Morals and Markets

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The possibility that market interactions may erode moral values is a long-standing, but controversial, hypothesis in the social sciences, ethics and philosophy *(1-7)*. To date empirical evidence on decay of moral values through market interaction has been scarce. This paper presents controlled experimental evidence on how market interaction changes the valuation of harm and damage done to third parties, i.e., to those who suffer from trade but who are not trading themselves. The context we study is the trade-off between life and money. Subjects decide between the life of a mouse and receiving a monetary amount. We compare individual decisions about killing the mouse to decisions made in a bilateral and a multilateral market. In both market situations, the willingness to kill is substantially higher than in individual decisions. Furthermore, in the multilateral market, prices for life deteriorate tremendously. In contrast, for consumption choices that do not have a moral dimension, differences between individual and market institutions are small.

It is a pervasive feature of market interactions that trade imposes costs on uninvolved third parties. Producing and trading goods often creates negative externalities, such as detrimental working conditions for workers, possibly associated with reduced life expectancy, or child labor, or suffering of animals, or environmental damage. People buying such goods often seem to act against their own moral standards. The risk of moral decay through market interaction has been discussed in politics, ethics and in the social sciences *(1-7)*. Observing that with technological progress and the increasing ubiquity of market ideas, markets continue to enter further and further domains of our social life *(8)*, political philosopher Michael Sandel has recently reemphasized this critique stating that "we have to ask where markets belong – and where they don't. And we can't answer this question without deliberating about the meaning and purpose of goods, and the values that should govern them." *(9)* It has also been argued that institutions may influence preferences in general *(10-12)*. However, due to lack of counterfactual field observations, evidence on deterioration of moral values in markets is scarce. This study provides controlled experimental evidence that market interaction affects the willingness to accept severe, negative consequences for a third party.

Our paradigm for studying moral values and detrimental effects on third parties is the trade-off between life and money. In our main treatments, subjects faced the decision to either receive no money and to save the life of a mouse, or to earn money and to kill a mouse. Sacrificing life for money is well suited for studying moral conflict. While the content of morality is culturally determined and time and space contingent, there exists a basic consensus that harming others in an unjustified and intentional way is considered as immoral *(13)*. Moreover, trading-off life for money is a drastic and irreversible decision, which differentiates our paradigm from experiments involving only monetary transfers.

In all treatments of the experiment, which was approved by the Ethical Committee of the University of Bonn, subjects were explicitly informed about the consequences of their decision. They knew that their mouse was a young and healthy mouse, which in case it survived would in expectation live for about two years in an appropriate, enriched environment, jointly with a few other mice. For illustrative purposes, we presented subjects the picture of a mouse on an instruction screen (Fig. S1). The instructions also informed subjects explicitly about the killing process, in

case they decided to kill their mouse. As part of the instructions we also presented subjects a short video, which showed the gassing process *(14)*.

The mice used in the experiment were so-called "surplus" mice: they were bred for animal experiments, but turned out to be unsuited for study, e.g., because some specific gene manipulation had failed. They were perfectly healthy, but keeping them alive would have been costly. While it was true that the mice would live or be killed based on the decisions of subjects in the experiment, the default for this population of mice was to be gassed, as is common practice in laboratories conducting animal experiments. Subjects were informed explicitly about the default in a post-experimental debriefing *(15)*. Mice that were chosen to survive due to subjects' decisions were purchased by the experimenters and kept in an appropriate, enriched environment. Thus, these mice survived precisely as stated in the instructions. As a consequence of our experiment, many mice that would otherwise have died were saved. To ensure credibility, we stated right at the beginning that all statements made in the instructions are true, as is standard in economic experiments, and that all consequences of subjects' decisions are implemented exactly as stated. We emphasized orally that the experimenters personally guarantee the truthfulness of the instructions. Moreover, in the instructions subjects were told that they could verify the correctness of all statements some time after the experiment. They were also invited to send us an email if they wanted to discuss the experiment.

Markets are institutions where sellers and buyers can trade items. Trade occurs whenever a seller and a buyer agree on a price. For our main result, we analyzed three different conditions (see Table S1): an individual treatment where subjects decided between the life of their mouse and a given monetary amount, a bilateral trading market and a multilateral trading market. Decisions made in the individual treatment reflect the nature and prevalence of moral values attached to the life of a mouse in the population of interest. The individual treatment serves as a benchmark and comparison standard for decisions made in market interactions. The bilateral market is the most basic form of a market situation with one buyer and one seller bargaining over prices in order to trade. The multilateral market resembles a stock-exchange-like situation with many buyers and many sellers who can potentially trade with each other *(16)*.

In the individual treatment, subjects faced a simple binary choice, labeled Option A and Option B. Option A implied that the mouse would survive and that the

subject would receive no money. Option B implied the killing of the mouse and receiving 10 euros. This treatment informs us about the fraction of subjects who are willing to kill the mouse for 10 euros. 124 subjects participated in this treatment.

To study markets we implemented the so-called double auction market institution, which is widely used in economics to investigate market outcomes *(17)*. In the bilateral double auction market, one seller and one buyer bargained over killing a mouse for a total gain of 20 euros that the two parties could split up between themselves. The seller was endowed with a mouse. As in the individual treatment, he or she was explicitly told that the "life of the mouse is entrusted to your care". Bargaining over the 20 euros was conducted during a continuous auction, i.e., buyer and seller could make as many price offers as they liked. Price offers had to be between 0 and 20 euros and were entered on a screen. On the same screen the buyer and the seller were informed about any price offer of the other party. A trade occurred if a buyer accepted a price offer of the seller and vice versa. To accept a price offer subjects had to click on the respective offer and to press an accept button. A buyer and a seller could trade only once per period. If a buyer and a seller agreed on a trade, the buyer received 20 euros minus the price agreed upon. The seller received the price. In addition, the mouse of the seller was killed, reflecting a situation where trade takes place to the detriment of a third party. If a seller or a buyer did not trade, earnings for both were zero and the mouse survived. Note that a seller in the bilateral market was in the same situation as a subject in the individual treatment in the sense that he or she could either refuse a monetary amount or accept a monetary amount and kill a mouse. However, subjects *bargained* over prices in the market treatment. Subjects were told that no market participant was forced to make price offers or to accept an offer, that their mouse would be killed only if a trade occurred, and that the mouse would survive if they decided not to trade. Following the standards in experimental economics, we used the stationary replication method, which allows for learning and for studying emergence of behavioral equilibria (*17*). In total there were ten periods, which lasted three minutes each. Each period, buyers and sellers were randomly and anonymously matched in pairs. The outcome of one randomly selected period was implemented. All rules of the experiment, including consequences for mice, were common knowledge. Control questions ensured that all participants had fully understood all details of the experiment. 72 subjects participated in this treatment.

The multilateral double auction market treatment was exactly like the bilateral market treatment, except that in this condition seven buyers and nine sellers bargained over prices. The nine sellers were all endowed with one mouse each. Subjects on both sides of the market could make as many price offers as they wished. Likewise, all subjects could accept a price offer from the other side of the market. All available price offers of both market sides were always shown on a screen. Once a price offer of a trader was accepted, all other outstanding offers of this trader were immediately removed from the market such that they were no longer available. Each trader could trade only once per period. As in the bilateral market, trading implied the killing of a mouse. There were ten periods, which again lasted three minutes each. One of these periods was randomly drawn and implemented. We ran six sessions with a total of 96 subjects.

To allow for further analyses we ran an additional individual treatment, the individual price-list treatment. Here we elicited the monetary amount needed to pay individual subjects to make them indifferent between killing and receiving money (see below). To provide a benchmark in terms of how market interaction affects non-moral values, we also ran an individual price-list treatment and a multilateral market treatment for a consumption good. Finally, we ran two further control treatments based on the individual treatment (see below). In sum we ran nine treatments with a total of 787 subjects.

Our key hypothesis was that markets would display a tendency to erode moral standards, relative to individual decision-making, due to three essential features of market interactions. First, in markets it takes two people who agree on trading to complete a trade, implying that responsibility and feelings of guilt may be shared *(18)*. Second, market interaction reveals social information about prevailing norms. Observing others trading and ignoring moral standards may make the pursuit of self-interest ethically permissible, leading further individuals to engage in trade *(19, 20)*. Third, markets provide a strong framing and focus on materialistic aspects such as prices, bargaining, and competition, and may divert attention from possible adverse consequences and moral implications of trading *(11, 21)*.

