Supplementary materials for the paper: Nobody likes a rat: On the willingness to report lies and the consequences thereof

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Appendix A – Additional descriptive statistics

Table A1 contains the mean and standard deviation (in parentheses) of key variables. It includes the stated earnings (s_i), the true earnings (t_i), the amount overstated ($s_i - t_i$), the amount overstated as a percentage of the maximum overstatement $(s_i - t_i)/(T_g - t_i)$, the

Table A1 – Descriptive statistics

Treatment	Random				Selection			
Periods	1-3	4-6	7-9	All	1-3	4-6	7-9	All
Stated earnings	186.3	186.0	170.3	180.9	213.4	196.7	192.7	201.8
	(92.5)	(89.3)	(92.5)	(91.6)	(90.9)	(85.8)	(90.8)	(89.6)
True earnings	152.1	157.1	144.4	151.2	144.0	137.5	133.3	138.6
	(90.9)	(86.4)	(84.4)	(87.3)	(84.5)	(81.1)	(81.0)	(82.4)
Points overstated	34.2	28.9	25.8	29.7	69.4	59.2	59.5	63.1
	(77.0)	(66.3)	(63.9)	(69.3)	(98.2)	(85.9)	(84.8)	(90.5)
Fraction of points overstated (in percent)	20.8	19.5	18.5	19.6	41.3	44.4	46.0	43.8
	(36.8)	(35.6)	(36.3)	(36.2)	(46.6)	(48.1)	(48.3)	(47.6)
Fraction reporting (in percent)	18.8	18.8	13.2	16.9	14.9	8.9	8.9	11.1
	(39.1)	(39.1)	(33.9)	(37.5)	(35.7)	(28.5)	(28.5)	(31.5)
Fraction inspected (in percent)	46.9	41.7	33.3	40.6	36.5	17.3	20.3	25.5
	(50.0)	(49.4)	(47.2)	(49.1)	(48.2)	(37.9)	(40.3)	(43.6)
Fraction sanctioned (in percent)	22.6	19.4	15.6	19.2	17.7	8.9	10.1	12.6
	(41.9)	(39.6)	(36.4)	(39.4)	(38.2)	(28.5)	(30.2)	(33.2)
Fraction of separated subjects	0.0	0.0	0.0	0.0	0.0	17.7	17.7	11.8
	–	–	–	–	–	(38.2)	(38.2)	(32.3)
Final payoff	115.7	137.5	133.9	129.0	134.1	135.1	128.4	132.5
	(179.1)	(147.0)	(130.8)	(153.7)	(201.0)	(149.6)	(148.1)	(167.9)

Table B1 – Treatment differences with Mann-Whitney U tests

Variable	*p*-value
Fraction of points overstated	0.010
Fraction overstating	0.038
Fraction of points overstated (periods 1 to 3)	0.021
Fraction overstating (periods 1 to 3)	0.083
Fraction reporting	0.038
Fraction reporting given others overstated	0.038
Fraction sanctioned	0.050
Fraction sanctioned given they overstated	0.010
Final payoff	0.959

fraction of subjects reporting others, the fraction of inspected organizations, the fraction of subjects sanctioned in inspections, the fraction of separated subjects, and the final payoff.

Appendix B – Additional statistical analyses

B.1. Non-parametric treatment comparisons

Table B1 displays the exact *p*-values from two-sided Mann-Whitney U tests that evaluate whether key variables significantly differ between the two treatments. In all cases, tests are performed with society means as observations. The first four rows provide support for Result 1. Namely, the amount overstated as a fraction of the highest feasible overstatement is significantly higher in Selection than in Random, as is the fraction of subjects overstating. Moreover, the difference occurs already in the first three periods. The next four rows provide support for Result 2. Specifically, the overall fraction of subjects reporting others and of subjects being sanctioned is significantly smaller in Selection than in Random. Moreover, these significant differences also exist when we limit ourselves to instances where subjects have an opportunity to report (because others overstate) or be sanctioned (because they overstate). Finally, the last row shows that final payoffs do not differ statistically between treatments. Hence, the additional points subjects make in Selection due to more overstating and lower sanctions are canceled out by a smaller T_g in organizations of $n_g = 2$ and the low earnings of separated subjects who do not manage to rejoin an organization (18 percent of subjects remain separated after the third period).

