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EVIDENCE FROM A FIELD EXPERIMENT WITH COMMERCIAL FISHERMEN

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ABSTRACT

Understanding what determines the extent to which economic agents tell the truth to their regulating authority is of major economic importance, from banking to environmental protection. To this end, we examine truth-telling of German commercial fishermen in an artefactual field experiment. Their regulator, the European Union (EU), has recently enacted a ban on discarding unwanted fish catches to the sea, without yet increasing monitoring activities. The regulator thus depends on fishermen's truth-telling, while standard economic theory predicts substantial self-serving dishonesty. Using a coin- tossing task, we test whether truth-telling in a baseline setting differs from behavior in two treatments that exploit fishermen's widespread ill-regard of the EU. We find that fishermen misreport coin tosses to their advantage, albeit to a lesser extent than standard theory predicts. Misreporting is stronger among fishermen in a treatment where they are faced with the EU flag, suggesting that lying towards their ill-regarded regulator is more substantial. Yet, some fishermen are more honest in a control treatment where the source of EU research funding is revealed additionally. Our findings imply that regulators can influence truth-telling behavior by means of their regulatory approaches and communication strategies.

JEL codes: C93, D63, Q22, K32, K42, L51
Keywords: Truth-telling, lying, field experiment, regulation, fishermen

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"fishermen hold an almost entirely negative view of the EU"
McAngus (2016: 4) reporting survey results for UK fishermen

1. Introduction

Although honesty is regarded as a virtue or even a moral duty (Kant 1785), lying and deception permeate economic life (Gneezy 2005). Studying truth-telling has accordingly become a focus of inquiry for economics.[1] An area of particular public economic importance is the truth-telling of economic agents towards their regulating authorities—from the banking industry (Cohn et al. 2014), and tax reporting (Jacobsen and Piovesan 2016, Kleven et al. 2011) to environmental regulation (Duflo et al. 2013). The recent case where the German car manufacturer Volkswagen systematically lied about cars' emissions is but one prominent example. Faced with uncertainty about how honest economic agents are, regulators need to decide how much to invest in monitoring and how to devise appropriate sanctioning schemes for misbehavior.

Appropriate monitoring and sanctioning mechanisms are especially crucial for the management of common pool resources (Ostrom et al. 1992, Rustagi et al. 2010), with the fishery as a prime example (Wilen 2000, Stavins 2011). Fishery management comes in many different forms around the globe. It ranges from stringent restrictions on fish catches using individual transferable quotas—as in New Zealand (Newell et al. 2005) or Iceland (Arnason 2005)—to largely unregulated open-access fishing, as it is still the case for most high-seas fisheries. The costs of illegal, unreported and unregulated fishing are substantial and amount to US$ 10 to 23 billion per year (Global Ocean Commission 2013). Due to its economic importance and the heterogeneity of its regulatory structures, the fishery has recently gained substantial interest in experimental economic work.[2]

This paper extends the scope of previous studies and investigates to what extent regulator framing affects truth-telling. Our study therefore adds a new dimension to effective regulatory policy. We present evidence from an artefactual field experiment that examines truth-telling of German commercial fishermen. German commercial fishing is regulated by the European Union (EU), which is the world's fourth largest producer of fish, under the European Common Fisheries Policy. The EU has recently enacted a ban on returning unwanted fish catches to the sea (also called "discard ban" or "landing obligation"), as the practice of discarding ensues substantial costs to the public.[3] The change in legislation has, as of yet, not been combined with more stringent monitoring. The regulator, and scientists assessing the status of fish stocks upon which recommendations for fishery management are based, thus depend on

[1] For instance, see Abeler et al. (2014, 2016), Cappelen et al. (2013), Cohn et al. (2014, 2015), Fischbacher and Föllmi-Heusi (2013), Gächter and Schulz (2016), Gibson et al. (2013), Gneezy (2005), Gneezy et al. (2013), Houser et al. (2016), Mazar et al. (2008), Pasqual-Ezama et al. (2015), Potters and Stoop (2016), Rosenbaum et al. (2014).

[2] Among others, previous studies scrutinize cooperativeness, competitiveness and impatience among fishermen in Brazil (Fehr and Leibbrandt 2011, Leibbrandt et al. 2013, Gneezy et al. 2015). Stoop et al. (2012) examine cooperation among recreational Dutch anglers, while Jang and Lynham (2015) investigate the emergence of social preferences among lake fishermen in Kenya.

[3] Unused catches imply opportunity costs for fishermen and society. Patrick and Benaka (2013) estimate that bycatch discards represent a loss of $4.2 billion in potential sales in the US alone.

fishermen's truth-telling. Continuing to discard unwanted fish catches to the sea remains the individually optimal choice for fishermen in the present regulatory regime unless the regulator enforces the new policy. This, however, would require costly monitoring and sanctioning mechanisms.[4] This trade-off for the regulator between more costly monitoring and reliance on regulatee's honesty is not only relevant in the fishery for the newly enacted European "discard ban" or compliance with fishing quotas, but holds more generally.

For studying to what extent fishermen tell the truth towards their regulator, we conduct a coin-tossing game in a mail field experiment targeting all commercial fishermen in Germany. Adapting the 4-coin toss game of Abeler et al. (2014), we ask fishermen to toss a coin 4 times and report back their number of tail tosses. For each reported tail toss, they receive five Euros. In a between-subjects design, we test whether truth-telling in a baseline setting differs from truth-telling in two further treatments with different EU framings, where, first, the EU flag is made salient on the instruction sheet, and, second, a framing that states additionally that the European Commission has funded the research. Based on a simple model of reporting behavior of fishermen that considers internal Nash bargaining among a pay-off maximizing 'selfish self' and a 'moral self'. We hypothesize in particular that the salience of the EU regulator may increase the bargaining power of the 'selfish self' vis-à-vis the 'moral self' and thus decrease overall lying costs if the EU is ill-regarded.

The fishery is an ideal test case for studying how truth-telling behavior may be affected by regulatory framing, as there is well-documented and wide-spread contempt among fishermen concerning stricter EU fishing regulation. We confirm the almost entirely negative view of the EU prevalent among UK fishermen (McAngus 2016) for our field experimental setting in Germany: Besides ample anecdotal evidence, our survey results indicate that 90% of participating fishermen have a low trust in the EU, while this is only the case for 32% of a student control group. If regulator framing impacts truth-telling, we will therefore expect an almost uniform direction of the effect.

We find that fishermen misreport coin tosses to their advantage, albeit to a lesser extent than standard theory predicts. As hypothesized, misreporting is larger among fishermen who are faced with the EU flag. However, a control treatment reveals that some fishermen are more honest if the source of EU funding is made salient. Our findings imply that regulators have to take into account not only some given degree of dishonesty among the regulated, but also that the nature and communication of the regulatory policy will affect truth-telling. Regulators may be able to encounter new, cost-effective means to curb dishonest behavior and improve public policy. We close by discussing further policy relevance of our results.

[4] More stringent monitoring could come in different forms, such as more frequent patrolling of sea police, sending observers on-board or installing video cameras on ships to monitor whether fishermen comply with the law. Associated cost estimates are substantial, ranging from $8,000 to $13,000 per ship annually for remote camera monitoring in Canada and Denmark (Mangi et al. 2013), to 200,000 € for on-board observers in Denmark (Kindt-Larsen et al. 2011). FAO estimates that discard-related spending by regulating authorities worldwide totals annual costs of $4.5 billion (Alverson 1994).

2. Field setting, experimental design and hypotheses

The fishery has economic relevance in the German coastal regions at both the North Sea and Baltic Sea. According to the European Union's Common Fisheries Policy (CFP), the Council of Ministers of the European Union and the European Parliament set fishing quotas for the German fisheries. The German Federal Office for Agriculture and Food distributes the national catch quotas to fishing organizations or individual fishermen. Monitoring and enforcement of compliance are the duty of EU member states, and ultimately of the federal states in the case of Germany. A total of 896 commercial fishermen, owning 1,465 fishing vessels (German Fishery Association 2015), are registered at the German Federal Office for Agriculture and Food as holders of catch permits for the North Sea or Baltic Sea. Cutter type trawlers and coastal vessels constitute the core of the fleet with 300 boats. Small coastal fishing with passive gear such as gill nets and fish traps on vessels of less than 12 meters length, composed of 1,139 vessels, is predominantly operated at the Baltic coast. The German fishing fleet also includes seven deep-sea trawlers and two special vessels for pelagic fishing that operate in long distant waters, and 46 shell- and other special boats. Figure 1 depicts a map of Germany's coastal regions, where the red dots indicate the zip codes of fishermen who have participated in our experiment.

