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On the preference for full-coverage policies: Why do people buy too much insurance?

Zur Shapira [a,*], Itzhak Venezia [b,1]

[a] *Stern School of Business, New York University, 40 West 4th Street #7-06, New York, NY 10012-1126, United States*
[b] *School of Business, Hebrew University, Jerusalem, Israel*

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Abstract

One of the most intriguing questions in insurance is the preference of consumers for low or zero deductible insurance policies. This stands in sharp contrast to a theorem proved by Mossin [Mossin, J. (1968). Aspects of rational insurance purchasing. *Journal of Political Economy, 76*, 553–568], that under quite common assumptions when the price of insurance is higher than its actuarial value, then full coverage is not optimal.

We show in a series of experiments that amateur subjects tend to underestimate the value of a policy with a deductible and that the degree of underestimation increases with the size of the deductible. We hypothesize that this tendency is caused by the anchoring heuristic. In particular, in pricing a policy with a deductible subjects first consider the price of a full-coverage policy. Then they anchor on the size of the deductible and subtract it from the price of the full-coverage policy. However, they do not adjust the price enough upward to take into account the fact that there is only a small chance that the deductible will be applied toward their payments. We also show that professionals in the field of insurance are less prone to such a bias. This implies that a policy with a deductible priced according to the true expected payments may seem ''overpriced'' to the insured and therefore may not be purchased. Since the values of full-coverage policies are not underestimated the insured may find them as relatively better ''deals''.

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* Corresponding author. Tel.: +1 212 998 0225; fax: +1 212 998 4234.
E-mail addresses: zshapira@stern.nyu.edu (Z. Shapira), msvenez@mscc.huji.ac.il (I. Venezia).
[1] Fax: +972 2 588 1341.

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1. Introduction

In a seminal paper, Mossin (1968) showed that under quite common assumptions, full-coverage insurance is not optimal. More precisely, he demonstrated that if the price of insurance is proportional to but higher than the expected payments made by the insurer and if the insured is risk averse, then full coverage is sub-optimal for the insured. He also showed that there exists a policy with a strictly positive deductible, which dominates the full-coverage policy.

Mossin's normative logic stands in contrast to the high demand for full-coverage policies and policies with very low deductibles. For example, almost all liability insurance policies provide full coverage or a zero deductible. Consider also collision damage insurance for rental cars. While specific rates vary by location, a typical collision damage waiver (CDW) for a rental car costs on average $25 per day, which is equal to $7200 on an annual basis. In stark contrast, comprehensive automobile insurance for one's own car does not cost more than $1000 per year in most locations in the US. The difference in price is clearly non-trivial. Why are people willing to pay such high rates for CDW when renting a car?

Another example arises from deductibles on automobile insurance policies. The deductible on automobile insurance is often as low as $100 and almost always below $500, which means that consumers are insured against losses of $500 or less. Cummins and Weisbart (1978) report that when Herbert Denenberg, Pennsylvania's Insurance Commissioner during the 1970s, tried to raise the minimum auto insurance deductible from $50 to $100, he was forced to withdraw this idea by massive consumer outcry.

Merchants who sell various electrical products such as cell phones costing $200 or less also offer insurance against loss, for a non-trivial additional cost. Consumer purchases of such insurance do not seem to be rational even when those policies include a service component. Companies offering such warranty in their service policies stand to make a high profit due to such consumer preferences. According to a Harvard Business School case (see Burns, 2004), to a first approximation Circuit City sold electronics at cost and made its profits on extended warranties.

The situation is even more salient in medical insurance. For example, the US Bureau of Labor Statistics reports that during the years 1994–1997, 34% of full time employees in the private sector enrolled in non-HMO medical care organizations had no deductibles in their medical plans. This percentage rose to 42% for "Preferred provider organizations" (US Department of Labor, 1999). Note also that HMOs typically have zero deductibles.

An attempt to explain the preference for full coverage was offered by Pashigian, Schkade, and Menefee (1966), who used US aggregate data as well as detailed data of automobile insurance purchases in Missouri. They found that the levels of deductibles chosen by clients are too low to be explained by expected utility theory. According to Pashigian et al. these deductibles can be reconciled with expected utility only if the insureds anticipate two or more accidents per year. This figure is considerably higher than the number of accidents actually expected by the average driver. Pashigian et al. conclude that: "the observed selection of deductibles can be explained [only] if there is a systematic tendency

to overestimate the objective probabilities of an accident greater than the deductible." (p. 40).