Table B2 – *P*-values for pairwise comparisons between different organizational sizes

Variable	Random $n_g = 3$ vs. Selection $n_g = 3$	Random $n_g = 3$ vs. Selection $n_g = 2$	Selection $n_g = 3$ vs. Selection $n_g = 2$
Fraction of points overstated	0.011	0.016	0.825
Fraction overstating	0.043	0.098	0.625
Fraction reporting	0.121	0.001	0.001
Fraction reporting given others overstated	0.037	0.032	0.646
Fraction sanctioned	0.203	0.001	0.001
Fraction sanctioned given they overstated	0.021	0.001	0.019
Final payoff	0.343	0.034	0.281

B.2. Effects of organizational size on overstating and reporting behavior

In this subsection, we analyze in more detail the role of organizational size in the Selection treatment. The size of an organization has different implications for behavior in various dimensions. On one hand, organizations of $n_g = 3$ have the advantage that honest behavior is more lucrative (the expected payoff of being honest is 150 points) compared to organizations of $n_g = 2$ (where the expected payoff of being honest is 112.5 points). On the other hand, if an individual is thinking of being dishonest then her belief that other individuals are indignant must be lower in $n_g = 3$ compared to $n_g = 2$ for overstating to be worthwhile (if the constant probability that an individual is indignant is ρ then overstating becomes worthwhile in $n_g = 2$ when $\rho < 0.333$, whereas in $n_g = 3$ it is $\rho < 0.184$). Finally, since organizations of $n_g = 2$ do not lose members, they can expect a longer period of stable repeated interaction that can facilitate collusion. Hence, organizations of $n_g = 2$ confer an advantage for those who want to overstate.

Table 1 in the paper indeed suggests that organizations of $n_g = 2$ in Selection are more dishonest than those of $n_g = 3$ (by design, there are no organizations of $n_g = 2$ in Random). Specifically, we see that the fraction of points overstated is higher whereas the fraction of subjects reporting others and the fraction of subjects sanctioned for overstating is lower.

In Table B2, we present the *p*-values of pairwise comparisons for key statistics between organizations of $n_g = 3$ in Random, organizations of $n_g = 3$ in Selection, and organizations of $n_2 = 3$ in Selection. The *p*-values are derived using regressions with the appropriate

dummy variables, subject random effects, and standard errors clustered on societies.[1] We use a Tobit regression (censoring at 1 and 0) for the fraction of points overstated, a GLS regression for the final payoff, and logit regressions for all other variables.

We can see that the results in the main body of the paper are robust to controlling for the size of the organization. Namely, the fraction of points overstated is significantly lower, the fraction reporting given someone overstated is significantly higher, and the fraction sanctioned given they overstated is significantly higher in Random than in both $n_g = 2$ and $n_g = 3$ in Selection. That being said, there are some significant differences between organizations of $n_g = 2$ and $n_g = 3$. Specifically, there is significantly less overall reporting and sanctioning in organizations of $n_g = 2$, which confirms the intuition that organizations of size $n_g = 2$ have an advantage when it comes to supporting dishonest behavior. Interestingly, Table 1 also shows that organizations of $n_g = 2$ have a higher average final payoff than organizations of $n_g = 3$, which hints that the net effect of easier collusion on dishonesty in $n_g = 2$ is larger than the effect of higher true payoffs in $n_g = 3$. However, this difference is not statistically significant.

B.3. Dynamics of overstating behavior

Here, we take a closer look at how subjects adjust their overstating behavior. To do so, we run two logit regressions per treatment. As the dependent variable we use a dummy variable indicating whether subject i overstates her earnings in period z. In the first two regressions we use independent variables that measure the effect of i's previous actions and factors that directly affect i's monetary payoff. Specifically, we include (i) i's temptation to overstate in period z, which we define as i's monetary gain of reporting the highest possible earnings $T_g - t_i$, (ii) a dummy variable equal to one if i overstated her earnings in period $z-1$, (iii) a dummy variable equal to one if i was sanctioned for overstating her earnings in period $z-1$ (because another subject chose to report), and (iv) a dummy variable equal to one if i reported another subject in period $z-1$. In the next two regressions, we add events

[1] We also tried the comparisons within Selection (i.e., $n_g = 3$ vs. $n_g = 2$) using subject fixed effects. The results are very similar.

