*European Research Studies Journal*
*Volume XXV, Issue 1, 2022*

*pp. 783-808*

# The Impact of Introducing Co-insurance into an Insurance Policy on Moral Hazard: An Incentivised Experiment

*Submitted 20/12/21, 1st revision 13/01/22, 2nd revision 16/02/22, accepted 10/03/22*

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***Abstract:***

***Purpose:*** *The aim of the paper is to determine the impact of entries into the insurance policy that result in the insured person bearing some costs in the event of a loss on the level of effort put into measures to reduce the risk of material loss.*
***Design/methodology/approach:*** *The hypothesis that the effort put into avoiding the loss increases as the own contribution expressed as a percentage of the damage increases was verified through an incentivised experiment conducted among large number of students.*
***Findings:*** *Most of the differences that were found in the research were between two groups: willing and not willing to buy the insurance and those who have bought and haven't bought the insurance policy. No statistically significant differences were found between groups with different level of co-insurance. The existence of ex ante moral hazard was confirmed-the insured tried less hard to avoid loss than the uninsured. It was only partially reflected in the amount of losses. Uninsured lost less than insured, but the difference was not significant.*
***Practical Implications:*** *Results of the conducted experiments bring important information about people's perception of insurance policies that can be useful for insurance companies. Firstly, it seems that even educated individuals are often not able to understand policy conditions and insurance companies should intensify efforts to help clients to comprehend them. Secondly, it seems that the level of coverage is not crucial in determinig individuals' behaviour, which gives some leeway to insurance companies.*
***Originality/Value:*** *A definite novelty compared to other studies is the use of effort put into avoiding loss as an ex ante moral hazard measure. An additional advantage of the research is its experimental nature, which allows the conditions of ceteris paribus to be maintained.*

***Keywords:*** *Moral hazard, adverse selection, incentivised experiment, risk attitude.*

***JEL classification:*** *G22, G52, D12.*

***Paper type:*** *A research study.*

***Funding:*** *The publication was financed by a subsidy from WSB University in Wroclaw, Poland.*

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## 1. Introduction

The insurance market operates with mutual asymmetry of information. On the one hand, the person considering buying an insurance policy has limited information on the probability distribution of possible damages and in his decisions can be guided only by a subjective assessment of the probability of damage, on the other hand, the insurance company can never be sure as to whether a person has decided to purchase an insurance policy due to a high propensity for risky behaviour (which threatens greater loss ratio) and whether the fact of having insurance will not induce a person to be more risk-taking. Therefore, to understand the functioning of this market, it is essential to know the behaviour of the insured and the factors affecting it.

In literature, two phenomena related to information asymmetry are most commonly mentioned - adverse selection and moral hazard[3]. The concept of adverse selection derives from the work of Akerlof (1970), who argued that in some markets it is not profitable for sellers to sell good quality goods because buyers, not knowing the quality of a given product copy, are guided by the overall quality of this product throughout the market. In relation to the insurance market, assuming the existence of adverse selection, it is considered that consumers have superior private risk-relevant information, and insurance contracts are concluded more often by persons who are exposed to higher claims (Siegelman, 2004).

On the other hand, the phenomenon of moral hazard can occur due to the fact that although the insurance is assumed to protect against uncontrolled events, in fact the insured has some impact on the probability of damage (Arrow, 1963). In the situation of full coverage, the insured lacks incentives to try to prevent damage. Because both phenomena can cause a positive correlation between the level of insurance coverage and the individual's degree of riskiness (Chiappori *et al.,* 2006), it is difficult to analyse them separately (Richter *et al.*, 2014).

In order to limit the occurrence of both of these phenomena, insurance companies have introduced, among others, partial insurance coverage in the form of deductible (fixed amount covered by the insured in the event of a loss) or co-insurance (the insured covers a certain percentage of the amount of loss suffered) as well as the premium discounts system (bonus malus). The effectiveness of these actions in reducing moral hazard is usually assessed on the basis of the number of claims filed by an insured, while it seems interesting to check whether the use of these incentives affects the insured's behaviour, especially effort made by the insured in order to avoid damage (and thus not to examine the results of the actions, as they are non-deterministic, but actions). This belief implies the aim of this paper, which is to determine the strength of the impact of one of these remedies on the level of effort

[3]*However, in the last years it is being questioned whether adverse selection and moral hazard are as strong as it was originally assumed (Chiappori and Salanie, 2000, Dionne et al. 2001).*

put into measures to reduce the risk of material loss. In particular, the following question is to be answered: how does the impact of introducing co-insurance on the effort to avoid damage change with the increase in the insured's share in the claim settlement costs? The following hypothesis is to be tested:

*Hypothesis 1: The effort put into avoiding the loss increases as the own contribution expressed as a percentage of the damage increases.*

In order to verify the above-mentioned hypothesis, an experimental study with the usage of purposely created software was conducted. As a measure of effort made by the insured to avoid damage time spent on a task that conditioned the amount of loss was taken.

As already mentioned, a severe problem in the study of adverse selection and moral hazard is to determine the result of which of these phenomena is the increased loss ratio of insured persons. In this research, that problem did not occur for several reasons. Firstly, the subjects did not have any impact on the level of insurance coverage they were covered. Secondly, the effort to avoid damage was measured and compared, while the risk of loss for individual subjects was not determined, and thirdly, comparing the behaviour of individuals who are not covered by the insurance with persons who are covered by this protection only answers of those who have not been insured despite expressing the desire to buy the policy were taken into account (while the responses of persons who would not want to insure were not taken into consideration).

A definite novelty compared to other studies is the use of effort put into avoiding loss as an ex ante moral hazard measure. An additional advantage of the research is its experimental nature, which allows the conditions of ceteris paribus to be maintained. Answering the question of whether insured persons change their behaviour only due to the fact that they have been covered by insurance is crucial. An additional advantage of the study is the ability to check not only whether the presence of participation in loss affects moral hazard (measured by effort) but also how different levels of participation in loss affect moral hazard.

This article consists of the following sections. Part 1 summarises world literature on moral hazard. Part 2 describes the methodology that was applied in the research. Part 3 gives information on the results of experiments conducted to verify the above-mentioned hypothesis. Part 4 includes conclusions learned from experiments and discussion.

## 2. Literature Review

One of the insurance functions is the preventive function. The goal of insurance institutions is primarily to minimise losses and maximise profits. In the case of insurance companies, this effect can be met in conditions where there will be as few

cases as possible implying the payment of compensation, and in the event of such necessity - the damage requiring indemnification will be as low as possible (Hyski, 2017). The preventive function can be implemented on two levels: legal (intangible) and material. The basic prevention tools include the introduction of obligations (and the consequences of non-compliance), exclusion of the payer's liability (including reduction/determination of various replacement rates), recourse law or elements defining the method of financing, for example, the bonus-malus system, co-payment (co-insurance, deductible) (Więckowska, 2018).

Some of those instruments are also believed to reduce moral hazard. Moral hazard is defined as the impact of insurance on the incentives to reduce risk (Winter, 2000) or lack of incentive to take care (Varian, 2010). Some researchers distinguish between moral hazard ex ante and moral hazard ex post. Ex ante moral hazard entails that agents respond to changes in incentives by changing the risk of losses. Ex post moral hazard concerns the effects of incentives on claiming actual losses. Ex ante moral hazard is captured by the endogenous loss prevention effort; ex post moral hazard by the endogenous claim choice (Abbring *et al.*, 2007).

