Compulsory versus Voluntary Insurance: How Contract Formation Affects Fraudulent Behavior

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Abstract

In this study we investigate whether the process that leads to the formation of an insurance contract affects ex post moral hazard. In a laboratory experiment we compare false loss reporting behavior under compulsory insurance to a setting in which individuals can freely choose their insurance coverage. We find that cheating is significantly lower under compulsory insurance and that this effect is driven by individuals’ self-selection into the insurance contract. Our results reveal that compulsory insurance is not only an effective measure to avoid adverse selection but at the same time also results in more honest behavior among the insured as compared to the case of voluntary insurance.

Keywords: Ex post moral hazard · compulsory insurance · self-selection

JEL Classification: C91 · D03 · D81 · G22

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1 Introduction

Policy makers naturally attempt to improve the allocation of resources with the aim to increase overall well-being. In insurance markets, we often observe the selection of mostly high risk individuals into insurance contracts, which threatens the sustainability of effective risk sharing arrangements (Tausch et al., 2014). Furthermore, many individuals neglect to insure completely or under-insure despite failing to reach their optimal insurance coverage (e.g., health: Lavarreda et al., 2011, Blewett et al., 2006, catastrophic risk: Kunreuther, 1984, automobiles: Findling and Germano, 1988).

A classical example for a counteracting intervention by the state is to introduce the legal obligation to purchase insurance (Rothschild and Stiglitz, 1976; Wilson, 1977). That way equality in insurance access for all risk types can be secured and under-insurance can be avoided. While such a paternalistic intervention may run into opposition as it deprives individuals of their freedom of choice, a more libertarian approach is increasingly applied which is the attempt to nudge individuals into purchasing (more) insurance. For example, insurance may be included into a purchase unless the customer explicitly declines it, or default options are specified or preselected whose choice presumably entails less effort for the customer.

The aim of this study is to investigate whether insurance favoring interventions entail hidden costs in the form of increased moral hazard behavior. The conclusion of an insurance contract, irrespective of whether it is voluntarily or compulsorily, may implicate unproductive behavior: policy holders behave carelessly, don’t invest in risk prevention (ex ante moral hazard; see Hölmstrom, 1979; Shavell, 1979), make claims to the insurance company that are higher than their actual loss or they do not take the least costly measure to eliminate an actual damage (ex post moral hazard; see Townsend, 1979; Gale and Hellwig, 1985; Lacker and Weinberg, 1989). We analyze how the obligation to be insured and being nudged into an insurance contract affects ex post moral hazard. In particular, we investigate how contract formation affects claim build-up and fictitious claiming, i.e. the extent to which policy holders make exaggerated claims after risk realization.

Fraud has long been identified as a major threat for the insurance industry. The Coalition Against Insurance Fraud in the US estimates that over all types of insurances, fraud creates costs of around $80 billion a year.¹ More than 60 percent of insurers perceive a negative development and report on an increase in fraudulent behavior over the last three years. Not only the insurers are the victims of fraudulent behavior, but also other policy holders have to deal with the negative consequences through increased premiums. In practice, it is difficult to truly identify fraudulent acts and insurers increasingly make use of technology in an attempt to combat fraud.²

Applying the experimental methodology in this study allows us to track fraud on an individual level. We observe the actual size of the individual loss and can match it with the loss amount that is claimed. Furthermore, we can keep the context neutral and compare settings that differ only with respect to the insurance contract formation process. This allows us to clearly identify the effect that contract formation has on (dis)honesty.

Our results reveal that insured individuals cheat significantly less under compulsory insurance and that this effect is driven by individuals’ self-selection into the insurance contract. We conclude

that compulsory insurance is great because it grants equal access for all risk types to insurance contracts and additionally, the risk sharing arrangement is more stable due to the lower fraction of fraudulent individuals as compared to a voluntary setting.

This research project relates to the Behavioral economics literature on lying aversion ((Mazar et al., 2008; Fischbacher and Föllmi-Heusi, 2013). A widespread finding is that a significant fraction of participants are unwilling to lie for a monetary benefit. whether this extends to the insurance literature is an empirical question (cite here the papers about experimental ex post moral hazard).

Another factor that has been investigated to influence fraudulent behavior is, e.g., the incentive structure of contracts. In two experimental studies Lammers and Schiller (2010) find more fraudulent behavior in a deductible setting than in a full insurance condition while Gabaldón et al. (2014) report no difference between a bonus-malus contract and under a classical audit system.

Out study furthermore adds to the literature on side effects of nudging. Handel (2013) shows that nudging in the form of information provision leads to an unraveling of the insurance market in that less people purchase comprehensive coverage. Damgaard and Gravert (2016) show that nudging in the form of sending reminders leads people to drop out of the mailing list.