In light of the difficulty of standard utility theory to explain the demand for low deductibles, Ben-Arab, Briys, and Schlesinger (1996) try to explain "excessive" insurance purchasing by assuming a multi-period habit-formation utility function. This type of utility function introduces a greater desire to smooth consumption over time than a "usual" one-period utility. It therefore gives rise to a higher incentive for insurance purchasing, and tolerance of lower deductibles. Wakker, Thaler, and Tversky (1997) argue that people buy too much insurance since they are averse to probabilistic insurance. Such behavior is not consistent with expected utility maximization. Other researchers such as Braun and Muermann (2004), explain it by aversion to regret.[2] Schoemaker (1976) demonstrates that when faced with decisions described as insurance against hypothetical losses, subjects chose full coverage alternatives over those with deductibles. Nonetheless, when the same choices were framed as lotteries, their choice pattern was reversed.[3] Schoemaker's findings imply that framing affects the way people evaluate insurance alternatives. Likewise, in an elaborate experimental design, Johnson, Hershey, Meszaros, and Kunreuther (1993) find that students preferred insurance alternatives framed as "rebates" rather than as policies with a deductible. Framing clearly affects the way people make choices among insurance alternatives, but there may be other factors at play when people evaluate the monetary value of alternative insurance policies.

In this paper, we provide a new explanation based on the anchoring heuristic for the preference for full coverage and test it experimentally.[4] We argue that the price of a full-coverage policy is a natural starting point for evaluating a policy with a deductible. Insureds continue from this starting point and calculate the price of policies with partial coverage by anchoring on the value of the deductible. In anchoring on the amount itself they neglect to take into account the probabilities associated with actual damages. Since they do not adjust for the probability that damage will actually occur, they end up underestimating the price of such policies. Insurance companies are unlikely to make such errors and hence the prices they set for policies with a deductible may seem unjustifiably high to customers. On the other hand insureds are less likely to underestimate the values of full-coverage policies, and hence they may deem such policies as more adequately priced then the partial coverage policies offered by the insurance companies, and hence prefer them to policies with a deductible.

We used insurance sellers as subjects in the experiments reported in this paper. We assumed that insurance sellers would pay more attention to pricing decisions than buyers would pay to their purchasing decisions. The reason is that sellers need to think of both their potential customers as well as their competitors in making their decisions. However, we have no reason to expect sellers to be less prone to biases such as the anchoring heu-

[2] In personal communications we had, the issue of regret came up very often. Many people expressed the idea that they will have hard time convincing their spouses that they would save money over their life time when they have to pay a high deductible. The extent to which such arguments affect decisions has not been empirically determined however.

[3] In a somewhat related study, Slovic et al. (1977) demonstrate that (contrary to utility theory's explanation of insurance) small expected damage, coupled with a high probability, is seen as more troubling than high expected damage with a small probability of occurring, which has the same expected value.

[4] For a definition of anchoring see Tversky and Kahneman (1974) and Mullainathan and Thaler (2001).

ristic, unless they have had some real experience in selling insurance policies in the past. Research on the insurance behavior of both buyers and sellers indicate that biases in terms of probability assessment that were found in studies of insurance in the context of natural disasters as early as 1977 (see Kunreuther et al., 1978) still persist today.[5]

We conducted three experiments to test our hypothesis. In all these experiments, we asked subjects to play the role of insurance sellers and to price policies with and without a deductible. They competed with other sellers and their objective was to set prices so as to maximize their profits. We compare the prices the subjects set relative to the true expected damages under each policy. We argue that if individuals underestimate the value of a policy with a deductible, the prices they set for policies with a deductible would be low relative to the expected damages covered under full-coverage policies. In the first two sets of experiments, subjects were amateur insurance consumers, and in the third the subjects were professionals in the field of insurance. In all contexts, subjects were requested to price a policy of full coverage and a policy with a specific deductible ($D = 100$ in the first and third experiment, $D = 60$ or $D = 120$ in the second experiment).

The paper is structured as follows. In Section 2, we review some of the literature on anchoring. In Sections 3–5 we present the experiments. The first experiment, presented in Section 3, used Israeli MBA students as subjects. In Section 4 we present the results of the second experiment, which is similar to the first experiment with two variations. First, we added an American sample of MBA students as a test of the generalizability of the results across countries. Second, instead of a single policy with a deductible, we split the sample and presented each group with a different deductible to allow a stronger test of our hypothesis about the effect of anchoring. Section 5 presents the results of the third experiment, in which professionals in the field of insurance were the subjects. Section 6 concludes.

