UNIVERSITY OF TROMSØ UIT

TROMSØ UNIVERSITY BUSINESS SCHOOL

Challenges in Experimental Economics

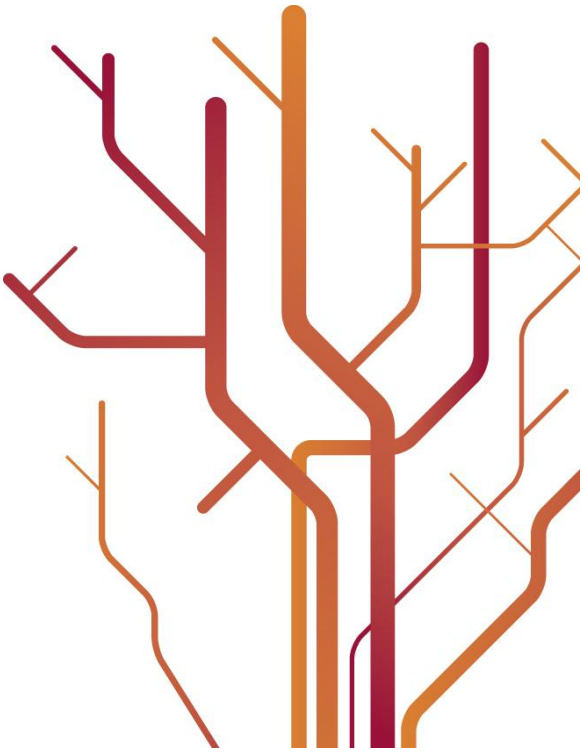
Discussions based on a field study among fishermen

Kia Johanna Uuskartano

Svetlana S. Breivik

Master's Thesis in Economics (30 credits)

May 2013



Preface

It is with great pleasure and relief that we now submit our final thesis. This journey has been both long and challenging, but not less importantly has it been a learning process which none of us could have predicted upfront. Now as we are closing up this chapter of our lives, we will look back at these five years with nothing but joy.

Already in the first year of our Master's studies we were given the opportunity via Nofima and The Tromsø University Business School to cooperate in an experiment in collaboration with The Beijer Institute in Stockholm. So choosing the subject for our thesis was not the biggest concern during our years at the university. This experience was challenging at times, but we learned a great deal during this journey, so we therefore want to thank the people at The Beijer Institute and Nofima for pointing us in the right direction.

In addition we want to thank our families for encouraging us through our years at the University. We especially want to thank Magne and Egil who have believed in us and stood out with us during this time. Also our fellow students and the professors at the University deserve a big thank you for making our University life a very pleasant one.

Last but not least we are very thankful to our supervisor Stein Østbye, who not only guided us through this thesis but who has also been our teacher during our 5 years at this University. We are glad you didn't give up on us.

Tromsø 29.05.2013

Kia & Sveta

Summary

Experimental economics has in later decades evolved to become a part of the economics science and is now steadily reported in economics journals. But there are still debates going on in this field; these debates regard for example whether theory should be revised due to findings from experiments, whether experiments should be conducted in the laboratory or in the field in addition to debates regarding methodological aspects.

In this thesis we will focus on some of these debates in addition to the challenges that arise when setting out to conduct experiments in economics. Our discussions are based on previous literature and our own experiences from a field study that we conducted in collaboration with Therese Lindahl, Ann-Sophie Crépin and Caroline Schill from the Beijer institute in Stockholm. They have done laboratory experiments concerning common-pool resources using standard subjects, and we did the same experiment using Norwegian fishermen as our non-standard subjects.

The main goal of this thesis is to try to pin down why experiments are still a divided topic in the economics science and what the main challenges are when implementing experiments to economics research.

Keywords: Experimental economics, Field experiments, Laboratory experiments, Common-pool resource economics.

Index

1 Introduction

When you hear the word *economics*, you think perhaps of numbers and computers, models and theories, maybe a professor teaching a class at the university. When you hear the word *experiment*, your thoughts might wander towards the picture of a man wearing a white coat, who surrounded by chemical substances is experimenting in a laboratory. For a long time there was no connection between these two scenarios; economics was considered a non-experimental science, and was often compared to astronomy, which is seen as a non-experimental science because of the limited possibilities of controlled experiments in that field. To quote Richard Lipsey:

> Experimental sciences, such as chemistry and some branches of psychology, have an advantage because it is possible to produce relevant evidence through controlled laboratory experiments. Other sciences, such as astronomy and economics, cannot do this.
>
> Lipsey (1979, p.8)

However, in later decades also in the economics science experiments have started to root themselves. But experiments in economics are still quite far from the white-coat laboratory experiments of sciences like biology or chemistry, being perhaps more closely linked to psychology. Experimental economics research has become vast in the past few years, and the research is steadily reported in economic journals showing the fact that it has become legit to perform experiments within economics.

The disputes and challenges in the field of experimental economics are the main focus of this thesis; our goal is to try to pin down why experiments are still somewhat rarely used by many economists. Our motivation for the thesis was our contact with Therese Lindahl and Ann-Sophie Crépin from the Beijer institute in Stockholm. They have done laboratory experiments concerning common-pool resources using standard subjects (Swedish students)

and needed someone to conduct field experiments in Norway with non-standard subjects. The challenges we faced in working with this field experiment is the basis of our thesis and the arguments we discuss. Based on our own experience and previous literature we try to draw some careful conclusions on why experiments within economics are still less important for generating data than traditional approaches generating happenstance data. Do experiments broaden the understanding of the economic world surrounding us and is it worth spending time on doing experiments in the first place?

Despite its newfound popularity, the field of experimental economics is still controversial. Many economists are not convinced of the usefulness of experiments in economics and there are disputes about both methods and results. The main disputes are regarding whether or not experiments should be used in testing economic theory, using experiments as models, whether these should be conducted in the laboratory or in the field, and whether the results from experiments should be used to revise economic theory and if so, to what degree one should weight economic theory against experimental results (Bardsley et al. 2010).