While examining the impact of different incentives on the occurrence of losses is relatively easy and widely described in the literature (some examples below) it is difficult to examine this impact on efforts made to avoid losses. The study described in this paper contributes to filling this knowledge gap by providing an answer to how co-insurance system affects the effort being made to avoid or reduce the amount of potential damage, i.e. the propensity to incur non-monetary costs (such as physical, mental or time effort) of hedging against potential loss.

It is believed that if moral hazard is of a type that can increase the likelihood of a loss, then a better way to reduce this risk is to introduce deductibles. However, if moral hazard increases the value of possible claims, co-insurance should be applied (The Economist, 1995, p. 66). However, it has not been unequivocally proven that the introduction of any of these remedies completely eliminates the occurrence of moral hazard. For example, by researching the housing insurance market Aarbu (2010) showed that there is no significant relationship between the level of deductible chosen and the probability of filling a claim.

In turn, by researching the health insurance market, Alessie *et al.* (2019) showed that voluntary deductible reduces moral hazard in the Netherlands, especially in the decision to have any doctor's visits (extensive margin) as compared to the number of visits (intensive margin). Kremslehner and Muermann (2016) attempted to determine the occurrence of ex ante moral hazard and adverse selection by analysing telematics data on drivers. They collected information about their driving style (speeding, night driving, kilometres travelled, etc.) and checked how driving style influences the choice of the insurance policy. These analyses show that whereas the number of car rides and average speeding are negatively related to the level of

liability coverage, the number of car rides and the relative distance driven at night are positively related to the level of first-party insurance coverage.

However, it should be noted, as the authors themselves emphasise, that the data concerned drivers who opted for a pay-as-you-drive policy who are not representative of the entire driver population. Moreover, it is possible that the drivers' behaviour was changed just because of the fact of being observed. In the 1970s, the RAND Health Insurance Experiment was conducted in the USA (Manning *et al.* 1988). Families were randomly assigned to insurance plans that differ in terms of participation in co-insurance (95%, 50%, 25%, 0%). It was found that the share of individuals with any annual healthcare spending decreases as the health insurance coverage becomes less generous.

In addition, the largest difference in expenditure on treatment appeared between persons assigned to 0% own contribution and persons with 25% own contribution. Studies conducted in Florida regarding wind damage insurance (Carson *et al.*, 2013) show that there is a relationship between the decision on investment in mitigation measures and the level of deductible (however, this is a negative correlation) and the amount of premium (a positive correlation was observed, which was interpreted as a desire for homes with high wind premiums to decrease the cost of their insurance by engaging in mitigation). However, among households that have decided to introduce mitigation measures choosing a larger deductible coincides with spending more on mitigation.

## 3. Methodology

The aim of this paper is to determine the impact of entries into the insurance policy that result in the insured person bearing some costs in the event of a loss on the level of effort put into measures to reduce the risk of material loss. In other words, the purpose is to check the existence and strength of moral hazard in the presence and absence of co-insurance. However, in the case of this paper, moral hazard will not only be measured ex post by the amount of incurred losses, but ex ante by means of the effort made to avoid loss. As a measure of this effort time spent on a task that conditioned the amount of loss was taken.

As moral hazard is defined as the impact of insurance on the incentives to reduce risk, the effort put into avoiding loss seems to be a good measure, because apart from factors independent of the insured, it is the effort put into avoiding loss that can increase or decrease the risk of its occurring. For example, a driver who wants to avoid an accident may make more effort by focusing more on driving or increase that effort by leaving home early so that he does not have to exceed speed. Before leaving home, the homeowner can carefully check if he has closed doors and windows, turned off the iron and gas stove. Everyone can also take care of their health by putting effort into healthy eating, choosing the right outfit or spending time on periodic examinations.

### 3.1 Subjects and Incentives

In order to verify the hypothesis put in the introduction part saying that the effort put into avoiding the loss increases as the own contribution expressed as a percentage of the damage increases, three experiments were carried out among students of Wroclaw University of Economics (Poland) who volunteered to participate. Although students are not a representative sample of the whole society, many scientific studies indicate that they are a sufficiently good research sample (Druckman and Kam, 2011). In experiments, stimuli were used to encourage subjects to act in a manner consistent with their preferences.

These incentives appeared in the first experiment in the form of additional credits added to the credits obtained on the test from the statistics course and in the second and third experiment as credits that were the only base for the final grade. This form of the stimulus was decided for two reasons.

First of all, during previous experiments, it was noticed that students attach great importance to decisions that were to influence how many credits they would score and often devoted a lot of time to make such decisions. Secondly, in situations where large sums of money cannot be withdrawn as a stimulus, the payment of small amounts is not justified, and the payment of a high number of credits seems to be the better solution. For example, it has been shown that when making decisions in risk conditions, the so-called peanuts effect occurs, which causes an increased risk-seeking behaviour while playing for low stakes (Mitchell and Wilson 2010; Hogarth and Einhorn 1990). Some researchers also use the technique of asking many hypothetical questions and then drawing one of them and making one actual payment.

However, also in this case, a single payment would have to be large enough, because as Laury (2005) showed in experimental conditions, when payoffs are scaled up by a factor of 10, a significant increase in risk aversion is observed. It should not matter that participants were students because they were not asked about hypothetical actions like whether they would buy car insurance or not surveyed if they do have a house insurance policy. They were put in a real situation where potential gains and losses were exactly described and real and insurance conditions explained in detail.

### 3.2 Experimental Design

The first experiment was conducted in class, experiments second and third were conducted online because of the lockdown during the COVID-19 pandemic.

Each of the experiments consisted of two phases. The first phase helped to define the risk attitude of experiments' participants. Then the subjects were randomly assigned to different scenarios, but with the same composition of each group in terms of risk attitude and an additional parameter which was the self-assessment of the

respondents' memory skills. Thanks to this, when the respondents' behaviour is compared, it cannot be said that one group behaves differently than the other because people in these groups may have different attitudes to risk.

Subjects' risk attitude was determined on the basis of survey (Attachment I), which was developed on the basis of a questionnaire used in the literature to analyse the risk attitude, so-called Holt-Laury and Task (2002). Normally in that survey respondents have to make ten decisions in which of the two lotteries they would like to take part in. Lottery pay-outs remain unchanged, but the odds of winning change.

In the case of the present study, pay-outs were real and were given in extra credits. The number of credits to be won was 0.5 vs 9.5 in the high-payoff treatment and 4 vs 5 in the low-payoff treatment. At the end of the semester, each person drew one decision number (1-10) and took part in the lottery that she/he has chosen, thus obtaining additional credits added to credits won in the second phase. Every rational decision-maker chooses lottery B at 10th choice, while the moment of switching from the selection of lottery A (with lower pay-outs, but less varied pay-outs) to the selection of lottery B (with one of the payments much higher than in lottery A and one much smaller) determines the attitude to the person's risk. The later this transition occurs, the greater the risk aversion of the individual.