2. Theoretical background

Several studies have shown that when considering the purchase of insurance policies, people do not behave in a rational manner (see, e.g., Kunreuther et al., 1978) and that their choices are affected by framing (Johnson et al., 1993). Shapira and Venezia (1999) show that subjects do not calculate expected damages properly.[6] Granted, at times the evaluation of a policy with a deductible may not be easy. A person renting a car may find it difficult to determine what is covered by his own insurance provider and/or by her credit card company. In such a situation, paying for a few days of collision damage insurance may not seem too expensive and simplifies the decision. As Kahneman and Tversky (1979) reasoned, the unattractiveness of "probabilistic insurance" is related to the desire of people to insure against worries rather than against actual damages. Their discussion highlights the difficulty to conceive of the potential situations that may arise if one does not have full coverage. Consequently, full-coverage policies provide an anchor for think-

[5] Viscusi and Zeckhauser (2006) report that in the aftermath of Hurricane Katrina the majority of a nationally representative sample of respondents in the US underestimated their risks from all hazards and judged them to be below average with only a third of the sample estimating their risks as average.

[6] Shapira and Venezia (1999) also show in similar experimental studies that subjects do not tend to use deductibles for screening purposes.

ing about insurance problems because such policies are easy to envision and the need to calculate expected damages is reduced. When offered a menu of policies with different deductibles, people may find it convenient to think about policies with small deductibles; these are close in price to a full-coverage policy. With high deductibles, people may exhibit a bias that emanates from the anchoring heuristic (cf. Tversky & Kahneman, 1974), that is, in estimating what would be a reasonable price for a policy with a deductible, they often anchor on the deductible amount itself, subtract it from the price of the full-coverage policy and in setting the price of the policy with the deductible they do not adjust the price enough upwards to take into account the fact that actual damage amounts are probabilistic. Thus, we hypothesize that as the deductible increases in value, people anchor on it and their estimate of a reasonable price of such a policy departs to a larger degree than is warranted from the price of the full-coverage policy.

3. Study 1: Pricing of policies with one deductible level (amateurs)

3.1. Subjects

Eighty-five MBA students enrolled in a course in risk management and insurance at the Hebrew University and at the Tel Aviv branch of Manchester University, whose age ranged from 21 to 29 participated in the Experiment. Prior to taking the course and participating in the experiment, the students completed several courses in economics and statistics, and at least one course in finance. The students were told that they would receive a bonus towards their grade based on the profits they generated in the experiment. Specifically, they were told that the top 2%, 5%, and 10% students with the highest profits would receive respectively 4, 2, 1 points, respectively, toward their final grade (on a 100-point scale). Since the students were highly motivated by grades, these rewards were quite attractive.

3.2. Method

The task facing the subjects was framed in the context of selling renter insurance policies and is described in Appendix A. Subjects were requested to determine prices for two possible policies, one providing full coverage, (i.e., a zero deductible, $D = 0$), denoted FC and the other, denoted D (with a deductible $D = \$100$). They could have also elected to price only one policy or none at all. We explained how deductibles work, and reminded them that lower prices induce higher demand, but are less likely to cover losses and provide a profit. We carefully explained to the subjects that their decisions would enter into a simulated market. The clients in the simulated market have damages and claims as described in Appendix A. Subjects were told that based on their prices, the prices of the competitors (which were the other subjects in the experiment), and the decisions of the simulated clients, we would compute profits for each of them. The students were told that the demand was not perfectly elastic, that lower prices would attract higher demand, but that the lowest price would not attract all customers. The profits were calculated as the difference between total revenues (the number of policies sold of each type multiplied by their respective prices) and total claims (simulated by using the number of clients of each type who bought each policy, and their distribution of claims). Each subject made his/her decision on their own and no communication among subjects was allowed.

Our analysis consists of comparing the prices set by the subjects with the true expected values of payments under the policies. We examine whether there is mis-pricing, and if mis-pricing is more common in policies with a deductible than in the full-coverage policies.[7] In order to make profits in this game subjects had to set prices higher than the expected payments. They would set prices lower than the expected payments only if they underestimate these payments. Thus one part of the analysis consists of comparing mis-pricing of the full-coverage policies, if any, with mis-pricing of the non-zero deductible policies.

