife of someone from Losike's clan. He hears about the incident from others. Losike then gathers his clan mates to beat the adulterer. Is this right or wrong?

SV6. Now suppose after hearing about the adulterer, Losike drives the adulterer's animals on his own without discussing with his clan mates. Is that right or wrong?

SV7.	Now suppose the adulterer's own clan refuses to beat the adulterer. People from another clan find the adulterer and beat him. Is that right or wrong?
SV8.	Now suppose the adulterer's own clan refuses to beat the adulterer. People from another clan drive away the animals of the adulterer. Is that right or wrong?
SV9.	Now suppose Losike neither raised the issue of the adulterer with others nor beat him, do you think the adulterer will help Losike at a time of need later?

Table 1.3 Excess and Unjust Punishment Questionnaire

Now, I will narrate to you a story, and afterwards I want to hear from you about what happened. There isn't a correct or wrong answer I'm expecting, just your own opinion. Understood? Listen carefully.

Second-order Free Rider Condition	**Appropriate Punishment (Control) Condition**
One day when the Turkana went to raid, there was a coward in Emuria's wing. The coward was from Emuria's own age-group. Emuria was angered and reported the incident to his age-mates. One day, Emuria along with his age-mates finds the man and they beat him too severely, more than how a coward is beaten.	*One day when the Turkana went to raid, there was a man in Lopeyok's wing who fought well. This man was from Lopeyok's own age-group. Even though this man fought, Lopeyok said he should be beaten. One day, Lopeyok along with his age-mates finds the man and they beat him*
Did you hear, or should I repeat? Can you recall the person in the story? What is his name? What happened?	
Q1. Is what Emuria did right or wrong? Q2. What Emuria did, will it please or displease people? Q3. Is having people like Emuria around good or bad for the community? Q4. Will you praise or criticize Emuria for what he did? Q5. Should anything be done to Emuria or not? Q6. If you meet Emuria on the way, will you help him? Q7. If Emuria wants to marry your daughter, will you give her?	Q1. Is what Lopeyok did right or wrong? Q2. What Lopeyok did, will it please or displease people? Q3. Is having people like Lopeyok around good or bad for the community? Q4. Will you praise or criticize Lopeyok for what he did? Q5. Should anything be done to Lopeyok or not? Q6. If you meet Lopeyok on the way, will you help him? Q7. If Lopeyok wants to marry your daughter, will you give her?

Section 3: Data and analysis

Punitive sentiments towards the character (data reported in figures 1a of the main text) are based on participants' responses to Q1-Q7.

Perceived costs of punishment in terms of lost social opportunities is based on participants responses to Q8 ("Costly to Punish") and SV9 ("Beneficial to not punish").

Attributes that cause punishment to be viewed as morally legitimate (fig. A1 in appendix) is based on participant's responses to SV1—SV3 and SV5—SV8, and their response to Q1 in the control condition of the Cowardice and Adultery study. For each vignette scenario, I categorized the four attributes as either present (✔) or absent. The table below shows the categorization for the cowardice study, and the same procedure was used for the adultery study.

Table 3.1 Categorization of short vignettes by attributes of punishment

	Punisher benefits	Punisher is 3rd party	Punisher not of preordained group	Punisher acts alone
One day when the Turkana went to raid, in Losike's wing, there was a coward who hid behind and endangered others. The coward was from Losike's own age-group. Losike was angered and reported the incident to his age-mates. One day, Losike along with his age-mates finds the man and beats him. Q1. Is what Losike did right or wrong?				
SV1. Now suppose Losike and his clan mates drive away the animals of the adulterer. Is that right or wrong?	✔			
SV2. Now suppose Losike, without telling his age mates, beat the coward on his own. Is that right or wrong?				✔
SV3. Now suppose Losike, without telling his age mates, makes the coward sacrifice an animal for himself alone. Is that right or wrong?	✔			✔
SV5. Now suppose Losike is from the same age group as the coward, but he did not himself go on this raid. He hears about the incident from others. Losike then gathers his age mates to beat the coward. Is this right or wrong?		✔		
SV6. Now suppose after hearing about the coward, Losike beats the coward on his own without discussing with his age mates. Is that right or wrong?		✔		✔
SV7. Now suppose the coward's own age group refuses to discipline the				

coward. A different age group finds the coward and beats him. Is that right or wrong?			✔	
SV8. Now suppose the coward's own age group refuses to discipline the coward. A different age group finds the coward and makes the coward sacrifice an animal for them. Is the right or wrong?	✔		✔	

Section 4: Results

Participants believe there are costs to punishing in terms of lost social opportunities. They are more likely to think that a coward will help the warrior at a future time of need if he spares him punishment (One Sample t test: $t_{67} = 18{:}17$, $p < .0001$); they are more likely to think that an adulterer will help the cuckolded man in the future if he spares him punishment ($t_{57} = 9{:}83$, $p < .0001$). For adultery but not for cowardice, they are more likely to think that the man who punishes will be refused help by the violator in the future ($t_{56} = 2{:}34$, $p < .05$).