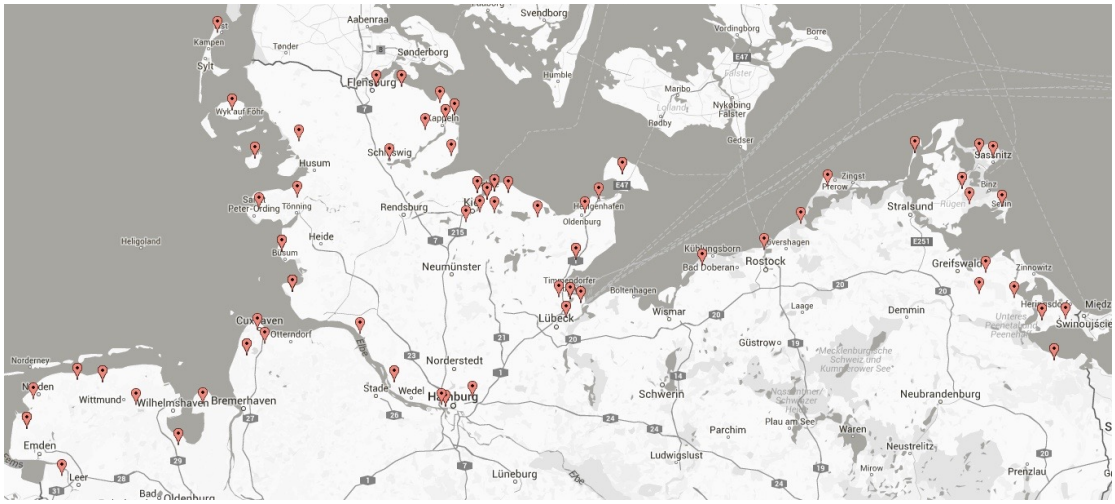

Figure 1: Map of North Germany. The red balloons represent the zip-codes of participating fishermen.

The recent economic literature on honesty and lying has made substantial progress to foster our understanding on what determines when and to what extent individuals lie. Abeler et al. (2016) conduct a meta-analysis of more than 30 studies using coin-tossing and die-rolling tasks. This meta-analysis shows that, on average, individuals lie to some, but not to an exhaustive, extent and that the extent of lying does not seem to increase with the stakes.

This paper contributes a new dimension to the analysis of truth-telling behavior: How the salience and communication of the regulator, who depends on truth-telling behavior in the policy context, affects the behavior of those being regulated. To this end, we adapt the 4-coin-tossing game of Abeler et al. (2014) for our mail field experiment. The fishermen's task was to toss a fair coin exactly 4 times, and report their result in a table printed on the instructions sheet. For

each instance they reported that the winning toss "tails" (in German "Zahl", meaning "number") laid on top, they received 5 €. A key feature of this task is that lying can be detected on aggregate when examining the distribution of decisions, but not on the individual level. Thus, depending on luck and honesty, each fisherman received between 0 and 20 € for this task. Besides the participant sample, the major difference to the previous study is that Abeler et al. (2014) conducted their 4-coin experiments via telephone or in the lab and the decision whether to report truthfully or to cheat was immediate, while our subjects had several weeks to decide on whether to report honestly or to lie.

In absence of a possibility to detect individual lying, a fisherman *i* is assumed to face a trade-off between monetary incentives and moral costs of lying (Akerlof and Kranton 2000, 2005; Cohn et al. 2015; Levitt and List 2007).[5] Here we propose the following extension of the standard model where an individual maximizes a utility function that describes this trade-off. We assume that an individual fisherman faces an internal bargain between two 'selves', one being a purely pay-off maximizing 'selfish self' (think of a 'devil' on the left shoulder), the other one being a 'moral self' purely interested in compliance with the moral standard to tell the truth (think of an 'angel' on the right shoulder). While the 'selfish self' derives utility only from its payoff proportional to the reported number r_i of coin tosses, the 'moral self' suffers a disutility from reporting a number r_i that deviates from the true number of tail tosses, r_{it}. Specifically, we assume utility functions

$$u^s(r_i) = -e^{-\beta_i r_i} \qquad \text{for the 'selfish self'} \qquad (1)$$

$$u^m(r_i) = -e^{\frac{\gamma_i}{2}\left(r_{it}-r_i\right)^2} \qquad \text{for the 'moral self'.} \qquad (2)$$

Here, $\beta_i > 0$ is a parameter capturing the marginal utility of income from reported tail tosses. The parameter $\gamma_i > 0$ can be interpreted as misreporting aversion. The larger γ_i, the more the individual suffers from dishonest reporting.

These two selves engage in a standard Nash bargaining (Binmore et al. 1986), i.e. they 'agree' on the reported number r_i of tail tosses that solves

$$\min_{r_i}\left(\bar{u}^s - u^s(r_i)\right)^{\alpha_i}\left(\bar{u}^m - u^m(r_i, r_{it})\right)^{1-\alpha_i}. \qquad (3)$$

That is, the resulting number r_i of reported tail tosses minimizes the weighted geometric mean of the deviation of utilities from respective upper reference levels $\bar{u}^s$ and $\bar{u}^m$.[6] To facilitate the analysis, we set $\bar{u}^d = 0 \geq \sup_{r_i} u^d(r_i)$ and

[5] Based on different schools of ethics, it is not trivial to assume an optimization problem of truth-telling. There may be some individuals who behave in line with Kantian deontological ethics and do not lie, out of a duty to tell the truth independent of the consequences. While studies like Gneezy (2005) and Gibson et al. (2013) find that many participants of their studies appear to be consequentialists, most studies also report at least some fraction of participants who never lie. It is therefore an implicit assumption that a sizeable fraction of fishermen are consequentialists.

[6] We assume that there always has to be an agreement, thus we consider the problem to minimize the deviation from some 'ideal' reference point, as opposed to the more often considered problem to maximize the improvement compared to some minimum utility levels of respective outside options.

$\bar{u}^m = 0 \geq \sup_{r_i} u^m(r_i)$ in the following. The parameter α_i captures the bargaining power of the 'selfish self' relative to the 'moral self'.

The first-order condition for the bargaining problem (3) is given by

$$\alpha_i \beta_i \left(e^{\frac{\gamma_i}{2}(r_{it}-r_i)^2} \right)^{1-\alpha_i} \left(e^{-\beta_i r_i} \right)^{\alpha_i} + (1-\alpha_i)\gamma_i (r_{it}-r_i) \left(e^{\frac{\gamma_i}{2}(r_{it}-r_i)^2} \right)^{1-\alpha_i} \left(e^{-\beta_i r_i} \right)^{\alpha_i} = 0 . \quad (4)$$

Solving for r_i yields the optimal tail toss reporting of an individual:

$$r_i^* = r_{it} + \frac{1}{\lambda_i} \quad (5)$$

with

$$\lambda_i = \frac{1-\alpha}{\alpha_i} \frac{\gamma_i}{\beta_i}, \quad (6)$$

which can be interpreted as an aggregated lying cost parameter (Cohn et al. 2015). The number of reported tail tosses monotonically decreases in λ_i towards the actual number of tail tosses r_{it}. An array of factors may impact lying costs, including an individual's gender, religion, and moral framing (Abeler et al. 2016, Arbel et al. 2014, Bucciol and Piovesan 2011, Rosenbaum et al. 2014, Utikal and Fischbacher 2013).[7] Our model captures some of these effects. In line with intuition, our theory predicts that lying costs increase with the coefficient γ_i of 'misreporting aversion of the 'moral self, and decrease with the relative bargaining power of the 'selfish self' α_i and with the marginal utility β_i of income of the 'selfish self'. The relative bargaining power of the 'selfish self' is a parameter that is contingent on the particular decision situation. In the following we derive hypotheses on how the treatments affect the relative bargaining power and thus lying costs.

In addition to previously studied effects, we hypothesize that the salience of the regulator affects individual lying costs. Salience of the regulator, in this case the EU, may decrease (increase) the 'devil's' bargaining power α_i if the EU is well (ill) regarded. In our field experiment we take advantage of the fact that there is well-documented and wide-spread contempt among fishermen concerning stricter EU fishing regulation over the past decade.[8] That is, we unambiguously predict an increase in the 'devil's' bargaining power α_i if the salience of the regulator matters for truth-telling.

In order to test our prediction, we sent out three versions of the instructions in a between-subjects design: (i) a baseline setting ('Baseline') in which only the logos of the University of Kiel and the Kiel Institute for the World Economy are

[7] Lying costs may also be affected by identity priming (Cohn et al. 2014, 2015; Cohn and Marechal 2016). In our setting, fishermen were targeted in their identity as German fishermen. Therefore professional identity considerations may increase lying costs due to reputational concerns inflicted on the profession, reducing the level of reported tail tosses across all treatments.

[8] This is confirmed by fishermen's self-reported trust in the EU concerning fishery policy in our survey. First, trust in the EU was substantially lower as compared to the German Fishery Association and the German Federal Government. Second, we find that trust in the EU is substantially lower as compared to a student control group. For further visual anecdotal evidence, see Appendix B. This antipathy towards the EU is not unique for German fishermen and may even be stronger in other countries. Indeed, UK fishermen played a key role in the `Brexit' campaign, and they overwhelmingly have a very negative view of the EU (McAngus 2016).

present on the letterhead, (ii) a version where the EU flag is made salient in the letterhead of the instruction sheet ('EU_Flag'), and (iii) a control treatment where the framing states that this research has been funded by the European Commission ('EU_Flag_Funding'), in addition to the EU flag. These framings were included on all three experimental sheets.[9] Figure 2 depicts the three letterheads and Appendix A includes the experimental instructions.