The second phase took place in conditions where the subjects did not know yet the results of the first phase of the experiment (nor the results of their final test in the first experiment) in order that the level of "wealth" did not affect their decisions. It was conducted with the usage of purposely created software that allowed for measuring time spent on learning words and time spent on filling blank spaces with memorised words. The second phase differed among Experiments I, II and III, so the detailed procedure is described for each experiment in a separate section.

## 4. Procedure and Research Results

### 4.1 Experiment I

*Procedure:*
The second phase of Experiment I was conducted according to 4 scenarios differing in the co-insurance level. The scenarios' parameters are listed in Table 1. Insurance premiums were set at a very low level to assure that only people who under any circumstances are never willing to insure themselves would not be insured. At the same time, prices are slightly varied so that students did not feel aggrieved that they had to pay the same for less insurance coverage.

***Table 1.*** *Scenarios in the Experiment I*

| Scenario | Share in costs of loss (Y) | Insurance premium (X) |
|---|---|---|
| A | 0% | 0.3 credits |
| B | 10% | 0.2 credits |

| | | |
|---|---|---|
| C | 20% | 0.1 credits |
| D | 100% (no insurance) | 0 credits |

***Source:*** *Own elaboration.*

The course of the experiment was as follows:

1) Participant identification (by album number) to be assigned to the appropriate scenario.
2) Informing participants that everyone gets 20 credits added to the credits from the test written in the middle of the semester (this is a significant amount since the same number of credits could be obtained from the test, and more than 20 credits were needed to complete the course [exact list of grades depending on the obtained credits are listed in Table 2]).
3) Introducing the task to participants. The task was to remember 50 words, while the time to learn these words was a maximum of one hour of time.[4] and the time for writing down the words was at most 10 minutes. Each word forgotten meant a loss of 1 credit from the initial 20 credits received.
4) [In the application] Asking participants three hypothetical questions – "would you be willing to insure yourself from losing credits for the price of X with your own share of costs in loss Y?" (X and Y see Table 1). In scenario D hypothetical questions were asked because it was necessary to separate subjects who were not willing to insure themselves from subjects who would not be insured because they were assigned to the scenario without insurance. Theoretical questions in groups A, B and C were introduced to verify whether the hypothetical answers are consistent with real decisions.

   To make it easier for respondents to make decisions, they were shown a pay-out table that showed the number of credits obtained depending on the number of words remembered and on being insured or not. An example of the pay-out table translated into English can be found in Attachment II. Additionally, students were informed that if they would buy an insurance policy and later they would like to benefit from it, they would have to fill in a damage report form and bring it to the experimenter no later than in one week.
5) [In the application] For scenarios A, B and C, asking the question – "do you want to insure against loss of credits at the price of X with own share of costs in the loss Y?" (X and Y see Table 1).
6) [In the application] Displaying the slide with 50 randomly selected Polish words. The program measured the viewing time of this board. The time spent learning the words displayed is used as a measure of effort made to avoid loss.
7) [In the application] Displaying the sheet for entering the memorised words. Also, in this case, the program measured the time for which the respondent filled in the sheet.

[4]*Available time was decided to be long, so that it could be possible for almost everyone to learn all words in shorter than the limit time. If time was too short, it could result in everyone using all of it for studying.*

8) From the last slide, the examined person found out how many credits he/she had obtained. Results were sent to an external server.
9) Having finished the game student was free to leave the classes.

***Table 2.*** *The range of credits needed to get the specific grade*[5]

| Credits | Grade |
|---|---|
| <0;20> | insufficient |
| (20;24> | sufficient |
| (24;28> | more than sufficient |
| (28;32> | good |
| (32;36> | more than good |
| Over 36 | very good |

***Source:*** *Own elaboration.*

*Findings:*
188 participants took part in the second phase of Experiment I. 3 students decided to retire from the game and write a regular test. Due to a software bug, results from the first group of participants needed to be excluded from the analysis. For this reason, the final sample included 168 subjects.

As mentioned above, participants were assigned to different scenarios based on their risk attitude and self-assessed memory skills indicated in a survey (see Attachment I). Statistics regarding these variables for particular scenarios are included in Tables 3 and 4. In Table 3 switching point is a number of the decision in which the riskier option was chosen for the first time. Table 3 also includes the category "irrational" because some subjects switched from one to another option more than once. Numbers in columns under scenario's names are indicating how many participants have switched in the particular question. Table 4 includes the average, median, mode and standard deviation of self-assessed memory skills. One-way ANOVA on ranks shows that there is no statistically significant difference between objects assigned to four scenarios in terms of risk attitude and memory skills.

***Table 3.*** *Risk attitude according to scenarios in the Experiment I*

| | Scenario | | | |
|---|---|---|---|---|
| Switching point | A | B | C | D |
| 1 | 0 | 1 | 1 | 0 |
| 2 | 1 | 0 | 0 | 1 |
| 3 | 0 | 2 | 0 | 0 |
| 4 | 1 | 1 | 1 | 1 |
| 5 | 5 | 5 | 6 | 6 |
| 6 | 3 | 4 | 3 | 4 |
| 7 | 10 | 10 | 10 | 10 |
| 8 | 6 | 7 | 6 | 6 |

[5]*Polish system of grades. Only with sufficient or higher grade student can proceed with his studies.*

| | | | | |
|---|---|---|---|---|
| 9 | 4 | 3 | 3 | 2 |
| 10 | 5 | 6 | 6 | 6 |
| irrational | 6 | 5 | 6 | 5 |
| TOTAL | 41 | 44 | 42 | 41 |

***Source:*** *Own elaboration.*

***Table 4.*** *Memory skills according to scenarios in the Experiment I*

| | Scenario | | | |
|---|---|---|---|---|
| Memory skills | A | B | C | D |
| Average | 3.15 | 3.28 | 3.21 | 3.29 |
| Median | 3 | 3 | 3 | 3 |
| Mode | 3 | 3 | 3 | 3 |
| Standard deviation | 0.7925 | 0.8259 | 0.8126 | 0.8439 |

***Source:*** *Own elaboration.*

In the second phase, participants needed to decide if they wanted to buy insurance against losing credits. Among 127 subjects that got the real offer of buying insurance 115 decided to buy the policy. Comparing real choice with the analogous hypothetical choice, it was found that 86% of hypothetical answers were confirmed with the same real choice. 8 participants changed their decision from not buying into buying in Scenario B, 6 in scenario C, and 1 in scenario A. 2 participants changed their decision from buying into not buying in Scenario A and 1 in Scenario B.

After consulting with students, it turned out that some of them thought they could only choose one insurance (although it was clearly stated that the questions were hypothetical and did not ask to choose between policies). Because much of the hypothetical choices were confirmed in real decisions in further analysis, it is to be assumed that the hypothetical answers of participants assigned to Scenario D are in line with their actual preferences. 31 participants assigned to that Scenario were ready to buy any type of insurance (A, B and C). 3 participants would buy insurance from Scenarios A and B but not C, 6 participants would buy only full coverage insurance (A), and 1 participant wouldn't buy any insurance policy from the offered ones.