2 Theoretical Framework

We introduce a theoretical framework that is the base from which we derive hypotheses for the extent of insurance claim exaggeration. We contrast cheating across three different treatments in which contract formation is either purely voluntary (Vol), voluntary but individuals are nudged towards the insurance policy (Nudge) or compulsory (Comp).

We consider an insurance company that offers the following insurance policy \((p, f)\) to an individual: \("In exchange to a price \(p\) paid in \(t = 1\), the individual has the right to claim compensation \(f\) of a loss \(l\) with \(l = f\) in \(t = 2\)."\) The individual \(i\) is initially endowed with \(w_0\), faces a risky loss represented by random variable \(l\) with support on \(L = \{0, \ldots, \bar{l}\}\) and probability mass function \(p : L \rightarrow [0, 1]\). Once the insurance policy is offered on the market the individual decides in \(t = 1\) whether to obtain an insurance policy \((a \in A)\) which allows to claim compensation \(f \in L\) after privately observing the outcome of the loss \(l \in L\).

We manipulate the choice set \(A\) in our analysis such that
\[
A = \begin{cases} 
A_V = \{0, 1\} & \text{if voluntary,} \\
A_N = \{1, 0\} & \text{if nudged,} \\
A_C = \{1\} & \text{if compulsory.}
\end{cases}
\]

The ex post wealth level of the individual composes of the initial wealth \(w_0\), the loss \(l\) and price \(p\)

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3A crucial assumption we make throughout the analysis is that the verification of the loss is never possible such that we exclude possible verification methods discussed in the insurance fraud literature (Townsend, 1979; Gollier, 1987). Thus deviation from standard preferences are not explainable by effects of monetary sanctions in the case of discovery.
and claim $f$ if an individual is insured,

$$w = \begin{cases} 
  w_0 - l - p + f & \text{if } a=1 \\
  w_0 - l & \text{if } a=0 
\end{cases}$$

We assume a concave utility function over wealth $u(w)$ to account for risk aversion and adapt the approach by Khalmetski and Sliwka (2017) to introduce lying aversion into the utility function. Suppose an individual obtains the insurance policy. Then preferences of the individual in $t=2$ are represented by

$$U_{i,2}(w, f, l, \gamma_i, \eta_i) = u_i(w) - \gamma_i 1_{\{f>l\}} - \eta_i \Pr[l \neq f]. \quad (1)$$

The first term represents the utility from wealth. The second part $-\gamma_i 1_{\{f>l\}}$ is the lying cost from misreporting that results from hurting the self-image. This psychological cost occurs when the claim exceeds the actual loss$^4$. Furthermore, $-\eta_i \Pr[l \neq f]$ represents a dis-utility from hurting the social-image through not being perceived as honest by other people. This in turn depends on the likelihood of a false report, i.e. $l \neq f$, conditional on report $f$. We assume that the probability of misreporting increases with the size of the claim (see Abeler et al., 2016).

The utility function in $t=1$ is the expectation over potential ex post utilities

$$U_{i,1} = \sum_{l \in L} p(l) U_{i,2}(w, f, l, \gamma_i, \eta_i). \quad (2)$$

If the individual is not insured there is no opportunity to misreport and preferences are simply represented by $U_{i,2} = u_i(w)$. The profit of the insurance company is $\Pi = p - f$ if the individual insure and zero otherwise.

### 2.1 Standard Preferences: $\gamma_i = 0 \ & \ \eta_i = 0$

Only if an individual $i$ is insured ($a = 1$) a claim with the insurer can be made. In that case the utility in $t=2$ after observing the actual loss is

$$U_{i,2}(w, f, l) = u(w_0 - l - p + \bar{l}) \quad (3)$$

since

$$\bar{l} \in \arg \max_{f \in L} u(w_0 - l - p + f). \quad (4)$$

An insured individual always reports the highest possible loss $\bar{l}$, irrespective of the contract formation process as long as utility is increasing in wealth.

If the insurance choice $a \in A$ is voluntary or nudged, the loss reporting decision is preceded by

$^4$We exclude psychological costs that might occur than reporting less the actual loss. We do not expect such behavior as there is not trade-off between monetary improvement and misreporting. In addition we do not find such behavior in the data.
the choice of the insurance policy in $t = 1$. Individual $i$ purchases the insurance if and only if

$$
\sum_{l \in L} p(l) u(w - l - p + \bar{l}) \geq \sum_{l \in L} p(l) u(w_0 - l) \\
\Leftrightarrow \bar{l} \geq p.
$$

(5)

We conclude that under the assumption of standard preferences individuals always purchase the insurance if given a choice and claim the highest possible amount as long as this amount is larger than the price for the insurance.\(^5\) The insurance policy-formation process is predicted to not affect cheating behavior.