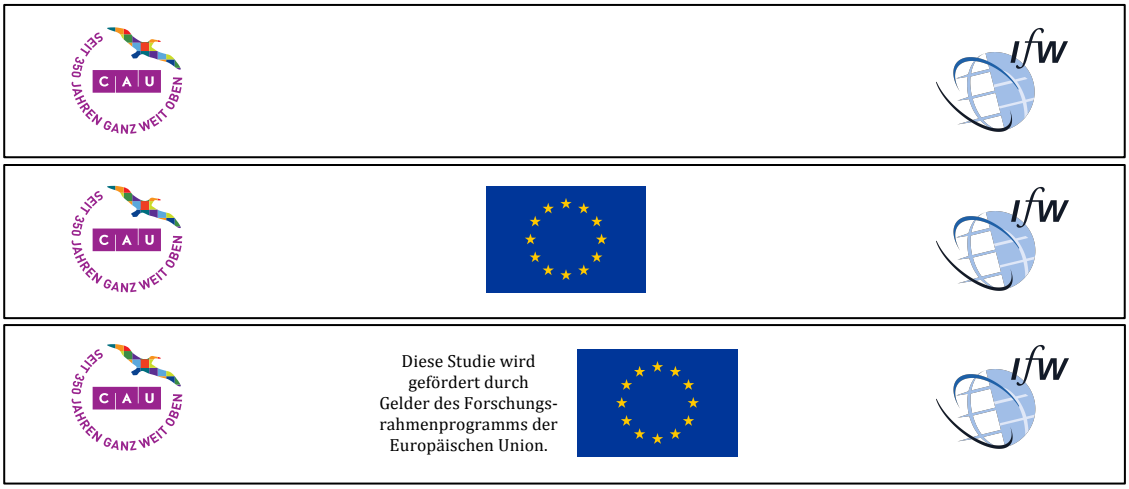

Figure 2: Letterheads of the three treatments (from top to bottom: Baseline, EU_Flag and EU_Flag_Funding).

Based on the insights from previous studies on lying behavior summarized in Abeler et al. (2016) and our treatments regarding the new regulatory dimension, we test three main hypotheses:

Hypothesis 1: Fishermen report greater tail-tosses than the truthful distribution, but do not fully misreport in the Baseline treatment.

The standard economic hypothesis of pure selfishness is that fishermen report their own payoff-maximizing option, i.e. every fisherman would report 4 times tails. This hypothesis has been called into question by recent empirical evidence on various lying costs (e.g. Fischbacher and Föllmi-Heusi 2013, Abeler et al. 2016). We therefore expect that fishermen, on average, report coin toss results in between the expected outcome of 2 times tails if all fishermen reported truthfully and the payoff-maximizing outcome of 4 times tails. Explanations for not reporting four winning tail tosses may include individual lying costs and internalized reputational costs for the profession. It may also mirror fishermen's professional behavior of misreporting somewhat instead of lying to the full extent, for example declaring some part but not all of their bycatch.

Hypothesis 2: Fishermen report less truthfully in the EU_Flag treatment compared to the Baseline treatment.

As documented above, there is evidence for a widespread antipathy towards the EU among German fishermen, as most of new regulations by the EU have been regarded as burdensome for the fishermen. This makes the context of our

[9] Note that the EU funding information is true and is also mentioned in the acknowledgements.

study very useful to test Hypothesis 2, compared to cases in which the attitude towards the regulator is ambiguous. We therefore hypothesize that the presence of the EU logo will increase the bargaining power of the 'selfish self' relative to the 'moral self' thus decreasing lying costs and that fishermen in this treatment will thus report less truthfully out of ill-regard towards their regulator.

Fishermen may also perceive the difference in the Baseline and the EU_Flag treatment as a difference in wealth of the specific institutions and the research institutions being backed by the EU. This may affect truth-telling, as previous research has shown that costs to others matter for lying behavior (e.g. Gneezy 2005). To disentangle this effect from the direct effect of a particular attitude towards their regulator, we include the third EU_Flag_Funding treatment.

Hypothesis 3: Fishermen report even less truthfully in EU_Flag_Funding compared to the EU_Flag treatment.

We hypothesize that fishermen may regard the additional informational cue as an indication that there is plenty of funding available to those conducting the study. This may reduce the moral cost of lying, reducing the 'misreporting aversion' of the 'moral self', and lead fishermen to report less truthfully. Fishermen may also regard the provided information as an opportunity to acquire some of the EU's funds to compensate for the regulatory burdens imposed on them, thus giving more bargaining power to the 'selfish self', and leading fishermen to report less truthfully as well.

To examine truth-telling of fishermen towards their regulator, we targeted all commercial fishermen in Germany in a mail field experiment. Due to rigorous data protection by the German Federal Office for Agriculture and Food, the address data of fishermen were not available to us. For the purpose of our study, the Thünen Institute of Sea Fisheries, the national fishery research institute responsible for carrying out fishery surveys, sent out the study documents to all 896 fishermen on our behalf. We prepared the envelopes with the survey materials, including stamped return-envelopes, at the University in Kiel. We then delivered the envelopes to the Thünen Institute and were present when the address data was added. The envelopes were sent out on Friday, December 4, 2015, and the closing date for the experiment was January 31, 2016. We assigned anonymous ID numbers to 1200 prepared surveys, which were numbered according to their treatment cell. After having randomly shuffled all envelopes, 896 of these envelopes were sent out to fishermen by the Thünen Institute.[10]

The experiment material consisted of 7 pages, including a cover letter, three experimental tasks with one page each, a two-page questionnaire and a sheet for payment information. Appendix A contains an English translation of the material. Besides the coin-tossing game, it includes an experimental task to elicit

[10] Additionally, fishermen could contact us directly by responding to advertisements in the journal of the German Fishery Association. If a fisherman contacted us, we cast a 6-sided die to determine which of the three treatments he would receive. Casting numbers 1 and 4 (2 and 5) [3 and 6] resulted in the Baseline (EU_Flag) [EU_Flag_Funding] treatment. We also randomly distributed envelopes to 34 junior fishermen. Five junior fishermen and three fishermen that contacted us directly participated in the study.

fishermen's risk preferences, and an experimental task on competitiveness.[11] Fishermen were told that the payment for participating in the study was limited to 100 €, with an expected average payoff of 50 € for around 30 minutes of work. Payment was made via bank transfer or by check via regular mail.

To ensure availability of a coin to toss, we enclosed a 1 € coin that we stuck on the page of the task (see Appendix B). To examine the impact of changing the decision environment (from the lab to our mail experiment) on honesty, we ran the same mail experiment with 50 business and economics undergraduate students at Kiel University at the same time. 44 of them participated.[12]

3. Results

We received 136 responses by fishermen, amounting to a response rate of 15%. 120 responses included results for the coin-tossing task (see Table 1 for descriptive statistics).[13] Figure 3 shows the theoretical binomial distribution for four tosses of a fair coin (blue dots connected by the dashed line), which is the distribution that we would expect if all fishermen truthfully report the outcome of their four coin tosses. The probability that four times tossing a coin results in r_{it} = 0 or 4 (1 or 3) [2] times tails is 6.25% (25%) [37.5%]. We refer to this distribution as the "truthful distribution", where the mean truthful response is $R_t = \frac{1}{N}\sum_{i=1}^{N} r_{it} = 2$ tail tosses. The payoff-maximizing choice would be the reporting of $r_p = 4$ times tails, with its mean denoted by R_p. Standard economic theory in the absence of lying costs predicts a distribution with 100% of reported coin tosses being tails. The grey bars in Figure 3 show actual reporting behavior of fishermen. With fishermen's actual mean response

$$R = \frac{1}{N}\sum_{i=1}^{N} r_i^* = \frac{1}{N}\sum_{i=1}^{N} \frac{1}{\lambda_i}\left(1 + \lambda_i r_{it}\right) = R_t + \frac{1}{\bar{\lambda}}, \qquad (7)$$

, we construct an 'honesty index' *H* that serves as a summary tool for comparing aggregate truth-telling behavior across groups and treatments. This honest index depends on the mean level of lying costs $\bar{\lambda} = \frac{1}{N}\sum_{i=1}^{N} \lambda_i$, with $\bar{\lambda}^2 \in \left[0.5, \infty\right)$:

$$H = \frac{R_p - R}{R_p - R_t} \times 100 = \left(1 - \frac{1}{2\bar{\lambda}}\right) \times 100 \ .^{14} \qquad (8)$$

The index describes the deviation of the average response from the truthful average response. It ranges from 0 (all respondents report only winning tosses)

[11] We do not find any significant correlations of truth-telling and risk or competitive choices and therefore do not discuss these tasks in more detail here.