These three features are present in all markets, even in simple bilateral trading. In addition, in the multilateral market with its presence of competing sellers, the notion of being pivotal may be diffused as well *(22)*; unless a seller cares specifically about his *own* mouse, he may argue that if he does not trade his mouse with some

buyer, another seller may conclude the trade with that buyer, selling and killing his mouse. This common feature of markets may make subjects feel less responsible, rendering it more difficult to sustain moral values even if values per se would remain unchanged. In sum we therefore expected a higher willingness to kill in the bilateral and the multilateral market compared to individual decision-making. In addition, due to notions of being less pivotal, the killing rate was expected to be even higher in the multilateral than in the bilateral market. We further hypothesized that the decay of moral values would also be reflected in prices, such that mice would be killed for lower prices in the market treatments compared to the individual benchmark. Finally, we studied markets where the cost of trading involves opportunity costs of consumption rather than moral costs. For these consumption good markets, we hypothesized no decline of values through market interaction.

Figure 1 shows our main result. Given our interest in studying the effects of institutions on moral valuations in a given population, we compare the fractions of subjects who are willing to agree to the killing in the individual decision treatment, the bilateral market and the multilateral market for monetary amounts below or equal to 10 euros *(23)*. For both markets, fractions are calculated using the lowest prices accepted by sellers in actually concluded trades. We focus on lowest accepted prices to approximate from above sellers' reservation values for killing a mouse. In the individual decision treatment 45.9 percent of subjects were willing to kill their mouse for 10 euros. In contrast, 72.2 percent of sellers in the bilateral market were willing to trade for prices below or equal to 10 euros. This is an increase of 57.1 percent relative to the individual decision treatment, a difference that is highly statistically significant ($p<0.01$, $n=160$, Two-sample test of proportions) *(24)*.

As hypothesized, the increase in willingness to kill is even more pronounced in the multilateral market (see Fig. 1). 75.9 percent of sellers were willing to kill a mouse for less or equal to 10 euros in this treatment. This is actually a lower bound, since in a given period, only seven of the nine sellers were able to trade at all. Compared to the individual decision condition this amounts to an increase of 65.2 percent, which is highly significant ($p<0.01$, $n=178$, Two-sample test of proportions).

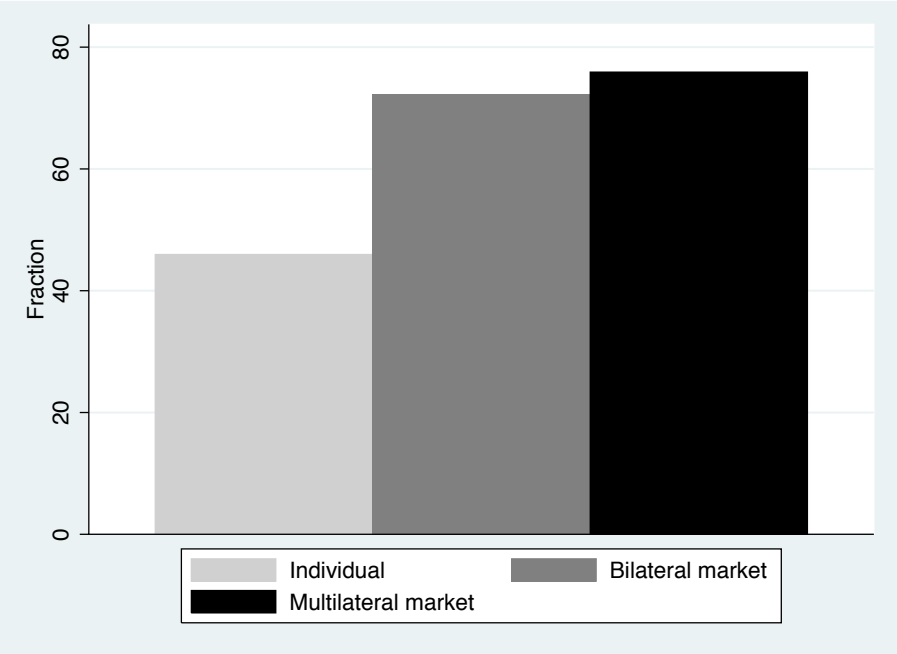

Figure 1: Market interactions display a tendency to erode moral values, relative to individually stated preferences: fractions of subjects who are willing to kill a mouse for monetary amounts below or equal to 10 euros in the individual decision treatment, the bilateral market and the multilateral market. For both markets, fractions are calculated using the lowest prices accepted by sellers in actually concluded trades. Differences between markets and the individual treatment are significant at the 1-percent-level.

To provide a more detailed understanding of the effects of markets on morals, we implemented an additional individual treatment, the individual price-list treatment. This treatment informs us about how much money subjects would need to receive in the individual condition to yield a similarly high killing rate as in markets. In this treatment, subjects faced an increasing price-list, which is a standard procedure for eliciting individual values and preferences in an incentive compatible way. As in the individual treatment, subjects were shown a list of binary alternatives, labeled Option A and Option B. Option A implied that the mouse would survive and that the subject would receive no money. Option A was the same in each decision row. Option B implied the killing of the mouse and the receipt of a monetary amount. Monetary amounts associated with killing the mouse increased from row to row, starting from 2.50 up to 50 euros, in steps of 2.50. Subjects were informed that one choice situation would be randomly selected after all choices had been made. The choice in this situation would be implemented, including payment consequences and, in case Option B had been chosen, the killing of the mouse. The switching point from Option A to

Option B informs us about the minimum monetary amount that makes a subject willing to kill the mouse, i.e., the moral value attached to the life of the mouse. The earlier a subject switches, the less he or she values the life of his or her mouse relative to earning money. Note that despite differences in elicitation procedures, including randomness of the selected choice, the fractions of subjects willing to kill for 10 euros or less was almost identical between the individual and the individual price-list treatment (45.9 vs. 42.7 percent of subjects, respectively, p=0.636, n=220, Two sample test of proportions). 96 subjects participated in the individual price-list treatment.

As shown above, in the bilateral trading market 72.2 percent of sellers were willing to trade for prices below or equal to 10 euros. In comparison, in the individual price-list treatment a similarly high willingness to kill (71.9 percent) was reached only for monetary amounts of 47.50 euros. Thus it is necessary for subjects to receive considerably more money in the individual than in the market condition in order to observe a comparable willingness to kill. Turning to the multilateral market a similar picture emerges. Here the killing rate was 75.9 percent for prices below or equal to 10 euros. A similar rate in the individual price-list treatment would require monetary amounts above 50 euros. This follows from the observation that in the latter treatment 27.1 percent of subjects were unwilling to kill their mouse for the maximum offered monetary amount of 50 euros, i.e., they were willing to forgo at least 50 euros rather than to kill the mouse *(25)*. Actual prices in the multilateral market were much lower than 10 euros, however (see Fig. S2). The overall average price level was only 5.1 euros and the average number of trades per period was 4.9. This equals a trading probability of 70 percent, relative to the maximum possible number of seven trades. In comparison, in the individual price-list condition the fraction of subjects who were willing to kill the mouse for 5 euros was only 34.4 percent. Thus, for prices that have actually evolved in the multilateral market, the killing rate was more than twice as high as in the individual price-list condition. Moreover, to reach a similarly high killing rate in the individual price-list condition (70.8 percent) as in the multilateral market, subjects would have to receive 45 euros rather than 5.1 euros (average actual price in the market).

The price-list treatment can also be used to illustrate the decay in valuations in terms of the predicted fraction of trade. Suppose valuations in the price-list condition and the bilateral market were the same. This would imply that valuations in the price-

list treatment could be used to predict the trade fraction in the bilateral market. To derive such a prediction we randomly drew values for hypothetical buyer-seller pairs from the distribution of values in the price-list treatment *(26)*. A seller valuation is just the drawn value, whereas the valuation of a buyer is 20 euros minus the drawn value. Trade is predicted to occur if the resulting buyer valuation exceeds the seller valuation. We randomly drew one million times, which resulted in a predicted trade probability of 25.9 percent. Put differently, in most cases trade should not occur because the respective buyer and seller would not be able to realize gains from trade. In sharp contrast to this prediction, the actual trading probability in the bilateral market averaged over all 360 periods amounts to 47.7 percent. Relative to the predicted level, this corresponds to an increase of 84.2 percent ($p<0.01$, $n=168$, Two-sample test of proportions), and indicates that valuations for mice have declined considerably.