To better understand the nature of the bias in pricing policies with a deductible we compared the prices of policies with and without deductibles. We hypothesize that the policy with a deductible is evaluated by starting with the value of the full-coverage policy and then adjusting for the deductible. A correct adjustment is to subtract the expected value of deductible non-payments from the value of a full-coverage policy reduce. If the deductible is \$100 and the probability of damage is 10%, then the correct adjustment is \$10 ($\$100 \times 0.1$). A possible error in evaluating a policy with a deductible stems from calculating its value by subtracting the deductible from the value of a full-coverage policy that is, by subtracting the full \$100 rather than its expected value, which yields a gross underestimate of the expected payments. To determine how prevalent this type of error is we counted the number of subjects for whom the difference in price was larger than or equal to the deductible. If the subjects did not err in the calculation, the difference should have been closer to the expected value of the payments they would not receive because of the deductible.

3.3. Results and discussion

Table 1 presents the summary statistics of the pricing of all policies for Experiment 1. We present the average price, P, the maximum price, and the minimum price determined for the two policies the subjects were required to price: policy FC (full coverage, or 0 deductible), and policy D (with a \$100 deductible). We then present in this table the expected payments, E, the insurers (subjects) would have to make to the insureds under each type of policy. Based on these variables, we calculated the expected profitability ratio EPR (P/E), that is, the average price relative to expected payments.

The expected profitability ratios exhibited by the subjects provide an indication of the undervaluation of the policies with a deductible. Note that the average expected profitability ratio of the policies with a deductible is less than 1 showing that they are underpriced, whereas the average expected profitability ratio for the full-coverage policy is higher than 1 (see Table 1). The underpricing of the policies with a deductible is quite pronounced. The average expected profitability ratio is 1.13 for the full-coverage policy compared with 0.64 for the policy with the deductible. Assuming that subjects set prices so as to at least cover their costs, these expected profitability ratios imply that on average subjects undervalued the expected payments they had to make under the deductible policies by at least 36%. In contrast to such striking undervaluation of the policies with a deductible, the prices of the full-coverage policies were more in line with expected payments as the expected profitabil-

[7] Risk aversion could also affect pricing. Since our subjects are sellers who price policies for many clients, this should not affect them directly. They can take into account the risk aversion of their clients; however risk aversion with respect to the loss of a deductible is trivial as the amount at risk is small.

Table 1
Summary statistics of prices of policies of full-coverage (FC, $D = 0$), and deductible policies ($D = 100$), Experiment 1, amateurs

	$D = 0$	$D = 100$
Panel A		
N (Number of contracts)	90	89
Average price (P)	146.6	70.1
Maximum price	288	204
Minimum price	75	20
Standard deviation of prices	33.0	44.6
Expected payments (E)	130	110
EPR (P/E)	1.13	0.64
Panel B: Differences between the two types of policies		
Average difference in price ΔP	75.9	
	Number	Percentage of all subjects
N ($\Delta P > D$)	19	21
N ($\Delta P = D$)	21	24
N ($\Delta P \geqslant D$)	40	45
N ($P_D < E_D$)	60	67
N ($P_{FC} < E_{FC}$)	18	20

Notes:

1. ΔP denotes the difference between the price determined for the full-coverage policy, and for the policy with a deductible.
2. ΔE denotes the difference between the expected payments by the insurer under the full-coverage policy, and under the policy with a deductible.
3. N ($\Delta P > 100$) denotes the number of subjects for whom $\Delta P > 100$.
4. N ($\Delta P = 100$) denotes the number of subjects for whom $\Delta P = 100$.
5. N ($P_D < E_D$) denotes the number of subjects who set a price for the deductible policy lower than the expected payments for this policy, E_D.
6. N ($P_{FC} < E_{FC}$) denotes the number of subjects who set the price of the full-coverage policy lower than its expected value, E_{FC}.
7. EPR is "expected profitability ratio".

ity ratio is about 13% above 1. This suggests that subjects seriously underestimated the expected payments under the policies with a deductible.

To demonstrate the undervaluation of the policies with a deductible in yet another way, we calculate the proportion of subjects who priced this policy for less than the expected damages, E_D. A large proportion, 67%, priced policies with a deductible at less than the expected damages. In contrast, the proportion of subjects who priced the full-coverage policy by less than the expected payments under that policy is only 20%, indicating that subjects are much more likely to underestimate the value of a policy with a deductible than to underestimate a full-coverage policy.