[12] One of the authors distributed 50 envelopes to students in the lecture "Cost- and Performance Accounting" on December 4, 2015, and the closing date for the survey was also January 31, 2016.

[13] We follow standard procedures to test for response-bias and find no indication that observable characteristics or time of response drive the reporting behavior of fishermen (see Appendix D).

[14] In contrast to previous approaches to identifying the proportion of cheaters (e.g. Houser et al. 2012), this honesty index does not necessitate the assumption that no one misreported to their own disadvantage, as the index can also result in values greater than 100.

to 200 (all respondents report no winning tosses), with the average response being equal to the truthful average response at 100. As we have no information on individual lying behavior, also the index gives information only on average behavior. In particular, it does not distinguish between outcomes in which all respondents report truthfully and outcomes in which half of the sample lies to their advantage and half of the sample lies to their disadvantage.

Table 1: Descriptive Statistics on Coin Tossing Results

Treatment	N	Honesty index value *H*	Mean number of tails *R*	Relative frequencies		
				0/4 tails tosses	3/4 tails tosses	4/4 tails tosses
Fisher_All	120	77	2.46	0.03	0.43	0.11
Fisher_Baseline	42	81	2.38	0.02	0.45	0.05
Fisher_EU_Flag	36	68	2.64	0.00	0.39	0.17
Fisher_EU_Flag_Funding	42	81	2.38	0.05	0.43	0.12
Fisher_Coin_Back	22	88.5	2.23	0.00	0.41	0.00
Fisher_Coin_Kept	98	74.5	2.51	0.03	0.43	0.13
Students_Baseline	44	43	3.14	0.00	0.45	0.34

Result 1 (aggregate truth-telling behavior).

Overall reporting by fishermen differs significantly from the truthful distribution as well as from payoff-maximization.

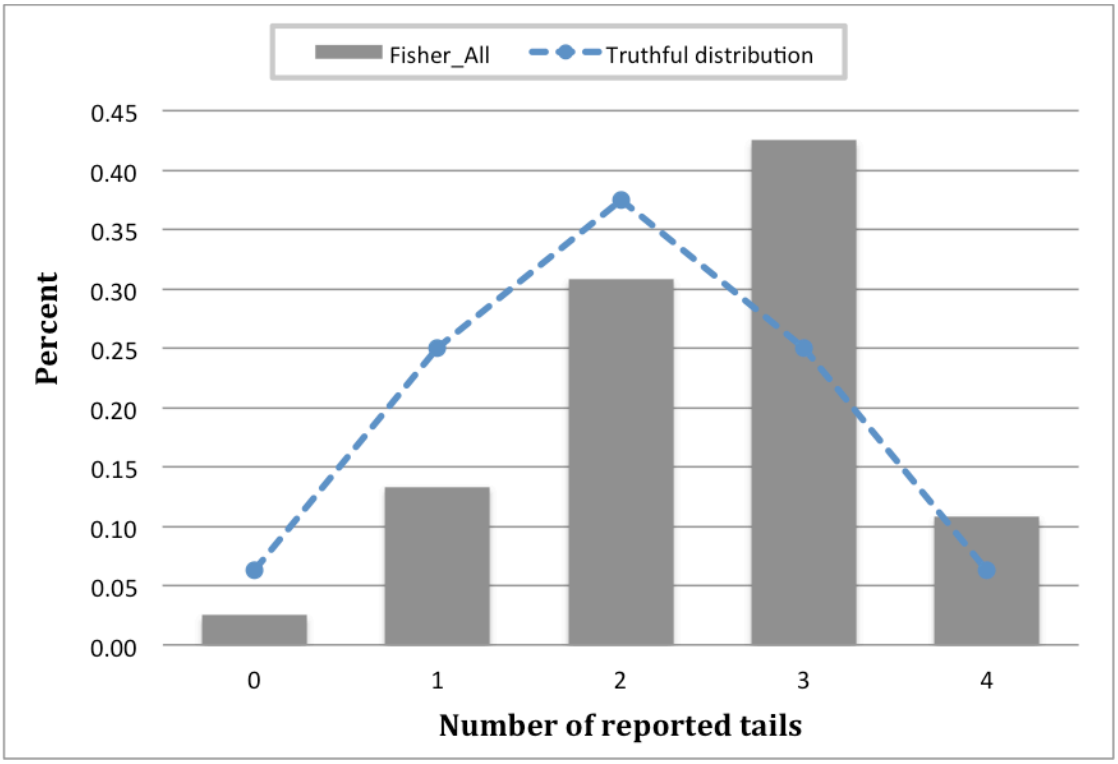

Figure 3: Aggregate reporting behavior of all fishermen in the 4-coin-toss task (grey bars). The blue dots connected by the dashed line represent the expected distribution if all fishermen reported coin toss outcomes truthfully (`truthful distribution').

Aggregating all of our three treatments, we find that all fishermen report to have tossed 2.46 winning tails on average. The honesty index *H* is thus 77 and indicates substantial lying costs in line with the previous literature. Figure 3 shows that 10.83% of fishermen report that they have obtained four times tails, and 42.50% report three times tails. The distribution of reported outcomes is statistically highly distinguishable from both the payoff-maximizing outcome as well as from the truthful distribution. Binomial tests of the expected truthful against the observed frequency for 3 tails and for the payoff maximizing decision of 4 reported tails yield $p<0.01$ and $p=0.055$ respectively. In particular, we find reporting of 3 tail tosses at the expense of reporting 0 or 1 coin toss (the latter differs significantly from the truthful distribution at $p<0.01$). We therefore confirm Hypothesis 1 and previous findings in the literature.

Next, we analyze the effects of our treatments on truth-telling.[15]

Result 2 (truth-telling behavior under EU_Flag treatment).

Fishermen misreport more severely when faced with the EU flag compared to the Baseline treatment.

In the Baseline treatment fishermen report an average coin toss result of 2.38 winning tails. In the EU_Flag treatment the average coin toss result was 2.64 tails. As Figure 4 shows, no fisherman in the EU_Flag treatment reported 0 tail tosses, less fishermen reported 1 tail tosses compared to the Baseline treatment (8.33% vs. 11.90%) and more fishermen reported 4 tail tosses (16.67% vs. 4.76%). While the frequency of fishermen reporting 4 tail tosses in the Baseline treatment does not differ significantly from the expected truthful reporting frequency, the result on 4 tail tosses of the EU_Flag treatment against the truthful distribution is statistically different at $p<0.05$. Furthermore, the difference between the Baseline and EU_Flag treatments in terms of 4 tail tosses is significant at $p=0.084$.

These findings provide confirmation for Hypothesis 2: The salience of the regulator does seem to play a role for truth-telling and the wide-spread ill-regard for the EU seems to translate into stronger over-reporting of tail tosses.

[15] In terms of response rates across treatments, we find that these are roughly equally distributed, with 45 (43) [48] in the Baseline (EU_Flag) [EU_Flag_Fund] treatment. Non-response concerning coin toss reporting is somewhat, but not considerably higher in the two EU treatments, with 7% (16%) [13%] Baseline (EU_Flag) [EU_Flag_Fund] treatment. Concerning questionnaire responses that are significantly correlated with truth-telling, we have no indication of bias across treatment for those 16 fishermen that did not report coin tosses. For instance concerning, the two major covariates of lying (year of birth and how often a fishermen has moved) go in opposite directions for the EU_Flag treatment: While fishermen in the EU_Flag treatment that did not report their coin-toss have only moved once in their lifetime on average, as compared to 3.5 [3.3] in the Baseline [EU_Flag_Fund] treatment, their mean birth year is 1952, as compared to 1960 [1957] in the Baseline [EU_Flag_Fund] treatment.

