Experimental economics

Seminar III - **Methodological foundations II**

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References:

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Risk Behavior in the Laboratory

- In the context of the economic model of rational choice, a person's decision is basi- cally understood as an act of choosing from a well-defined set of alternatives, taking into account the respective restrictions. The prerequisite for this is the existence of a preference, which transforms the alternatives available into an ordering.

- This preference ordering is represented by a utility function that assigns values to the elements of the set of alternatives according to their position in the preference ordering. In this way, three different types of choices are presented: first, the choice between alternative bundles of goods; second, the decision on when to consume (consumption today or in the future); and thirdly, a choice between lotteries, i.e. between a number of different alternatives involving risk.

- The first decision is taken on the basis of a preference ordering for bundles of goods, while the second decision presupposes the existence of a rate of time preference. This rate is used to place a valuation on current and future consumption. As a rule, the shift of consumption into the future means that it is necessary to temporarily forego consump- tion, which leads to a utility loss. Depending on the extent of this loss, the rate of time preference indicates how much higher future consumption must be in order to corre- spond to current consumption.

- The third choice presupposes that the decision-maker has an idea of how he evaluates the risk associated with different lotteries. This is referred to as a risk preference. Based on expected utility theory, in economics three classes of risk preference are frequently distinguished. Risk neutrality occurs when a decision-maker is indifferent between choosing a lottery and a guaranteed payoff that corresponds exactly to the expected value of the lottery. In this sense, the decision-maker does not pay any attention to the risks associated with the lottery. Risk-averse decision-makers prefer the guaranteed payoff to the lottery with identical expected value because by doing so they can elimi- nate the risk. Risk-seekers, on the other hand, prefer the lottery to the guaranteed payoff because they value the chances of winning offered by the lottery.

Risk Behavior in the Laboratory

- In the laboratory, all three types of preferences (goods preference, time preference and risk preference) can in prin- ciple play a role. Using the induced value method, we have already explained how pref- erence for goods is modeled. Time preferences rarely play a role in experiments because decisions in the laboratory usually have consequences immediately and not first at some time in the distant future. Therefore, knowledge of the relevant time preference is not usually so important for conducting an experimental study – unless it is specifically the focus of the investigation.

- The picture is entirely different when it comes to risk preference. In many situations, it is essential for the experimenter to know the risk attitude of the subjects. This is quite obvious when models on the risk attitudes of the actors are being tested. For example, if an auction model requires that bidders behave in a risk- neutral manner, and if the Nash equilibrium is based on this assumption, the model can only be tested in the laboratory with subjects who are actually risk-neutral. Testing the model with risk-averse subjects may mean that the Nash equilibrium is not observed, although the model might have been confirmed with risk-neutral subjects.

- The question is, of course, whether risk preferences cannot be induced in a similar way to preferences for bundles of goods. In order for risk neutrality to be induced, it is neces- sary to fulfill an axiom that says something about how individuals maximizing expected utility behave when dealing with a compound lottery, i.e. a lottery whose winnings are lottery tickets.

Risk Behavior in the Laboratory

- However, the experimental results show that, especially for more complex decision-making situations the theoretical justification for the assertion that binary lotteries induce risk neutrality no longer exists. Given these findings, it is unlikely that we can get around revealing the risk preferences of the subjects. A whole series of methods for doing this have been intensively discussed in the literature.

- The most widespread and best-known method is the multiple price list (MPL), which was used especially by Holt and Laury (2002) and is therefore also known as the Holt-Laury method. In this procedure, the subjects have to make a series of choices between two binary lotteries. Lottery A has payoffs that are relatively close to each other, for example $2.00 and $1.60.16 Lottery B has more divergent payoffs, such as $3.85 and $0.10. The ten choices between the two lotteries differ in terms of the probabilities of the payoffs.

- Up to and including the fourth choice, lottery A has a higher expected payoff than lottery B, i.e. a risk-neutral decision-maker should choose lottery A for the first four decisions. A risk-averse decision-maker will not switch over to lottery B at the fifth decision and possibly not even at decision six to a maximum of decision nine. After all, risk aver- sion means that a person is willing to accept a lower expected payoff if it reduces the risk. The line as of which the decision-maker's risk aversion crosses over from A to B provides information on the extent of the decision-maker's risk aversion.