The final step of the analysis compares decay in moral vs. non-moral values. We hypothesized that for moral values the decay is more pronounced than for private consumption values where trading involves opportunity costs of consumption rather than costs to third parties. To test this we ran two additional treatments, identical to the multilateral market and the individual price-list treatment but using consumption goods. The good we considered was a coupon that could be used to buy products at the university shop of the University of Bonn *(26)*. In both treatments, the price-list and the market treatment, subjects were endowed with a coupon. In case they accepted a monetary amount (in the price-list condition) or decided to trade (in the market condition) they had to return their coupon, which was then invalidated. Parameters, instructions and procedural details were identical to the mice treatments. Thus, consequences were similar in the mouse and the coupon treatments, except that in the latter the cost of trading involved opportunity costs of consumption rather than moral costs, i.e., loss and invalidation of a coupon vs. killing of a mouse.

To assess the effect of markets on moral vs. private consumption values, we use valuations from the individual price-list conditions and compare them to valuations in the respective multilateral markets *(26)*. The dependent variable is a subject's minimum trading price. Running Tobit and interval regressions we find that in the mice treatments there is a strong negative and statistically significant effect of market interactions. This implies that for a given monetary amount, subjects reveal a higher willingness to kill in markets than in the individual condition. For coupons the

effect of markets is much smaller and insignificant. In the mice market we also observe a negative and significant price dynamic with average prices declining from 6.4 euros in period one to levels as low as 4.5 euros in the final period (see Fig. S2). No price trend is observed in the coupon market. The downward trend in the mice market is suggestive of social learning and endogenous social norm formation. Intuitively, observing low trading prices in the market may make it normatively acceptable to offer or accept low prices as well. Interestingly, if traders seek to update the prevailing social norm from offered prices, markets generally tend to foster social learning that leads to a decline in valuation: among all market participants, those with lowest values make price offers and trade most frequently while those who object to trading are not active in the market at all. Given the salience of prices it is plausible that subjects focus on prices and therefore update prevailing social norms from the lower part of the value distribution. While *prices* decline in the multilateral market, trade volumes in both bilateral and multilateral markets are constant across periods. If we regress the trading probabilities of sellers on a linear time trend (period), the period coefficient is not statistically different from zero, confirming that trade fractions are intertemporally stable (Probit regression, $p=0.656$ for multilateral and $p=0.530$ for bilateral market, clustering on session level, respectively).

In sum, the analysis reveals a systematic difference between markets involving moral vs. private values. Using identical procedures, parameters and market institutions, we find that moral values erode significantly more than consumption values.

In the following we discuss four potential concerns that may be raised with respect to our main finding. First, one could argue that we observe the main treatment effect because total surplus was greater in markets than in the individual condition (20 vs. 10 euros). If traders dispose of social preferences, they may have cared not only about their own payoff but also attached some value to the payoff of the other trader (buyer). We therefore ran a control condition, which was identical to the individual condition but in which we introduced a second passive participant. 116 subjects took part in this control treatment with 58 subjects participating in the role of active decision makers. A passive participant received 10 euros if the active participant decided to kill the mouse (such that the death of a mouse generated a total surplus of 20 euros as in the market treatments). The observed fraction of killing

among subjects in the active role is 44.8 percent. This fraction is significantly different to fractions in both market conditions (bilateral market, p=0.009, n=94, and multilateral market, p=0.001, n=112, Two sample test of proportions). Furthermore, this fraction is remarkably similar to the individual condition (p=0.890, n=182, Two sample test of proportions). While this finding does not rule out the presence of social preferences (in fact, responses to a questionnaire measure of altruism elicited at the end of the experiment are positively correlated with reservation values for killing mice *(27)*), it implies that our main finding is not driven by concerns about total surplus or altruistic concerns of sellers towards buyers.

Second, subjects may have perceived killing the mouse as a *side-effect* of the act of trading in the market treatments, while in the individual treatment subjects may have perceived killing the mouse as a direct *means* to earn money. If this were the case subjects may have found it more difficult to opt for killing in the individual treatment. We therefore ran another control treatment identical to the individual treatment but in which subjects could buy a lottery ticket for two euros. This renders it more likely that subjects perceive the mouse death as a side-effect of a buying decision. The lottery paid out either 10 or 15 euros, respectively, both with 50 percent probability. We chose an expected net value of 12.50 – 2 = 10.50 euros to compensate for possible risk aversion of subjects. If subjects bought the lottery ticket, a mouse got killed "as another consequence" of the buying decision, i.e., as a side-effect. 43 subjects participated in this additional control condition. Again, outcomes are very similar to those in the individual condition: 46.5 percent of subjects decided to buy the ticket accepting the killing of a mouse. This fraction is significantly different to fractions in both market conditions (bilateral market, p=0.021, n=79 and multilateral market, p=0.003, n=97, Two sample test of proportions). Unsurprisingly, the killing rate is not significantly different from the individual condition (p=0.946, n=167, Two sample test of proportions).

Third, let us comment on why we used the minimum trading price as our main dependent variable to assess a seller's willingness to kill a mouse in markets. Very likely, traders tried to negotiate higher prices than their reservation values in order to realize positive gains from trade. This should be the case for any market situation with information rents in which reservation values are private, as in our case. For example, a seller in the bilateral market with a reservation value of 5 euros is unlikely to actually trade at 5 euros. Instead, he should try to negotiate higher prices. We

therefore think that concluded prices provide an upper bound for the sellers' reservation values.

One may argue that using the minimum concluded price could bias results if sellers made *mistakes*, erroneously agreeing to trade at prices lower than they would have actually liked to accept. We believe that it is unlikely that traders made such mistakes because trading involved a deliberate decision to accept or make offers. Yet, accounting for this possibility we also calculated median values of concluded trading prices below or equal 10 euros. The corresponding killing fractions are 67 percent for the bilateral market and 76 percent for the multilateral market, very similar to the ones reported in Figure 1. These fractions are statistically significantly different from the individual condition ($p=0.029$ for bilateral market and $p<0.001$ for multilateral market, Two sample test of proportions).

Fourth, one may object that in focusing on lowest concluded prices, we concentrate on a single period when in fact sellers could be active in ten periods. For example, one may question to classify a trader as "willing to kill" if he traded only once within ten periods. We therefore checked for trading frequencies on an individual level. Aggregating over both markets (bilateral and multilateral) we find that *all* but three sellers traded at least *four* times within the ten periods. Furthermore, we evaluated the very first period of the market treatments to assess the willingness to kill in another way: looking at concluded trades *and* offers (below or equal 10 euros), the fractions of sellers willing to trade for 10 euros or less amounts to 66.7 percent in the bilateral market and 77.8 percent in the multilateral market. This shows that right from the beginning in the market treatments moral standards are lower than in the individual condition. Moreover, the *intention to trade* is likely to be much higher than reflected by concluded trades only as offers needed to be accepted by other traders. In sum, effects of market interaction on moral outcomes are substantial, robust and are observed already in the very first period of market trading.

We would like to stress another aspect of our results: following the methodological standards in economic experiments, it was essential to incentivize subjects' decisions in the individual condition, i.e., subjects needed to receive money according to their decisions. Otherwise a comparison with market outcomes would have been misleading. For subjects, it would be "cheap" to claim that they are moral if being moral costs nothing. The comparison of the individual treatment with markets did therefore not involve paying money vs. not paying money. Yet, note that

introducing a money prime may already lower moral standards, as several studies have pointed out *(28)*. Hence, the impact of markets on moral behavior may be even more pronounced than our study suggests.