Bardsley et al. (2010) point out the fact that experiments are still a divided topic even amongst the people within the field. They start by referring to a paper by Binmore (1999), who points out similarities between drawing conclusions from experiments to prove economic theories wrong and using dirty test-tubes in chemistry. While Binmore focuses on the role of experiments in testing economic theory, another paper by Levitt and List (2007) puts the focus on how well the laboratory might capture the real effects outside the laboratory. The third paper mentioned by Bardsley et al. (2010) is a paper by Rubinstein (2001) who claims that experimental economics as a theory testing device is pointless because of the fact that theories do not themselves predict people's behavior in all situations. But Rubinstein leaves at the same time the question regarding experimental economics as a science open; he claims some of the fault is in the experimental methods used in experimental economics, a view that is also held by Franscesco Guala who focuses a lot on the methodological aspects of experimental economics in his work.

Before we discuss our field experience, it is of importance to get a grip of what experimental economics actually is and what types of experiments that actually are conducted. Therefore in chapter two we will further discuss many of the aspects mentioned above.

Our field experiment concerns common-pool resource economics, so in chapter three we will cover some previous literature within common-pool resource economics, especially focusing on experiments done within this field.

After covering both experimental economics in general and experiments within common-pool resource economics, we are ready to move on to the description of our field experiment. Chapter four covers both the previous findings made by Lindahl et al. (2012) in the laboratory, and our experimental journey and our findings from the field.

After discussing the field experience, we move on to chapter five which covers the analysis of what we observed in the field and this will be related to the main points discussed in chapter two and three.

In the final chapter we will try to draw some careful conclusions based on the discussion in the previous chapters, related to our own experiences and previous literature.

2 Experimentation in economics

As mentioned, economics has in the last two decades evolved from a purely observational and theoretical science, to one where experimentation has won a significant role. It is no longer of common belief that because of uncontrollable factors, it would be impossible to do more than observe the world of economics (Harrison and List 2004).

The literature on experimental economics has become vast and is steadily reported in economic journals. To get a picture of what experimental economics is about this chapter presents a discussion of experiments in economics based on some of the main views by some of the most influential researchers in the field, among these Glenn Harrison and John List.

The chapter starts out with a discussion on the role of economic experiments as both theory-testing devices, but also explaining experiments beyond this role. The chapter continues by discussing the range of experiments used in economics based on a taxonomy proposed by Harrison and List (2004). We start out with laboratory experiments and the traditional criticism against them, further we compare economic experiments with experiments in psychology and in addition we discuss the use of incentives. We move on to the different aspects of field experiments; explaining the different types, starting with artefactual field experiments and ending with natural field experiments.

In addition this chapter discusses how the different methods in economic experimentation might or might not strengthen each other and how economic experiments actually relate to what is happening in the real world. We also include a discussion on the trade-off between internal and external validity.

The chapter ends by introducing some of the challenges which an experimenter might face when conducting experiments, these will be important later when discussing our own experience. In the latter part we will also present an overview of some experiments that have previously been done in economics, this to shed a light on how experimental economics works in practice and to show the broad usage that experiments actually have.

Before moving on to the description of different types of economic experiments, it is of use to try pointing out what experiments in economics are set out to do. One of the broader views of

experimental economics is that doing experiments in economics serves as a tool to tighten the gap between economic theory and observable data. Ranging from strictly controlled laboratory experiments to natural field experiments, experimentation is becoming a part of mainstream economics, providing a bridge between theory and the real economic world (Harrison and List 2004; Levitt and List 2009; List 2011). Levitt and List (2009) propose an experimental bridge to shed a light on how the different economic disciplines are interrelated.

Controlled Data			Naturally-Occurring Data	
Lab Experiments	Artefactual field Experiments	Framed field Experiments	Natural field Experiments	Non Experimental Methods

Figure 1 Experimental Bridge

Laboratory and field experiments differ in many ways, and what the description of an ideal experiment should be, depends on the question at hand and who you ask. There is some criticism pointed at experimental economics, arguing that the environments in economic experiments are too simple to mimic both theory and the real world (Davis and Holt 1993). It is also claimed that when investigating very complicated matters, where there are several variables affecting each other, experiments are not necessarily the right tool (Davis and Holt 1993). There are limitations to all types of experiments, but as will become prominent throughout this chapter, many researchers agree in that by using one type of experiment to complement another, and in addition using theory and econometrics, there should be a much higher chance for convincing results (Harrison et al. 2011).

> We see the beauty of lab experiments within a broader context – when they are combined with field data, they permit sharper and more convincing inference.
>
> Harrison and List (2004, p.1009)

Before covering the different experiments in more detail and how to choose between them, it is of use to explain how experiments are used in theory testing.

2.1 The role of theory

In many cases the starting point and main usage of an economic experiment is economic theory. These theories include assumptions and explanations of economic situations. Just like data in many other sciences, economic data can be observed; econometrics has been used to investigate the effects of data collected from many different settings. As Guala (2012) argues, the main concern has been that it is not always possible to disentangle effects from each other by simply using econometrics, and this causes more uncertainty about results in the economic science compared to some other sciences, such as biology where it has been pretty straight forward to systematically collect data in the laboratory.

It is argued by many that to test whether or not theories hold and to make the gap between observed data and theory smaller is one of the main purposes of experimental economics (Levitt and List 2009). An economic theory may involve factors like risk preferences of individuals, time horizons and behavioral assumptions. These assumptions differ between theories, but a standard economic model often includes the assumptions of rationality, relative or absolute risk aversion and equilibrium concepts. Models are by definition wrong, but they are nevertheless the building blocks of economics.

Based on basic economic models economists can construct and compare new and better theories, and to do this, experiments have risen and become a useful tool. Experiments, ranging from laboratory to field experiments, are like economic theory not perfect, but they

are very important for the process of developing new and better understanding of underlying economic processes (Levitt and List 2009). The literature appears to agree on the view that experiments can be seen as a link between theory and the observational data; theories are simplifications of the real world, but with the use of experiments these theories can be modified and at least approach what actually goes on outside the world of theory. One can isolate the impacts of specific factors and hopefully make useful predictions of the future by using experiments as a complement to theory (Levitt and List 2009; Harrison and List 2004).