- The Holt-Laury method is often used in conjunction with the random-lottery incentive system, which means that not all lines of are played and paid off, but only a randomly selected one. This payoff mode does not change the incentive compatibility of the method. Given that a random move determines which line is played, the best answer is to make a choice that corresponds to the risk preference that actually exists, thus ruling out (in the case of rational behavior of the subjects) the possibility of strategic behavior, in which a different lottery is chosen instead of the one actually pre- ferred.

Table 2.3 Choices in the Holt-Laury method

Lottery A		Lottery B				
p($2.00)	*p($1.60)*	*p($3.85)*	*p($0.10)*	Expected value A	Expected value B	Difference
0.1	0.9	0.1	0.9	1.64	0.48	1.17
0.2	0.8	0.2	0.8	1.68	0.85	0.83
0.3	0.7	0.3	0.7	1.72	1.23	0.49
0.4	0.6	0.4	0.6	1.76	1.60	0.16
0.5	0.5	0.5	0.5	1.80	1.98	−0.17
0.6	0.4	0.6	0.4	1.84	2.23	−0.51
0.7	0.3	0.7	0.3	1.88	2.73	−0.84
0.8	0.2	0.8	0.2	1.92	3.10	−1.18
0.9	0.1	0.9	0.1	1.96	3.48	−1.52
1.0	0.0	1.0	0.0	2.00	3.85	−1.85

Risk Behavior in the Laboratory

- The Holt-Laury method has several advantages that explain why it is used relatively frequently. For one thing, it is easy to understand and easy to use. In addition, there are to a certain extent built-in checks that can be used to determine whether the subjects have understood the procedure. For example, a subject should not choose A in the last line – unless he prefers a safe $2.00 to a safe $3.60. Moreover, the decisions should be consistent. Having switched from A to B, those who have understood the procedure and who behave in line with expected utility theory should not change back again. Another advantage is that the method is incentive-compatible.

- In addition to the Holt-Laury method, there are others that can always be used to iden- tify risk preferences. We would like to present one of them in more detail, seeing as it is also very common and is not only used to uncover risk preferences. In the Becker-DeGroot-Marschak (BDM) method, which has been in existence since Becker et al. (1964), the subjects are required to participate in a lottery and state their "selling price", i.e. indicate the minimum price for which they are willing to sell the lottery ticket.

- The subjects are informed that a "purchase price" will be randomly selected from a relevant interval, for example, between the minimum and maximum payoff of the lottery. If the selling price is higher than the purchase price, the lottery is played; if it is lower, the lottery ticket is sold to the experimenter at the purchase price. As a result of the random draw, the method is incentive compatible. Given that the purchase price is independent of which selling price is chosen, the weakly dominant strategy in this game is to state the true valuation of the lottery as the selling price. These prices can then be used to draw conclusions about risk preferences. Thus, risk neutrality implies that the selling prices correspond to the expected payoffs, while risk aversion, that they are lower and risk seeking, that they are higher.

- The BDM method can be used quite generally to determine the willingness to pay for goods in an incentive-compatible manner. However, this presupposes that the subjects have understood that the weakly dominant strategy is to specify the true valuation as the price. Although meeting this requirement cannot be taken for granted, it is rela- tively easy to explain it using examples. If the instructions are formulated with due care, there should be no difficulties in understanding the BDM method, at least. Both the Holt-Laury and the BDM methods are simple to use and reveal the risk preferences of the subjects of experiments with comparatively high reliability.

Selecting the Payoff Mechanism

- As a rule, economic experiments use monetary payoffs to create incentives in the labo- ratory, which are assumed either to be effective in the model (to be tested) or to play a role in real decisions. This raises not only the question of how large the incentives should be, but also how they should be paid. This question becomes much more important when the subjects make several decisions. In the last section, we dealt with experiments that deal with this very issue. In order that information about the risk preference of the subjects can be obtained, they are usually required to perform several lottery comparisons. However, repeated deci- sions or several similar decisions are not an exclusive feature of experiments to reveal risk preferences. On the contrary, they can be found in many contexts.