We have shown that market interactions display a tendency to lower moral values, relative to individually stated preferences. This phenomenon is pervasive. Many people express objections against child labor, other forms of exploitation of the workforce, detrimental conditions for animals in meat production or environmental damage. At the same time they seem to ignore their moral standards when acting as market participants, searching and buying the cheapest electronics, fashion or food, and thereby consciously or subconsciously creating the undesired negative consequences to which they generally object. We have shown that this tendency is prevalent already in very simple bilateral trading where both market sides are fully pivotal in the sense that if they refuse to trade, the mouse will stay alive. In markets with many buyers and sellers, diffusion of being pivotal for outcomes adds to moral decay. This "replacement" logic is a common feature of markets and it is therefore not surprising that the rhetoric of traders often appeals to the phrase that "if I don't buy or sell, someone else will".

In the experiment subjects were fully aware of the consequences of their decisions. Our findings therefore suggest that appealing to morality has only limited potential for alleviating negative market externalities. For example, anti-child-labor or environmental campaigns may not be that effective because markets for goods undermine the relevant social values. The results also suggest why societies do ban markets for certain "repugnant" activities *(29)*. Historically, dispute about the marketability and the appropriateness of markets have led to some of the most fundamental upheavals within modern societies. For example, the abolishment of trading human beings was a major issue in the American Civil War. Martin Luther's critique of the trade of indulgences, in which buyers and sellers exchanged money for the freedom from God's punishment for sin, was a key element of the Protestant Reformation. Karl Marx' idea that capital stock should not be tradable, that it must belong to the workers themselves, was a cornerstone of communist ideology. With the recent financial crisis, discussion has arisen about the appropriateness of markets for complex financial products like derivatives involving high risks. Stock traders have been criticized for riding bubbles and for cashing in short-term profits without

thinking about possible negative long-term impacts on companies and stock-holders, as well as on society in general.

Markets have tremendous virtues in their capability to generate information about scarcity and to allocate resources efficiently. The point of this paper is not to question market economies in general. In fact other organizational forms of allocation and price determination such as in totalitarian systems or command societies do not generically place higher value on moral outcomes *(30)*. Furthermore, the development of a complex market structure may require and therefore correlate with the prevalence of moral and social values, such as trust and cooperativeness. Results confirming this intuition, in line with the *Doux-commerce Thesis (31)* and Arrow *(32)*, are found in Henrich et al. (2001, 2010) and Herrmann et al. (2001) *(12)*. However, focusing on the causal effects of institutions we show that for a given population, market institutions erode moral values. We therefore agree with the statement quoted at the beginning that we as a society have to think about where markets are appropriate – and where they are not.

References and Notes

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14. For a comparable publicly available demonstration video from the University of Zurich, see:
http://www.ltk.unizh.ch/user_content/editor/files/Aus- und Weiterbildung/euthanasie mit co2.mpg

15. This information is irrelevant for the *consequences* of subjects' decisions. If they choose to save their mouse, the mouse survives. If they decide to kill it, they receive money and the mouse is killed. We could have introduced another framing, informing subjects about the existence of "surplus" mice. While this would not have changed any consequences, it may have changed the *perception* of the situation at hand, e.g., in line with evidence on the so-called omission-commission bias, see, e.g., M. Spranca, E. Minsk, J. Baron, *Journal of Experimental Social Psychology* **27**, 76 (1991).

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23. Median and modal prices in the bilateral market are 10 euros. 80.7 percent of all trades were in the range of 9 to 11 euros. In the multilateral market all prices were below or equal to 10 euros, with one exception of a price of 10.1 euros.

24. Apparently, markets reduce moral concerns. Additional support for this conjecture comes from self-reported feelings of bad conscience. In case a subject decided to kill a mouse he was asked about feelings of bad conscience on a seven-point Likert scale. Traders in the bilateral market express significantly lower feelings of bad conscience than subjects in the individual condition ($p=0.0203$, $n=118$, Wilcoxon rank-sum test).

25. In comparison, only 22.2 percent of all traders in the bilateral market never traded, with a maximum trading price across all trading days of only 13 euros. In the multilateral market, 24.1 percent never traded, with a maximum trading price across all sessions of only 10.1 euros. Those subjects who refuse to exchange money for life at all may follow a rule-based, e.g., Kantian ethic, refusing to trade off money for life in general: "… everything has either *price* or *dignity*. Whatever has price can be

replaced by something else which is *equivalent*; whatever, on the other hand, is above all price, and therefore admits of no equivalent, has a dignity". Immanuel Kant, Groundwork for the Metaphysics of Morals [1785], edited by Lara Denis, Broadview Press Ltd., 2005, p. 93.

26. Materials and methods are available as supplementary material on *Science* Online.

27. The question we asked was: "How would you describe your willingness to share with others for charitable purposes without receiving anything in return?" (This question was experimentally validated and predicts behavior in the dictator game, see A. Falk, A. Becker, T. Dohmen, D. Huffman, U. Sunde, An Evidence Based Preference Module, *Discussion Paper*, University of Bonn (2012)). If we regress minimum accepted prices in our treatments with price variation on a standardized measure of responses to this question, we find a positive and significant effect ($p<0.05$, one sided, $n=186$).

28. K. Vohs et al. (*Science* **314**, 1154 (2006)) show that money primes lower helpfulness and increase competitiveness. A. Kay, C. Wheeler, J. Bargh and L. Ross (*Organizational Behavior and Human Decision Processes* **95**, 83 (2004)) observe that material primes like boardroom tables or briefcases lower social behavior as measured, e.g., by offers made in the ultimatum game. R. Frank, T. Gilovich and D. Regan (*The Journal of Economic Perspectives* **7**, 159 (1993)) suggest that an economic background (which comprises exposure to economic models assuming selfish preferences) correlates with and may be causal for selfishness, e.g., in charitable giving or cooperation. V. Liberman, S. Samuels and L. Ross (*Personality and Social Psychology Bulletin* ***30***, 1175 (2004)) show that using the label "Wall Street game" instead of "Community Game" decreases cooperation in a prisoners' dilemma situation.

29. Alvin Roth discusses many examples of repugnant transactions and consequences for what type of markets we see: A. E. Roth, *Journal of Economic Perspectives* **21**, 37 (2007).

30. R. E. Lane, *The Market Experience* (Cambridge University Press, Cambridge, 1991).

31. Charles-Louis de Montesquieu, Adam Smith, and Thomas Paine all expressed the view that markets and social behavior go hand in hand (*Doux-commerce Thesis*), see Hirschman (*Journal of Economic Literature* **20**, 1463 (1982)).

32. K. Arrow, *The Limits of Organization* (W.W. Norton & Company, New York and London, 1974) points out that markets may require high levels of "professional ethics" (p. 36) in order to perform complex transactions under private information.

Acknowledgements

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Martin von Gaudecker, Jürgen von Hagen, Donna Harsch, Paul Heidhues, David Huffman, Simon Jäger, George Loewenstein, Christian May, Andrew Oswald, Frank Rosar, Nikolaus Schweizer, Avner Shaked, Gerhard Wagner, Florian Zimmermann and participants at various seminars for helpful comments. Finally we thank all students, colleagues and post-docs for helping to run the experiments. We acknowledge financial support by the German Science Foundation (DFG) through the Leibniz Program.

Ethical approval

The study was approved by Ethical Committee of the University of Bonn, Reference Number: 066/12.

Supporting online material

Morals and Markets

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Overview Supporting Online Material

1. Additional figure and reference to video

Figure S1: Picture of a mouse as presented in the instructions of the experiment.

Video: In the instructions subjects were informed about the process how mice are killed: "The mouse is gassed. The gas flows slowly into the hermetically sealed cage. The gas leads to breathing arrest. At the point at which the mouse is not visibly breathing anymore, it remains in the cage for another 10 minutes. It will then be removed." They were also shown a short video: The mice first move vividly in the cage, then they successively slow down. Eventually they die, with their hearts beating visibly heavy and slow. For a publicly available demonstration video showing the gassing process of mice that is comparable to the one subjects saw, see *(14)*.

2. Analysis of moral vs. non-moral goods

In the final step of our analysis we compare the decay of moral vs. non-moral values through market interaction. We also explain our estimation strategy and report evidence on the different price dynamics in both types of markets.