During further analysis, subjects were divided into 5 groups. Group 1 were those who were assigned to scenario A and bought insurance policy, Group 2 were those who were assigned to scenario B and bought insurance policy, Group 3 were those who were assigned to scenario C and bought insurance policy, Group 4 were those who were assigned to scenario D and were willing to buy insurance in each of the hypothetical questions (9 subjects that gave mixed answers were excluded from the analysis because it would be debatable to which group they should be assigned), Group 5 were those subjects who did not want to buy insurance (in hypothetical or real question).

After dividing participants into groups, an additional analysis regarding memory skills and risk attitude was performed. Firstly One-way ANOVA was conducted in

order to compare all groups. No statistically significant differences were found in the case of both variables (with p- values equal to 0.8851 and 0.1202, respectively.[6]), yet the p-value for risk attitude motivated another division, so that first group [Group Alpha henceforth, n=146(125 having excluded irrational answers)] were those who wanted to buy insurance (independently on the scenario) and the second group were those who did not want to buy it [Group Beta henceforth, n=13].

Under that partition, a significant difference was found (p-value 0.006 for one-sided t-test) with a surprising result that on average participants who did not want to buy insurance switched from less risky to more risky lottery later (average switching point 8.3846) than participants who wanted to buy insurance (average switching point 6.944), while that result should be treated with caution because variable distribution is not normal. The same regularity was found, though, for medians (median switching point 9 vs 7, p= 0.0125460038 for the two-tail test). However, it is worth noticing that there were only 13 students that did not wish to get insured. No statistically significant difference in memory skills between Alpha and Beta was found.

For the created five groups the average and other position statistics of words remembered in the game (Table 5) were calculated. Surprisingly one-way ANOVA showed no statistically significant differences between the average number of remembered words. With the division in Alpha and Beta groups, it appears that on average Group Beta (48.69) remembered more words than Group Alpha (46.73) with a p-value of one-sided t-test equal to 0.0089 (test with independent variance estimation).

However, again there is an issue with variable distribution, which is not normal. Mann-Whitney test shows no difference between medians in Group A and B, but its assumption (regarding using the test for comparing medians) is also violated because of not equal variances. Additionally, the Wald-Wolfowitz test shows that words remembered are differently distributed depending on the group (p= 0.0016). Also, comparing groups of those who had bought any type of insurance [Group Alpha' henceforth] with those who did not (because they did not want to or could not to) [Group Beta' henceforth], a difference was found although less significant.

The average number of remembered words for Group Beta' (48.17, n=53) is higher than for Group Alpha' (46.48, n=115) with a p-value of one-sided t-test equal with independent variance estimation to 0.0238413. This result suggests that the type of insurance is irrelevant to the number of remembered words, but only the fact of being insured or not (or having the willingness to buy insurance) influences the result of the given task. However, as mentioned above, in order to verify the existence and strength of moral hazard directly, another measure was used.

[6]*From the analysis irrational answers were excluded because of the difficulty in quantifying them. In the case of the remaining answers bigger number means being more risk-averse.*

***Table 5.*** *Remembered words in the Experiment I*

| Group | Observations | Average | Median | Mode | Standard deviation |
|---|---|---|---|---|---|
| 1 | 39 | 46.62 | 49 | 50 | 8.5243 |
| 2 | 39 | 46.15 | 49 | 49 | 9.0162 |
| 3 | 37 | 46.68 | 49 | 50 | 7.0358 |
| 4 | 31 | 47.65 | 49 | 50 | 3.1043 |
| 5 | 13 | 48.69 | 49 | 50 | 1.8879 |

***Source:*** *Own elaboration.*

Aiming to verify the hypothesis that *the effort put into avoiding the loss increases as the own contribution expressed as a percentage of the damage increases* statistics regarding the time remaining for learning words and time remaining for writing down the remembered words were counted (Table 6).

***Table 6.*** *Time remaining [seconds] for learning words and writing words down in the Experiment I*

| Time remaining [seconds] | Group | Observations | Average | Median | Mode | Standard deviation |
|---|---|---|---|---|---|---|
| Learning | 1 | 39 | 920 | 905 | Multiple | 857.2821 |
| Writing down | 1 | 39 | 226 | 227 | 0.000000 | 140.1940 |
| Learning | 2 | 39 | 711 | 575 | Multiple | 572.7203 |
| Writing down | 2 | 39 | 180 | 203 | 0.000000 | 141.2508 |
| Learning | 3 | 37 | 1172 | 1000 | Multiple | 787.6188 |
| Writing down | 3 | 37 | 197 | 211 | 0.000000 | 126.9580 |
| Learning | 4 | 31 | 895 | 955 | 0.000000 | 563.2866 |
| Writing down | 4 | 31 | 199 | 206 | 0.000000 | 127.3036 |
| Learning | 5 | 13 | 801 | 747 | 0.000000 | 678.1729 |
| Writing down | 5 | 13 | 220 | 228 | Multiple | 126.1125 |

***Source:*** *Own elaboration.*

It should be reminded that subjects had at most one hour (3600 seconds) for learning the words and at most 10 minutes (600 seconds) to write the words down. On average most time left for learning had Group 3 (aprox.19.5 minutes), and the least average time left for learning was observed in Group 2 (aprox.12 minutes) – both groups being insured but with 20% and 10% participation in co-insurance, respectively. On average most time left for writing down the words had Group 1 (approx. 3 minutes and 46 seconds), and the average least time left for writing down words was observed in Group 2 (3 minutes). Different than expected, Group 4 that wanted to buy insurance but couldn't is somewhere in the middle of other groups.

The hypothesis that *the effort put into avoiding the loss increases as the own contribution expressed as a percentage of the damage increases* would only be

confirmed if Group 4 used more time for learning and writing down words than Group 3 and Group 3 used more time than group 2 and Group 2 more than Group 1.

Therefore, the hypothesis must be rejected. Moreover, one-way ANOVA indicates there is no statistically significant difference between times left for writing down the words for different groups (p=0.6131). For time left for learning words p-value for ANOVA[7] test is 0.09 and post-hoc Tukey's test shows only one statistically significant difference between Groups 2 and 3 (p=0.038). Additionally, differences remain insignificant when dividing participants in Groups Alpha and Beta and Alpha' and Beta'.

Justification for those surprising results could be the requirement to supply a damage report form in case someone needed to take advantage of the insurance. In that case, students might have been nervous about the procedure of claiming losses or think about the time needed to supply the form to the experimenter. That all together could have been perceived as a higher cost than additional minutes spent on learning words. Another explanation is that subjects didn't understand the difference between hypothetical and real questions.

Among 42 students who supplied damage report forms, only 15 indicated properly the type of insurance they had bought. 23 students indicated that they didn't know the type of insurance they had bought, and 4 students indicated the wrong type. To avoid this confusion, Experiments II and III did not include hypothetical questions for scenarios A, B and C. That has worked partially because among 56 students that supplied damage reports in Experiment II 39 indicated properly the type of insurance they had bought (10 subjects indicated that they did not know, 7 indicated the wrong type). In Experiment III, among 19 students that have sent the damage reports, 12 knew the type of insurance they have bought, and 7 claimed they did not know.

### 4.2 Experiment II

*Procedure:*
As mentioned earlier, Experiment II was conducted during the COVID-19 pandemic. Due to lockdown, universities in Poland in that period were working on remote teaching. For that reason, both phases of Experiment II (and III) were performed online. For the first phase (measuring participants' risk attitude), a Google form survey was created, reflecting fully the paper survey used in Experiment I. The second phase of Experiment II was again conducted according to the same 4 scenarios differing in the co-insurance level but with prices of insurance being set slightly higher than in Experiment I (Table 7).