- At first glance, one might think that in such cases it is the gold standard to pay off all the decisions of all the subjects. Whether this standard is achieved solely depends on the funds available. But this point of view is wrong because the "pay-each-task" payoff method is only acceptable if it is ensured that the subjects of this method treat each indi- vidual decision as if they only had to make that one decision, thus making it necessary to examine each decision in isolation. However, there are good reasons for believing that in many cases this just cannot be guaranteed. Two effects can prevent this isolation hypothesis from being fulfilled.

- First, income effects can lead to decisions later in the experiment taking place under conditions that differ from those prevailing at the time of earlier decisions. If every decision is paid off individually, a subject can calculate how much he or she has already earned.

- The second effect that is capable of violating isolation is the portfolio effect. This means that in the case of decision under risk, the combined effect of decisions can lead to different results than if all individual decisions are taken separately. Take as an example the two-stage choice between two lotteries A and B, with the former being less risky than the latter. A risk-averse decision-maker would choose (A, A) for isolated decisions while a risk-seeker would choose (B, B). However, if the decision-maker can form a portfolio of both lotteries, it is possible that (A, B) has a higher expected utility than (A, A) and the risk-averse decision-maker therefore prefers (A, B)

- Wealth effects and portfolio effects can occur in repeated decisions in many cases and should therefore be eliminated by appropriately choosing the payoff mechanism. As a result, a lot of experiments pay for only one randomly selected decision, just as in Holt-Laury example.

Eliciting Beliefs

- The great advantage of the experimental method is that it allows decision processes to be observed under controlled conditions. By systematically changing individual parameters in the experimental treatments, we obtain behavioral data that provide information on how the conditions under which choices are made influence the behavior of the subjects in the experiment. There is admittedly one constraint we need to accept.
- The behavior we observe is the result of individual calculations (perfectly rational or boundedly rational) in which two factors that we cannot directly observe play an important role: the preferences and the beliefs of the subjects. It may not be possible to deduce, from the behavioral data, what contribution these two things made to the decision.
- When considering the possibility of eliciting beliefs, two important questions arise: first, how best to do this, and second, does eliciting have any effect on the actions of subjects? At first sight, there is a straightforward solution to this problem, and that is by eliciting the beliefs after the subjects have made their decision. This does have some drawbacks, however.
- For example, there is uncertainty as to whether the beliefs will not then be adjusted retrospectively. It could well be the case that it is not the beliefs that are then the basis of the decision, but rather that the decision that has already been taken determines what beliefs are reported when subsequently elicited. This risk is, of course, diminished if there are monetary incentives to state the true beliefs.
- If eliciting beliefs is an important element of the experiment and if the formation of beliefs takes place via a complex process, then it is advisable – to be on the safe side – to choose an incentivized method of eliciting beliefs. Nevertheless, in many cases simple elicitation without monetary incentives should be sufficient. Risk aversion of the subjects is in principle a problem, but the experimental findings indicate that this does not play a particular role in quantitative terms when eliciting beliefs.

The Experimenter Demand Effect

- The experimenter influences what happens in an experiment through different channels. Some are obvious, such as the instructions given to the subjects by the experimenter, or the exercises used to test whether the subjects have understood the experiment. Others are less obvious, but just as important. Thus, the experimenter can consciously or unconsciously exert social pressure or certain expectations can be generated in the subjects as to the purpose of the experiment and what behavior is now expected of them.

- In laboratory experiments the interaction between the experimenter and the subject is inevitable (even if it is through the design developed by the experimenter). It cannot therefore be a question of avoiding any kind of interaction, but rather of designing it in such a way that it does not lead to any distorting influence on the behavior of the subjects (experimenter demand effect), thereby curtailing the interpretability of the data obtained.

- Cognitive experimenter demand effects occur because the experimenter has to explain the experiment to the subjects. Understanding this explanation is a cognitive process and it may well happen that how it is explained leads to it being understood in a particular way, for example what is appropriate behavior in the experimental situation. Experimenters should be aware of the fact that subjects may take every word seriously and, therefore, that every word used by the experimenter should be carefully considered.

- In addition to cognitive experimenter demand effects, undesirable manipulation of the subjects may also result from social pressure, which can arise both between the subjects and vertically from the experimenter. There are many reasons why people succumb to social pressure. For example, a role may be played by the desire for conformity, or by social acceptance, which is experienced when acting in accordance with a social norm. It is quite possible that there are also subjects who attach great importance to being nonconformist and therefore oppose any social pressure. While it may not be too bold a hypothesis to suggest that nonconformists are rare, the widespread desire to conform to social norms is well known.