We observe the following common error in valuation. Subjects calculated expected payments under the policy with a deductible by computing first the payments of the full-coverage policy, and then subtracting the deductible of \$100. This led them to underestimate the expected payments since only the expected non-payments of the deductible should have been subtracted from the value of the full-coverage policy. To demonstrate how pervasive this error was, we calculated the proportion of subjects for whom the difference in price between the full coverage and the deductible policy, ΔP, was at least \$100 (that is,

equal or larger than the deductible). We observe from Table 1 that for about 45% of the subjects, the price of the full-coverage policy weakly exceeds that of the policy with the deductible by $100 or more. The difference in expected payments between the two policies is, however, only $20.

4. Study 2: Pricing policies with different deductibles (amateurs)

The purpose of this study was to test the effect of anchoring on the pricing of a policy with different levels of a deductible. We hypothesize that people begin their calculation with the price of the full-coverage policy and then anchor on the amount of the deductible without adjusting enough. Thus, the larger the deductible, the more pronounced is the effect of the mis-adjustment.

4.1. Subjects

The subjects were 39 practicing managers who were enrolled in an executive MBA program in a northeastern university. Their ages ranged from 28 to 45. By the time they participated in the experiment, they have had several courses in economics and finance.

4.2. Method

The method was a replication of the method used in Experiment 1 with two changes. First, the subjects were divided into two groups and the amount of the deductible varied by group. It was $60 for the first group and $120 for the second. In addition, two monetary awards were announced in each group. These were a $50 Barnes and Noble gift certificate for purchasing books for the winner and $25 for the runner up. These two prize categories were announced (and later awarded) in each group.

4.3. Results and discussion

Summary statistics of the pricing of all policies are presented in Table 2. The main results are similar to those of Experiment 1. As in the previous experiment we find that the difference between the prices of the deductible policies and the full coverage are much higher than those justified by the difference in expected values. For the group with $D = 60$ ($D = 120$) the difference in price between the full coverage and the policy with a deductible is 35.88 (117) whereas the difference between the expected values of payments of these policies is only 18 (32). This shows that both groups overcharge for full coverage. Note however, that the lower deductible group overcharges around 100% for eliminating the deductible (they add 35.88 to the price for increasing the expected payments by 18). The higher deductible group overcharges by 265% (they add 117 to the average price for increasing payments by 32).

We also find, as hypothesized, higher measures of mis-pricing to the group with the higher deductible. This can be observed from Panel B of Table 2. Note also that a higher percentage of subjects in this group priced the policy with a deductible by subtracting the deductible from the full coverage. The percentage of subjects for whom the difference in price between the full coverage and the deductible policy is larger than or equal to D, is 55.6% for the group with $D = 120$ as compared to 23.8% for the group with the lower

Table 2
Summary statistics of prices of policies of full-coverage (FC, $D = 0$), and deductible policies ($D = 60$, 120), Experiment 2, amateurs (USA)

	Group 1		Group 2	
	$D = 0$	$D = 60$	$D = 0$	$D = 120$
Panel A				
N (Number of contracts)	21	21	18	18
Average price (P)	161.50	125.62	204.50	87.50
Maximum price	200	250	500	280
Minimum price	100	78	10	5
Std. Dev. prices	36.03	36.28	114.64	80.86
Expected payments (E)	140	122	140	108
EPR (P/E)	1.15	1.03	1.46	0.81
	Group 1, $D = 60$		Group 2, $D = 120$	
Panel B: Differences between the two types of policies (within each group)				
Average difference in price ΔP	35.8		117	
	Number	Percentage of all subjects	Number	Percentage of all subjects
N ($\Delta P > D$)	1	4.8	6	33.3
N ($\Delta P = D$)	4	19.0	4	22.2
N ($\Delta P \geqslant D$)	5	23.8	10	55.6
N ($P_D < E_D$)	10	47.6	10	55.6
N ($P_{FC} < E_{FC}$)	4	19.0	2	11.1

Notes:

1. ΔP denotes the difference between the price determined for the full-coverage policy, and for the policy with a deductible.
2. ΔE denotes the difference between the expected payments by the insurer under the full-coverage policy, and under the policy with a deductible.
3. N ($\Delta P > 100$) denotes the number of subjects for whom $\Delta P > 100$.
4. N ($\Delta P = 100$) denotes the number of subjects for whom $\Delta P = 100$.
5. N ($P_D < E_D$) denotes the number of subjects determining a price for the deductible policy lower than the expected payments for this policy, E_D.
6. N ($P_{FC} < E_{FC}$) denotes the number of subjects determining the price of the full-coverage policy lower than its expected value, E_{FC}.
7. PR is "expected profitability ratio".