[7]*The same result was obtained when using the Kruskal-Wallis test.*

***Table 7.*** *Scenarios in the Experiment II*

| Scenario | Share in costs of loss (Y) | Insurance premium (X) |
|---|---|---|
| A | 0% | 3 credits |
| B | 10% | 2 credits |
| C | 20% | 1 credit |
| D | 100% (no insurance) | 0 credits |

***Source:*** *Own elaboration*

This time before starting the game students watched a prepared earlier movie posted on YouTube that explained in detail the rules of the second phase of the experiment. Because of changed conditions, it was decided that students could choose between participating in the experiment and writing their final test. Other changes made in regard to the first experiment were:

1) The number of credits possible to keep in the second phase. Instead of 20 credits in Experiment I, 40 credits were introduced.
2) Missing one word resulted in a loss of 2 credits (vs 1 in Experiment I)
3) The software was modified in a way one couldn't use the PrintScreen button, and once the game was started, it was in Full-Screen mode until the end of the game. While playing, everyone needed to have their cameras on, and one could not write down anything. All these actions were aimed at minimising the chances of cheating.
4) If needed, the damage report form was to be supplied via e-mail.

The system of grades remained unchanged (as showed in Table 2).

*Findings:*

210 students participated in the first phase of the experiment. Only 3 people decided to write the final test instead of playing the game what resulted in 207 participants of the second phase. Table 8 includes information on the number of participants who switched from less risky to the more risky lottery in the particular question of the survey regarding risk attitude. Table 9 gives information on the memory skills of students assigned to different scenarios. Again students were assigned to the scenarios in a way assuring that the distribution of risk attitude and memory skills is similar between particular groups. No differences in that terms between scenarios were confirmed by One-way ANOVA on ranks.

***Table 8.*** *Risk attitude according to scenarios in the Experiment II*

| | Scenario | | | |
|---|---|---|---|---|
| Switching point | A | B | C | D |
| 1 | 1 | 1 | 0 | 1 |
| 2 | 1 | 1 | 1 | 2 |
| 3 | 3 | 3 | 3 | 2 |
| 4 | 5 | 5 | 6 | 6 |
| 5 | 5 | 5 | 4 | 4 |
| 6 | 4 | 4 | 5 | 4 |
| 7 | 5 | 5 | 5 | 5 |

| | | | | |
|---|---|---|---|---|
| 8 | 7 | 7 | 6 | 6 |
| 9 | 7 | 7 | 7 | 7 |
| 10 | 6 | 5 | 5 | 6 |
| irrational | 8 | 9 | 9 | 9 |
| TOTAL | 52 | 52 | 51 | 52 |

***Source:*** *Own elaboration.*

***Table 9.*** *Memory skills according to scenarios in the Experiment II*

| | Scenario | | | |
|---|---|---|---|---|
| Memory skills | A | B | C | D |
| Average | 3.40 | 3.38 | 3.38 | 3.37 |
| Median | 3 | 3 | 4 | 3 |
| Mode | 4 | 4 | 4 | 3 |
| Standard deviation | 0.8691 | 0.9108 | 0.8438 | 0.8237 |

***Source:*** *Own elaboration.*

Exactly as in the Experiment I, in the second phase participants needed to decide if they wanted to buy insurance against losing credits. Among 155 subjects that got the real offer of buying insurance 109 decided to buy the policy.

In the group assigned to Scenario D with hypothetical questions 23 participants were ready to buy any type of insurance (A, B and C). 2 participants would buy insurance from Scenarios A and B but not C, 3 participants would buy insurance from Scenarios B and C but not A, 1 participant would only buy insurance from Scenario B, and one from Scenarios A and C. 13 participants would buy only full coverage insurance (A), and 9 participants wouldn't buy any insurance policy from the offered ones.

As in the Experiment I, during further analysis subjects were divided into 5 groups. Group 1 were those who were assigned to scenario A and bought insurance policy, Group 2 were those who were assigned to scenario B and bought insurance policy, Group 3 were those who were assigned to scenario C and bought insurance policy, Group 4 were those who were assigned to scenario D and were willing to buy insurance in each of the hypothetical questions (19 subjects that gave mixed answers were excluded from the analysis because it would be debatable to which group they should be assigned), Group 5 were those subjects who did not want to buy insurance (in hypothetical or real question). No difference between groups (also Alpha vs Beta and Alpha' vs Beta') in terms of memory skills and risk attitude were found.

As can be seen in Table 10 average number of remembered words increases with decreasing coverage; however, the difference is not statistically significant (p-value for One-way ANOVA equals 0.4630). However, after dividing participants in Group Alpha and Beta (willing/ not willing to buy insurance) average for Group Beta (49.08, n=48) is statistically significantly higher than for Group Alpha (47.74, n=108) with a p-value of one-sided t-test with independent variance estimation equal

to 0.004243. For Groups Alpha' and Beta' a similar result is obtained (av. Alpha'= 47.56, n=88, av. Beta'=48.70, n=84, p= 0.03178656).

***Table 10.*** *Remembered words in the Experiment II*

| Group | Observations | Average | Median | Mode | Standard deviation |
|---|---|---|---|---|---|
| 1 | 40 | 47.40 | 49.5 | 50 | 6.8343 |
| 2 | 34 | 47.74 | 49.0 | 50 | 3.4228 |
| 3 | 35 | 47.91 | 49.0 | 50 | 3.0134 |
| 4 | 23 | 48.48 | 49.0 | 50 | 1.6479 |
| 5 | 55 | 48.82 | 50.0 | 50 | 2.3261 |

***Source:*** *Own elaboration.*

Same as in the Experiment I, in order to measure effort made to avoid loss, time consumed on learning words was used. Descriptive statistics on time left for learning are included in Table 11 (together with the same statistics regarding time left for fulfilling the chart with remembered words). Surprisingly, on average less time left had Group 3 (insured with 20% co-insurance) and most time left Group 4 (with no insurance). Less time left for writing down the words had also Group 3 and most time Group 1 (insured with full coverage).

However, One-way ANOVA showed no statistically significant differences between groups, both in the time left for learning and time left for writing down the words (p= 0.9651 and p= 0.7675, respectively). The same conclusions can be made when comparing Groups Alpha to Beta and Alpha' to Beta'. Obtained results once again show that nor the level of co-insurance nor the fact of being insured or not influence effort expressed as time dedicated to complete the task made to remember words.

