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Improvements and Future Challenges for the Research Infrastructure in the Field "Experimental Economics"

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Improvements and Future Challenges for the Research Infrastructure in the Field "Experimental Economics"

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Abstract

Experimental economics is an established method of generating controlled and replicable empirical knowledge. It is complementary to other empirical methods in the social sciences. The research infrastructure for laboratory experiments is very good in Europe and also in Germany. One useful instrument would be to develop a short socio-economic questionnaire with questions already used in surveys that experimental economists could use to administer to their participants. The analyses of the selectivity of subject pools would then be an easy task. However, among experimental economists no standard exists yet, which limits the comparability of respective data sets. An effort shall be undertaken to "create" such a common questionnaire. The status quo with regard to data reporting is that no standard has emerged yet. There exists one data repository (in the United States) where data of experiments are collected and are freely available. Building up a data archive that integrates (merges) existing data is very laborious and requires substantial scientific inputs of interested researchers.

Keywords: Experimental economics, data archives, selectivity of subject pools
JEL Classification: C81, C9

Key points and recommendations

1) Experimental economics is an established method of generating controlled and replicable empirical knowledge. It is complementary to other empirical methods in the social sciences. The research infrastructure for laboratory experiments is very good in Europe and also in Germany.

2) Most previous experiments have been conducted with students. A recent research interest is how results from the laboratory (with students) generalise to other social groups. Of particular interest in this regard are experiments that are conducted as part of representative surveys, like the German Socio-Economic Panel (SOEP) or the British Household Panel Study/"Understanding Society" (BHPS). The advantage of these studies is that representative socio-demographic information can be connected to experimentally observed behaviour. The future potential of this method is very large and research has just begun. The German SOEP has a pioneering role in this development in Europe.

3) The status quo with regard to data reporting is that no standard has emerged yet. The release of data after publications is voluntary (except with two top journals where publishing the data of accepted papers is mandatory). There exists one data repository (in the United States) where data of experiments are collected and are freely available.

4) Building up a data archive that integrates (merges) existing data is very laborious and requires substantial scientific inputs of interested researchers. Building up such a data base will be very difficult, because of the multidimensionality of the data, different interests of researchers and their property rights on the use of data.

5) One useful instrument would be to develop a short socio-economic questionnaire with questions already used in surveys like BHPS or SOEP that experimental economists could use to administer to their participants. The analysis of the selectivity of subject pools would then be an easy task. However, among experimental economists no standard exists yet, which limits the comparability of respective data sets. An effort shall be undertaken to "create" such a common questionnaire.

First I will explain the nature of experimental data because this is of course also relevant for a proper understanding of the issues discussed in subsequent sections. In Section 2 I will describe of what I see as the current status quo of experimental economics. Here I will also discuss the current situation of data reporting and recording. Section 3 discusses interesting future developments. Section 4 describes what I see as the main challenges. Section 5 discusses some recommendations.

1 Research questions and the data of experimental economics

Economic experiments are a method of observing economic decision making under controlled conditions. Thus, experimental economics is not a subfield of economics but an empirical method to answer specific scientific questions. These questions come from all parts of economics.[1-6] Experiments have been used to test theories, to uncover empirical regularities, to test the behavioural implications of institutions and incentives, to uncover the structure of peoples' attitudes towards risk and uncertainty, their time preferences and their social preferences. Many experiments can be considered basic research but research of using experiments for consulting, policy advice, and "economic engineering" is growing.[7]

Methods of experimental economics are not only used within economics, but increasingly also in management science, anthropology, political science, biology, social neuroscience, and psychology. As such, experimental economics is a platform for interdisciplinary research. There also exist close links to psychology, not least because experimental economics is a frequently used toolbox by behavioural economists who are interested in increasing the psychological realism of economics.[8] Although experimental economics and experimental approaches in psychology have a lot in common, there are also sometimes substantial differences in methodology.[9]

A large part of empirical research in economics uses "field data", that is, naturally occurring data which accrue in daily economic life. These data are typically collected for recording purposes (e.g., by statistical offices) and are often not directly useful for answering scientific questions, in particular those that are motivated by economic theory. The reason is that economic theories (and most research questions derived from them) are typically "if-then" statements, and naturally occurring data do not exist in this fashion. In experiments these "if-then" conditions can be implemented by way of experimental design.