To test the market effect on non-moral values we ran two additional treatments, identical to the multilateral market and the individual price-list treatment but using consumption goods rather than goods that have a moral dimension. The item we considered was a coupon that could be used to buy products at the university shop of the University of Bonn. Products included pens, mugs, T-shirts, sweaters etc., i.e., a large portfolio of consumption goods. We proceeded in three steps. First we

calibrated the value of the coupon to get valuations comparable to our main treatment. The value derived for the coupon was 25 euros. Second, we ran an individual price-list treatment, exactly identical to the individual price-list treatment for mice. Subjects were endowed with a coupon worth 25 euros, which could either be kept or exchanged for increasing monetary amounts. In the latter case, the coupon was invalidated. We used the same screens and decision tables with prices increasing from 2.50 euros up to 50 euros. This generates a benchmark distribution of valuations for the coupon, analogous to the mice treatments. We observed a large variance in individual valuations for the coupon. Third, we ran a multilateral double auction market, again completely analogous to our main treatment. Note that in the mice treatments buyers as well as sellers might have felt responsible for the mouse that was killed in case trade occurred. To keep treatments as similar as possible we therefore endowed both, buyers and sellers, with a coupon. Buyers and sellers could offer prices in the interval between 0 and 20 euros and accept any offer of the other market side at any point in time. If a buyer and a seller concluded a trade both had to return their coupons, which were then invalidated. If a trade was concluded the buyer received 20 euros minus the price and the seller received the price. Thus, consequences were similar in the mouse and the coupon market, except that in the latter the cost of trading involved opportunity costs of consumption rather than moral costs, i.e., loss and destruction of a coupon vs. killing of a mouse.

To assess the effect of markets on moral vs. consumption values, we use valuations from the individual price-list conditions and compare them to valuations in the respective markets. Table S1 reports Tobit (columns (1) to (3)) and interval regressions (columns (4) to (6)), separately for mice and coupons as well as jointly for both items. The dependent variable is a subject's minimum trading price. In the individual price-list conditions this is the switching point. For sellers who traded in the market we take the minimum trading price. Conceptually this is an upper bound for the minimum acceptable price as due to strategic reasons, subjects may trade at considerably higher prices than their reservation prices. If a seller did not trade but was active in the market, we use the minimum price offer that seller had made. Such an offer could have been accepted and was therefore relevant. If a seller neither traded nor made any price offer, we set this seller's valuation equal to or larger than 20 euros.

	Mice	Coupons	Mice and Coupons	Mice	Coupons	Mice and Coupons
	(1)	(2)	(3)	(4)	(5)	(6)
Mouse			0.698			1.646
			(1.692)			(1.609)
Market	-7.795***	-0.995	-0.928	-6.788***	0.777	1.050
	(1.597)	(1.872)	(1.938)	(1.608)	(1.779)	(1.854)
Interaction			-6.643***			-7.549***
			(2.468)			(2.404)
Constant	16.064***	14.770***	15.013***	15.088***	12.791***	12.957***
	(1.472)	(1.121)	(1.145)	(1.473)	(0.943)	(0.975)
Observations	150	126	276	150	126	276
Log pseudo likelihood	-410.9	-346.7	-758.9	-372.6	-312.4	-688.2

Table S1: Tobit (columns (1) to (3)) and interval (columns (4) to (6)) regression coefficient estimates with trading prices as dependent variable. Mouse is a dummy, which takes value 1 if observations come from the mice treatments and zero otherwise. Market is a dummy, which takes value 1 if observations come from the market treatments and zero otherwise. Interaction is an interaction term of the two dummies. For the individual treatment we use the switch point at which a subject prefers to kill the mouse or to invalidate the coupons, respectively. The interval regressions account for the fact that these observations were elicited in intervals. All observations are censored at 20 euros to yield an identical support between treatments. Robust standard errors in brackets are clustered on market sessions (and at the individual level in the individual conditions) to account for possible correlation of the error term across sellers from the same market. *** indicate significance at the 1-percent-level.

In columns (1) and (2) of Table S1, trading prices are regressed on a market dummy, which takes value 1 if observations come from market treatments and 0 otherwise. For the mice treatments we find a strong negative effect of market interactions, which is significant at the 1-percent-level. This implies that for a given price, subjects reveal a higher willingness to kill in markets than in the individual condition. For coupons the effect of markets is much smaller and insignificant. In column (3) we include a mouse dummy, which takes value 1 if the observations come from the mice treatments and zero otherwise. In addition we include the interaction term of the two dummies. The coefficient of the interaction term is negative and highly significant, indicating that for a given price the negative market effect on valuations is significantly stronger for mice than for coupons. In columns (4) to (6) we repeat the analysis using interval regressions. The results are virtually unchanged. In particular, the interaction coefficient is highly significant.

Price dynamics

In as much as prices reflect moral concerns, it is also interesting to study the price dynamics for mice and coupon markets. Figure S2 shows the evolution of average prices for both types of markets. In the coupon market the overall price level is 8.1 euros, displaying no time trend at all (Spearman's rho = 0.3697, p=0.2931, n=10, (10 periods)). In contrast, in the mice markets prices are much lower and show a significant downward trend (Spearman's rho = –0.9758, p<0.0001, n=10; we get a similar result using all trading prices and regressing prices on a linear time trend clustering standard errors at the session level). Here the average price level is 5.1 euros, with prices starting at 6.4 euros and a final period price level of only 4.5 euros. The analysis shows a systematic difference between markets with moral vs. non-moral goods.

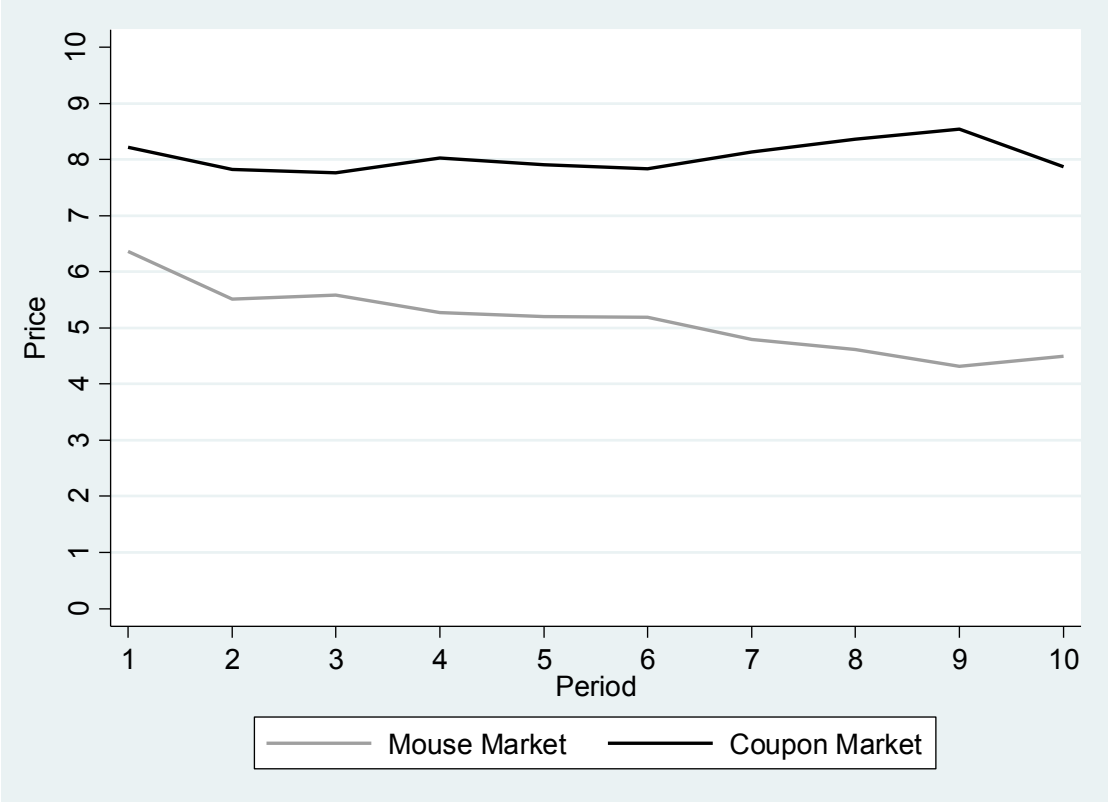


Figure S2: Evolution of average prices in mice and coupon market

3. Simulating predicted trade fractions in the bilateral market

We use the price-list treatment to illustrate the decay in valuations in terms of the predicted fractions of trade. To derive the predicted fractions of trade we randomly

draw values for hypothetical buyer-seller pairs from the distribution of values in the price-list treatment. We use the switch points. A seller valuation is just the drawn value, the valuation of a buyer is 20 euros minus the drawn value. Trade is predicted to occur if the resulting buyer valuation exceeds the seller valuation. If both values drawn are 10 euros, gains from trade are zero, i.e., a buyer and a seller would be indifferent between trading and not trading. In these cases we assume that trade takes place. We randomly drew one million times. The predicted trade probability was 25.9 percent. The actual empirical fraction of trade in the bilateral market was 47.7 percent. This difference is significant at the 1-percent-level (Two-sample test of proportions with n=96 for price-list and n=72 for bilateral market). If we use the mean value of a given price-list interval, the predicted trade fraction is slightly higher (28.4 percent). Significance levels are not affected.