But as Bardsley et al. (2010) mention, experimentation in economics is still controversial. There are still quite a number of economists that do not conduct experiments and the field remains divided. There is no consensus in how much one should put in the results of economic experiments and to what extent theory should be changed due to the results obtained from experiments (Bardsley et al. 2010). They argue that the main reason for this is the fact that experiments in economics is so new; there is no general methodology used by everyone, thus creating disputes both about general methodological issues and deeper understandings of what economics is.

When moving over from a certain theory to an experiment, the purpose is to observe whether the predictions of the theory are in fact correct. This is of course a best case scenario and as will be explained, the experimenting process itself might be biased, which is why it is very important to perform and plan the experimental process with great care and not implement it when it is not possible. Because even though experimental economics has become a bigger part of mainstream economics, one should not think it is not still under debate (Bardsley et al. 2010).

2.1.1 Experiments as more than a theory testing device

As pointed out by Bardsley et al. (2010), experiments in economics have other purposes than theory testing; they are also used in the creation of new theories or merely as new ways of understanding the world of economics. Shifting from a purely theoretical view of the economic science, there are new ways discovered that rather point out the non-theoretical facts of economics (Bardsley et al. 2010). Traditionally economists have relied on many sets

of basic assumptions and the theory has been built on these assumptions. In other words, economics is now evolving to become more inductive (Bardsley et al. 2010). Induction means that one observes regularities in the world, and theories can therefore rely on what has been observed over and over again, instead of pure assumptions that are made before hand. Bardsley et al. (2010) argue that perhaps a more inductive use of economics has become possible because of changes in the methodology of economics. Related to this are exhibits, which Bardsley et al. (2010) refer to as "a mechanism that induces some specific regularity in human behavior". There are several examples of these kinds of experimental designs; mentioned are for example the Ellsberg paradox and the ultimatum game. The main point by Bardsley et al. (2010) is that the regularities that are found in these exhibits might contradict some well-known theories, and thereby questioning whether one should put too much faith in them.

Experiments are sometimes used as models (Bardsley et al. 2010). Just like theoretical models an experimental model could be a way to describe the behavior in the real world. Bardsley et al. (2010) do not claim that "models are experiments, experiments are models" as was done by Mäki (2005), but they agree in that experiments can in certain cases be used as models. In cases where the modeler is not able to understand all the underlying mechanisms but has an understanding of the system as a whole, experimental models might be more useful than traditional theories that need certain assumptions about specific underlying processes (Bardsley et al. 2010). One of the upsides of experimental models mentioned is that they are not restricted by the modeler's imagination, and can therefore include unforeseen factors as well. Another main argument for the experimental model approach is the fact that some of the regularities that are found do simply not have theoretical explanations and therefore they cannot be transformed into theoretical models. That being said Bardsley et al. (2010) argue that one should not abandon theoretical models for the experimental ones, but rather use them as complementary, in particular using experimental regularities as a prior to possible theoretical explanations.

2.2 The range of experiments in economics

When having got a better picture of the main usage of experiments, it is of importance to get a picture of which types of experiments that are conducted in economics. As briefly mentioned in the beginning of this chapter, experiments in economics can be divided into different categories, depending on several factors. The lines are not definite, but it is of great use to at least try to draw up some guidelines to distinguish between the different types of experiments. A taxonomy is proposed by Harrison and List (2004), in which they first distinguish between laboratory and field experiments, and then divide field experiments into three categories; artefactual, framed and natural field experiments, all of which will be explained in more detail later in this chapter. Before doing this it is in place to discuss the factors which this taxonomy is based on.

This taxonomy of Harrison and List (2004) is based on six factors that might influence and define an experiment: 1. The nature of the subject pool, 2. The nature of the information that the subject brings to the task, 3. The nature of the commodity, 4. The nature of the task or trading rules applied, 5. The nature of the stakes, and 6. The nature of the environment that the subject operates in.

These six factors are to great help when distinguishing one type of experiment from another. Harrison and List (2004) focus on trading games when discussing this taxonomy, but the same taxonomy also fits other kinds of experimental fields. Sometimes the experiments differ in all aspects above, sometimes only in one of them. We will now go on to describe each of these factors in more detail.

The nature of the subject pool and the nature of the information they bring to the task

When distinguishing between experiments in the laboratory and the field, a main difference is the nature of the subject pool (Harrison and List 2004). In the laboratory the most common subject pool used is students. In the field the subject can range from a certain type of target population depending on the study, to a more general population to represent a wide range of characteristics in terms of gender, age or occupation. The main difference, using non standard subjects instead of students, is the knowledge they might bring to the task, which students do

not necessarily have; some of this knowledge might be lost in using only students as the subject pool (Harrison and List 2004).

Nevertheless it is important to point out the fact that there might also be cases where it does not really matter whether the subjects are students or not, and that the only thing that the nonstandard subject pool would bring is a greater variation in for example gender, age and occupation (Harrison and List 2004).

The nature of the commodity and the nature of the task and stakes

Not only does the subject pool vary, but also the commodity used. Harrison and List (2004) argue that if the commodity used is too far from an actual commodity, it might not affect the task in the same manner as an actual commodity would. Again this depends on the experiment, if the experiment is set out to measure risk-preferences of sport-card dealers as in Harrison and List's experiment on sport-card dealers; the fact that the experiment is conducted with sports-cards and experienced dealers is crucial. The nature of the task and the trading rules (if talking about trading situations) should also mimic the actual task and rules for that specific area of the economy. The same goes for the stakes of an experiment. If they aren't high enough, the incentives to actually make serious bids might disappear (Harrison and List 2004), The use of incentives has been provided a lot of attention in experimental economics and we will therefore discuss the use of incentives in more detail later in this chapter.

The nature of the environment

As will become more prominent when discussing field experiments, one of the main differences between the laboratory and the field is the nature in which the experiment is conducted. It is believed that the role-playing behavior that might be prominent in the laboratory might be less prominent in natural settings, and this is one of the main reasons why experiments are also conducted outside the laboratory (Harrison and List 2004).

Having discussed the factors that might influence an experiment, Harrison and List (2004) still point out that while these factors offer some guidelines for distinguishing between different types of experiments, the lines are blurred. Some experiments might for example

contain both non student subjects and an actual commodity, but take place in the laboratory, so whether it should be defined as a pure laboratory study or more as a field study is not written in stone. We now continue by discussing the different types of experiments in more detail, starting out with laboratory experiments.