In addition to laboratory experiments there also exist "field experiments" where the experiment takes place in the natural decision environment of the participants.[10] A particularly

interesting possibility is conducting experiments as part of representative surveys, where the advantages of experiments and survey data are combined.[11] Some recent studies also utilise the possibilities of the internet.

In the following I describe the typical procedures of a laboratory experiment. In the large majority of cases the participants are undergraduate students at the respective university. There exists now specialized web-based software for managing recruitment.[12, 13] When participants decide to take part they normally do not know what the experiment will be about; they are invited "to take part in an experiment on economic decision making". Thus, self-selection depending on the type of experiment is not a problem. Upon arrival in the lab the participants receive written instructions which contain the complete rules of the particular experiments.

The large majority of experiments is conducted in networked computer laboratories and the interactions take place via purpose-made specialist software, like, for example, the popular toolbox "z-Tree".[14] In addition to being fully scripted (written instructions and rules that ensure that experiments are always conducted in a comparable way) there are two further standard procedures for conducting experiment: participants get paid according to their decisions and deception is ruled out.[9, 15, 16] Thus, experiments are real decisions, and not hypothetical ones (like in questionnaire-based research, or in simulations).

The decisive advantages of experiments over other methods of data collection are control and replicability of the data generating process. Naturally occurring decision situations are complex; many conditions under which natural decisions occur are unknown to the researcher and cannot be influenced or occur simultaneously with other conditions, such that it is not possible to say anything about causality. By contrast, in an experiment the experimenter designs ("controls") the decision situation and therefore causal inferences can be made when conditions (treatments) change.

Replicability refers to the possibility of running the exact same experiment either in the same research lab or in any other lab. This is a very important feature that is normally not feasible with other methods of data generation. There are various forms of replication. Researchers typically replicate the same experiments several times, simply to collect enough data. Sometimes researchers replicate their experiments in different participant pools (within and even across cultures) to see the robustness of findings across different social groups.[17-22] Another type of replication occurs if other scientists want to run the same experiment in their own lab. This is usually quite easy, because it is standard good practice to document the instructions used in the appendix of the research paper. Similarly, the software code is also

frequently available. Exact replication is quite rare (because it is hard to publish) but it is common to replicate previous results alongside new treatments (to have comparisons).[23] Replicability is a particular advantage of laboratory data and might not be feasible with field experiments because they take place in naturally occurring decision situations which might change (in an uncontrolled way) over time.

A common critique of laboratory experiments (with undergraduates) is that undergraduates are a very special slice of the population. Furthermore, laboratory experiments have the potential drawback that they are artificial and do not resemble natural decision contexts much (this can be a decisive advantage of experiments, however). It has therefore become increasingly popular to conduct experiments with non-student participant pools and also to conduct experiments outside university labs.

Doing experiments with non-students, cross-culturally, and in the much noisier "field" has consequences for both the design of experiments and their statistical analysis. Simple comparisons of means often will not suffice because using varied participant pools requires controlling for their characteristics. To the extent subject pool characteristics are important (or even the focus of research), this suggests two implications: first, the requirements on the number of data collected increases and simple non-parametric statistics cannot be used. Multivariate regression techniques are needed. The rapid development of microeconometrics is certainly very valuable here but these techniques have to be adapted to the nature of experimental data.[24]

2 Status quo

In this section I will address the following issues: 1) the status of Experimental Economics, 2) the standards in conducting experiments, 3) the current situation in reporting data. Finally, I will describe one repository of experimental data, called "ExLab".