Alternatively to using the price-list treatment one could also roughly estimate the predicted trade fraction using the individual treatment. In the latter treatment, the fraction of subjects willing to kill the mouse for 10 euros is 46 percent. Thus the likelihood that two subjects simultaneously agree to trade for 10 euros (the most common price in the bilateral market) is simply 0.46 times 0.46 = 22.2 percent.

4. Treatments and procedures

Table S2 presents an overview of all nine treatments. All treatments were computerized using z-Tree as experimental software *(33)*.

Treatment	Individual	Individual price-list	Bilateral trading market	Multilateral trading market	Individual calibration	Individual price-list	Multilateral trading market	Control treatment: Two participants	Control treatment: Lottery ticket
Item traded	Mice	Mice	Mice	Mice	Coupon	Coupon	Coupon	Mice	Mice
Method	Binary choice: killing for 10 euros vs. receiving 0 euros and saving the mouse.	Price-list. 2.50 euros up to 50 euros.	Bilateral double auction, with one seller and one buyer. Random matching. 10 periods.	Multilateral double auction, with 9 sellers and 7 buyers. Six sessions with 10 periods each.	Price-List. Varying levels of coupon value vs. receiving 10 euros.	Price-list. 2.50 euros up to 50 euros.	Multilateral double auction, with 9 sellers and 7 buyers. Six sessions with 10 periods each.	Binary choice as in Individual. One active participant, one passive participant. Both receive 10 euros for killing the mouse and 0 euros for saving the mouse.	Binary choice as in Individual. Choice is to buy a lottery ticket for 2 euros that pays either 10 or 15 euros with equal probability. If lottery ticket is bought a mouse gets killed, otherwise it is saved.
Purpose	Comparison standard for main result. Individual valuation of moral values.	Benchmark distribution of individual valuations of moral values (life of mouse). Used for comparison with mice and coupon markets.	Simple market form of bilateral trading. Effect of markets on moral valuations.	Markets with multiple buyers and sellers. Effect of markets on moral valuations.	Calibration of value for coupon.	Benchmark distribution of individual valuations of consumption values (coupon).	Markets with multiple buyers and sellers. Effect of markets on valuations for consumption goods.	Control condition if subjects are concerned about total surplus (social preferences).	Control condition for potentially different perceptions of side-effects in individual vs. market transactions.
Number of subjects	124	96	72	96	72	72	96	116	43

A total of 787 subjects, mainly undergraduate university students from all majors, took part in the experiments. They were recruited using the software ORSEE *(34)*. The main mice experiments were conducted between May 2 and 4 in 2012. They were conducted in six different rooms at the "Beethovenhalle", the largest concert hall in Bonn. We set up six parallel computerized labs in these rooms using 192 notebooks. The coupon experiments were run in June 11 to 13 at the Bonn Econ Lab. The two individual control conditions were also run in the Bonn Econ Lab in January 3 to 4. Subjects in all conditions received payments according to the rules of the experiment and an additional show-up fee. In the mice treatments subjects received their payments in an envelope outside the room where the experiment had taken part. This way, neither other subjects nor the experimenter handing over the envelopes knew what a particular subject had earned. This procedure was explained in the instructions.

Every subject in the mice or the coupon treatments participated only in one of the respective treatment conditions. At the beginning of an experimental session, participants received detailed information about the rules and structure of the experiment. In all treatments, the experiment started only after all participants had answered several control questions correctly. In addition, in the market experiments subjects performed one trial period of the market to ensure that they had understood how to use the computer program. In the bilateral double auction, buyers and sellers were randomly matched each period. Depending on room capacity, session sizes were 40 and 32 subjects, respectively. Within a session we formed matching groups of 8 subjects each (total of 9 matching groups). Random matching of buyer and seller pairs occurred within matching group. The experiments were followed by a detailed questionnaire including, e.g., personality (Big-5, Machiavelli, economic preferences), socio-demographics and cognitive ability.

5. Instructions

In the following we provide an English translation of the instructions for the individual treatment and the bilateral market treatment in the mice conditions (see, 5.1 and 5.2). We also provide instructions for the two additional control conditions based on the individual condition (see, 5.3 and 5.4). The price-list mouse treatment was identical to the individual treatment except that instead of offering a single binary choice, subjects were presented a table with an increasing price-list, ranging from

2.50 euros to 50 euros. In both individual treatments, the choice between Options A and B was associated with taking part in an identical trivia quiz. This framing was chosen in an attempt to make it actually easier to choose Option B. No quiz frame was used in the market experiments. The multilateral market treatment was basically identical to the bilateral treatment except that instead of bilateral trade 7 buyers and 9 sellers interacted. The instructions for the coupon treatments were identical to the mice instructions, except for the description of the item. Translations for all nine treatments are available on request.

5.1 Instructions for the individual treatment

Thank you very much for your participation!
For your participation you will in any case receive 20 euros. In the following you can earn an additional amount of money. At the end of the experiment you will receive your money in an envelope. Neither the other participants of the experiment nor the experimenter will be able to see how much money you have earned.

Please note: Throughout the whole experiment **communication between the participants is not allowed**. On the computer please only use the functions intended to be used. If you have questions please raise your hand. Your question will then be answered at your cubicle!

Please note: **All statements made in these instructions are true.** This holds for all experiments carried out by the Bonn Econ Lab, and also for this experiment. **In particular, all actions to be taken will be implemented exactly in the way they are described.** If you want to, you will be able to verify the correctness of all statements made in these instructions after the experiment.

In this experiment, there is a **Quiz A** and a **Quiz B**. Both, Quiz A und Quiz B, are simple trivia quizzes with questions from history, geography, sports, and so on. One example question could be: “Capital of Belgium?” There will, respectively, be four possible answers out of which one answer is correct. The posed questions in Quiz A and Quiz B are identical, that means, they are exactly the same regarding their difficulty. You will get three minutes to solve the quiz. The more questions you solve correctly, the more you can earn. **For each question that is answered correctly, you receive 5 cents.**

Depending on which quiz you choose, you may earn different amounts of money in addition. Additionally, depending on which quiz you choose, there will be different consequences for a mouse.

Details on the Mouse

In this study, the life of a mouse is entrusted to your care. It is a healthy, young mouse, living with some other mice together in a small group. The expected lifetime of this mouse is approximately two years.

What is the difference between Quiz A and Quiz B?

Quiz A: In Quiz A, at the end of the experiment, you earn no additional money besides the **20 euros** for participation and the mouse stays alive.

Quiz B: In Quiz B, at the end of the experiment, you **get 10 euros in addition**. As another consequence, **the mouse will get killed**.

Details on the killing process:

If you opt for the death of the mouse, the mouse is gassed. The gas flows slowly into the hermetically sealed cage. The gas leads to breathing arrest. As soon as the mouse is not visibly breathing anymore, it remains in the cage for another 10 minutes. It will then be removed.

Summary:

In Quiz A you earn no additional money, and the mouse does not get killed. In Quiz B, you earn additionally 10 euros, and the mouse gets killed. The decision is yours.
You take your decision on a decision screen that will be shown as soon as you have answered the control questions on the following screen.

Control Questions
In case of Quiz A:
How many euros do you receive in addition? ____
Will a mouse be killed?
☐ Yes
☐ No

In case of Quiz B:
How many euros do you receive in addition? ____
Will a mouse be killed?
☐ Yes

□ No

Video
To visualize the killing of mice by gas, you will in the following see an excerpt of a documentation video (30 seconds). The mouse will be killed in an identical way.