***Table 11.*** *Time remaining [seconds] for learning words and writing words down in the Experiment II*

| Time remaining [seconds] | Group | Observations | Average | Median | Mode | Standard deviation |
|---|---|---|---|---|---|---|
| Learning | 1 | 40 | 1610 | 1519 | 1183 | 698.5358 |
| Writing down | 1 | 40 | 233 | 268 | Multiple | 124.6622 |
| Learning | 2 | 34 | 1538 | 1539,5 | Multiple | 729.0340 |
| Writing down | 2 | 34 | 204 | 252 | 21 | 133.9883 |
| Learning | 3 | 35 | 1551 | 1600 | Multiple | 589.6767 |
| Writing down | 3 | 35 | 202 | 243 | Multiple | 114.9173 |
| Learning | 4 | 23 | 1636 | 1724 | 1784 | 681.4521 |
| Writing down | 4 | 23 | 211 | 229 | Multiple | 103.0214 |
| Learning | 5 | 55 | 1555 | 1507 | 1870 | 459.9163 |
| Writing down | 5 | 55 | 222 | 239 | Multiple | 109.9607 |

***Source:*** *Own elaboration.*

### 4.3 Experiment III

*Procedure:*
Just as Experiment II also Experiment III was conducted online. In relation to Experiment II, three conditions were changed. First of all, participants in Experiment I and II were Bachelor Studies students, and in Experiment III Master Studies students took part. Also, before the second phase, students were reminded (based on the example of car insurance) what happens when someone buys policy insurance and what happens when he/she does not. That two changes were made to get a higher level of certainty that participants know how insurance policies function (assuming that Master students are older and more familiar with goods that might be insured). The last change was dictated by the number of students frequenting classes. Because it was lower than in Bachelor Studies, Scenario B was excluded.

*Findings:*
114 students participated in the first phase of the experiment. 9 people decided to write the final test instead of playing the game what resulted in 105 participants of the second phase. Table 12 includes information on the number of participants who switched from less risky to the more risky lottery in the particular question of the survey regarding risk attitude. Table 13 gives information on the memory skills of students assigned to different scenarios. No differences in that terms between scenarios were confirmed by One-way ANOVA on ranks.

***Table 12.*** *Risk attitude according to scenarios in the Experiment III*

| | Scenario | | |
|---|---|---|---|
| Switching point | A | C | D |
| 1 | 2 | 2 | 2 |
| 2 | 1 | 1 | 2 |
| 3 | 1 | 0 | 1 |
| 4 | 4 | 6 | 4 |
| 5 | 3 | 4 | 3 |
| 6 | 3 | 3 | 4 |
| 7 | 2 | 2 | 3 |
| 8 | 6 | 5 | 4 |
| 9 | 3 | 3 | 2 |
| 10 | 3 | 2 | 4 |
| irrational | 7 | 6 | 7 |
| TOTAL | 35 | 34 | 36 |

***Source:*** *Own elaboration.*

***Table 13.*** *Memory skills according to scenarios in the Experiment III.*

| | Scenario | | |
|---|---|---|---|
| Memory skills | A | C | D |
| Average | 3.23 | 3.32 | 3.28 |
| Median | 3 | 3 | 3 |

| Mode | Multiple | 3 | 4 |
|---|---|---|---|
| Standard deviation | 0.9727 | 0.9761 | 1.1113 |

***Source:*** *Own elaboration.*

Among 69 subjects that got the real offer of buying insurance 53 decided to buy the policy. In the group assigned to Scenario D with hypothetical questions 26 participants were ready to buy any type of insurance (A, B and C). 4 participants would buy insurance from Scenarios A and B but not C, 1 participant would buy insurance from Scenarios B and C but not A, 1 participant would only buy insurance from Scenario A, and 1 from Scenarios A and C. 3 participants would not buy any insurance policy from the offered ones.

During further analysis subjects were divided into 4 groups. Group 1 were those who were assigned to scenario A and bought insurance policy, Group 3 were those who were assigned to scenario C and bought insurance policy, Group 4 were those who were assigned to scenario D and were willing to buy insurance in each of the hypothetical questions (7 subjects that gave mixed answers were excluded from the analysis because it would be debatable to which group they should be assigned), Group 5 were those subjects who did not want to buy insurance (in hypothetical or real question). No difference between groups in terms of memory skills and risk attitude were found (however, it is worth noticing that the p-value for One-way ANOVA on ranks for risk attitude variable was equal to 0.07).

A significant difference in terms of risk attitude was found between Groups Alpha and Beta (who were willing/were not willing to buy insurance) with a Mann-Whitney test p-value equal to 0.0086. The median switching point for those who were willing to buy insurance (Group Alpha) was $7^{th}$ question, and for those who were not willing to buy insurance (Group Beta) it was the $4^{th}$ question. The same regularity was found when comparing averages in that groups (Av. Group Alpha=6.48, n=66, Av. Group Beta=4.64, n=14). The result is surprising when compared to the result obtained in Experiment I when it was Group Alpha who was ready to switch earlier from less to the more risky lottery.

However, it should be mentioned that Group Beta consisted of only 19 subjects (of which 5 gave irrational answers regarding risk attitude, and it was not used during calculation). A less significant difference in terms of risk attitude was found between Groups Alpha'(n=44) and Beta'(n=41) with average switching point in Group Alpha' equal to 6.5 (median equal to 7) and in Group Beta' 5.63 (median equal to 5). The average in Group Alpha' was statistically significantly higher than in Group Beta' with p for one-sided t-test equal to 0.065 (p-value for two-sided Mann-Whitney test equals 0.0991). No statistically significant differences were found in terms of memory skills.

As in the case of previous experiments, further analysis firstly consisted of comparing the number of remembered words in particular groups (Table 14). The

average number of remembered words increases with decreasing insurance coverage (but the highest median occurred in Group 2); however, One-way ANOVA showed no statistically significant differences between Groups 1,2,4 and 5 (p=0.518). Also, no difference in terms of remembered words was found between Groups Alpha and Beta. Subjects in Group Alpha' (insured) remembered on average 46.07 words (n=53), while subjects in Group Beta' (not insured) 47.87 words (n=52), however one-sided t-test with independent variance estimation indicates that the average for Group Beta' is higher than for Group Alpha' with p equal to 0.083 which is too high to be sure we can believe in the existence of that inequality.

***Table 14.*** *Remembered words in the Experiment III*

| Group | Observations | Average | Median | Mode | Standard deviation |
|---|---|---|---|---|---|
| 1 | 28 | 45.18 | 49 | 50 | 10.8834 |
| 3 | 25 | 47.08 | 50 | 50 | 4.7074 |
| 4 | 26 | 47.46 | 49 | 50 | 3.5240 |
| 5 | 19 | 47.84 | 49 | 50 | 4.5979 |

***Source:*** *Own elaboration.*

The next step in the analysis was to compare time reaming for learning and writing down the remembered words (Table 15). Less time for learning left had Group 4 (1540 seconds) following Group 5 (1789 seconds). Most time left had Group 1 (1936 seconds). The same regularity was observed for the time remaining for writing words down. Experiment III is the first of described experiments that initially seems to have given the expected results. That is that people who have policy insurance with higher coverage take less effort (use less time) to avoid losses. Unfortunately, One-way ANOVA showed no differences in terms of time left for learning (p=0.1488). There is a difference, thou, between time left for writing down the words (p-value for One-way Anova equal to 0.0253). Post-hoc Tukey test shows a statistically significant difference between Groups 1 and 4 (p=0,018672) but not between Groups 1 and 5 (p=0.2392).