2.3 Laboratory experiments

The data used in empirical work is typically happenstance data, which is naturally occurring data collected from economic activity, but the data for experimental work is generated by the experimenter and can in that sense be seen as artefactually generated. Since economists have not necessarily collected all naturally occurring data themselves, but the data has often been collected by non-economists, it might be difficult and expensive to verify whether the data is correctly gathered (Guala 2012), here laboratory data comes in handy.

One of the main reasons for moving to the laboratory is that experiments performed in the laboratory have the properties of control and replicability, while naturally occurring data is rarely controllable. This has been one of the main criticisms against the economics science compared to other sciences, and even though econometricians have managed to find causal relations, the problem has been to disentangle the truly exogenous variables (Guala 2012).

Replicability points to which extent other researchers can replicate a certain study. It is of importance that other researchers can replicate studies and verify results found by other researchers. Another important quality of laboratory experiments is the fact that in the laboratory an experimenter can make *ceteris paribus* observations; the experimenter has a certain amount of control over a range of factors, including control of the participants and the laboratory environment (Levitt and List 2007). In economic experiments these factors might also include information about the price, stakes etc. The control offered by the laboratory can help the researcher when testing alternative theories by changing some of the variables, which seldom is possible with naturally occurring data. Also in econometric analysis, the ceteris paribus condition is tried to be implemented. A range of control variables can be introduced to mimic the laboratory setup. But as it turns out, this approach is far from perfect.

One of many critics in this area is Edward Leamer. In his book, "Let's take the con out of econometrics" (1983) he questions whether estimates of "casual effects" based on untested assumptions can be defined as *ceteris paribus*. He argues that by using instrumental variables that are difficult and sometimes impossible to measure, data analysis can only be used as a guideline to the direction we should take but cannot add certainty to the research (Leamer 1983). His work has been debated by several economists, with both critics like Angrist and Pischke (2010) and favored by others, among these Keane (2010). The debate is narrowed down to whether or not data analyses can be taken seriously or not, as they are all depending on assumptions built up by the researcher, and thus some remain skeptical towards them.

Those against Leamer's view argue that empirical work has come a long way since then, a lot due to better and improved research design. They even go as far as to claim that good research design in a combination with external validity has provoked revolutionary credibility in data analysis (Angrist and Pischke 2010). On the opposite side Keane (2010) claims that for the ability to create useful results we first need to create if possible an assumption free statistical inference, which is very time consuming and nearly impossible. He further claims that such data analysis creates a false sense of certainty as it uses instrumental variables that are based on pure assumptions and have not been tested (Keane 2010).

We have no intention to take a particular stand in this debate as the views on such empirical work will always create discussions which can stretch out to be very long, but we do however believe it is of importance to mention that despite the improvements in this area some are still very critical to the results from happenstance data. We do however agree in the view of many others; combined with theory and experiments, econometrics is a useful tool.

Contrary to experiments in many other sciences, where control is often seen as merely positively contributing to the experiment, this is not always the case when doing experiments in economics. The main challenge when doing laboratory experiments in economics is to know to what extent one should try to control factors that are in fact uncontrollable in the world outside the laboratory. For the laboratory results to be meaningful, the results should be generalizable to the world outside (Levitt and List 2007). While this goes without saying in physical sciences, this is not always an easy task in the economic science, as will be explained in more detail below. One of the reasons why economics differ from other sciences is the fact that many of the main factors in economics depend on people and their behavior or preferences; people might behave differently depending on the surroundings and react in

certain ways when being controlled; something which has been familiar to the science of psychology for a long time.

2.3.1 Comparing experiments in economics and psychology

As briefly mentioned above, experiments in economics have been compared more to experiments in psychology than any other experimental science, one of the reasons being that the root of experimental economics originally stems for psychology. In a survey done by Vernon Smith in 1992, Herbert Simon among others claims that a majority of economists that got involved in experiments did so as a result of first being introduced to experiments in psychology; for psychologists experiments came naturally and was the only way they did research in their science (Smith 1992). Being an experimental economist himself, Vernon Smith was at the beginning of his carrier first inspired by Sydney Siegel, who at that time was a well-known psychologist. Among the important reasons for the comparison of psychology and economics is that both sciences are aiming to understand the different aspects of human behavior, thereby making it an essential point for further discussion. Regardless of the similarities between experiments in the two sciences mentioned by Croson (2005), like convenience populations, experimental design and appropriate statistical analysis, the methodological approach in these two areas also contain many counterparts, which are not always agreed upon by experimenters in the two fields. We can divide these counterparts into five main categories; incentives, context, subject pools, deception, experimental details and data analysis (Croson 2005), which will be discussed in more detail below.

Incentives

Croson (2005) claims that incentives are to a great extent one of the more important factors in an experiment, regardless of whether the experiment is aimed for a psychological or economical purpose. In economics, the experimenter is looking for specific and trustworthy answers, and according to Croson (2005) this can only be obtained if the participant pool is appropriately incentivized. By incentives he is referring to the payment that the subjects will receive when participating in the experiment. He believes incentives to be a critical factor in

order for the theory testing to come out right, and further refers to the practice of induced valuation, which states that not only do the participants have to be paid but the amount earned should be based on the actions of the participants. He argues that in the absence of payment, there is less chance to obtain informative answers. Further he believes this to be the main difference between psychology and economics; the difference lies in that psychological experiments do not always pay the participants based on their actions, but rather pay a flat-fee which is represented by a small amount as a cash payment, an extra credit in a course or nothing at all, while economic experiments most often involve salient payment based on the decisions made (Croson 2005). By using well-adjusted incentives one can decrease framing effects, bring auction bids closer and eliminate preference reversal (Croson 2005). Incentives are a widely discussed topic in experimental economics literature and we will provide it with some more attention in the next section of this chapter.