2.2 Lying Aversion: $\gamma_i > 0$ & $\eta_i > 0$

Recent experimental evidence, however, shows that people forgo monetary payoffs to avoid lying (Mazar et al., 2008; Fischbacher and Föllmi-Heusi, 2013). Based on the underlying experimental data, several recent studies conclude that the reason for lying costs is a combination of a preference for being honest and a preference to appear honest (Abeler et al., 2016; Dufwenberg and Dufwenberg, 2016; Khalmetski and Sliwka, 2017). Following their conclusion, as in Khalmetski and Sliwka (2017) we assume an individual specific dis-utility $e_s$ depicted in equation 1 with $\gamma_i, \eta_i \geq 0$.

Consider first the case where the individual is insured. The optimal claim in $t = 2$ is

$$
f^* \in \arg \max_{f \in L} u(w_0 - l - p + f) - \gamma_i 1_{\{f > l\}} - \eta_i \Pr[l \neq f|f].
$$

(6)

Figure 1 represents different degrees of lying aversion. The optimal claim lies within the range $[l, \bar{l}]$.\(^6\)

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\(^5\)Anticipating this behavior no insurance would be offered in the first place (see Shavell, 1979).

\(^6\)Given a very high $\eta$ also optimal claims lower than $l$ are possible. We do not observe such claim behavior in the experimental data which coincides with other studies as Gneezy et al. (2016) who find that there is almost no underreporting (1 out of 602 observations).
decision in \( t=1 \). An individual that anticipates his behavior in \( t = 2 \) purchases the insurance policy if and only if

\[
\sum_{l \in L} p(l) \ [u(w_0 - l - p + f) - \gamma_i 1_{(f > l)} - \eta_i \ Pr[l \neq f | f]] \geq \sum_{l \in L} p(l) \ [u(w_0 - l) - u(w_0 - l)] \geq \gamma_i 1_{(f > l)} + \eta_i \ Pr[l \neq f | f],
\]

(7)

As equation (7) illustrates the individual’s decision to purchase the insurance depends on risk and lying preferences. First, suppose that \( \gamma_i \) and \( \eta_i \) are defined such that the solution of equation (6) is \( f = \bar{l} \). Then the analysis from the standard preference case repeats. Hence we concentrate on cases where the optimal claim is lower than \( \bar{l} \) and we pick for illustration the truthful report \( f^* = l \). Nevertheless the argument generalizes for every \( f^* \in (l, \bar{l}) \). In this case the prediction depends on the risk attributes, i.e. the concavity of \( u(\cdot) \). In the case of the truthful reporting the loss \( (f^* = l) \) the analysis coincides with one where misreporting is not possible. The higher the actual risk aversion the more likely an individual with a high aversion towards lying is likely to take up an insurance against the risk.

The prediction of the insurance purchase thus depends on the degree of lying aversion and the degree of risk aversion of the individual and is summarized in Table 1:

<table>
<thead>
<tr>
<th>Predictions</th>
<th>low Lying Aversion</th>
<th>high Lying Aversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>low Risk Aversion</td>
<td>Insurance (a=1) &amp; ( f^* = \bar{l} )</td>
<td>Vol: No Insurance (a=0) &amp; Comp: Insurance (a=1) &amp; ( f^* = l )</td>
</tr>
<tr>
<td>high Risk Aversion</td>
<td>Insurance (a=1) &amp; ( f^* = \bar{l} )</td>
<td>Insurance (a=1) &amp; ( f^* = l )</td>
</tr>
</tbody>
</table>

Table 1: Behavior Predictions depending on Risk and Lying Attributes

In case of a compulsory insurance individuals can not opt out of the insurance policy formation. Hence, some individuals are part of the risk sharing arrangement that are unwilling to cheat. Similarly, some individuals that are unwilling to cheat and who would not have obtained the insurance policy if the purchase was purely voluntary may be pushed into the policy through he nudge intervention. Consequently, cheating should be highest in the Vol treatment, followed by the Nudge treatment and the Comp treatment. Next to selection effects of different contract formation schemes we investigate direct effects of them on the cheating behavior, i.e. whether \( \gamma_i, \eta_i \) depend on the kind of contract formation. In the following we introduce two potential mechanisms discussed in the literature which might influence them.