Status of Experimental Economics. Experimental economics is now an established method of empirical economic research.[25] Since the mid-eighties the number of publications has increased tremendously. Experimental papers are now published in all top journals as well as in field journals. Since 1998 there is also a special field journal ("Experimental Economics") which is devoted to the development of experimental economics, broadly conceived.[26] Meanwhile, there are also textbooks[15, 27], monographs[3, 28], and handbooks[1, 2]. There also exists a professional society of experimental economists, called "Economic Science Association"[29],

where most experimental economists are members. Many universities now run experimental economics laboratories and the infrastructure in Europe, including Germany, is in general excellent and competitive compared to the infrastructure in the US.

Standards in conducting experiments. I have described the status quo with regard to the rules of conduct of experiments above. The standard is very uniform and gets normally enforced through editorial policies. There is no standard with regard to eliciting socio-demographic background information. Researchers were often not interested in these variables because the experiments tested some behavioural theories and used convenience samples of sociologically homogeneous undergraduates for that purpose. The only notable exception was maybe an interest in gender differences. The situation has changed somewhat. Many researchers now collect socio-demographic data routinely, in particular if they use non-student participant pools. Thanks to specialist and easy-to-use software (like "z-Tree"[30]) is has become easy to administer these questionnaires. However, no standard questionnaire has emerged yet.

Status quo in reporting. It is common practice to attach the written instructions of an experiment to the manuscript when it is submitted to a journal. The instructions are important to evaluate the validity of an experimental design. Often these instructions are published together with the article, or on the website of the journal or the author. It is uncommon to submit the data at the review stage.

With regard to reporting the data of *published* papers no uniform standard exists yet. Three top journals so far, the American Economic Review, Econometrica, and the Review of Economic Studies, publish the data (of any empirical paper, not only experimental ones) on their websites.[31-33] These journals make it a requirement to submit the data (raw data, software and code for analysing the data) for publishing them on the journal websites. I am not aware of any other economics journal that publishes the data of empirical studies on its website. However, since the American Economic Review and the Review of Economic Studies are top journals, other journals might follow suit.

Some researchers publish the instructions, software, and data on their websites voluntarily (alongside with the paper). No standard has emerged yet. There is a social norm that instructions, software and raw data of *published* papers are supplied if requested by another researcher. As far as I can tell people normally comply with this social norm. Non-compliance to release data is usually motivated by plans to further utilize the collected data in new research projects.

Description of the data repository "ExLab." To my knowledge, there exists only one repository for experimental data, called "ExLab". ExLab is run at the College of Business Administration of the University of Central Florida. ExLab is open for use by all researchers in Experimental Social Sciences.[13]

"ExLab" consists of three modules. The "Experiment Manager" provides a platform for organising experiments (scheduling sessions, recruitment, registration of participants…). The "Questionnaire Builder" can be used to develop online questionnaires. The most interesting functionality from the viewpoint of this expertise is the "Digital library" module. Here registered researchers can upload their data, instructions, software and paper, published or not. It is also possible to just download selected materials.

There are roughly 150 projects registered (usually a (published) paper is a project). Many of them contain raw data. However, there is no common format. Some data are just a pdf-file, some are xls-files, some are Stata data files and some refer to an external website. The quality of data documentation is variable, which has partly to do with how old the data are. Because the "Digital Library" is not managed centrally the quality of data documentation depends on the researchers who upload data. In some cases socio-demographic information of participants is available.

3 Future developments

Experimental economics is certainly here to stay. It has become a valuable tool of economic research that complements existing tools. One important task of previous research was to test theories, and for this purpose undergraduates where often sufficient. Many experiments returned highly regular results and therefore the important question of generalisability to other social groups has arisen. Some future developments are a response to this demand. Here I will discuss future developments 1) in field experiments, 2) in the integration of experiments into representative surveys, and 3) in the cross-fertilization with other behavioural sciences. 4) A recent development is also the use of the internet for conducting experiments.