Context

There are several reasons to why economists try to maintain a context-free environment in an experiment. First of all, Croson (2005) mentions that the theory which is being tested often aims to not only reflect the actions of a certain group but also predict behavior in many different contexts and give results that can be used more generally. Secondly, he mentions the fact that by adding context to a given theory one simultaneously adds variance to the data. The choices made by the participants might depend on their beliefs and norms, so if for example some participants are against the testing of products on animals and others are not, describing the decisions in terms of testing or not will be different from letting the subjects choose between options A or B. He does not imply that this would necessarily change the final decisions, but that it might nevertheless be harder to find statistically significant differences between the experiments. The last and perhaps most important argument for remaining context-free is the fact that adding context to an experiment we have a smaller chance of avoiding systematic biases and demand effects, this is a concern especially in situations where a group in aggregate can have an effect on each individual's decisions (Croson 2005). Because of the reasons above, it is important for economists to maintain a context-free environment, compared to experiments in psychology, where the researchers tend to actually add context to their experiment. On the one hand they avoid the cost of loosing variables of interest but on the other hand they lose the methodological deviation that can

mainly be obtained by excluding context (Croson 2005). For economists, the price of avoiding context is low and in return they are able to observe actions more closely related to the real world, so Croson (2005) claims that in order for psychological experiments to be approved by economists to a higher degree they need to remove the context, so that the results they gain can be applied in multiple contexts.

The subject pool

The third factor separating psychological and economic experiments mentioned by Croson (2005) is the subject pool. As was the case regarding context, economists often want to look at theory in general and not only apply it to one specific environment or one specific group of people. There are of course some theories that focus on individual differences, but the most common goal for many economic theories is to look at the big picture and the interactions between things in general. By using "true volunteers" such as students, given that the students do not have knowledge about the exact theory being tested, or using "real people" such as professionals within a specific field, economists have an opportunity to compare and question the different outcomes and the logic behind it. The main challenge of this approach mentioned by Croson (2005) is to collect volunteers that are not students, which might sometimes be a hard task because it might be challenging to offer the right incentives for some groups. Psychological experiments on the other hand are known for using students from their own department as subjects, who use these experiments as part of their education and learning process. But this may eventually lead to a selection bias and removes the ability for the results to be taken seriously by for example economists (Croson 2005).

Deception

Another important issue for economists is validity, and Croson (2005) argues that validity can only be obtained if the participants are properly incentivized, which in turn rests on the link between behavior and payoff. Deception has therefore received a lot of attention in the research sector; economists are in disfavor of this approach, as they believe that if deceiving the participants about the purpose of an experiment or more importantly a specific outcome one is hoping for, the results can be misleading and wasted (Croson 2005). Croson (2005) argues that this is much to the nature of trust but also to the way it might affect behavior;

when the subject is told how and what amount he has a chance to earn, it is important that the subject believes that these are actually the real amounts. As mentioned by Bardsley et al. (2010); if the subject does not believe that the task-related incentives are in fact true, the subject might not act in a natural way and at the same time the deception has created distrust for further experiments. Nevertheless Croson (2005) mentions that there are situations where deception is necessary, for instance in non-natural occurring situations like responses to low offers in ultimatum games. But even here he argues that deception can be avoided by simply not saying anything at all or present the theory in very general terms (Croson 2005). The use of deception might be the biggest difference in economic and psychological experiments, as economist try to avoid deception not only before but also after the experiment. On the contrary psychologists are in favor of this methodology and often deceive the subjects about the upcoming situation, what amount they can expect to earn, and afterwards also tell the subjects about the deception (Croson 2005). As a result psychological experiments have much to overcome in order to be accepted by economists, this is easily demonstrated by the fact that economic journals will not publish work were deception has been used (Croson 2005).

A critic to this view is Ariely (2009), who in his book "Predictable Irrational" argues that despite the non-existence of deception in economic experiments, subjects in economic experiments do not act in rational ways. Experiments themselves provide us with insight in how we think and how we make decisions by exploring the different contexts of life (Ariely 2009). He concludes that all humans are predictably irrational regardless of the general belief that all humans behave in fundamentally rational ways.

Experimental procedures and data analysis

Experimental procedures and data analysis are the last two methodological dimensions that we intend to discuss. Croson (2005) refers to several reasons why the methodology of experimental economics is often easily accepted by the human subject committee. He suggests three points for that being the case. First of all economists do not use deception, so the subjects do not lose their trust in the researchers. Secondly, even if an experiment does not go according to the plan, there are no great consequences for the participants, and the losses for the investigator in terms of money are small. The third argument is the payment, as it usually takes place privately researchers avoid the consequences of social comparison. It is also worth mentioning that psychological experiments can have greater consequences on the

participants, as they investigate human mind on a deeper level and often use deception (Croson 2005).

But the "easy" approach for economists also has its pitfalls. The first involves the earnings; economists are often interested in looking at the behavior in the face of losses rather than gains, this has created situations where the economists are forced to pay a large show-up fee and then withdraw the losses from that amount (Croson 2005). The second concern is the interaction between the participants; since the most common approach is to run the experiment with a group rather than with one person, the strict rules against deception can be challenging (Croson 2005). Economists have solved this problem by debriefing all the participants at the same time. In return they are ensured that all the participants are aware of the instructions, and the common knowledge they are all faced with creates trust (Croson 2005). But there are exceptions as will be explained in chapter three; there are in fact situations where the experiment will mimic a real world situation to a higher degree when the participants are allowed to interact with each other and where the results depend largely on this interaction.

Analysis of data employed by economics and physiologists is quite similar as both use nonparametric statistics, but while economists favor the Mann-Whitney U test, psychologists are more in favor of the Chi-squared test or other that fit discrete data (Croson 2005). The differences in these two methods have to do with the reference discipline and what it is trying to tell us, in addition empirical and traditional economists also use regression analysis to ensure the readers that the results are valid (Croson 2005). The interpretation of interaction in economics and psychology are often analyzed in differing ways; while economists are uncomfortable with results given by interactions and want to explore the implications of a result rather than the cause of a given result, psychologists often want one treatment where the result is present and another where it is not (Croson 2005).

To sum it up, we see that there are both similarities and counterparts between the methods used by economists and psychologists. Croson (2005) believes that in order for psychological experiments to be accepted to a higher degree by economists they have to focus on the validity of their work. The main point of this part of the chapter is that psychological research has been a big influence in the start of the experimental economic science and that they do contain both similarities and differences.