**Self-Serving Justification**

Studies show that people use information to maintain a positive self image. In Pre-Violation Justification (Shalvi et al., 2015) people interpret situations in a way that allow them to behave immoral without feeling guilty about their action. For instances, insurance fraud is easier justifiable
given a higher premium paid (Tennyson, 1997). Translating this into our setting we predict that the more conscious this fact is the larger the justification. Hence, a voluntary paid premium would lead to a higher justification rate of immoral behavior than an unconscious paid premium. "I paid the premium although I would not have need it. I deserve to get the money back". See for instances Clot et al. (2016) who show that moral licensing is more likely to occur under voluntary actions than under compulsory ones. The resulting prediction from that reasoning would be that cheating is highest in Vol, followed by the Nudge treatment, and lowest in Comp.

Control Aversion

On the other hand, several studies show that people reciprocate after a restriction of their choice set (Falk and Kosfeld, 2006). We take this reasoning a step further. Given this result we expect that when people are unable to directly reciprocate on the manipulated choice set (in our case the insurance purchase) the behavior is on a dependent but different choice set towards the same entity. In our case this would be the compensation claim towards the insurer. In addition we expect an quantitative effect: The elimination of an element of the choice set (= compulsory) is a stronger interference than the priming of an element (= nudge). The control aversion reasoning would thus result in cheating rates to be lowest in Comp, followed by the Nudge treatment and highest in Vol.

3 Experimental Design

The experiment consists of two parts in which subjects’ decisions are incentivized, followed by a questionnaire. The first part elicits individual risk preferences, while the second part contains an insurance experiment that reflects the theoretical framework we just introduced. At the beginning of the experiment subjects are provided with instructions for both parts. In order to insure the understanding of the instructions, they are required to answer a set of control questions. Only if all subjects had correctly answered all questions, we would start with the experiment.

3.1 Risk Elicitation

We implement a variant of the "Bomb Risk Elicitation Task" introduced in Crosetto and Filippin (2013). At the beginning subjects are required to work for the endowment that is subsequently used for the Bomb task. We employ a modified version of the real-effort task introduced in Benndorf et al. (2014). Subjects are asked to encrypt three combinations of three letters into numbers. Each letter has to be assigned a three digit number that can be read off a table on the same screen. For the three correctly encrypted letter combinations they earn 3 Euros in the form of 100 (virtual) boxes; each box is worth 3 Eurocents. One of the boxes contains a bomb. The computer would throw away the boxes one after the other and the subjects are asked to decide when to stop the computer from throwing away those boxes. If the box with the bomb was among those boxes that were thrown away, subjects could keep all the boxes which they hadn’t thrown away. If, however, the box with the bomb was not among those that were thrown away, the bomb would explode and destroy all boxes such that subjects get zero earnings for this part of the experiment. Thus, with
each box that is thrown away, the probability to receive zero is lowered by 1%, but at the same
time the possible earnings are lowered by 3 Eurocents. The more risk averse, the later subjects
would stop the computer from throwing away the boxes. Subjects do not receive information about
their earnings from the risk elicitation task until the end of the experiment.

3.2 Main Experiment

At the beginning of the second part each subject takes part in the same effort-task as employed in
the first part of the experiment. This time subjects needed to encrypt eleven combinations of three
letters. They are paid 11 Euros for their work and are informed in advance that their income is
exposed to the risk \( \tilde{r}_x = (-6, \frac{1}{3}, -3, \frac{1}{3}, 0) \). After completion of the task subjects can decide whether
they want to purchase a full coverage insurance for a price of 4 Euro. This corresponds to the fair
price of 3 Euro plus a 33% mark up of 1 Euro. The parameters are chosen with the aim to have at
least 50% of the subjects purchase the insurance.\(^7\) We implement three treatments that vary with
respect to the design of the insurance situation: Vol, Comp and Nudge. In Vol subjects can choose
whether to purchase the insurance. In Comp subjects need to purchase the insurance and do not
have a choice. In Nudge subjects can choose, but they are pushed into the direction of purchasing
the insurance through a default intervention. We apply a between subject design such that each
subjects only takes part in one of the treatments.

In the Vol treatment, subjects are asked to choose between two sealed envelopes: the no in-
surance envelope and the insurance envelope. Each envelope contains 3 matchboxes that are also
sealed. They contain the incomes corresponding to the different risk realizations. While the no
insurance envelope contains three matchboxes with either 11 (no loss), 8 (3 Euro loss) or 5 Euros
(6 Euro loss), in the insurance envelope the 4 Euros insurance premium is additionally deducted,
resulting in incomes of 7, 4 and 1 Euros. Subjects are informed that the insurance would allow them
to receive a refund of their actual loss from the insurance. In particular, they can make a claim
\( f_i \in (0, 3, 6) \) to the insurance company, by simply indicating what loss they occurred. Subjects
have to indicate their decision between the two envelopes on the computer screen. An experimenter
then comes to a subject’s seat, checks the indicated insurance decision and hands out the according
envelope.