($D = 60$) deductible (see Table 2). The group with the higher deductible also has as a higher percentage of subjects underpricing the deductible policy (55.6% vs. 47.6%), but not the full-coverage policy.[8]

In addition to asking the subjects for the prices they would set, we asked them to write down their calculation and the reasons for the particular prices they set for the policies. Their responses provide support for our hypothesis about anchoring on the deductible without sufficient adjustment. Several subjects in the higher deductible condition wrote down their calculation where they literally subtracted the deductible from the price of the full-coverage policy price. One subject wrote: "To make a profit on the full-coverage

[8] These measures of mis-pricing are not independent, however.

policy, according to my calculations I will charge $280. Accordingly, I will charge $180 for the $100 deductible policy." Another subject wrote that "since in the $0 deductible policy the expected payout is $140, I will charge a 20% markup and set a price of $168. For the $120 policy, the expected payout is $20 and with a 10% markup I will charge $22 for it." A subject in the low deductible condition wrote: "To cover the cost of the full-coverage policy I need to charge $140. This price is not competitive though. We know that 70% of the market incurs no claims, and 20% incur small claims. Therefore, I would discount the price to 80% of the initial price and charge $112. For deductibles with $60, I would charge $80." Finally, a couple of subjects commented in their responses that "no one will buy the $120 deductible policy but many will buy the $0 deductible one."

Note that we did not test whether the subjects in our experiments were profit maximizers, We were just trying to determine whether the subjects were prone to the anchoring bias. They were rewarded according to the profits they made so there is no reason to assume that they would have set prices that would harm their profits. Some of the subjects, mainly those who proved to be prone to the anchoring bias, lost money because of this predisposition. However, from the subjects' written answers and explanations about the calculations they made we are able to infer that they were using a cost-plus strategy and tried to maximize their profits. Unfortunately for those who miscalculated the probabilities due to the anchoring bias, this strategy ended in losses.

5. Study 3: Pricing of policies by professionals

5.1. Subjects

All 26 subjects participating in this study were insurance practitioners, ranging in age from 30 to 55 years and possessing at least 5 years of experience in the industry. Their job titles included insurance agent, supervisor of insurance agents, underwriter, and owner of an insurance agency. The subjects were enrolled in classes at the College of Insurance in Tel-Aviv, Israel, pursuing advanced courses in Insurance. They completed the task during the first 30 minutes of a regular class session.

5.2. Method

The method essentially replicated the method of the first experiment.

5.3. Results and discussion

The results are presented in Table 3.

The table displays the same statistics as Tables 1 and 2. In the case of the professionals, policies with a deductible are not as underestimated (if underestimated at all) as in the case of amateurs. The average expected profitability ratio of the policies with the deductible are well above 1 although lower than the average expected profitability ratio for the full-coverage policies. The difference between the average expected profitability ratio of the full-coverage policies and the deductible policies is .20 (1.46 − 1.26) for the professionals as compared with .49 (1.13 − .64) for the amateurs (see Tables 3 and 1 respectively). Pricing of the policies below the expected payments was also less common among professionals. Only about 27% priced deductible policies lower than the expected value, as compared

Table 3
Summary statistics of prices of policies of full-coverage (FC, $D = 0$), and deductible policies ($D = 100$), Experiment 3, professionals

	$D = 0$	$D = 100$
Panel A		
N (Number of contracts)	22	26
Average price (P)	190.3	138.3
Maximum price	550	500
Minimum price	60	25
Standard deviation of prices	106.1	103.7
Expected payments (E)	130	110
EPR (P/E)	1.46	1.26
	$D = 0$	$D = 100$
Panel B: Differences between the two types of policies		
Average difference in price ΔP	55.2	
	Number	Percentage of all subjects
N ($\Delta P > D$)	4	18.2
N ($\Delta P = D$)	3	13.6
N ($\Delta P \geqslant D$)	7	31.8
N ($P_D < E_D$)	6	27.3
N ($P_{FC} < E_{FC}$)	5	22.7