2.3.2 Incentives

An important part of any discussion regarding experimental economics is the use of incentives. Incentives were mentioned briefly above when discussing the differences between experiments in economics and psychology, but it is in place to pay the use of incentives some more attention. Incentives are often used in economic research, but despite this incentives are still a controversial theme both within and between sciences, and as discussed above, the use of incentives differ between experiments in psychology and economics. As pointed out by Bardsley et al. (2010), neither within the economic science is there a unified consensus on how and to what extent incentives should be used. The discussion regarding incentives is a complicated one, but to at least get a grip of the most important facts, we will discuss some of the main points of interest regarding incentives below; to which extent they should be used, what factors affect the decision to use incentives and whether they affect the behavior of the subjects or not. This discussion will mainly be based on factors mentioned by Bardsley et al. (2010).

A widely used distinction between incentives is turn-up fees and task-related payment (Bardsley et al. 2010). A turn-up fee is a payment that is made based on the fact that the subjects turn up and are willing to give up their time for the purpose of the experiment. The turn-up fee is usually flat and thus does not vary depending on the results of the experiment. On the contrary, task-related incentives depend on what happens during the experiment and are thus believed to in some cases affect the behavior of the subjects (Bardsley et al. 2010). Both types of incentives are common in economic experiments, but there have traditionally been given more attention to the task-related incentives since these are the incentives that are believed to affect behavior to varying degrees. Thus our focus will also mainly be on task-related incentives.

Bardsley et al. (2010) distinguish between motivations and incentives, this because it is important to understand the fact that motivation is something which lies within the subject and is not controllable but which affects the subjects behavior to a high degree. But since incentives are controllable for the experimenter, the experimenter can in some sense control also the motivation by applying the right incentives to the experiment. The main point being that it is of great importance to set the right incentives based on the experimental design to motivate the subjects in a proper way (Bardsley et al. 2010).

One widely accepted reason to use incentives in economic experiments mentioned by Bardsley et al. (2010) is the fact that if one wants to test a theory concerning public goods, individual choice behavior or other types of common themes in economics, and one does not have the right stakes in the game, the subjects might not act as they would when there are correct stakes present. They also point out that there unfortunately exists a tendency among researchers to use incentives only to distinguish their research from psychological research, where as mentioned, incentives are a lot less used. Bardsley et al. (2010) thus argue that it is of great importance to rather look at how the task-related incentives might affect the behavior of the subjects and base the decisions on this, rather than to use incentives just to distinguish the research from psychology, which might induce the wrong kinds of incentives to the experiment.

Frameworks

Bardsley et al. (2010) distinguish between three different frameworks concerning incentives. We will briefly cover these to get a picture of why incentives might affect the behavior of subjects.

The capital-labor-production framework

The first perspective is something that they refer to as the "capital-labor-production framework". This framework is based on the idea that not all agents possess the same ability to put a proper effort into a task and that if there is not high enough incentives offered this effort might not be used in a realistic way. Bardsley et al. (2010) argue that if the proper incentives are not offered this might create a high variability in the performance of the subjects. Based on a study by Gneezy and Rustichini, Bardsley et al. (2010) argue that incentives do affect effort, but only up to a certain point. The study by Gneezy and Rustichini divided the subjects into groups with no payment, low payment, intermediate payment and high payment and found that there was not a very big difference in the intermediate and high payment groups in terms of effort. This is quite straightforward in games where one measures certain types of performance, but when it comes to for example public-good games, one cannot say that some decisions are "good" and some "bad" in the same sense. In these cases

the point of incentives is to merely create the situation for the game and not really measure the effort or decisions as "good" or "bad" (Bardsley et al. 2010).

The intrinsic and extrinsic motivation framework

The second framework that Bardsley et al. (2010) mention is the "intrinsic and extrinsic motivation framework", they argue that subjects might be motivated by more than monetary incentives. Intrinsic motivation is the motivation that lies within subjects who want to perform well merely to satisfy the activity without getting monetary rewards. Extrinsic motivation is the opposite, where financial rewards act as the motivation for the activity (Bardsley et al. 2010). They even go further arguing that if there is sufficient intrinsic motivation, sudden extrinsic motivation might cause an opposite reaction, making the subjects perform worse. This is called crowding out and is said to appear because of the outside intervention in the task or because an outside intervention might break a well functioning collaboration between subjects (Bardsley et al. 2010). This will be further explained in chapter three concerning common-pool resource economics where it has been noted that in some well functioning small-scale, self-governing communities, an outside intervention has actually made things less efficient. When looking at incentives based on the intrinsic-extrinsic motivation framework Bardsley et al. (2010) argue that one then has to choose the incentives based on which kind of motivation one wants the experiment to imply. They mention the fact that sometimes intrinsic motivation makes subjects act very competitively in games where this is not beneficial, but yet again sometimes the goal might be to investigate behavior that arises from this intrinsic motivation, making it important not to lose this by inducing extrinsic motivation when not necessary. They also argue that it is sometimes better with no payment than a very low payment, since a very low payment might actually offend the subjects; here they refer back to the game by Gneezy and Rustichini where the no payment group actually performed better than the low payment group.

The affect framework

The third framework presented by Bardsley et al. (2010) is the "affect" framework, these affects might be feelings and emotions experienced in the real world, such as disappointment, happiness etc. Sometimes experimenters want to induce these in the experiment to mimic behavior in the real world, and as Bardsley et al. (2010) argue, it would in most cases be hard to induce affects if the tasks or incentives are not realistic enough and this could lead to false predictions about real behavior. The affect framework is thus attended mostly for experiments where one might want to induce irrational affect dependent behavior because the experiment is set out to be very realistic in terms of behavioral aspects (Bardsley et al. 2010).

The differences of these frameworks set aside, Bardsley et al. (2010) want to point out the importance of considering what one wants to measure when deciding on the incentives of an experiment, while at the same time mentioning the fact that the incentives should be "incentive compatible", i.e. they should make the subjects answer truthfully to the questions asked. This raises the question on what it is that decides the compatibility. If one bases the decisions on theories, they might challenge empirical evidence on the same theme and vice versa. Therefore Bardsley et al. (2010) distinguish between theoretical incentive compatibility and behavioral incentive compatibility, the first of these being more compatible with a priori theoretical evidence and the latter being more compatible with empirical evidence.