In the Comp treatment, subjects can not choose whether they want to purchase insurance
or not. In order to keep constant between the treatments that subjects are in contact with the
experimenter when the envelope is handed over, also in Comp the insurance envelope is distributed
at the same point in time in the experiment as in the Vol treatment.

In the Nudge treatment, subjects are asked to choose whether they want to purchase the in-
surance or not, but they face an insurance favoring default, i.e. they start out with the insurance
envelope in their cubicle and can decide whether they would like to reject the insurance by ex-

\(^7\)The parameters were pretested in a pilot study in which 20 subjects were provided a short description of the Vol
treatment and asked to indicate (a) whether they want to purchase the insurance and (b) which insurance claim they
want to make conditional on all possible actual loss outcomes. Incentives were down-scaled as compared to the main
experiment such that subjects could earn a maximum of 5 €.50. 55% of the subjects decide to purchase the insurance.
None of the subjects reports a loss that is smaller then the acutal loss. In the condition of a 6 € loss all subjects claim
6 €. In the condition of a 3 € loss 73% claim 6 € instead of their actual loss. In the condition of a zero loss 36% claim
6 € and 18% claim 3 €.
changing the envelope for the no insurance envelope. Also, on the computer screen the option in favor of the insurance is pre-ticked. Subjects are informed that an experimenter will drop by each cubicle, check on the insurance decision and exchange the envelope if this is desired.

In all treatments, subjects are then asked to open one of the three matchboxes privately in the envelope in their cubicle and to collect the money. The draw reflects the 1/3 chance of either incurring a high loss, a low loss or no loss.\(^8\) Money in the matchboxes is divided into coins and notes such that subjects could not infer the content of a box. The earnings in the different matchboxes are denominated as follows: 5 Euro note + 2x2 Euro coin (11 Euro), 5 Euro note + 3x1 Euro coin (8 Euro), 2x2 Euro coin and 1 Euro coin (5 Euro), 5 Euro note + 2x1 Euro coin (7 Euro), 2x2 Euro coin (4 Euro), 2x0.5 Euro coin (1 Euro).\(^9\) Individuals that drew the insurance envelope then decide whether and which claim \(f_i \in (0, 3, 6)\) they want to make to the insurance. They indicate their decision on the computer.

At the end of the experiment, subjects are paid out their indicated insurance claim, the show-up fee and the earnings from the risk elicitation task.

### 3.3 Questionnaire

Subsequent to the main experiment, subjects are asked to answer a questionnaire that includes three sets of questions concerning (1) Demographics (2) Lying and norm-violating behavior (3) (Soft) paternalistic preferences and self-determination in decision making. The latter includes variables that have been suggested to be correlated with individuals’ risk preferences in previous studies.

### 3.4 Experimental Procedure

The experiment was conducted in December 2016 at the Kölner Laboratorium für Wirtschaftsforschung at the University of Cologne. Subjects were recruited on-line with hroot (Bock et al., 2014). The software implementation was done with z-Tree (Fischbacher, 2007). A typical session lasted approximately 43 minutes and the average earnings were 10.26 €, including a 4 € show-up fee. In total 130 subjects participated in five experimental sessions (54 in Vol, 24 in Comp and 52 in Nudge).

In order to ensure privacy, subjects could open their drawn matchbox in the cubicle and immediately pocket the money. Through this procedure it was impossible for the experimenter to know during the pay-out whether a subject cheated or not. While thus privacy is ensured during the experiment, we required subjects to leave the two unopened matchboxes in their cubicle in order to verify their actual losses after the experiment (see Friesen and Gangadharan (2012, 2013) for applications of that procedure). Two observations had to be dropped from our sample in the Comp treatment, as the subjects left the money from their drawn matchbox in their cubicle.

\(^8\)Pooling the observations from all treatments we find that the distribution of actual losses is not different from a uniform distribution (Pearson \(\chi^2\), \(p=0.293\)).

\(^9\)Note, that the lowest possible income is 11-6-4-1=1 Euro (purchase the insurance, incur the maximum loss and do not claim anything) and the highest is 11-0-4+15=13 (purchase the insurance, do not incur a loss and claim the maximum loss).
The experimental instructions and the questionnaire translated from German can be found in the Appendix.