5.2 Instructions for the bilateral market treatment: Instructions Buyer

(We present the instructions for buyers. The instructions for sellers were analogous).

Thank you very much for your participation!
For your participation you will in any case receive 20 euros. In the following you can earn an additional amount of money. At the end of the experiment you will receive your money in an envelope. Neither the other participants of the experiment nor the experimenter will be able to see how much money you have earned.

Please note: Throughout the whole experiment **communication between the participants is not allowed**. On the computer please only use the functions intended to be used. If you have questions please raise your hand. Your question will then be answered at your cubicle!

Please note: **All statements made in these instructions are true.** This holds for all experiments carried out by the Bonn Econ Lab, and also for this experiment. **In particular, all actions to be taken will be implemented exactly in the way they are described.** If you want to, you will be able to verify the correctness of all statements made in these instructions after the experiment.

You are trading with one other, randomly selected participant, respectively. The participants are randomly divided into two roles: buyers and sellers. You are a buyer. Both sides, buyers and sellers, can make price proposals. Everyone can accept the price proposals made by the other side. Each trading day lasts 3 minutes.

In total, there are 10 trading days. In the end, the result of one trading day gets paid out. The computer determines randomly which trading day is paid out. You receive the corresponding amount of money, in addition to the participation fee of 20 euros. At that trading day, a mouse is traded.

Information about the precise rules of the market

1. Each trading day, the computer opens the market anew and you get newly matched with a randomly chosen trading partner.

2. A buyer makes price offers to a seller. Likewise, a seller makes price offers to a buyer. Each seller and each buyer can maximally accept one price offer. Regarding the price offers, the following holds:

a) For you as a buyer, your price must be higher than the most recent non-accepted price proposed.

b) For the sellers, the respective price hast to be lower than the highest non-accepted price so far.

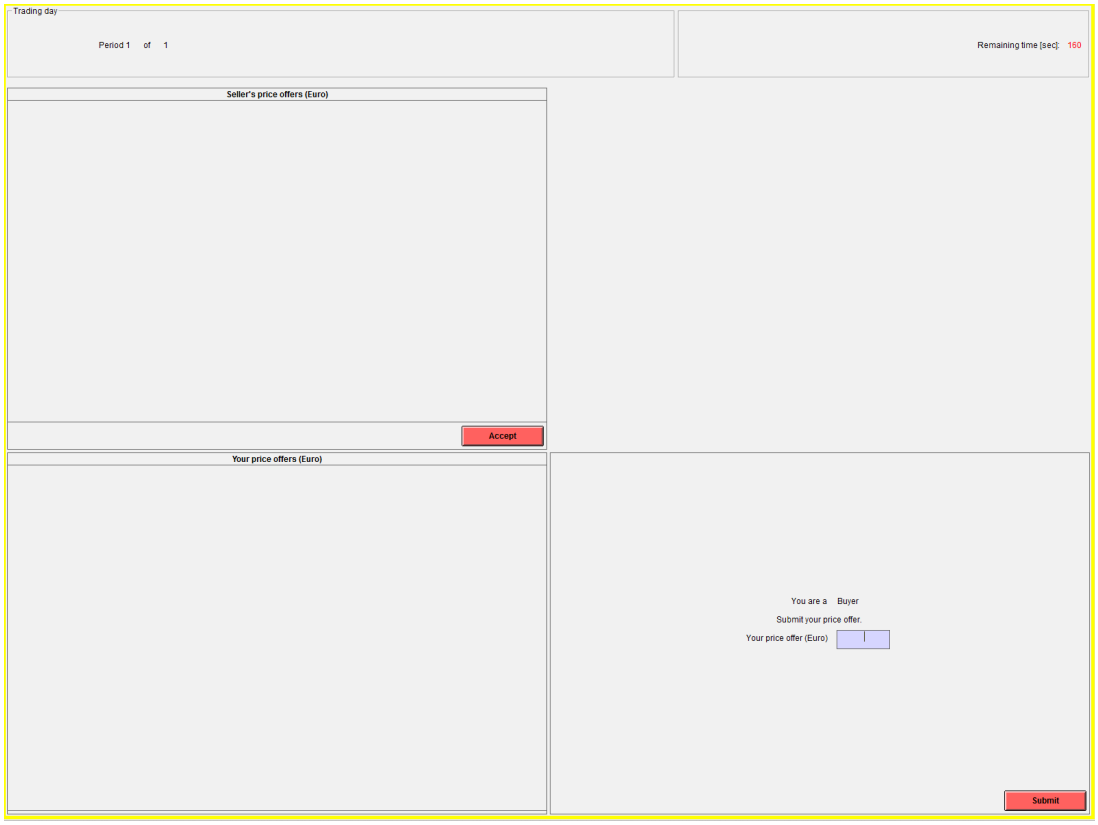
All prices between (and including) 0 and 20 euros are allowed. You enter your price offers on the **input screen**. Allowed are all prices between 0 and 20 euros in steps of **10 cents.** Thus, possible price proposals range from 0, 0.1, 0.2, 0.3 and so on up to 20 euros.

An example of the input screen can be found on the next page.

Down to the right you find your area for input "Your price offer". To make a **price offer**, type your price into this area. This is always a number between 0 and 20 euros. You can type in prices in steps of 10 cents, e.g., 0.3 euros, 1.7 euros or 13.4 euros and so on. Then you click on the button "Submit". Your price proposal then appears on the left side in the rectangle under the header **"your price offers"**. Please note that your prices have to be higher than the most recent unaccepted price offer. Both, seller and buyer, can make as many price offers as they wish.

All price offers by the buyer appear sorted by level at the bottom of the left side. If many offers are made and the rectangle is "full", you just see the most recent offers. At the same time, a scrollbar appears at the right of the rectangle. With the help of the scrollbar you can see all your price offers.

On the upper left you see the **price offers by the seller**. These appear sorted by level under the header "**seller's price offers**". If many prices are offered and the rectangle gets "full", you see analogously to the prices you offered just the most recent prices offered by the sellers. At the same time, a scrollbar appears at the right of the rectangle. With the help of the scrollbar you can see all price offers.
Please click ENTER to see an example of the input screen.



3. A trade is concluded if you accept an offer by a seller or if the seller accepts one of your price proposals.

You can always choose and accept one out of all offers made by the seller. If you want to accept an offer by the seller, you first have to choose by mouseclick an offer from the rectangle "seller's price offers". The offer you selected will become colored. If you want to accept it, you now click with the mouse the "Accept" button. You have now concluded a trade with the seller who has made the price offer.

Each trading day, you can conclude at most **one** trade. This means, **if you have agreed on a trade at one trading day, you cannot accept another offer at this trading day**. As soon as you have accepted an offer of the seller or as soon as one of your price offers got accepted, a trade is concluded.

In total, you and the seller have about **3 minutes time** to make price proposals or to accept them, respectively. In the first column of the input screen, you can always see the remaining time. As soon as the time has elapsed, no new price offers can be made nor accepted.

4. **No seller knows with which trader he concludes a trade and vice versa.**

How is your income on a trading day calculated?

1. If you did not conclude a trade, you earn 0 euros on that trading day.

2. A buyer receives 20 euros each trading day, which he may use for paying the price offers. If you accept the offer of a seller or if a price offer you made was accepted, it hence holds:

Income buyer in euros: = 20 – price accepted

How is the income of the sellers on a trading day calculated?

1. If the seller accepts an offer of a buyer, the seller gets the price agreed upon. Hence it holds:

Income seller in euros: = price accepted

2. If a seller does not conclude a trade, this seller earns 0 euros on that trading day.

More details on the market experiment

In the market described above, a mouse is traded. This mouse is alive. It gets killed as soon as the trade, i.e., the selling, is finalized. **We randomly select only one of the ten trading days. This trading day is implemented and paid out. If the mouse is traded on that day, it is killed. If there is no trade on that day, the mouse stays alive.**

Details on the mouse

In this study, the life of a mouse is entrusted to your care. It is a healthy, young mouse, living with some other mice together in a small group. The expected lifetime of this mouse is approximately two years.

Details on the killing process:

If you conclude a trade, a mouse gets killed. The mouse is gassed. The gas flows slowly into the hermetically sealed cage. The gas leads to breathing arrest. As soon as the mouse is not visibly breathing anymore, it remains in the cage for another 10 minutes. It will then be removed.