Field experiments are certainly the fastest growing area of experimental economics. Researchers conduct field experiments in almost all parts of economics, except maybe pure theory testing experiments, which are best conducted in the lab. Field experiments are an important addition to our toolbox because they enhance our understanding of economic

decision making outside the artificial (though indispensible!) worlds of lab experiments. Field experiments can also give us a richer picture with regard to the importance of socio-demographic variables for economic decision making. Therefore I expect field experiments will grow in importance.

Integration of experiments into representative surveys. While running experiments in the field and with non-student participants can give us important insights into the generalizability of laboratory findings, it is only representative samples that allow drawing more general conclusions. The integration of experiments into representative surveys is an exciting development. In Germany the German Socio-Economic Panel (SOEP)[34] has a pioneering role in this development. In the Netherlands CentERdata[35] has also facilitated studies with representative participant pools. In the US, TESS ("Time-sharing Experiments for the Social Sciences") offers researchers the possibility to run experiments on representative participant pools.[36]

Previous experimental research has been on trust, fairness and risk attitudes.[11, 37-40] Research in this field is an exciting new development and I expect it to expand rapidly, in particular, given that there now exists accumulated experience in implementing the experiments in the surveys.

Cross-fertilization of experiments in other behavioural sciences. Economic experiments (in particular simple games) are now used in all behavioural sciences. The data sets produced depend on the specific research environment and question of the respective science. For example, anthropologists have run experiments in small-scale societies where people of course differ strongly in their socio-economic background from people living in modern highly developed societies.[21, 22] But apart from that the data are not that different than those we already know.

The situation is somewhat different in the emerging field of neuroeconomics and the closely related field of social neuroscience, which are exiting new developments.[41, 42] So far, the data sets are typically small in particular if scanning methods (like fMRI) are used. Representativeness (with regard to socio-demographics) has not yet been an issue because most research has tried to establish some basic facts. In this respect neuroeconomics is in the same pioneering situation where standard experimental economic was fifteen to twenty years ago. For example, research at this time tried to establish some basic facts about trust and reciprocity (in rather small-scale lab studies with students) and nowadays the experiments are

run with potentially thousands of participants in representative surveys, like the SOEP. It is conceivable that a similar development occurs in neuroeconomics, provided some basic findings are replicated in other studies, and appropriate techniques (e.g., biomarkers) are developed.

Experiments using the internet. The internet offers in principle the possibility of reaching large (world-wide) participant pools (in some cases several thousand participants)[43] with diverse socio-economic backgrounds.[44] Thus, internet experiments are a potentially attractive research tool. The drawback is that an internet experiment allows for less control than a lab experiment. Participants might also perceive the decision situation to be more anonymous, compared to a lab environment where typically other people are in the room. Whether increased anonymity is a problem or even an advantage depends on the research question. Some research has started to compare decision making in the lab and the internet.[17, 45, 46] Combining lab and internet experiments will be a fruitful area of research. The lab can provide the (small-scale) benchmark and be used to generate hypotheses about what should happen in the (large-scale) internet experiment (or in a representative experiment).

A novel area with some potential is to run experiments on virtual interactive platforms, like "Second Life".[47] Some researchers see great potential in using such virtual worlds for economic[48] or social science research[49] because experiments can be done there that are not feasible in the real world and these virtual worlds have millions of users. From an experimental economics viewpoint the question is whether experiments on virtual platforms have any scientific value, due to potential selection biases of virtual world participants and due to a lack of control who actually participates. Research on the comparability of results on well-known laboratory findings has just begun and is encouraging.[50] Thus, it is to be expected that research in this field continues and will produce some interesting findings shortly.

4 Future Developments: European and International Challenges

Challenges for conducting cross-national research exist at two levels – funding and comparability of methods. The funding issue is beyond the scope of this expertise.

With regard to methods the biggest challenge occurs in cross-cultural research. Ensuring comparability of procedures and participant pools are the key problems which need to be solved. Comparability of participant pools is the more challenging problem. If representative experiments are not feasible, one approach is to maximize participant pool comparability by

running all experiments with the same social groups.[20]

Since participant pools will never be perfectly homogenous across locations it is important to control statistically for the socio-demographic background characteristics. For a proposal for such questions see Siedler, et al.[51] If representative experiments are feasible the challenge is reduced to the comparability of procedures and to obtaining sufficiently large numbers of participants. This can be done as previous research[40] (comparing Germany and USA) has shown. The challenges of course increase the more societies are compared. Here, e. g., a collaboration of household panels that can run these experiments is essential.