Bardsley et al. (2010) come to a conclusion that because of incentives being a quite complicated matter, one cannot expect there to be a set standard for how incentives should be used in economic experiments, but that incentives are very dependent on the type of experiment one is set out to do; sometimes high incentives are in place, sometimes lower, sometimes even none at all. The point being that the experimental design should be the main concern, possible incentives should come second.

When this is said, there are some other aspects of incentives that need to be accounted for, some of these aspects we stumbled upon in our own field experiment. Even though one might have found the proper incentives in terms of theory, the problem does not always lie in the theoretical aspects of incentives, but rather in the possibility to actually provide these incentives. As will be mentioned later, students are considered quite easy to incentivize, since the payment does not need to be very high. But in our case the target group was in a field of study where the payment would have had to be quite high before it would have been enough in monetary terms. We faced perhaps some of the problems mentioned in Gneezy and

Rustichini's study, feeling that if using monetary incentives, they would have been too low and actually offended the subjects. This made us to some extent rely more on intrinsic motivation even though we did use lotteries as payment. So sometimes the restrictions lie in the economic boundaries which are necessary for the intended research, and as pointed out by Bardsley et al. (2010) the use of high incentives have almost become entry-fees to the conducting of experiments. If one has little or no budget for the conduction of an experiment, this might actually stop the intended experiment.

2.3.3 Traditional criticism against laboratory experiments

As argued earlier in the chapter, one of the main concerns in laboratory experimentation is the fact that people are so easily affected by their surroundings. Levitt and List (2007)mention five factors that might influence the behavior of people: 1. The presence of moral and ethical considerations, 2. The nature and extent of scrutiny of one's actions by others, 3. The context in which the decision is embedded, 4. Self-selection of the individuals making the decisions, and 5. The stakes of the game.

In laboratory experiments the most common type of subject pool used are students. They are often readily available and willing to participate. But it has also been argued that students cannot be seen as a representative group because of the homogeneity of students; their choices might well be representative of a bigger population, but the problem is that this cannot be known before the experiment or without using non-student subjects as well (Levitt and List 2007).

Linked to this problem is the obvious fact that people participating in a laboratory experiment are aware of the fact that they are participating in an experiment and this might influence their behavior. When observed by others, people might have a tendency to act differently than they would in a naturally occurring setting (Harrison and List 2004).

Another important criticism of laboratory experiments mentioned by Harrison and List (2004) is that there is not an unlimited amount of choices in the laboratory. In the real economic world, there might be numerous solutions to a problem, some overlapping the others. But in the laboratory these are often simplified to certain types of choices. These choices are also

made on a quite short run perspective contrary to the world outside, where decisions need to be taken with the long run in mind (Harrison and List 2004).

But nevertheless, as argued by Levitt and List (2007) laboratory experiments have proved to be useful, both as a starting point before moving out to the field, and because of the replicability that the laboratory environment offers. Even if the results cannot directly be extracted to the outside world one can, if keeping in mind the biases that arise in the lab, obtain useful information in the laboratory settings as well (Levitt and List 2007). As will be discussed further below, the laboratory offers a great complementary to theory, field studies and econometrics.

2.4 Field experiments

Field experiments are a combination of several tools of research that have the ability to examine interactions in the real world; the manners in which subjects value choices and decide among them are the key when negotiating between behavioral theory and facts (Harrison and List 2004). The context of an experiment is as mentioned above based on six main factors proposed by Harrison and List (2004); the nature of the subject pool, the information subjects bring to the task, the nature of commodities, the nature of the task or trading rules and the environment in which they operate. The results occur on the bases of these factors, where the treatment is selected in a way that can be compared to real life situations (Harrison and List 2004). Since the results of field experiments contain many changes compared to traditional lab experiments, they are further compared and interpreted in this part of the chapter. According to Harrison and List (2004) experiments carried out in the field can be separated into three main categories; artefactual, framed and natural field experiments.

2.4.1 Artefactual field experiments

Artefactual field experiments are not far from conventional lab experiments. They deviate only in the choice of subjects, which are now chosen randomly or chosen from a certain group of subjects, depending on the research. As argued by Harrison and List (2004) these changes might provoke a more accurate result in that specific environment, getting rid of the criticism of students not being "real" people. The downsides of these experiments are therefore to decide whether the observed results from particular groups are generalizable to other people or environments outside the laboratory, despite of the new subjects (Harrison and List 2004).

2.4.2 Framed field experiments

As an attempt to make experiments more natural, framed field experiments are performed in an everyday environment of the subjects and the commodities that are used might be changed to actual goods. This gives the subjects incentives to act in a manner close to their real behavior in the field. Complications of this approach are the subjects' awareness of being a part of an experiment as well as being monitored. These may in turn be critical factors influencing the behavior of the subjects in the study and therefore some of the same issues still remain (Harrison and List 2004).

2.4.3 Natural field experiments

The nature of natural field experiments is a combination of realism and randomization that provide us with results that are generalizable. Contrary to the other two categories these experiments are performed such that subjects have no knowledge of being involved in an experiment and hence the choices they make are more likely to be natural. However as these conditions are very strict, they are less likely to be suitable under general circumstances. When observing the actions of individuals in natural environments when the they are not

aware of it, one looses a great amount of control, and this is one of the main challenges facing natural field experiments (Harrison and List 2004). When the subjects have no information regarding the fact that they are participating in an experiment, there is a great loss of internal validity. Another important factor concerning the information is moral costs. The moral costs might be high for several reasons, there might be financial externalities or social norms present, or the individuals' actions might be scrutinized (Levitt and List 2007).

Externalities that impose negative impact on others lead to more negative moral payoff on the subject itself; if one participates in an experiment that is illegal in a specific government of society there are less chances that one is willing to participate or act in a natural way, the same goes for if the study one participates in is being televised or takes place in front of a child; the moral costs will be high, and the results are more likely to be untrue (Levitt and List 2007). In some cases one might want to monitor the actions of the subjects in terms of these moral costs and despite the fact that experimental economists are to a less extent willing to use deception in their experiments, the reality of natural field experiments is sometimes different. Some might refer to natural field experiments as deceptive, because of the fact that subjects do not know they are taking part in these experiments. This might to some degree not be very serious, depending on the type of experiment one is conducting. But if one was to measure for example racism, it makes a difference in not letting the subjects know they are taking part in such an experiment. But on the contrary, by informing the participants' about being part of such an experiment, the results would have less resemblance to real world behavior. In cases where one is set out to measure this kind of behavior it could in the end have some negative effect on the participants if they were told that they were monitored after the experiment.