Notes:

1. ΔP denotes the difference between the price determined for the full-coverage policy, and for the policy with a deductible.
2. ΔE denotes the difference between the expected payments by the insurer under the full-coverage policy, and under the policy with a deductible.
3. N ($\Delta P > 100$) denotes the number of subjects for whom $\Delta P > 100$.
4. N ($\Delta P = 100$) denotes the number of subjects for whom $\Delta P = 100$.
5. N ($P_D < E_D$) denotes the number of subjects determining a price for the deductible policy lower than the expected payments for this policy, E_D.
6. N ($P_{FC} < E_{FC}$) denotes the number of subjects determining the price of the full-coverage policy lower than its expected value, E_{FC}.
7. EPR is "expected profitability ratio".

with 67% of the amateurs. The proportions of subjects for whom the difference in price between the full coverage and the deductible policy is larger than or equal to 100 is smaller among the professionals, 31.8%, as compared with 45% for the amateurs. This indicates that although some professionals made the same evaluation error as the amateurs, this phenomenon is much less pervasive among the professionals.

Observing that the professional sellers seem to be "more rational" it is interesting to explore whether and how they could exploit their superior knowledge. Even if the sellers expect the buyers to underestimate the expected damages associated with a policy with a deductible, they would never set a price for a policy with an EPR < 1, since such prices would lead them to losses. Suppose however that not all buyers are homogeneous and asymmetric information between sellers and buyers exists about the risk level of the buyers. The sellers could then, under certain circumstances, use this knowledge to attract the lower risk customers. They could device a menu of contracts, some with a deductible and one of full coverage all with an EPR > 1 that would induce buyers to self select; the lower

risk individuals would select contracts with a deductible and the higher risk buyers will choose the full-coverage contract.[9]

6. General discussion

Our results show that amateurs tend to underestimate the value of policies with a deductible. This bias occurs because subjects are inclined to estimate the value of such policies by calculating the value of an equivalent full-coverage policy, and then subtracting the deductible. In this case, the higher the deductible, the higher the undervaluation of the policy. This bias emanates from subjects' tendency to anchor on size of the deductible without adjusting enough. The findings suggest that in purchasing insurance policies subjects' behavior is affected by the anchoring heuristic (Chapman & Johnson, 2002; Kahneman, 1992), which leads consumers to purchase insurance with low or no deductibles.

According to Epley and Gilovich (2006) the anchoring literature deals either with a "phenomenon" (namely, estimates gravitate toward an anchor) or with a "process" where people adjust their final estimates from an initial anchor. They further argue that true insufficient adjustments occur when people adjust insufficiently from values they "generate themselves as starting points from values known to be incorrect but close to the target value." (p. 312). The authors claim that such self-generated anchors help simplify the complex cognitive process involved in making judgments. Along these lines, it appears that our subjects might have gone through a similar process. They were not provided with an anchor but the amount of deductible was construed by them as a good enough estimate for the price of a policy with a deductible even though they did not verify that it was the correct value. It definitely helped them come up with a plausible value without engaging in an effortful evaluation and they figured out that the error, if existed, could not be substantial.

We also find that in comparison with amateurs, professionals are less likely to exhibit the above bias. Professionals are likely to value and price deductible policies correctly (i.e., according to the true expected payments), whereas the general public (amateurs) may find the prices the professionals set for policies with a deductible to be too high compared with their own underestimated expected payments. Note that the professionals in our studies had a similar academic background to that of the amateurs. Yet, the professionals' experience helped them perform better than the amateurs in the present quantitative experimental setting. Possibly, the professionals' experience in the field minimizes the tendency to anchor on the deductible when evaluating policies with deductibles.

The preference of subjects for low deductibles is often interpreted as an indication of high-risk aversion. Our results suggest that such behavior can also result from cognitive biases. One may argue that such a bias may not have significant effects on market behavior since the more sophisticated insurance sellers may eventually lead the market to a more rational equilibrium. The truth may actually be the opposite. Even if professional insurance sellers are (relatively) immune from this bias, the fact that amateur consumers are affected by it has direct implications since two sides are needed for market transactions. A real life example can illustrate this argument. During the time we ran one of the exper-

[9] We thank an anonymous referee for suggesting this argument but defer a fuller analysis of this line of reasoning to future research as it is outside the scope of this paper.