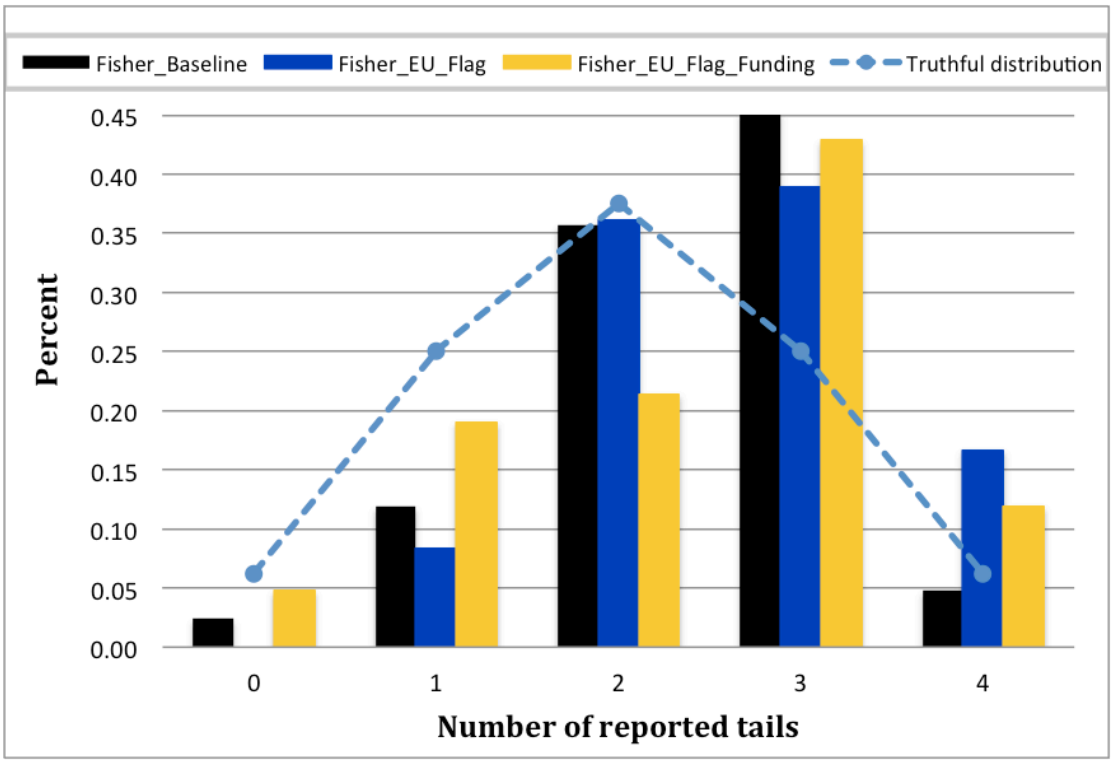

Figure 4: Aggregate tail toss reporting behavior in the Baseline (black bars), the EU_Flag (blue bars) and the EU_Flag_Funding treatments (yellow bars).

Result 3 (truth-telling behavior under EU_Flag_Funding treatment).

More fishermen report lower tail tosses when information on EU funding is made salient compared to the treatment that only includes the EU flag.

While fishermen report on average 2.64 tails in the EU_Flag, they report only 2.38 tails in the EU_Flag_Funding treatment (see Figure 4). We find no material and significant differences between the EU_Flag and the EU_Flag_Funding treatments in terms of 3 and 4 tail toss reporting, which occur in 39% vs. 43% and 17% vs. 12% of the cases, respectively). However, we find that fishermen in the EU_Flag_Funding treatment report significantly more 0 and 1 tail tosses (combined: 23.81% in the EU_Flag_Funding vs. 8.33% in the EU_Flag treatment, different at $p=0.067$) but fewer 2 tail tosses (different at $p<0.05$). While combined 0 and 1 tail toss reporting in the EU_Flag treatment differs significantly from the truthful distribution ($p<0.01$), we cannot reject the null hypothesis that fishermen in the EU_Flag_Funding treatment report 0 and 1 tail tosses truthfully.

These findings reject Hypothesis 3. First, we do not find support for the 'wealth-of-funding-institutions' or 'taking-back from the EU' hypotheses as fishermen in the EU_Flag_Funding do not report more 4 or combined 3 and 4 tail tosses. However, we find that the EU_Flag and the Funding effect seem to affect fishermen's reporting behavior in two opposing directions. We therefore conjecture that the salience of (research) funding may have increased the 'misreporting aversion' of the 'moral self', thus increasing lying costs and inducing more fishermen to report truthfully. This effect may provide an indication on how policy could curb misreporting and lying.

Result 4 (truth-telling behavior of fishermen versus students).

Fishermen are significantly more honest than student subjects.

We compare fishermen in the Baseline treatment with our student sample that faced the exactly same study design as the fishermen (see Figure 5). While fishermen reported to have tossed 2.38 tails on average, students report 3.14 tails on average. The honesty index *H* among fishermen in the Baseline treatment is 81, while it is only 43 among the student sample. This level of cheating among students closely approximates what has been found in other studies so far (Abeler et al. 2016). A two-sided Mann-Whitney test rejects the null hypothesis against a significant difference at $p<0.01$.

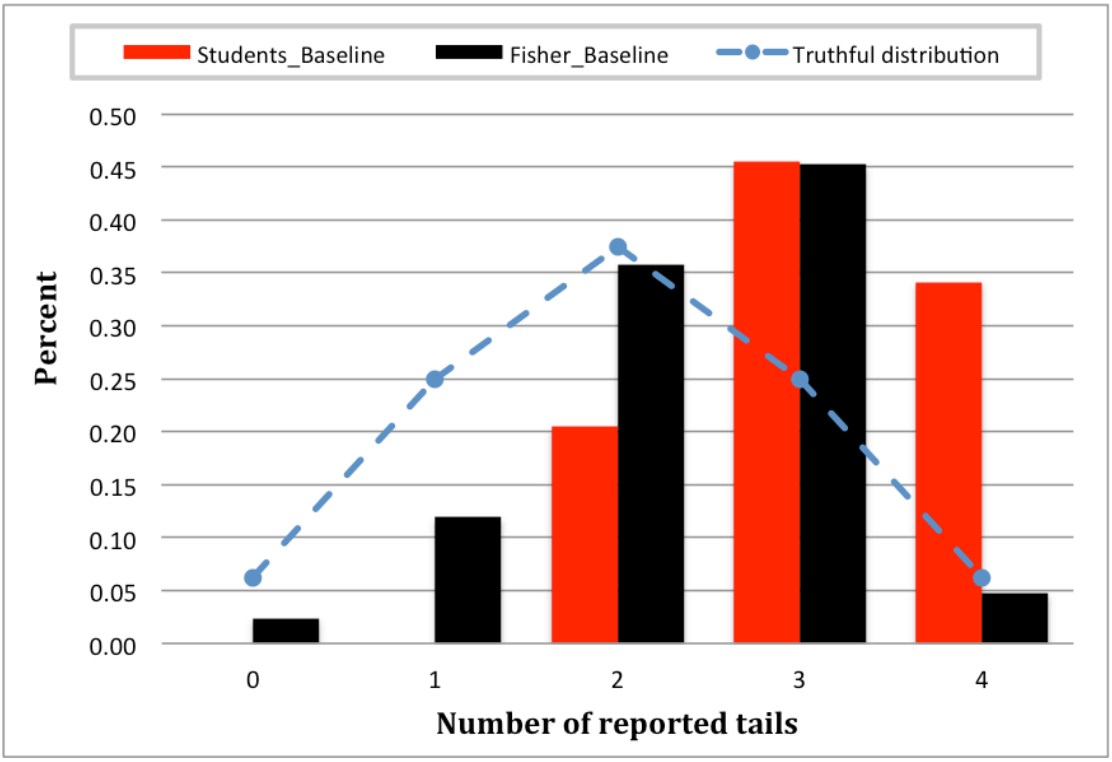

Figure 5: Aggregate reporting behavior of fishermen in the 4-coin-toss task (black bars) versus the student sample (red bars), both in the Baseline version.

Result 5 (consistency of truth-telling behavior).

Lying behavior of fishermen corresponds to behavior in other parts of the study.

Two further observations from the study offer the possibility to underscore truth-telling or lying behavior. First, we deliberately left the ownership about the coin that we included on the coin tossing decision page unclear. A related aspect of fishermen's fidelity is thus whether they sent back the 1 € coin with their decision sheets. We find that the 22 fishermen who sent back the 1 € coin report a coin toss result of 2.23 tails on average, compared to 2.51 tails for those who did not send back the coin (see Figure C.1 in Appendix C). This difference is not significant ($p=0.102$ in a one-sided t-test), yet tentatively suggests consistent behavior between the coin-tossing task and this hidden measure and therefore some external validity. However, there is still an over-reporting of 3 tail tosses

(relative frequency of 41% versus 25% in the truthful distribution, significant at $p<0.10$) for those who sent back the 1 € coin.

Second, we conducted a separate task to measure fishermen's competitiveness using a real production task where fishermen have to produce paper shreds by hand from an A7-sized (74 × 105mm) piece of paper. Fishermen decided on whether they want to be paid 0.05 € per piece, or whether they want to play competitively and receive 0.15 € per piece if they perform better than a randomly drawn other participant. As the A7-sized paper we sent the fishermen was of standard white format, dishonest fishermen could add additional alien paper shreds to increase their payoffs. To control for this potential possibility to cheat, we measured the weight of the returned paper shreds on an analytical scale from the physical chemistry lab. We find that the 10 heaviest envelopes with paper shreds, i.e. those where paper shreds have been added most likely to unduly increase payoff, report a mean coin toss result of 3.00 tails, compared to 2.41 tails for the rest. This difference is significant at $p<0.05$ (one-sided t-test). These findings thus support recent findings on the external validity of experimental measures of lying behavior (Cohn and Maréchal 2015, Cohn et al. 2015, Dai et al. 2016, Gächter and Schulz 2016, Potters and Stoop 2016).[16]

Finally, we consider the effect of questionnaire responses on reporting behavior. Table C.1 in Appendix C reports descriptive statistics for the key questionnaire data. Only few covariates are correlated with lying behavior (with significant correlation coefficients). The number of times a fishermen has moved in his lifetime, indicating mobility, is negatively correlated with dishonesty at $p=0.05$. Year of birth is positively correlated with dishonesty at $p<0.05$, i.e. older fishermen report more honestly. We also find that fishermen report more tail tosses the longer their planning horizon in the fishery ($p<0.1$) and the higher their expectance of a medium-term income increase ($p<0.01$), which are both highly correlated with year of birth. Receiving a base salary from the fishery is also positively correlated with the number of tail tosses reported ($p<0.1$).[17]

[16] Qualitatively, we find a similar pattern among students: The eight students sending back the 1 € coin report 3.00 tails on average, compared to 3.17 tails for those who did not send it back. The four students with the heaviest envelopes report 3.75 tails as compared to 3.08 tails for the rest.