Summary

In the market, a buyer and a seller can trade a mouse. To this end, both market sides, buyer and seller, make price proposals. Whenever a price proposal is accepted, a trade is concluded. The seller receives the price in euros and the buyer receives 20 euros minus the price. In addition a mouse is traded. In total, there are 10 trading days. Each buyer and each seller can only conclude one trade per trading day. At the end of the experiment, one trading day is randomly drawn and implemented with all consequences for mice and payoffs, i.e., if a mouse was traded it will get killed. Hence the outcome of this trading day is implemented and paid out. Each trading day, you get randomly selected to a new trading partner.

Control Questions

1. Suppose you are accepting a seller's offer of 5 euros. What is your income and the income of "your" seller?

Your income: _____
Income of your seller: _____
Will a mouse be killed?
☐ Yes
☐ No

2. Suppose you are offering a price of 14 Euros, which is accepted by a seller. What is your income and the income of "your" seller?

Your income: _____
Income of your seller: _____
Will a mouse be killed?
☐ Yes
☐ No

Before we start with the 10 periods of trade, we now run a **training trading round that will not get implemented, hence also not paid out.** This round is meant just to make you familiar with the trading platform and the trading procedure.

Video

To visualize the killing of mice by gas, you see in the following an excerpt of a documentation video (30 seconds). The mouse will be killed in an identical way.

5. 3 Instructions for individual control treatment "Two participants"

Thank you very much for your participation!
For your participation you will in any case receive 20 euros. In the following you can earn an additional amount of money. At the end of the experiment you will receive your money in an envelope. Neither the other participants of the experiment nor the experimenter will be able to see how much money you have earned.

Please note: Throughout the whole experiment **communication between the participants is not allowed**. On the computer please only use the functions intended to be used. If you have questions please raise your hand. Your question will then be answered at your cubicle!

Please note: **All statements made in these instructions are true**. This holds for all experiments carried out by the Bonn Econ Lab, and also for this experiment. **In particular, all actions to be taken will be implemented exactly in the way they are described**. If you want to, you will be able to verify the correctness of all statements made in these instructions after the experiment.

In this experiment, there is a Quiz A and a Quiz B. Both, Quiz A und Quiz B, are simple trivia quizzes with questions from history, geography, sports, and so on. One example question could be: "Capital of Belgium?" There will, respectively, be four possible answers out of which one answer is correct. The posed questions in Quiz A and Quiz B are identical, that means, they are exactly the same regarding their difficulty. You will get three minutes to solve the quiz. The more questions you solve correctly, the more you can earn. For each question that is answered correctly, you receive 5 cents.

Depending on which quiz you choose, you may earn different amounts of money in addition. Additionally, depending on which quiz you choose, there will be different consequences for a mouse.

Details on the Mouse

In this study, the life of a mouse is entrusted to your care. It is a healthy, young mouse, living with some other mice together in a small group. The expected lifetime of this mouse is approximately two years.

What is the difference between Quiz A and Quiz B?

In this experiment you are matched with another person in a group of two. The other participant was randomly matched with you. The other participant also takes part in one of the experiments. The choice between Quiz A or Quiz B has consequences for

you and the other participant.

Quiz A: In case of Quiz A, at the end of the experiment, you and the other participant earn **no additional money** besides the 20 euros for participation and **the mouse stays alive**.

Quiz B: In case of Quiz B, at the end of the experiment, you and the other participant each get **10 euros in addition**. As another consequence, **the mouse will get killed**.

Thus in case of Quiz A both, you and the other participant receive no additional payment and the mouse stays alive. In case of Quiz B you and the other participant each receive an additional payment of 10 euros and the mouse will get killed.

Please note: The other participant receives the exact same information as you. However, he does not take a decision.

How do you take your decision?

On the decision screen you will later have two options: You can choose **Quiz A** or **Quiz B**.

If you choose Quiz A, you and the other participant will take part in Quiz A, with the respective consequences as described above.

If you choose Quiz B, you and the other participant will take part in Quiz B, with the respective consequences as described above.

Details on the killing process:

If you opt for the death of the mouse, the mouse is gassed. The gas flows slowly into the hermetically sealed cage. The gas leads to breathing arrest. As soon as the mouse is not visibly breathing anymore, it remains in the cage for another 10 minutes. It will then be removed.

Summary

You are matched with another participant in a group of two. You can either choose Quiz A or Quiz B. In case of Quiz A you and the other participant earn no additional money, and the mouse will not get killed. In case of Quiz B, you and the other participant each earn additionally 10 euros, and the mouse gets killed. The other participant receives the exact same information as you. However, he does not take a decision. You take your decision on a decision screen that will be shown as soon as you have answered the control questions on the following screen.

Control Questions

In case of Quiz A:
How many euros will the two of you receive each in addition? ____

Will a mouse be killed?
□ Yes
□ No

In case of Quiz B:
How many euros will the two of you receive each in addition? ____
Will a mouse be killed?
□ Yes
□ No

Video
To visualize the killing of mice by gas, you will in the following see an excerpt of a documentation video (30 seconds). The mouse will be killed in an identical way.

5. 4 Instructions for individual control treatment "Lottery"

Thank you very much for your participation!
For your participation you will in any case receive 20 euros. In the following you can earn an additional amount of money. At the end of the experiment you will receive your money in an envelope. Neither the other participants of the experiment nor the experimenter will be able to see how much money you have earned.

Please note: Throughout the whole experiment **communication between the participants is not allowed**. On the computer please only use the functions intended to be used. If you have questions please raise your hand. Your question will then be answered at your cubicle!

Please note: **All statements made in these instructions are true**. This holds for all experiments carried out by the Bonn Econ Lab, and also for this experiment. **In particular, all actions to be taken will be implemented exactly in the way they are described**. If you want to, you will be able to verify the correctness of all statements made in these instructions after the experiment.

Depending on your decision, you may earn different amounts of money in addition. Additionally, depending on your decision, there will be different consequences for a mouse.

Details on the Mouse

In this study, the life of a mouse is entrusted to your care. It is a healthy, young mouse, living with some other mice together in a small group. The expected lifetime of this mouse is approximately two years.

Offer to buy

You can later decide whether you would like to buy a **lottery ticket**. With this lottery ticket you take part in a lottery. With **50%** probability you receive **10** euros and with **50%** probability you receive **15** euros. You will receive your earnings from the lottery in an envelope. The lottery ticket costs 2 euros. If you buy the lottery ticket, as a further consequence, **a mouse will get killed.**
If you do not buy the lottery ticket, you will not pay 2 euros and the **mouse will not be killed**.

Details on the killing process:

If you opt for the death of the mouse, the mouse is gassed. The gas flows slowly into the hermetically sealed cage. The gas leads to breathing arrest. As soon as the mouse is not visibly breathing anymore, it remains in the cage for another 10 minutes. It will then be removed.

Summary

If you do not buy the lottery ticket, you don't pay 2 euros and the mouse will not be killed. If you decide to buy the lottery ticket you will take part in the lottery. In the lottery you will either win 10 or 15 euros, each with a probability of 50%. Buying the ticket costs 2 euros and as a further consequence a mouse will be killed. The decision is yours. You take your decision on a decision screen that will be shown as soon as you have answered the control questions on the following screen.

Control questions

If you buy the lottery ticket:
Which amount can you earn at least? (in euro) ____
Which amount can you earn at most? (in euro) ____
How likely is it that you receive the higher amount? (in percent) ____
How much does the lottery ticket cost? (in euro) ____
Will a mouse get killed?

□ Yes
□ No

If you decide against buying the lottery ticket:
Will you receive the lottery ticket?
☐ Yes
☐ No

Will a mouse get killed?
□ Yes
□ No

Video
To visualize the killing of mice by gas, you will in the following see an excerpt of a documentation video (30 seconds). The mouse will be killed in an identical way.

6. References and notes

33. U. Fischbacher, z-Tree: Zurich Toolbox for ready-made economic experiments. *Experimental Economics* **10**, 171 (2007).

34. B. Greiner, "An online recruitment system for economic experiments" (in Forschung und wissenschaftliches Rechnen 2003. GWDG Bericht 63, Ges. für Wiss. Datenverarbeitung, Göttingen, pp. 79–93).