Table B3 – Determinants of overstating

	Specification I				Specification II			
Treatment	Random		Selection		Random		Selection	
Independent variables	o.r.	s.e.	o.r.	s.e.	o.r.	s.e.	o.r.	s.e.
Temptation to overstate	1.93***	(0.22)	2.29***	(0.35)	2.00***	(0.19)	2.35***	(0.33)
Overstated in $z-1$	4.68***	(0.99)	2.66***	(0.96)	2.99***	(0.74)	1.62	(0.51)
Sanctioned in $z-1$	0.06***	(0.03)	0.37**	(0.15)	0.06***	(0.03)	0.43**	(0.17)
Reported in $z-1$	0.35***	(0.08)	0.49***	(0.13)	0.15***	(0.05)	0.25***	(0.09)
Others overstated in $z-1$					2.79***	(0.73)	2.17***	(0.46)
Others sanctioned in $z-1$					0.27**	(0.18)	0.12***	(0.06)
Organization of $n_g = 2$			0.98	(0.29)			0.98	(0.31)
Period fixed effects	Yes		Yes		Yes		Yes	
Subject fixed effects	Yes		Yes		Yes		Yes	
Pseudo R^2	0.21		0.16		0.23		0.19	
# of obs./subj./societies	648/72/8		396/59/8		648/72/8		462/59/8	

Note: Odd ratios from logit regressions. The dependent variable indicates whether subjects overstate their earnings. Robust standard errors allowing for correlation within societies. Asterisks indicate significance at 1 percent (***), 5 percent (**), and 10 percent (*).

observed by i that have no direct effect on her payoff. Namely, we include (v) a dummy variable equal to one if i observed at least one other subject overstate their earnings in period $z-1$, and (vi) a dummy variable equal to one if i was not sanctioned but observed another subject being sanctioned in period $z-1$ because a subject other than i chose to report. In all regressions, we use subject fixed effects, period fixed effects, and robust standard errors clustered on societies. Finally, in the Selection treatment, we use a dummy variable for the organization size. The estimated odds ratios and respective standard errors are presented in Table B3.[2]

Consistent with models where lying behavior is sensitive to the benefits of lying (e.g., Ellingsen and Johannesson, 2004), Table B3 shows that subjects are significantly more likely to overstate their earnings as the gain from doing so increases. Specifically, an

[2] To facilitate the interpretation of the coefficient of the variable 'temptation to overstate', we normalize it to have a mean of zero and a standard deviation of one. Moreover, since we use subject fixed effects and there are subjects who never or always overstate (within a given organization size), the coefficients are estimated using less than 96 subjects and 864 observations.

increase of one standard deviation in the temptation to overstate roughly doubles the odds of overstating. This finding explains the patterns seen in Figure 1 in the paper. Namely, when subjects overstate, most do so maximally, but they do not overstate in all periods as the gains from doing so are sufficient only in some instances.

As is common in laboratory experiments, subjects tend to repeat actions that resulted in a high payoff and avoid actions that yielded a low payoff. Specifically, subjects who overstated and were not sanctioned have increased odds of overstating, whereas subjects who overstated and were sanctioned have decreased odds of overstating.[3] With the second specification, we see that subjects are learning from observing the actions of others. That is, observing other subjects overstate increases the odds of overstating and observing other subjects be sanctioned for overstating decreases the odds of overstating. Finally, note that the dynamics of overstating are similar in both treatments.[4] Hence, selecting who enters the organization does not seem to affect how subjects react to each other's actions.

B.4. Dynamics of reporting behavior

To evaluate the determinants of reporting we run two logit regressions per treatment. The dependent variable is a dummy variable indicating whether subject i reports other subjects for overstating their earnings in period z. In the first two regressions we concentrate on the effect of i's actions and others' actions in period z. We use the following independent variables: (i) the amount by which others overstate their earnings in period z, $\sum_{j\neq i}(s_j - t_j)$, which measures the extent to which others lie; (ii) the difference in stated earnings between i and others in period z, $\sum_{j\neq i}(s_j - s_i)$, which captures incentives to report that are unrelated to lying but might be important such as inequity aversion and competitive preferences; (iii) a dummy variable equal to one if i overstated her earnings in period z; (iv) an interaction term between (i) and (iii); and (v) an interaction term between

[3] We also observe that subjects are less likely to overstate if they reported someone in the previous period. It is not clear why this might be the case, but it could be due to subjects expecting retaliation from subjects who were sanctioned. For evidence of this type of retaliation see Nikiforakis (2008) and Hopfensitz and Reuben (2009).

[4] If we run one regression where we interact all variables with a treatment dummy variable, we obtain a significant interaction term only for 'sanctioned in $z-1$' ($p = 0.001$, for all others $p > 0.145$).