[17] We do not find a significant unbalance across treatments for the pertinent questionnaire responses, except for the case that the five fishermen who receive a base salary are only represented in the EU_Flag and EU_Flag_Funding treatments (cf. Table C.2). Excluding these five observations keeps all findings on treatment effects qualitatively unchanged, except that the p-value for the comparison of EU_Flag vs. Basline for 4 tail tosses reduces to $p=0.125$ (Result 2).

5. Discussion and conclusion

This paper presents field experimental evidence on truth-telling of German commercial fishermen who are regulated by the European Union (EU). To our knowledge, this is the first artefactual field experiment with professional common-pool resource users on truth-telling.[18] Examining truth-telling of German fishermen is of direct relevance, as the member states of the European Union stand to decide on how much costs to incur to monitor a recently enacted ban on discarding unwanted fish catches to the sea. The regulator thus currently depends on fishermen's honesty, while standard economic theory predicts substantial lying behavior. This paper not only studies fishermen's overall degree of dishonesty but extends the scope of previous studies by asking how regulator framing affects truth-telling—a dimension that is relevant for the effective and efficient design monitoring and sanctioning mechanisms. Our results are therefore not only relevant for the specific fishery context, but crucial for a broader understanding of truth-telling, the management of common pool resources around the world, and for regulatory policy more generally.

Adapting an established coin-tossing game (Abeler et al. 2014), where subjects have to toss a coin 4 times and receive 5 € for each of the 0 to 4 reported tail tosses, we test whether truth-telling in a baseline setting differs from behavior in two treatments with different EU framings. The fishery is an ideal test case for studying how truth-telling behavior may be affected by regulatory framing, as there is almost uniform contempt among fishermen concerning stricter EU fishing regulation. We therefore hypothesized that if regulatory framing affects truth-telling, it would lower lying costs and thus result in higher misreporting among the treated fishermen.

We find overall that fishermen misreport coin tosses to their advantage, albeit to a significantly lesser extent than standard theory would predict. Specifically, we find an average tail toss result of 2.46, while the expected truthful distribution would result in 2 and the payoff-maximizing choice in 4 tail tosses. Fishermen thus do not lie to their maximum advantage, but partial misreporting (in particular reporting 3 tail tosses) is prevalent among fishermen. Crucially, we find that misreporting is larger among fishermen who are faced with the EU flag. This confirms a hypothesis, according to which many fishermen adhere to consequentialist moral principles and have lower moral lying costs towards the EU, which they dislike. This indicates that previously elicited degrees of truth-telling may not be appropriate for principal-agent relationships, where the principal or regulator is ill-regarded by the economic agents. In contrast, a control treatment shows that fishermen do not report more tail tosses if the source of EU research funding is made salient but in particular that significantly more fishermen report 0 and 1 tail tosses. This rejects the a hypothesis, according to which fishermen would interpret the provided information as a means to acquire some of the EU's funds to compensate for the regulatory burdens imposed on them. By contrast, the salience of funding might increase internal lying costs by increasing misreporting aversion, thus mitigating

[18] Previous studies examining social behavior among common pool resources users have either reported cooperativeness in standard public goods games, common pool resources or ultimatum games (e.g. Gneezy et al. 2015, Jang and Lynham 2015, Velez et al. 2009) or more severe forms of anti-social behavior (e.g. Prediger et al. 2014).

some over-reporting of tails. Moreover, we find evidence tentatively suggesting consistent behavior between the coin-tossing task and two other measures of truth-telling or lying behavior.

Overall, our findings imply that regulators not only have to consider some exogenous degree of dishonesty among the regulated, but also take into account that truth-telling depends on the nature and communication of the regulatory policy. Faced with a variable degree of dishonesty, the regulator can act strategically in adopting its regulatory approach, considering how the regulated will adapt their behavior. This consideration may yield effective and low-cost policy alternatives (or complements) to current approaches.

Whereas the substantial number of fishermen who likely report honestly might suggest that softer monitoring approaches could be sufficient, the strategic aspect of regulatory experience calls for a more deliberate approach. One possible solution to coping with this strategic dimension of dishonesty would be to choose the 'corner solution' and comprehensive control.[19] In practice, this would mean a monitoring scheme relying on on-board observers or camera systems. Yet, our treatment results on funding salience suggest that low-cost informational approaches, which might include framing the environment in which fishermen have to report their catches, could increase truth-telling considerably. Therefore, instead of directly incurring the high costs to the regulator and fishermen of comprehensive control, a recommended approach could be to introduce monitoring of different degrees of stringency selectively to study the effects of monitoring on honesty. Besides camera systems, on-board observers and patrolling boats, this may also include targeted information campaigns on how fishermen's own discarding and misreporting harms other fishermen as well as the public. Studying this new dimension of truth-telling in further detail is a promising avenue for future research.

[19] For determining optimal fishery regulation and enforcement, the regulator must also consider the cost of enforcement (Nøstbakken 2008, Sutinen and Andersen 1985).

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Appendix A. Instructions and Decision Sheets.

Cover letter

Dear fishermen,

we kindly invite you to participate in a scientific study on the conditions of the German fishery by the University of Kiel and the Kiel Institute for the World Economy.

In our research project "sustainable consumption and management of marine resources", **we are dependent on your cooperation**. The research project is funded in particular from the German Ministry of Education and Research (and the European Commission). The project is supported with fishery-specific advice by Peter Breckling (German Fishery Association) and Benjamin Schmöde (fishery cooperative of the North and Baltic Sea Fishermen). We not only aim at improving the available data for economic studies on the fishery, but also to better understand the economic behavior of people who regularly use natural common pool resources. With our study, we strive for basic insights, which can be applicable to different questions in economic and sustainability research. For this, we conduct the present study among German fishermen, for which we kindly ask you to work on three easy **tasks on economic decision-making** and answer a small number of **questions**. These tasks may seem a bit exceptional, but they are based on validated methods in economic research and are also suited for being conducted with other subject groups. With these tasks, we can study economic behavior in abstract decision-contexts. To obtain reliable results, you will decide upon **real money payoffs**.

The participation in the study usually takes **less than 30 minutes**, and the total payoffs amount to a maximum of **100 Euro, on average around 50 Euro**. The total payoffs are comprised of payoffs for the single tasks and for the questionnaire. In addition, we hold a draw of **500 Euro** among all participants of task 3 until the deadline on **31.01.2016**.

For the purpose of this scientific study, the Thünen Institut für Seefischerei in Hamburg will by way of exception send you a letter to your address that is only known to the Thünen Institut. If you would like to voluntarily participate in the study, you should provide us with your address so that we can send you your payments. You will find details on the last page. Under no circumstances will be passing on personal data to third parties. We would be happy to personally inform you of the results of the study. In addition, we will make us of the **anonymized data** in our scientific research that focuses on economic aspects of the fishery. We will make openly available the results of these studies to the public.

We very much hope that you will participate in this study. If you have any questions, do not hesitate to contact us.

With kind regards

(signatures)

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Prof. Dr. Menusch Khadjavi — Menusch.Khadjavi@ifw-kiel.de
Moritz Drupp — Drupp@economics.uni-kiel.de

Group of Environmental, Resource and Ecological Economics, Chair for Economics and Ethics and Institute for the World Economy at the at the University of Kiel

Task 2 (Baseline treatment)

The payoff in task 2 is determined by a coin toss, which you toss yourself.
For this, we have sent you enclosed a 1 Euro coin.

Your task is to toss this coin **exactly 4 times**. For each case that **"tails"** lies on top, you will receive 5 Euro.

Afterwards, please record your result in the table below.

Times of coin tosses where „tails" came out top	**Payment**	**Your outcome (please make one cross)**
0	0.00 €	
1	5.00 €	
2	10.00 €	
3	15.00 €	
4	20.00 €	

Examples: If the number of coin tosses, for which "tails" came out top, is 1, you will receive 5.00 €. If the number of coin tosses, for which "tails" came out top, is 3, you will receive 15.00 €.

Important: Your result will only be paid out if you make **exactly one cross** in the table and send all materials to us until the closing of the survey on 31.01.

Task 2 (EU_Flag treatment)

The payoff in task 2 is determined by a coin toss, which you toss yourself.
For this, we have sent you enclosed a 1 Euro coin.