4 Results

In a first step we verify whether the nudging intervention was effective in increasing insurance take-up. While in the Comp treatment all subjects are insured by design, in the Vol and Nudge treatment we observe that 63% and 67% of the subjects respectively decide to purchase the insurance. Obviously, the nudging intervention did not push individuals towards purchasing the insurance. We therefore focus our analysis on the comparison between the Vol and the Comp treatment and use the results of the Nudge treatment for additional robustness checks only.

Cheating In order to investigate ex post moral hazard we compare subject’s actual losses with the claims they indicated after the risk realization. Cheating is defined as reporting a loss that is larger than the actual loss. Note, that subjects with an actual loss of 6€ do not have the scope to exaggerate their claim and can therefore not be considered in the following analysis.

We first consider cheating at the extensive margin. Figure 2 depicts the percentage of cheaters across treatments. We observe that subjects cheat less in the Comp treatment as compared to the Vol treatment, both if the actual loss is zero or 3€.

![Figure 2: Cheating Rate by Treatment](image)

Pooling both categories, a Fisher-exact test yields that differences between the two treatments are significantly different (p=0.014).\(^{10}\) Splitting the analysis yields, that in both conditions differences are insignificant (p≥0.142), which however is likely due to the low number of observations (Comp: 12 and 13, Vol: 6 and 11). The logit regression in Table 2 column 1 that controls for individuals’ actual losses confirms that cheating is significantly lower when insurance purchase is

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\(^{10}\)All reported tests are two-sided.
compulsory as compared to voluntary. In particular, subjects are 23 percentage points more likely to cheat in Vol as compared to Comp.

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>Cheat Standard</th>
<th>Cheat Controlled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comp</td>
<td>-0.23**</td>
<td>-0.10</td>
</tr>
<tr>
<td></td>
<td>(0.11)</td>
<td>(0.11)</td>
</tr>
<tr>
<td>Pr(InsurancePurchase)</td>
<td>0.27**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.11)</td>
<td></td>
</tr>
<tr>
<td>Loss</td>
<td>-0.04</td>
<td>-0.04</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.03)</td>
</tr>
<tr>
<td>Observations</td>
<td>42</td>
<td>42</td>
</tr>
<tr>
<td>Pseudo R-squared</td>
<td>0.205</td>
<td>0.349</td>
</tr>
</tbody>
</table>

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2: Marginal effects of logit regression on cheating behavior

**Result 1.** The percentage of individuals who exaggerate their insurance claims is significantly higher under a voluntary as compared to a compulsory insurance setting.

Considering cheating at the intensive margin we find that all of the subjects in Comp cheat fully, i.e. they report a loss of 6 €, irrespective of their actual loss. Similarly, only one of the subjects in Vol that does not incur any loss cheats partially and claims 3 € only. None of the subjects claims a loss that is lower than the actual loss.

Since the nudging intervention did not trigger higher insurance-take-up it is not surprising that the cheating rate in Nudge is not different from that in Vol (Fisher exact test, p=1.00) and significantly higher as compared to Comp (Fisher exact test, p=0.018). Among the subjects who cheat, all but one subject who did not incur any loss claim the highest loss of 6 €.

As described in Section 2 two channels may explain the higher cheating rates in the voluntary as compared to the compulsory insurance setting: a higher self-justification to cheat due to the self-determined purchase of the insurance or the selection of a particular type of subjects into the insurance contract. In order to disentangle the two channels we use the risk elicitation results, the questionnaire data on subjects’ demographics and their information on lying and norm-violating behavior to find a linear logit model that best predicts the likelihood of voluntary insurance purchase for subjects in the Vol treatment with the leaps-and-bounds algorithm by Furnival and Wilson (1974) (programmed in stata by Lindsey and Sheather (2010)). Afterwards we use this model to predict the probability that participants in Comp would have bought the insurance if they had had the opportunity to choose freely.
Figure 3: Distribution of predicted insurance purchase between treatments

The distributions of the predicted insurance probabilities that is depicted in Figure 3 do not differ significantly between the Vol and the Comp treatment (Two-sample Kolmogorov-Smirnov, p = 0.926). To control for selection effects we include the predicted insurance probabilities in our analysis (Table 2, column 2) and find that the difference in cheating between Vol and Comp turns insignificant which suggests that selection effects are the driver of the treatment differences.

**Result 2.** The extent of cheating among individuals that exaggerate their insurance claims is not influenced by the insurance contract formation process.

**Insurer profitability** Due to the high extent of cheating it is not profitable for the insurer to offer the insurance contract, irrespective of the contract-formation process. Figure 4 shows the average loss per policy holder that an insurer incurs in the different settings. We observe that the insurer’s loss is significantly lower when insurance purchase is compulsory as compared to when people are free to choose their coverage (Mann-Whitney test, p=0.0158).