To examine what attributes make punishment legitimate I used a mixed-effect logistic regression model in which the four attributes that were varied were fixed effects and subject ID and order were random effects.The analysis was done in R using lmer package's glmer function, and the results are presented in Tables 3.1 and 3.2 for cowardice and adultery respectively. The raw proportions are presented in Figure 1A. In summary, participants judge punishment to be wrong if it is dispensed single-handedly without consulting others, or if it is meted by members outside the preordained group responsible for punishing. Whether punishment benefits the punisher, or is initiated by a third party not the injured party, had much smaller effects.

Table 4.1 Attributes that make participants judge punishment of cowardice as wrong

Generalized linear mixed model fit by the Laplace approximation				
Number of obs: 558, groups: subjectID, 70				
logLik: -231.1				
Deviance: 462.3				
Random effects				
Groups	Variance	Std.Dev.		
subjectID	3.4007	1.8441		
Fixed effects				
	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-3.44162	0.43506	-7.911	0.104
Punisher Benefits	0.47851	0.29405	1.627	2.14e-06 ***
Punisher is 3rd party	0.06191	0.39254	0.158	0.875
Punisher not of preordained group	3.57307	0.40448	8.834	< 2e-16 ***

Punisher acts alone	5.51023	0.42262	13.038	< 2e-16 ***

Table 4.2 Attributes that make participants judge punishment of adultery as wrong

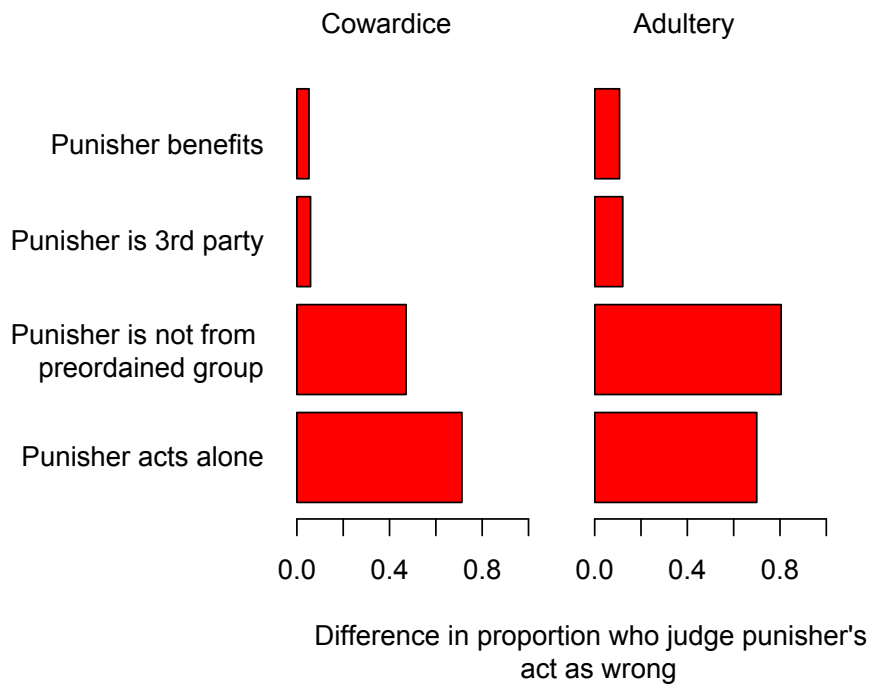| **Generalized linear mixed model fit by the Laplace approximation**				
Number of obs: 471, groups: subjectID, 59				
logLik: -163.1				
Deviance: 326.2				
Random effects				
Groups	Variance	Std.Dev.		
subjectID	3.1821	1.7839		
Fixed effects				
	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-4.3452	0.5366	-8.098	5.58e-16 ***
Punisher Benefits	1.2820	0.3935	3.258	0.00112 **
Punisher is 3rd party	1.7665	0.4659	3.792	0.00015 ***
Punisher not of preordained group	6.7504	0.5981	11.287	< 2e-16 ***
Punisher acts alone	5.5488	0.4855	11.428	< 2e-16 ***

Figure 1A. Attributes that legitimize peer punishment. Horizontal axis shows difference in proportion of participants who judged punishing a violator to be wrong when it had the attribute indicated on the vertical axis from when it lacked the attribute.