***Table 15.*** *Time remaining [seconds] for learning words and writing words down in the Experiment III*

| Time remaining [sec] | Group | Observations | Average | Median | Mode | Standard deviation |
|---|---|---|---|---|---|---|
| Learning | 1 | 28 | 1936 | 1905 | Multiple | 658.5757 |
| Writing down | 1 | 28 | 264 | 263 | 0.000000 | 137.5011 |
| Learning | 3 | 25 | 1834 | 1852 | Multiple | 687.7107 |
| Writing down | 3 | 25 | 227 | 237 | 0.000000 | 123.6764 |
| Learning | 4 | 26 | 1540 | 1468 | Multiple | 664.6419 |
| Writing down | 4 | 26 | 160 | 169 | Multiple | 108.9411 |
| Learning | 5 | 19 | 1789 | 1880 | Multiple | 512.2413 |
| Writing down | 5 | 19 | 192 | 166 | Multiple | 139.7293 |

***Source:*** *Own elaboration*

As previously, an additional analysis was conducted involving a comparison of Groups Alpha to Beta and Alpha' to Beta'. There is no difference between Alpha and Beta in terms of time left for learning and nor in terms of time left for writing down the words. In Group Alpha' average time left for learning was 1888 seconds, and in Group Beta' 1685 seconds. One-sided t-test shows that the average for Alpha' is higher than for Beta' with p equal to 0.0518. On average, Group Alpha'(246 seconds) had more time left for writing down the words than Group Beta'(184 seconds), which is confirmed by a one-sided t-test with p equal to 0.01272.

## 5. Summary and Discussion

Three incentivised experiments have been conducted in order to verify the hypothesis saying that *The effort put into avoiding the loss increases as the own contribution expressed as a percentage of the damage increases*. Experiments measured subjects' risk aversion, self-assessed memory skills, number of words remembered in a game, time spent for learning the words and time spent for writing remembered words down. Subjects were assigned to four different scenarios, which differed in terms of the insurance policy offered. According to subjects' decisions regarding buying insurance policies and types of policy offered, subjects were divided ex post into five groups.

The first experiment showed that there were no statistically significant differences in any of the analysed variables between five groups except one in the time left for learning words, but the difference observed regarded Groups 2 and 3 what is more than surprising taking into consideration the fact that there was no difference found between groups that differed more in terms of coverage of possessed insurance policy. Because of the obtained results, it was decided to conduct an analysis with division in other groups. Variables were compared for groups that were willing/were not willing to buy the insurance and for those who have bought/haven't bought an insurance policy. On average, people willing to buy insurance policy took more risky decisions than people who did not want to buy insurance.

Moreover, people who were not willing to buy insurance remembered on average more words than those who wanted to buy it. Also, people who could have and have bought insurance, on average, remembered fewer words than people who could have not or did not want to buy insurance. What is important no differences in time spent on learning and writing down the words were found. To resume, results from Experiment I did not confirm the hypothesis put. Information coming from students and confirmed by a low rate of those who knew the insurance policy they have bought among those who provided damage report gave reason to suppose that there is a lot of information noise in the results obtained in Experiment I. For that reason, hypothetical questions were excluded from scenarios with real insurance offers in Experiment II.

Moreover, the experimenter, before starting the game, stressed several times to be aware of the difference between expressions "for real" and "hypothetically". Experiment II was conducted online, but participants were controlled during the whole time of the game. Also, prices of policies were increased, and the number of credits to be lost for forgetting one word was set higher so that differences between scenarios were more pronounced. Also, credits from the experiment were only credits that mattered for the final grade. That way, possible influence on the behaviour of students' assessment of how they coped with the test was removed.

Again, there were no differences found between the five groups. Only differences found were in numbered of remembered words between those who were willing(lower number)/were not (higher number) to buy the insurance and those who have bought(lower number)/have not (higher number) bought the policy. Again, data obtained from Experiment II did not confirm the hypothesis on the effort put in avoiding loss. That is why other modifications were made in Experiment III. Firstly, participants were older. Secondly, before the game started, participants were reminded (on an example of car insurance) how does insurance work (or does not work when someone did not buy it). Same as previously, it was stressed few times that there is a difference between real and hypothetical questions.

Unfortunately, the number of participants was lower than in previous experiments, so also the number of scenarios was reduced. The multi-group analysis did not show any differences. Especially, no difference was found between groups 1 and 3, neither in remembered words neither in the time left for learning or writing down the words. Lack of that differences forces rejection of the hypothesis that t*he effort put into avoiding the loss increases as the own contribution expressed as a percentage of the damage increases.* On average, subjects who were willing to buy insurance/who bought insurance in the risk attitude survey switched from less risky to more risky option later than those who were not willing to buy it/who did not buy insurance. On average group that did not buy insurance remembered more words than the group that did buy insurance (of any type).

A statistically significant difference was found between times left for learning and writing down the words for Groups Alpha’ and Beta'. On average group that did not buy insurance had less time left for learning and for writing down the words than the group that bought insurance of any type.

Most of the differences that were found in the research were between two groups willing and not willing to buy the insurance and those who have bought and haven't bought the insurance policy. That might let one suppose that the level of coverage was not significant to participants. However, looking at the percentages of those who wanted to buy insurance among different scenarios full coverage was most popular (although not significantly). On the other side, no differences between the five groups might be caused by the low number of observations (while for groups Alfa and Beta or Alfa’ and B’ there were more observations).

It might be puzzling how it is possible that in the first two experiments, those who were not insured remembered more words than the insured while there were no differences between them in self-assessed memory skills or times consumed on learning and writing down the remembered words. One explanation would be that students did not assess their memory skills properly or honestly, but in the case of Experiments I and III in the group of non-insured subjects memory skills were positively correlated with time left for writing down remembered words ($p<0.01$). That means that those who rated themselves higher in terms of memory skills consumed less time on writing down remembered words which seems to be logical.

Also, in Experiment I there was a positive correlation between memory skills and the number of remembered words. Still, in Experiment II there was not such a correlation, but there appeared to be a negative (and significant, $p<0.05$) correlation between remembered words and time left for learning them. Another explanation is that uninsured students made more effort not to remember the words but to cheat. Although the experiment was conducted in conditions that were meant to limit cheating still it is probable that some of the participants managed to do that. The last explanation (unfortunate to this paper) is that time used for learning words is not a good measure of effort made to avoid loss in the form of unremembered words or that this kind of effort does not influence the results and what affects the results is something different, for example, an internal effort made to focus on the task.

There are also other ambiguous facts revealed in the research. For example, in all three experiments only two people who had full coverage insurance decided not to try to remember any word. It is unknown why others did not. Maybe they did not trust the information that they would indeed get the complete number of credits or were afraid of the formalities. It is also possible that they did not understand the mechanism of the proposed insurance policy entirely or thought they would feel ashamed not writing anything. What is at first moment astonishing is that (especially among uninsured participants) there was a positive and significant correlation (in each of the experiments) between the number of remembered words and time left for answering, which means that those who needed less time for writing down the words, in fact, remembered more words. After consideration, it appears clear that when someone memorised words properly, he did not need much time to write them down.

Experiment III gave different results than Experiments I and II, and because of the reason mentioned earlier, it seems that it is that Experiment that's findings are most reliable. In that experiment, participants who took less risky decisions were more willing to buy insurance. That can suggest that there is no phenomenon of adverse selection in the case of insurance, but rather there exists a propitious selection. The Propitious Selection Theory assumes that individuals are (to some extent) consistent in their liking for risk physically and financially. Risk avoiders will tend to take physical precautions and seek financial security. Risk seekers will not do a single one (Hemenway, 1990). On the other side median of self-assessed memory skills

among those who were not willing to buy insurance was 4 and among those who wanted to buy it 3 (however, the difference is not statistically significant). If the difference was statistically significant, it would mean that people tend to buy insurance when they think that avoiding loss is more difficult for them.