Figure 4: Insurer Loss by Treatment
5 Conclusion

In this study we investigate how insurance contract formation affects fraudulent behavior. In a laboratory setting we compare loss claiming behavior between settings with voluntary versus mandatory insurance take-up. We find that fraudulent behavior is significantly less pronounced when individuals are required to purchase insurance. The difference can be fully attributed to the self-selection of dishonest subjects into the insurance contract. Our results speak for the effectiveness of compulsory insurance schemes. Not only do they erase adverse selection problems, i.e. they make sure that the risk exposure is balanced across policy holders, but at the same time they mitigate insurance fraud. Both features foster the sustainability of risk sharing arrangements. It remains an open question how the application of a nudge that in fact increases insurance take-up would influence honesty; a follow-up project investigating alternative nudge interventions will attempt to clarify this question.

References


A Appendix

A.1 Instructions

General Instructions for Participants

You are about to take part in an economic experiment. The experiment consists of two independent parts. You can earn money in both parts. Your payment depends on your decisions and on chance. At the end of the experiment you will also be asked to fill in a brief questionnaire. In addition, you will receive a flat sum of 4 euro for participating. The money you earn will be paid to you in cash.

Please read the following instructions carefully. You will initially be asked to answer a series of control questions on both parts of the experiment. Only once all participants have correctly answered these questions will we proceed with the experiment.

Communication is prohibited during the experiment. Disobeying this rule will lead to exclusion from the experiment and all payments. If you have any questions, please ask us. Raise your hand and we will come to you.

Information on Part 1 of the Experiment

In this first part of the experiment, we ask you to solve a task. The instructions for this task are on your screen. You are given an income of 3 euro in order to complete the task, in the form of 100 packages, which you will see on your screen. Each of these packages is thus worth 3 eurocent.

The computer will throw away one package per second for you. For each discarded package, 3 eurocent is subtracted from your income. The computer will begin in the top left corner. As soon as a package has been discarded, it will disappear from your screen.

During the experiment, you will always be able to see your current losses in relation to your income. Initially, however, these losses are purely hypothetical, for one of the packages contains a mine that can destroy all other packages. You are not aware which of the packages contains the mine. The mine can be in any of the packages, with the same probability.

It is now your task to stop the computer once you think it has discarded enough packages. Your payment for the first part of the experiment depends on the number of discarded packages and on whether the package containing the mine has been thrown away:

1. If you have thrown away the package containing the mine, you will receive 3 eurocent for each package that has not been discarded.

2. If you have not thrown away the package containing the mine, you will receive 0 euro, because the mine will destroy all packages in your possession.

Please look at the following screenshots. As soon as the 25-second countdown has elapsed, the computer will start to discard the packages one by one. Each corresponding square will turn light gray once the package is gone. The number of discarded and remaining packages will be shown to you in the information field. In addition, you will see the current sum subtracted from your 3-euro income, incurred by the discarding of packages.
If, for example, 2 packages are discarded, the subtracted sum is $2 \times 0.03 = 0.06$ euro. If the mine is in one of the 2 discarded packages, your income will be $3$ euro $- 0.06$ euro $= 2.94$ euro. If, say, 98 packages are discarded, the subtracted sum is $98 \times 0.03 = 2.94$. If the mine is in one of the 98 discarded packages, your income will be $3$ euro $- 2.94$ euro $= 0.06$ euro. If the mine is in one of the remaining packages, your income will always be 0. To end the discarding of packages, please click the 'STOP' button.

Only at the end of the experiment will you be told in which package the mine was, and informed about the payment resulting from your decision.

**Information on Part 2 of the Experiment**

In the second part of the experiment, we ask you once again to solve a task. The instructions for this task are on your screen. You are given an income of 11 euro in order to complete the task.
Your income is exposed to risk as the experiment continues. With a probability of 1/3, you will lose 6 euro of your income; with a probability of 1/3, you will lose 3 euro; and with a probability of 1/3, you will lose nothing and keep your entire income of 11 euro.

You are obliged to insure yourself against the risk of loss. This insurance costs 4 euro. It entitles you to reimbursement of the sum you may lose.

At the end of the experiment, you can put in a claim with your insurance. If you claim a loss of 3 euro, 3 euro will be paid to you. If you claim a loss of 6 euro, 6 euro will be paid to you. If you claim no loss, nothing will be paid to you.

**Insurance**

**(Comp)** A team member will come to your booth and hand you an envelope marked "Insurance". This envelope contains three boxes. The boxes contain various sums of money corresponding to your income from the task, minus the respective loss and minus the price for the insurance: 11-6-4=1 euro in case of a loss of 6 euro, 11-3-4=4 euro in case of a loss of 3 euro, and 11-4=7 euro in case of no loss.