Your task is to toss this coin **exactly 4 times**. For each case that **"tails"** lies on top, you will receive 5 Euro.

Afterwards, please record your result in the table below.

Times of coin tosses where „tails" came out top	**Payment**	**Your outcome (please make one cross)**
0	0.00 €	
1	5.00 €	
2	10.00 €	
3	15.00 €	
4	20.00 €	

Examples: If the number of coin tosses, for which "tails" came out top, is 1, you will receive 5.00 €. If the number of coin tosses, for which "tails" came out top, is 3, you will receive 15.00 €.

Important: Your result will only be paid out if you make **exactly one cross** in the table and send all materials to us until the closing of the survey on 31.01.

This research is funded by money from the scientific framework programme of the European Commission.

Task 2 (EU_Flag_Funding treatment)

The payoff in task 2 is determined by a coin toss, which you toss yourself.
For this, we have sent you enclosed a 1 Euro coin.

Your task is to toss this coin **exactly 4 times**. For each case that **"tails"** lies on top, you will receive 5 Euro.

Afterwards, please record your result in the table below.

Times of coin tosses where „tails" came out top	**Payment**	**Your outcome (please make one cross)**
0	0.00 €	
1	5.00 €	
2	10.00 €	
3	15.00 €	
4	20.00 €	

Examples: If the number of coin tosses, for which "tails" came out top, is 1, you will receive 5.00 €. If the number of coin tosses, for which "tails" came out top, is 3, you will receive 15.00 €.

Important: Your result will only be paid out if you make **exactly one cross** in the table and send all materials to us until the closing of the survey on 31.01.

Questionnaire

You would help us a lot, if you would answer the following short questions by marking the respective boxes with an X. If you answer all 24 questions, you will get a remuneration for your time of 10€

1. In which year were you born? 19 ☐☐

2. What is your highest degree of education?

Hauptschule ☐ Realschule ☐ Berufsschule ☐ Abitur ☐

Hochschulstudium ☐ Other:_____

3. Have you finished a vocational training outside the fishery? YES ☐ NO ☐

If YES, which: _____

4. How often have you moved in your lifetime? ☐ times.

5. How many years have you been working in the fishery? ☐☐ years.

6. How many years do you plan to continue working in the fishery? ☐☐

7. Was/is your father or mother also working in the fishery? YES ☐ NO ☐

8. How many kids do you have? ☐ How many are/will be working in the fishery? ☐

9. Do you live for rent ☐ or in your own house/flat ☐ ?

10. What is your position in the fishery? Multiple answers possible.

Boat owner ☐ captain/skipper ☐ crew member/employee ☐

11. What is the registry number of the boat you work on? ☐☐☐☐☐

12. How large is the crew on average, yourself included? ☐☐

13. If you are a boat owner, how many do you own? ☐

How many of these boats are completely paid off, i.e. debt-free? ☐

14. Are you a full-time ☐ or part-time fishermen ☐ ?

How many days were you fishing in the last twelve months? ☐☐☐

15. Which types of gear do you use? Multiple answers possible.

Set gillnets ☐ Botton trawls ☐ trawls ☐ pelagic trawl ☐

Dredges ☐ Pots/traps ☐ set longlines ☐ Other:_____

16. Are you a member in a fishery association or cooperative? YES ☐ NO ☐

17. How do you get paid? Base salary ☐ Profit sharing ☐ Owner ☐

18. Is the fishery your only source of income? YES ☐ NO ☐

If NO: Which part of total income is derived from the fishery (in percent): ☐☐

19. Ho would you rate your income in comparison to other fishermen?

very low — average — very high

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐

20. How strongly do you compete with other fishermen for your catch?

not at all — very much

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐

21. How to you evaluate the future prospects of the fishery in Germany?

very bad — very good

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐

22. How do you evaluate the trust-worthiness of the following institutions regarding fishery policy?

Not trustworthy — very trustworthy

	1	2	3	4	5	6	7	8	9
German Fishery Assoc.	☐	☐	☐	☐	☐	☐	☐	☐	☐
German Government	☐	☐	☐	☐	☐	☐	☐	☐	☐
European Commission	☐	☐	☐	☐	☐	☐	☐	☐	☐

23. How likely is it that you income will increase over the next 5 years?

☐☐☐ (0-100%). Do not know ☐ .

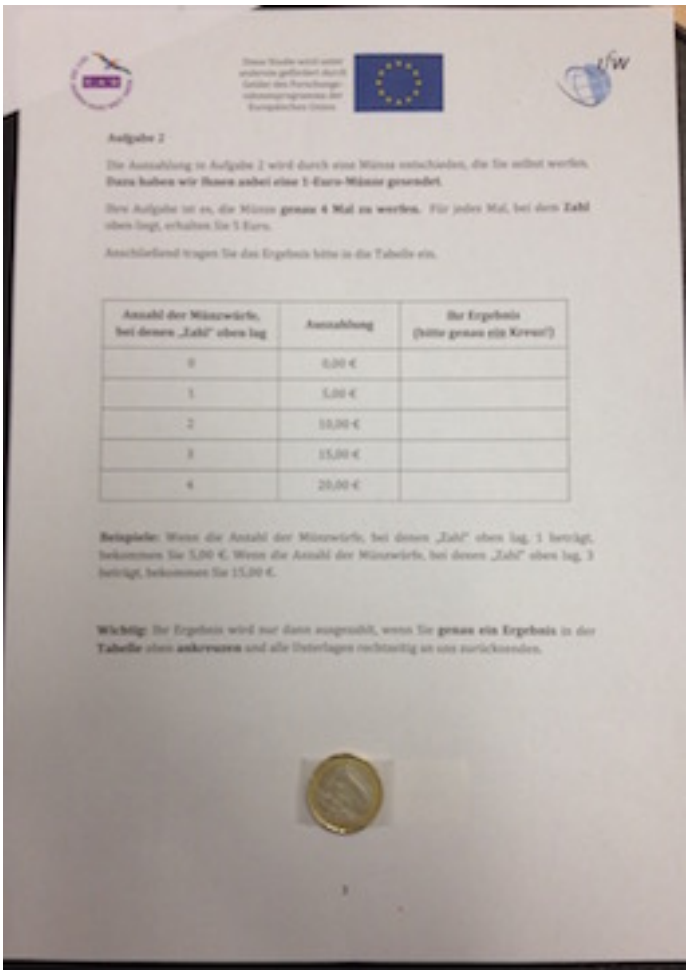
24. How likely is it that there are more fish to catch in 5 years compared to today?

☐☐☐ (0-100%). Do not know ☐ .

You are very welcome to provide us with further feedback here or via E-Mail.

Many thanks for answering these questions!

Appendix B. Supporting materials



Aufgabe 2

Die Auszahlung in Aufgabe 2 wird durch eine Münze entschieden, die Sie selbst werfen. **Dazu haben wir Ihnen anbei eine 1-Euro-Münze gereicht.**

Ihre Aufgabe ist es, die Münze **genau 4 Mal zu werfen.** Für jedes Mal, bei dem **Zahl** oben liegt, erhalten Sie 5 Euro.

Anschließend tragen Sie das Ergebnis bitte in die Tabelle ein.

Anzahl der Münzwürfe, bei denen „Zahl" oben lag	Auszahlung	Ihr Ergebnis (bitte genau ein Kreuz!)
0	0,00 €	
1	5,00 €	
2	10,00 €	
3	15,00 €	
4	20,00 €	

Beispiele: Wenn die Anzahl der Münzwürfe, bei denen „Zahl" oben lag, 1 beträgt, bekommen Sie 5,00 €. Wenn die Anzahl der Münzwürfe, bei denen „Zahl" oben lag, 3 beträgt, bekommen Sie 15,00 €.

Wichtig: Ihr Ergebnis wird nur dann ausgezahlt, wenn Sie **genau ein Ergebnis** in der **Tabelle** oben **ankreuzen** und alle Unterlagen rechtzeitig an uns zurücksenden.

Figure B.1: Experimental instructions for task 2 (treatment version "EU_Flag_Funding") with the 1 € Coin attached.

Figure B.2: Fishing vessel in Burg Staaken, the port with the most registered fishing vessels in Germany, indicating the attitude to the EU.