The Experimenter Demand Effect

- The instructions that the subjects receive at the beginning of an experiment are ideally suited to creating massive experimenter demand effects. The language used, for example, is suspected of doing this. It is possible to describe things in an emphatically neutral way or to "load" them with valuations to a greater or lesser extent.
- Liberman et al. (2004) report on two public good experiments, which were identical except for the names of the games provided to the subjects. One was a "Community Game" and the other was a "Wall Street Game". The names actually had a huge influence on the results, with much more cooperation in the Community Game than in the Wall Street Game.
- In the experiment by Burnham et al. (2000), too, altering only one word triggered substantial effects. In their experiment, two players could significantly increase their payoffs compared to the equilibrium payoff if player 1 trusted player 2 and player 2 acted reciprocally, thus vindicating the trust. In the first treatment, the other player was called the "partner", while in the second treatment the word "opponent" was used. The word "partner" led to significantly more trust and trustworthiness at the beginning of the experiment. Admittedly, both declined in later rounds.
- The decisive question in both cases is what effect is actually present. Is it a particular value judgment associated with the respective terms, or is it an experimenter demand effect? In the latter case, when a game is called "Wall Street Game", the subjects might have the feeling that the experimenter wants to test how well they can assert themselves. If the game is called "Community Game", the experimenter might want to know how well the subjects perform as social beings. If the other player is called a partner, the experimenter apparently wants to test the ability to cooperate. If, on the other hand, the other player is designated an "opponent", then competition is evidently at issue and it is a matter of asserting oneself.
- Experimenter demand effects can act in different directions. The reference point is the experimental effect expected in the experiment. The experimenter demand effect may be in the same direction, opposite or orthogonal to the experimental effect.
- The most problematic is the experimenter demand effect that acts in the same direction as the expected experimental effect. In such a case, it is difficult to decide whether what is observed is due to the experimenter demand effect or to the experimental conditions. If the experimenter demand effect runs in the opposite direction, it can just offset the experimental effect and no clear effects can be detected. The least problematic are experimenter demand effects that are orthogonal to the experiment effect. They may not influence the behavior of the subjects in a way that hinders the interpretation of the results of the experiment.

Double-Blind Design

- Double-blind procedure is an experimental design that ensures that the experimenters cannot observe how the individual subject acts and that also maintains anonymity between the subjects. This is generally achieved by having the subjects drawing identification numbers randomly and in a concealed manner. As a result, the experimenters know how, for example, subject number 17 behaved, but not who number 17 is. A single-blind design means that the subjects cannot observe each other, but the experimenter sees what the individual person is doing.

- It is essential to see double-blind designs in close conjunction with the experimenter demand effect. This is necessary because it cannot be ruled out that the use of a double-blind design itself will trigger an experimenter demand effect. If experimenters explicitly draw the attention of their subjects to the fact that they are acting anonymously and cannot be observed by the experimenter, then it is obvious that the subjects will think about why it is so important to the experimenter that they can act without being observed. Therefore, when using a double-blind design, it is not advisable to explicitly point out that this is intended to achieve anonymity.

- Double-blind designs are particularly effective where a strong experimenter demand effect is expected, however, if a sufficiently high degree of anonymity is already guaranteed by a single-blid design, double-blind might not be necessary.

The Frame of the Experiment

- The frame of an experiment is the way in which a specific decision problem is presented to the subjects. Framing effects are the changes in the subjects' behavior that occur solely because the presentation of the decision problem is varied without changing the problem itself and its solution.

- In the recent literature, two types of framing effects play a special role. The first occurs when only the name of a game is changed (label frame). We have already referred to the following example in the previous section. Whether you call a public good experiment “Community Game” or “Wall Street Game” makes a major difference.

- The second framing effect that has attracted much attention is what is named the valence frame. This means that certain terms are loaded with respect to the values or preconceptions associated with them. The standard example again concerns the public good game, which can be played in a “Give” or a “Take” treatment (Dufwenberg et al. 2011).

- In the Give frame, the individual members of a group each receive an initial endowment (zi), which they can either keep or pass on to any part of a joint project (the public good). In the Take frame, the entire initial endowment (i.e. the sum of the zi) is in the joint project and the subjects can withdraw money up to the amount of zi. Obviously the same decision problem is involved in both cases, but the experimental findings show that significantly more is invested in the public project under the Give frame than under the Take frame.