5 Conclusions and Recommendations

The gold standards of any experimental science are control of the environment and replicability of results. This is also true for experimental economics. The laboratory offers a very high degree of control and many useful and replicable insights have been gained. Experimental economics is an established tool and has become part of "mainstream economics".

Most previous experiments were run with undergraduates. One interesting question is how these results generalize to other social groups. Running experiments in the field, in the internet and as part of representative surveys are exciting and fruitful new developments.

With regard to availability of data the situation is mixed and probably will be for some time. Some journals publish the data on their websites, and some researchers do so voluntarily too on their own websites. There is no "universally" accepted data base/repository where people post their data after results have been published. The only data repository I know is "ExLab" described above. The question is, how desirable is such a data archive? A repository has the advantage that there is one place where the data can be found, so search costs are low. However, given today's search machines and specialised mailing lists[52] it is also quite cheap and easy to track down existing data sets and most researchers are willing to send data upon request. Those who are not would also not be willing to submit their data to a repository. Maintaining a data archive and getting people to contribute to it is a very costly activity with probably not much scientific merits for those who maintain it.

Another issue concerns the quantitative comparison of research findings across studies ("meta-analysis"). This is not yet common in experimental economics, although examples exist.[53, 54] A meta-analysis looks at the means or medians of published findings and compares those. Scientifically more interesting is to merge the data of a particular type of experiment

into one data base, and then do the analysis on the combined observations (that is, all data points) of all studies. Two types of analyses can be done: Compare the impact of different experimental rules on outcomes and investigate the role of socio-demographics and other survey variables on decision making (that is, doing in the small scale what the representative experiments can do in the large scale). Being able to do this kind of research requires much more than a mere data repository can deliver. It requires building up a data archive (using data base tools) that keeps track of all the dimensions and variables of the original studies (data and "paradata").[55] The main problem is the nature of experimental data, which are multidimensional and very specific to a particular research question. Thus, in practice even experiments of one type (for example, trust games, or public goods games) differ across many dimensions. Merging data from different experiments into one data base and thereby also ensuring comparability is a very laborious and also scientifically challenging task.

I know these challenges because together with my PhD student Eva Poen I am currently building up a data base of all the public goods experiments I have been involved over the last 15 years. Developing this data base took more than one year and is now only tailor-made for the public goods experiments I have been involved in. This data base contains experimental data as well as socio-demographic information and questionnaire responses from more than 6000 participants of (only) 18 different studies. This data base will not be publicly available until we have answered our main research questions ourselves.

In summary, from my own experience I think that merging data (of one type of experiment) into one data base would be scientifically desirable. However, I do not think it is feasible without the substantial scientific input of interested parties who then also will have property rights on the use of the data base. These problems become even more profound the larger the number of involved scientists is. A one-size-fits-all (top-down) solution will probably not work.

As I mentioned several times in this paper, one of the exciting developments is the integration of experiments into representative surveys, which allows the investigation of the impact of socio-demographics on experimentally observed behaviour. Some experimenters (including me) have also always elicited socio-demographics and responses to psychological questionnaires (like personality questionnaires) from their participants. However, these efforts were uncoordinated between researchers. Moreover, so far (experimental) economists were only marginally interested in socio-demographics and therefore eliciting these variables was more of a subsidiary interest, which sometimes led to inconsistencies in the questionnaire design and thereby compromised comparability. Providing the scientific community with a

standard set of interesting questions that can be administered after any experiment (and that does not last longer than 10 minutes) would be very helpful. A useful step in that direction would be if survey experts in collaboration with experimental economists would propose such a questionnaire and argue for its usefulness in an appropriate scientific outlet.

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