Appendix C. Supplementary materials for further analysis

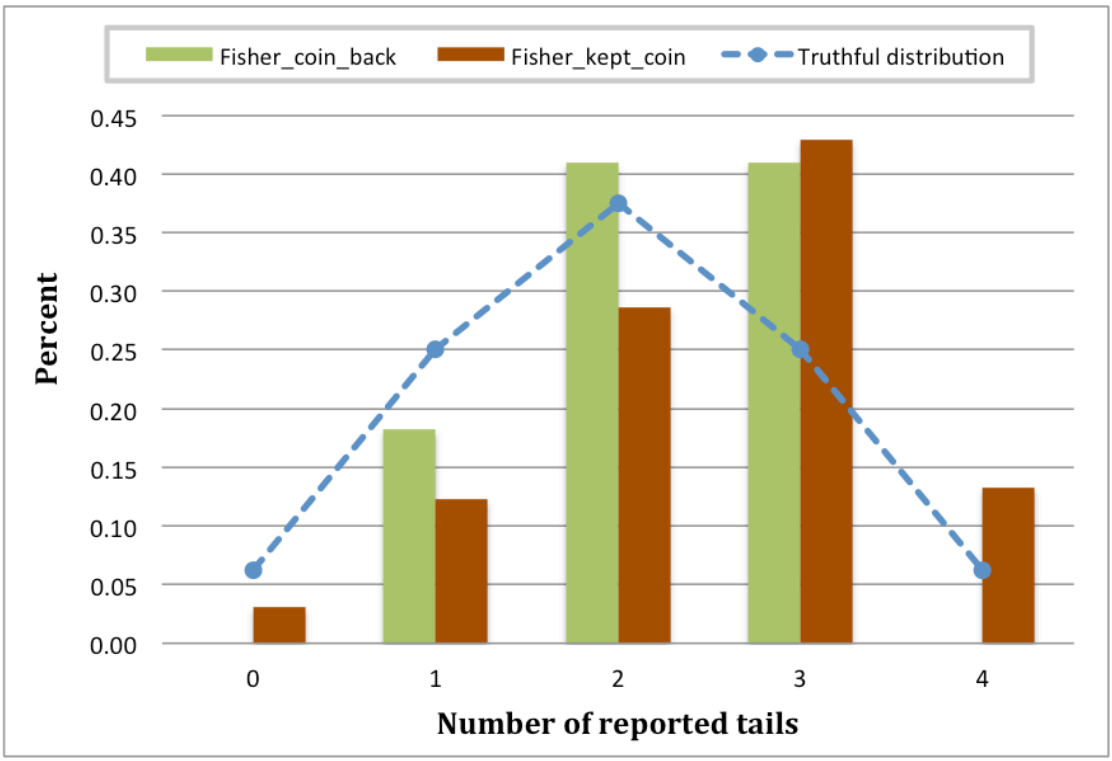


Figure C.1: Aggregate reporting behavior in the 4-coin-toss task of those fishermen that send back the 1 € coin (green bars) vs. those that did not send it back (orange bars).

Table C.1: Descriptive statistics on main questionnaire results

Survey Question	Mean	Median	StDev	Min	Max	N
(1) Year of birth	1963	1962	14	1933	1997	119
(4) Moved how often?	3.02	3	2.42	0	12	118
(5) Years in fishery	30.69	31	15.40	1	70	117
(12) Number of crew members	1.70	2	0.86	1	6	119
(13a) How many boats do you own?	1.56	1	1.07	0	7	116
(14b) How many days fishing in last 12 month?	147	150	94	0	350	116
(19) Income relative to other fishermen (scale: 1-9)	4.02	5	2.18	1	8	118
(18) Share of income from fishery	62.14	98	43.29	0	100	113
(22a) Trust-worthiness of the German Fisheries Association? (scale: 1-9)	5.47	6	1.98	1	9	118
(22b) Trust-worthiness of German government? (scale: 1-9)	2.98	3	1.69	1	8	117
(22c) Trust-worthiness of European Commission? (scale: 1-9)	2.40	2	1.65	1	9	117

Table C.2: Covariates across treatments and treatment robustness checks

Variables\Treatment	Fisher_Baseline	Fisher_EU_Flag	Fisher_EU_Flag_Fund
(1) Year of birth	1961	1962	1965
(4) Moved how often?	3.07	3.31	2.69
(5) Years in fishery	29.5	32.03	30.04
(6) Planned years in fishery	18.28	13.94	15.92
(12) Fishing alone	54.76%	52.78%	38.10%*
(13a) How many boats do you own?	1.68	1.4	1.54
(14b) How many days fishing in last 12 month?	151	146	147
(17a) Salary	0	8.33%**	4.76%*
(19) Income relative to other fishermen (scale: 1-9)	4.10	3.94	4.02
(22c) Trust-worthiness of European Commission? (scale: 1-9)	2.29	2.42	2.46
(23) Probablity income increase	27.39%	37.94%	27.22%

The difference between the proportions of fishermen being alone on a boat is (borderline) significantly higher in the Fisher_EU_Flag_Fund treatment as compared to the Baseline at p=0.06 (EU_Flag at p=0.0993). However, this is not significantly correlated with lying behaviour. Receiving a salary as fishery income is significantly higher among EU_Flag [EU_Flag_Funding] compared to Baseline at p=0.03 [p=0.08] and is significantly correlated with lying behaviour. A robustness check excluding the five fishermen who receive a salary, changes our treatment effects as follows: The comparison of the EU_Flag results with the truthful distribution for 4 tail tosses is now significant at p=0.052, while the p-value for the comparison of EU_Flag vs. Basline for 4 tail tosses is reduced to p=0.125 (Result 2). The comparison of EU_Flag_Funding compared to EU_Flag for reporting 0 and 1 tail tosses is significant at p=0.077, while it also remains that 0 and 1 tail toss reporting in the Baseline and EU_Flag treatments differs significantly from the truthful distribution (at p=0.01 and p=0.003), while this is not the case for the EU_Flag_Funding treatment results (p=0.25).

Table C.3: Descriptive statistics on fishing vessels

	Mean	Median	StDev	Minimum	Maximum
Vessels whose owners responded					
Length (in meters)	11.39	9.24	6.49	3.82	45.54
Construction year	1982	1981	14	1930	2014
Vessels of all officially registered fishermen					
Length (in meters)	9.15	6.40	6.55	3.75	45.54
Construction year	1984	1984	15	1919	2015

Table C.4: Fishing personnel and participating fishermen by German states

	Fraction (in per cent) of	
State	**overall personnel**	**fishermen with coin toss**
Hamburg	1.85	1.68
Bremen	0.22	0
Mecklenburg-Vorpommern	43.21	22.69
Niedersachsen	16.23	16.81
Schleswig-Holstein	38.49	58.82

Appendix D. Testing for overall non-response bias

To test for the existence of non-response bias, we follow standard procedures (Dalecki et al. 1993, Necker 2014) and compare officially registered respondents to the population of fishermen along a range of observable characteristics of their fishing vessels. These observables include, among others, boat construction year and length, location as well as fishermen's primary fishing gear. Table C.3 in Appendix C shows descriptive statistics on fishing vessels for the whole sample of officially registered fishermen as well as those participating in the study.[20] We observe that responding fishermen tend to have somewhat longer (total length 11.39m vs. 9.16m) and older boats (year of construction 1982 vs. 1984) compared to the whole distribution of officially registered fishermen. As vessel length and construction year are not significantly correlated with lying behavior, our results should not be biased by the lower representation of smaller vessels. Figure 1 shows that participating fishermen are spread out rather evenly all along the German coasts. Table C.4 in Appendix C lists the distribution of overall fishing personnel and fishermen who participated in the study by German States. We find that participating fishermen come over-proportionately from Schleswig-Holstein (59% compared to 39%) and under-proportionally from Mecklenburg-Vorpommern (23% vs. 43%).[21] Yet, this non-representative response behavior does not seem to bias coin toss results, as the average coin toss result is 2.41 tails in Mecklenburg-Vorpommern and 2.37 tails in Schleswig-Holstein (a Mann-Whitney test cannot reject the hypothesis of equal tail toss reporting in the two States). Finally, we compare officially registered and participating fishermen in terms of their fishing gear. The primary gear for all 1465 officially registered vessels is distributed as follows: set gillnets (75%), beam trawls (15%), bottom trawls (4%), and pots/traps (3%). We could link response data to data from the official registry via the elicited boat's registry number for 103 fishermen that participated in the coin-tossing task. Among this subsample, the primary gear as reported in the registry is as follows: set gillnets (58%), beam trawls (32%), bottom trawls (7%), and pots/traps (2%). We thus overall have an under(over)-representation of fishermen using set gillnets (beam trawls). In terms of coin toss reporting between these two groups, we find that beam trawlers report an average of 2.44 tail tosses and set gillnet fishermen report 2.52 tails. We therefore have no indication of bias due to the under-proportionate representation of set gillnet fishermen.

Furthermore, we divide the sample in early and late responses. While the 62 responses that we had received until the Christmas break (22.12.2015) reported an average tails toss of 2.40, the remaining 58 reported 2.52 tail tosses. A (two-sided) Mann-Whitney test cannot reject the null hypothesis of no difference, thus providing no indication for a response bias.

[20] We asked participating fishermen for their vessels' registry numbers. This allows us to link their questionnaire answers to the official vessel registry. For this and the following comparisons, we exclude the 8 high-sea fishery boats.

[21] Reasons for this regionally differentiated response behaviour may include less well organized fishery associations in Mecklenburg-Vorpommern and that fishermen in Schleswig-Holstein have a stronger relation to a study that was conducted by the university of their state's capital.