Table 4
Advertised prices for automobile insurance for Toyota Corolla 2004

Deductible	Policy price	No. of students choosing	Percent of students choosing
137	928	8	18.6
180	893	3	7.0
245	851	11	25.6
396	775	9	20.9
579	719	6	14.0
746	658	6	14.0

Note: All values are in $US. We converted the Israeli Shekels prices to $US according to the exchange rate (4.33IS = 1US$) that prevailed on the day the prices were published, December 28, 2003.

iments, the Direct Insurance Corporation, one of the largest insurance companies in Israel advertised insurance rates for car owners. The advertised rates for policies with different levels of deductible for a $30,000 2004 Toyota Corolla, for drivers whose age was 25 or higher, are displayed in Table 4.

We used those publicly advertised rates and circulated a survey among MBA students enrolled in a graduate course on "Risk management and insurance" at the Hebrew University. We asked the students to indicate what level of coverage they would choose if they had a car of a similar value and were offered those rates. Forty three students responded to the survey. Twenty-two of them (51%) chose the lower three levels of deductible. Note that in raising the deductible from $137 to $180, an increase of $43, the insured saves $35. Practically, unless the insured is certain that he or she will have an accident, or is extremely risk averse; the lower deductible is not a highly valued alternative. By increasing the deductible from $180 to $245, an increase of $65, the insured saves $42; again unless there is a very high probability of an accident (71%), the higher deductible is more reasonable. We do not have data on the percentage of insureds that buy policies at each level of deductible from the Direct Insurance Company, but it is reasonable to assume that if the insurer advertised this price list, there was demand for all those deductibles.

The fact that the insureds in our sample failed to comprehend the implications of the alternatives presented to them has direct market implications. It also complements other studies where investors made costly mistakes, such as in the study of Benartzi and Thaler (2002). Our findings have some ramifications both from the point of view of consumer groups and from the perspectives of regulators in the insurance industry. In the Benartzi and Thaler (2002) study investors appear not to have well defined preferences as their choices depend on irrelevant alternatives, and hence intervention in this market may be desirable. Whereas in their study the bias is due to framing, in our experiments as in Choi, Laibson, Madrian, and Metrick (2004), the bias stemmed from anchoring. A similar argument has been proposed by Gneezy, List, and Wu (2006) who showed that in certain situations subjects preferred the worst outcome of a lottery over the lottery itself. They attribute their finding to the uncertainty effect and claim that in some situations of uncertainty people tend to discount lotteries for uncertainty in a manner similar to the one we discussed above. Finally, the current findings may also be useful in analyzing behavior in other areas where high risk aversion is invoked as an explanation, such as the issue of the risk premium puzzle (Mehra & Prescott, 1985, 2003). Future research should examine whether bounded rationality and computational limitations can further our understanding of behavior in other financial puzzles.

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Appendix A. Selling insurance

Assume that you are an insurance agent. You were offered an opportunity of making a bid for insuring rental apartments through a large organization in the city ($N = 1000$). Basically, if your bid is accepted you'll be able to sell policies to these 1000 employees (who will buy *personal* insurance from you) covering their personal belongings in the apartments they rent, against fire and theft.

Assume that the probabilities of damages that these employees may incur (based on their previous insurance records) come from the following two distributions:

A		B	
Loss ($)	Probability	Loss ($)	Probability
0	0.70	0	0.90
100	0.20	100	0
1200	0.10	1200	0.10

You *cannot* know which distribution a particular employee "comes" from; the company told you that 75% of the employees "come" from distribution A and 25% from distribution B.[10]

What would be the prices you'd charge? Recall that there is competition (other agents can come with more attractive offers). At the same time, in setting the price of the policy you should not forget the potential claims. Expected claims are affected by the policy an employee buys as well as the distribution he "comes" from. Employees are free to choose between the offered policies and may also decide not to buy any policy.

Please note that if you price the policy(ies) too high you may have no demand. On the other hand, if you price them too low you may eventually lose money. This potential deal is very important to you as insurance business is declining. Think and decide!

Policy 1: A deductible of $100
Policy 2: A deductible of $0

[10] In Experiments 1 and 3, for about half of the subjects, the sentence read as above, for the other half the sentence said that 25% of the employees "come" from A and 75% from B. In Experiment 2 we presented the subjects only with distribution A.

Decision

Policy 1: sell/no sell at price $___ each
Policy 2: sell/no sell at price $___ each

Please explain your decision:

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