Table B4 – Determinants of reporting overstatements

	Specification I				Specification II			
Treatment	Random		Selection		Random		Selection	
Independent variables	o.r.	s.e.	o.r.	s.e.	o.r.	s.e.	o.r.	s.e.
Deviation from true earnings	9.53***	(4.79)	9.83***	(5.56)	9.18***	(4.49)	9.97***	(5.25)
Difference in earnings	0.93	(0.11)	1.32**	(0.18)	0.94	(0.11)	1.39**	(0.18)
Overstated	0.05***	(0.03)	0.05***	(0.04)	0.05***	(0.03)	0.06***	(0.05)
Overstated × dev. true earnings	0.18***	(0.11)	1.18	(0.63)	0.18***	(0.11)	1.14	(0.60)
Overstated × diff. earnings	1.54	(0.84)	2.92	(2.40)	1.60	(0.86)	2.42	(1.78)
Sanctioned in $z-1$					0.57	(0.27)	3.16	(3.13)
Reported in $z-1$					0.76	(0.42)	0.88	(0.45)
Others reported in $z-1$					0.98	(0.79)	2.50	(2.36)
Organization of $n_g = 2$			0.67	(0.35)			0.59	(0.33)
Period fixed effects	Yes		Yes		Yes		Yes	
Subject fixed effects	Yes		Yes		Yes		Yes	
Pseudo R^2	0.33		0.53		0.33		0.55	
# of obs./subj./societies	585/65/8		318/41/8		585/65/8		318/41/8	

Note: Odd ratios from logit regressions. The dependent variable indicates whether subjects report others. Robust standard errors allowing for correlation within societies. Asterisks indicate significance at 1 percent (***), 5 percent (**), and 10 percent (*).

(ii) and (iii). In the other two regressions, we also control for events in the previous period. To this end, we use (vi) a dummy variable equal to one if i was sanctioned for overstating her earnings in period $z-1$; (vii) a dummy variable equal to one if i reported others in period $z-1$; and (viii) a dummy variable equal to one if i observed at least one other subject being sanctioned in period $z-1$. We use subject fixed effects, period fixed effects, robust standard errors clustered on societies, and a dummy variable for organization size. The estimated odds ratios and standard errors are presented in Table B4.[5]

Table B4 shows that observing others overstate is a powerful determinant of deciding to report. The coefficient for 'deviation from true earnings' is both large and statistically significant in both treatments. This is consistent with the assumption that some individuals feel indignation toward those who lie (and more so the larger the lie is) and are willing to

[5] As before, we normalize the continuous variables 'deviation from true earnings' and 'difference in earnings' to have a mean of zero and a standard deviation of one. Moreover, since we use subject fixed effects and some subjects never or always report, the coefficients are estimated using less than 96 subjects and 864 observations.

sanction them for doing so. A second powerful determinant of the decision to report is having had overstated. Subjects who overstated are significantly less likely to report others, which is not very surprising as by reporting they also sanction themselves. By contrast, the effect of differences in earnings is significant only in Selection and is markedly smaller compared to the previous two. Lastly, note that the interaction term for having overstated times the deviation from true earnings is *not* significant in the Selection treatment, which shows there is some willingness to report others even when doing so implies incurring a sanction. We should note, however, that overstating and then reporting is a rare occurrence, so these latter results are based on few observations (11 out of 585 in Random and 10 out of 318 in Selection).

It is worth mentioning that the coefficients of the two most impactful variables (i.e., the deviation from true earnings and having had reported) are not significantly different across treatments.[6] This shows that the lower reporting rate in Selection is not due to honest subjects being less willing to report, but rather to fewer instances where honest subjects see others overstate. In the next subsection, we analyze how the selection process facilitates this effect by separating subjects who report from those who overstate.

Appendix C – Experiment's procedures and instructions

Here we describe in more detail the experiment's procedures and provide the instructions of the Selection treatment (instructions of the Random treatment are available on request).

C.1. Procedures

The computerized experiment was conducted using the typical procedures of anonymity, neutrally worded instructions, and monetary incentives. In total, 192 students participated in the one-hour experiment. Each session of the experiment consisted of 24 subjects who were randomly assigned to one of two societies. We employed a between-subjects treatment design so that in each session subjects in one society played the Random

[6] If we run one regression where we interact all variables with a treatment dummy variable, we obtain $p = 0.905$ for the interaction with 'deviation from true earnings' and $p = 0.870$ for the interaction with 'overstated'.

treatment and those in the other played the Selection treatment. This gives us eight independent observations (societies) per treatment. Points were converted to US dollars at a rate of 150 points = $1 and subjects received a show-up fee of $15. Average earnings equaled $22.84.