**(Nudge)** There is an envelope marked "Insurance" in your booth. This envelope contains three boxes. The boxes contain various sums of money corresponding to your income from the task, minus the respective loss and minus the price for the insurance: 11-6-4=1 euro in case of a loss of 6 euro, 11-3-4=4 euro in case of a loss of 3 euro, and 11-4=7 euro in case of no loss.

You may choose whether you wish to keep the envelope marked "Insurance", or whether to exchange it for an envelope marked "No Insurance".

The boxes in the envelope marked "No Insurance" contain various sums of money corresponding to your income from the task, minus the respective possible loss: 11-6=5 euro in case of a loss of 6 euro, 11-3=8 euro in case of a loss of 3 Euro, and 11 Euro in case of no loss.

If you wish to buy insurance, please choose the envelope marked "Insurance". If you do not wish to buy insurance, please choose the envelope marked "No Insurance". The insurance decision is initially asked by the computer. Then, depending on your decision, your screen will either show the words "Insurance" or "No Insurance". A team member will come to your booth and exchange the envelope, if appropriate.

**(VOL)** You may choose between two envelopes. One is marked "Insurance", and the other is marked "No Insurance". Each of these envelopes contains three boxes.

The matchboxes in the envelope marked "No Insurance" contain various sums of money corresponding to your income from the task, minus the respective possible loss: 11-6=5 euro in case of a loss of 6 euro, 11-3=8 euro in case of a loss of 3 Euro, and 11 Euro in case of no loss.

The matchboxes in the envelope marked "Insurance" contain various sums of money corresponding to your income from the task, minus the respective loss and minus the price for the insurance: 11-6-4=1 euro in case of a loss of 6 euro, 11-3-4=4 euro in case of a loss of 3 euro, and 11-4=7 euro in case of no loss.

If you wish to buy insurance, please choose the envelope marked "Insurance". If you do not wish to buy insurance, please choose the envelope marked "No Insurance". The insurance decision is initially asked by the computer. Then, depending on your decision, your screen will either show the words "Insurance" or "No Insurance". A team member will come to your booth and exchange the envelope, if appropriate.
Please open the envelope and choose one of the boxes. Please leave the other two boxes unopened in your booth. Open the box you have chosen and take the money contained therein.

Opening more than one box will lead to exclusion from the experiment and all payments.

Claim

Please announce which claim you wish to put in with the insurance. The sum you mention will be covered completely by the insurance and paid to you at the end of the experiment. If you claim 6 euro, you will receive 6 euro at the end of the experiment; if you claim 3 euro, you will receive 3 euro at the end of the experiment; and if you claim nothing, you will receive nothing.

A.2 Questionnaire

Demographics

• What is your gender?
• How old are you?
• How tall are you?
• What is your highest degree (Abitur, bachelor, master, doctor, ...)?
• Which subject do you study?
• What is your relationship status (single, in a relationship, engaged, married)?
• What is the highest degree of your mother (Abitur, bachelor, master, doctor, ...)?
• What is the highest degree of your father (Abitur, bachelor, master, doctor, ...)?
• How many siblings do you have?
• What religion do you belong to?
• How often do you consume alcohol?
• How often do you consume cigarettes?

Lying and norm-violating behavior

• Did you ever lie to sell something?
• Did you ever lie in an application for work, a membership, school, university or foundation?
• How often did you go by bike with more than 0.5 per mill?
• How often did you go by car with more than 0.5 per mill?
• Please indicate your estimate how many percent of the other insured participants that are present made a claim that is higher than their actual loss (0-10%, ..., 90-100%)?
• Please indicate to what extent the following statements are true for you (true, rather true, partly, rather not true, not true):
  - I am more likely to lie if there is a lot to win.
  - I am more likely to lie if the chance of being caught is low.
  - Either you lie or you do not lie. There are no further distinctions.
(Soft) paternalism

- Please indicate to what extent the following statements are true for you (true, rather true, partly, rather not true, not true):
  - When I have to make a decision I usually ask for a second opinion.
  - I myself know best what is good for me.
  - I do not always do what is best for me.

- Please indicate to what extent you agree with the following statements (agree, rather agree, neither agree nor disagree, rather disagree, disagree):
  - The government should help smokers who want to quit smoking.
  - Cigarette packages should warn of the detrimental effects of smoking (e.g. via text messages or deterrent pictures).
  - Cigarettes should be taxed.
  - Car drivers should decide for themselves whether to buckle their seat belt.
  - Bicyclists should decide for themselves whether to wear their helmet.