- The observation that the results of experiments can be strongly influenced by the respective frame has led to the emergence of neutral frames as a standard – at least when it comes to testing general models. This means that names that could be given to an interaction or the persons involved are consciously avoided and that the description of the experiment is designed as value-free and neutral as possible.

The Frame of the Experiment

- Let us assume that when subjects enter a laboratory and receive instructions for an experiment, they first try to understand what the experiment is about and what behavior is expected from them. The frames of the experiment then serve as an orientation aid for the subjects. What is the name of the experiment? What is the name of the activity I need to perform? What conclusions can be drawn from the type of task I am faced with here?

- Questions of this kind will occupy the subjects. It should be borne in mind that the subjects assume that the frame – i.e. the answers to their questions – was set by the experimenter. The person who wrote the instructions and designed the experiment thus provides the information that the subjects use to make sense of the experiment.

- This means that each frame – no matter how it is designed – is always associated with a potential experimenter demand effect. If one accepts this consideration, the question of whether a change of the frame impacts on the behavior can also depend on whether this alters the potential experimenter demand effect and whether this in turn has any impact.

- Of course, the behavior of subjects is not only determined by experimenter demand effects. Ideally, their influence is rather small and the effect of monetary incentives dominates the decision. Nevertheless, when designing an experiment, one should at least be aware of the potential connection between frames and experimenter demand effects.

- The second way the frame has an impact is that it can also influence the beliefs of the subjects about other subjects' behavior. This is all the more the case because the frame directly creates common knowledge.

- A third way it impacts arises because a frame can be accompanied by the activation of social norms. It is important to note that such norms can also have an influence in the real world. If a real phenomenon is to be simulated in the laboratory, a corresponding frame should therefore be included.

Instructions and Comprehension Tests

- All the elements of an experimental design must be communicated to the subjects of the experiment. This is done in the instructions, which are either provided verbally or distributed in writing to the subjects. Two important questions are of interest here. First, how can the instructions be conveyed in such a way that it is certain that all the subjects have actually taken note of and understood them, and second, how can potentially distracting effects be eliminated?

- Ideally, instructions should be in writing and distributed as a document to the subjects. An important reason for this is that it is then certain that the subjects can look at the instructions again during the ongoing experiment if anything is unclear to them. This also rules out variations in the presentation of the instructions from session to session that can undoubtedly take place if the instructions are communicated verbally (even if arises simply through a variation in the emphasis of some words).

- However, by providing the instructions verbally, it is possible to ensure that they are common knowledge for all the subjects. In other words, the subjects know that everyone knows that everyone knows... that everyone knows what is in the instructions. It is therefore not at all unusual for the instructions to be distributed in writing, and also to be read out.

- As far as the content of the instructions is concerned, there are three points to bear in mind: (1) The description of the experiment should be as short and concise as possible. (2) The description of the experiment must be as simple and understandable as possible. (3) Instructions are the point where experimenter demand effects could be generated or norms might be triggered. This is something to be aware of, i.e. when writing the instructions it is important to remember that signals are being sent to the subjects who could possibly use them to interpret what they should do.

Instructions and Comprehension Tests

- How should we deal with questions that the subjects still have after they have received the instructions? We recommend that questions not be asked publicly. For this reason, reading the instructions out loud should not be concluded by asking the group if anyone has a question but rather by pointing out that questions can only be asked in the strictest confidence and then answered one-on-one between the subject and the experimenter.

- Why is it not advisable to have questions asked publicly? The problem is that there is no control over what is asked. As a consequence, questions might be asked that are not about understanding the experiment, but rather about giving an indication of indi- vidual expectations or behavior or how one should behave.

- The saying that trust is good but control is better also applies to experimenters. It is therefore a good idea to check whether the subjects really have understood the experiment. Control questions are therefore important, but they also entail the risks already mentioned. They can trigger experimenter demand effects, activate norms or lead to anchoring effects.

- In any case, all the subjects should be given the *same* control questions. This means that if values are determined randomly, then this should be done once for all the subjects and not for each one individually. This ensures that the group of subjects is homogeneous in terms of subjects' previous experience.