Upon arrival, each subject drew a card to be randomly assigned to a seat in the laboratory. Once everyone was seated, subjects read the instructions for the experiment (a copy of the instructions is available in the online appendix) and answered a few questions to ensure their understanding of the game. When all subjects had correctly answered the questions, the computerized experiment (programmed in z-Tree, Fischbacher, 2007) started. After the game ended, subjects were confidentially paid their earnings in cash.

C.2. Instructions

You are now taking part in an economic study. You can earn money depending on your decisions and the decisions of other participants. How you earn money is described in these instructions. Please read them carefully.

During the study, you are not allowed to communicate with other participants. If you have a question, raise your hand. One of us will come to answer your question. During the study, your earnings will be calculated in points. At the end of the study, points will be converted to dollars at a rate of 150 points = 1 dollar.

In the study, you will be randomly assigned to a *market* of 12 participants (i.e. you and 11 other participants). The game is divided into *9 periods*. Your total earnings for the game will be the sum of your earnings over all periods. You will play with the same 12 participants during all the periods. Furthermore, within each market, you will be randomly divided into *groups*. Initially all groups have 3 participants (i.e. you and 2 other participants).

Your decisions in each period

You will observe a button called 'Get endowment' on the computer screen. Every time you click the button, it generates a random number from a *uniform* distribution. If you are part of a group of three participants, it will generate a number between 0 and 300 (each

equally likely). If you are part of a group of two participants it will generate a number between 0 and 225 (each equally likely).

In every period, you will receive an endowment. Specifically, your endowment equals the random number you generate with your *first* click of the `Get endowment' button. Of course, you may click the button more than once to ensure the randomization algorithm is working properly. However, your endowment always corresponds to your first click.

Before making your decisions, you will be informed of the endowments of other participants in your group. You will not be informed of the endowment of participants in other groups. You make two decisions in each period.

For your first decision, you are asked to *state* what your endowment is. Your earnings in each period depend on the number you state. If you are part of a group of three participants, you can state a number between 0 and 300. If you are part of a group of two participants, you can state a number between 0 and 225. Note that the computer will not check whether the number you state is the same as the endowment you received. Before you make your second decision, you will be informed of numbers stated by all participants in your group.

Your second decision is to indicate whether you want your group to be *reviewed* or *not reviewed*. Your group will be reviewed if at least one of the participants in the group indicates they want a review. How this affects your and the earnings of others is explained below.

Earnings

Your earnings, in points, in each period depend on the number you state and on whether your group is reviewed or not. If your group is *not reviewed* then your earnings are equal to the number you state. If your group is *reviewed* then all the members of the group who stated a number that is bigger than their endowment will have their earnings reduced by *three times the difference between their stated number and their endowment*. There is no effect on the earnings of participants whose stated number is smaller than or equal to their endowment.

Example 1

If your endowment equals 200 points, you state 300 points, and your group is not reviewed then your earnings in this period equal 300 points.

Example 2:

If your endowment equals 200 points, you state 300 points, and your group is reviewed then your earnings in this period equal $300 - 3 \times (300 - 200) = 0$ points.

Example 3:

If your endowment equals 200 points, you state 200 points, and your group is reviewed then your earnings in this period equal 200 points.

Switching Groups

In addition, at the end of every *three periods* (i.e. after period three and six), in all groups of three participants, one participant will be randomly selected and separated from their group (groups with two participants do not become smaller). Participants who are separated from their group can be accepted into their old group or into a new group. The procedure for acceptance is described below.

First, all participants in the market receive information regarding the separated participants. Specifically, they will be able to see for each separated participant: (i) his/her average stated number over the last three periods; (ii) whether he/she requested at least one review in the last three periods; and (iii) whether he/she had his/her earnings reduced due to a review in the last three periods.

Second, participants in all groups indicate for each separated participant whether they would accept him/her in their group of not. If everyone in a group accepts a participant, he/she joins that group in the next period. If a participant is accepted by more than one group then he/she will be randomly assigned to one of the accepting groups (with equal probability). Similarly, if a group accepts more than one participant then it will be randomly assigned to one of the separated participants (with equal probability).

Note that participants who are not accepted to any group get earnings equal to 0 points for the next three periods. After three periods, they have another chance of being accepted

into a group. Groups that do not accept any participants will remain as a group of two for the next three periods.

Click on 'Done' once you have finished reading the instructions.

References

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