Experiment III confirms the existence of ex ante moral hazard; the insured tried less hard to avoid loss (consumed less time on learning words) than the uninsured. It was only partially reflected in the results of the game. Uninsured remembered more words, but the difference is not significant. The results are in line with a model proposed by De Donder and Jean (2009). They argue that even if more risk-averse agents are more cautious, in pooling equilibrium, they also buy more insurance. This, in turn, prompts those who are more risk-averse to be less cautious than those who are less risk-averse and who buy less insurance.

In order to cut previous studies limitations, another experiment should be conducted soon. For sure, it will require familiarising the participants with insurance more profoundly. Also, the sample should be enlarged. Instead of asking participants to assess their memory skills, a memory skills test should be conducted. That should lead to obtaining results with less noise and giving empowerment for statistical inference. Also, the hypothesis that when buying insurance, it is not risk aversion, but loss aversion that is at stake seems worth testing.

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## Appendix:

*Attachment I:*

Answer sheet for risk attitude and remembering skill survey (translated from Polish version)

Dear Student,

As part of a scientific experiment, we want to test your attitude to risk. We kindly ask you to complete the survey below according to your true preferences. You have ten decisions to make about whether you would like to participate in Lottery A or Lottery B. In these lotteries you can win extra credits to pass the subject (how many points it depends on the lottery). At the end of the semester, you will draw one of the decision numbers (from 1 to 10) and then you will take part in the lottery that you have chosen in that decision (A OR B), receiving additional credits. The lottery will consist in the fact that from a properly composed pool (depending on which lottery you have chosen) you will draw one ticket, which will indicate the amount of your winnings.

| DECISION | LOTTERY A | LOTTERY B | YOUR CHOICE (A OR B) |
|---|---|---|---|
| 1 | 10% chance for 5 credits<br>90% chance for 4 credits | 10% chance for 9.5 credits<br>90% chance for 0.5 credit | |
| 2 | 20% chance for 5 credits<br>80% chance for 4 credits | 20% chance for 9.5 credits<br>80% chance for 0.5 credit | |
| 3 | 30% chance for 5 credits<br>70% chance for 4 credits | 30% chance for 9.5 credits<br>70% chance for 0.5 credit | |
| 4 | 40% chance for 5 credits<br>60% chance for 4 credits | 40% chance for 9.5 credits<br>60% chance for 0.5 credit | |
| 5 | 50% chance for 5 credits<br>50% chance for 4 credits | 50% chance for 9.5 credits<br>50% chance for 0.5 credit | |
| 6 | 60% chance for 5 credits<br>40% chance for 4 credits | 60% chance for 9.5 credits<br>40% chance for 0.5 credit | |
| 7 | 70% chance for 5 credits<br>30% chance for 4 credits | 70% chance for 9.5 credits<br>30% chance for 0.5 credit | |
| 8 | 80% chance for 5 credits<br>20% chance for 4 credits | 80% chance for 9.5 credits<br>20% chance for 0.5 credit | |
| 9 | 90% chance for 5 credits<br>10% chance for 4 credits | 90% chance for 9.5 credits<br>10% chance for 0.5 credit | |
| 10 | 100% chance for 5 credits<br>0% chance for 4 credits | 100% chance for 9.5 credits<br>0% chance for 0.5 credit | |

**Note that** you do not have to agree to participate in the study. If you agree and complete this questionnaire, you will also have to take part in the second part of the study, which will take place in January. In this case, you will not be able to know the results of your first test until the entire experiment is completed. Don't worry, the second part of the experiment will not make you lose any credits.

I give my consent to participate in the study

Name, Surname, group

Signature

Additionally, please rate how good you are at remembering dates, telephone numbers, etc. on a scale of 1 to 5 (1 being very bad and 5 being very good)

……..

*Attachment II:*

Exemplary table showing how much credits one would get if uninsured (left side) and if insured (right side) with a given number of words remembered for insurance premium 0.2 credits and co-insurance level 10%.

| JEŚLI NIE KUPISZ UBEZPIECZENIA | | | |
|---|---|---|---|
| Zapamiętane słowa | Twój wynik końcowy | Zapamiętane słowa | Twój wynik końcowy |
| 50 | 20 | 24 | 0 |
| 49 | 19 | 23 | 0 |
| 48 | 18 | 22 | 0 |
| 47 | 17 | 21 | 0 |
| 46 | 16 | 20 | 0 |
| 45 | 15 | 19 | 0 |
| 44 | 14 | 18 | 0 |
| 43 | 13 | 17 | 0 |
| 42 | 12 | 16 | 0 |
| 41 | 11 | 15 | 0 |
| 40 | 10 | 14 | 0 |
| 39 | 9 | 13 | 0 |
| 38 | 8 | 12 | 0 |
| 37 | 7 | 11 | 0 |
| 36 | 6 | 10 | 0 |
| 35 | 5 | 9 | 0 |
| 34 | 4 | 8 | 0 |
| 33 | 3 | 7 | 0 |
| 32 | 2 | 6 | 0 |
| 31 | 1 | 5 | 0 |
| 30 | 0 | 4 | 0 |
| 29 | 0 | 3 | 0 |
| 28 | 0 | 2 | 0 |
| 27 | 0 | 1 | 0 |
| 26 | 0 | 0 | 0 |
| 25 | 0 | | |

| JEŚLI KUPISZ UBEZPIECZENIE | | | |
|---|---|---|---|
| Zapamiętane słowa | Twój wynik końcowy | Zapamiętane słowa | Twój wynik końcowy |
| 50 | 19,8 | 24 | 17,2 |
| 49 | 19,7 | 23 | 17,1 |
| 48 | 19,6 | 22 | 17 |
| 47 | 19,5 | 21 | 16,9 |
| 46 | 19,4 | 20 | 16,8 |
| 45 | 19,3 | 19 | 16,7 |
| 44 | 19,2 | 18 | 16,6 |
| 43 | 19,1 | 17 | 16,5 |
| 42 | 19 | 16 | 16,4 |
| 41 | 18,9 | 15 | 16,3 |
| 40 | 18,8 | 14 | 16,2 |
| 39 | 18,7 | 13 | 16,1 |
| 38 | 18,6 | 12 | 16 |
| 37 | 18,5 | 11 | 15,9 |
| 36 | 18,4 | 10 | 15,8 |
| 35 | 18,3 | 9 | 15,7 |
| 34 | 18,2 | 8 | 15,6 |
| 33 | 18,1 | 7 | 15,5 |
| 32 | 18 | 6 | 15,4 |
| 31 | 17,9 | 5 | 15,3 |
| 30 | 17,8 | 4 | 15,2 |
| 29 | 17,7 | 3 | 15,1 |
| 28 | 17,6 | 2 | 15 |
| 27 | 17,5 | 1 | 14,9 |
| 26 | 17,4 | 0 | 14,8 |
| 25 | 17,3 | | |