2.5 Choosing between the laboratory and the field

From the discussion above, it is clear that both laboratory and field experiments have positive and negative properties. When deciding between the laboratory and the field, there are no set rules. The laboratory offers the control and replicability that the economic science was lacking for a long time. On the other hand there exists obvious limitations in studies done in

the laboratory, but one should nevertheless not abandon the laboratory for the field completely; as argued by Harrison et al. (2011) one should rather recognize the limitations and once that is done, the laboratory can be seen as a great complement to field studies.

Laboratory experiments have many properties that make them easier to conduct than field experiments. Field experiments are more cumbersome to conduct, they involve more planning, time and patience (List 2011). But nevertheless, field experiments are very important when one wants to get rid of some of the most common criticism against laboratory experiments mentioned above. Moving to the field should not implicate that laboratory experiments should be abandoned altogether, as argued by Harrison et al. (2011), theory, laboratory experiments, field experiments and econometric methods should be used together to get the full understanding of the question at hand. They point out that theory is important when making the experimental design; field experiments should be used to test the policy applications and laboratory experiments are a good way to construct robustness tests without the high cost of field experiments. As will be brought up later in the discussion of experimentation in common-pool resource economics, the upsides in combining laboratory and field experiments is also emphasized by Ostrom (2006) in experiments concerning common-pool resource economics.

2.5.1 Internal and external validity

A theme which one comes across in almost any written piece about experimental economics when it comes to choosing between the laboratory and the field is internal and external validity. The most general way to look at internal and external validity is to see internal validity as something which describes what happens in the experimental setting, in other words something which can be controlled. On the contrary external validity is something that happens outside the experiment, which is something generalizable to the actual world (Bardsley et al. 2010). A quite general view is that if one has a certain amount of internal validity, one automatically looses a certain amount of external validity and vice versa. As discussed earlier, one of the main reasons for moving outside the conventional laboratory is the claim of lost external validity.

> Strictly, all that one observes in a particular laboratory experiment is what happens in it.
>
> (Bardsley et al. 2010, p.53)

This particular claim would suggest that one cannot generalize the things that happen in the laboratory to the outside world. As mentioned, the choice between the laboratory and the field is often affected by whether one focuses on wanting to maintain internal validity or gain external validity, and this type of trade-off discussion is often found in experimental economics articles.

Laboratory experiments are often seen as a good measure of internal validity while field experiments are seen as good in measuring external validity (Guala 2012). But Bardsley et al. (2010) also point out that even though moving to a specific field setting, what is done there might not apply to all other field settings, therefore not necessarily eliminating the external validity problem as such.

The discussions concerning the trade-off between internal and external validity seldom end in specific claims on whether the laboratory or the field should be chosen, but rather they often come to the same main conclusion; if one wants to focus on internal validity, keeping the experiment in line with the theory it is set out to test, one might want to stay in the laboratory. But if one wants to add external validity, one might have to sacrifice some control and thereby some internal validity to gain some external validity, or at least bring in more natural factors into the laboratory (Bardsley et al. 2010). As mentioned by Bardsley et al. (2010) the discussion on the internal-external validity trade-off is an ongoing debate, they suggest that perhaps in making the decision one has to take into account the goals of the research before putting all the time and effort in a comparison of lab and field results due to the internal external validity trade-off, pointing out that perhaps this discussion is more important if the results are going to be used for policies (Bardsley et al. 2010).

2.6 Behavior in the real economic environment

Regardless of whether one chooses laboratory or field experiments, one of the main questions in experimental economics is to what extent the outcome might be linked to real economic behavior. Laboratory experiments have the ability of generating internal validity; much because of the controlled setting where subjects are mostly students and not randomly chosen people, which thereby allow for a more precisely measured outcome. Field experiments on the other hand focus on human behavior with non-standard subjects and are therefore good instruments to control for external validity. By performing experiments in everyday environments and less controlled settings, field experiments allow us to build on a deeper and a more contextual understanding of real world issues (Harrison and List 2004). Results from both lab and field experiments are aiming to link theory and facts and give economists reasons to further develop their theories.

Although later literature has come to value this form for research some are still questioning its credibility in its connection to the real world (Levitt and List 2007). Experiments performed in a laboratory give the subjects an awareness of participating and also imposes an unrealistic environment, which might give misleading results. On the other hand field experiments that are run in a more natural settings, lack the informative part, and one is not always able to confirm whether the interests of the investigator are similar to the subjects.

The main point is, when setting out to do experiments in economics, it is of importance that the experiment in some way helps in describing the real world in a way that the theory might not previously have been able to do

2.7 Challenges in conducting experiments in economics

In addition to the skepticism against experimental economics due to the factors mentioned throughout this chapter, there are in addition some other aspects to consider that might make researchers avoid using experimenting in their work, even when the general skepticism might be overcome. As mentioned by Bardsley et al. (2010) it is far from every economist that uses experimental methods. There are some complications in conducting experiments that might

contribute to the reason that experiments, despite of all their upsides, are not conducted by everyone.

As was previously discussed, one of the biggest concerns in generalizing laboratory findings is the fact that the subject pool consists of students. To get rid of this problem, artefactual field experiments are conducted, using subjects drawn from other areas, these subjects might be farmers, traders, executive officers among others. The possible criticism against artfactual field experiments is the problem of the laboratory environment. The behavior of the subjects might be influenced by the laboratory settings. By moving out to the field, and conducting framed field experiments, in which the subjects take part in the experiment in their natural settings, has solved this, but here the subjects are still aware of the fact that they are participating in an experiment. This might be a concern, since people might alter their behavior when knowing they are observed. Natural field experiments take care of this problem, as the subjects do not know they are taking part in an experiment. This type of experiment combines randomization and realism. Natural field experiments take care of the self-selection problem, prominent in all other types of experiments, the concern has been that only people who expect to gain the most, participate voluntarily in experiments, and in that way do not represent the rest of the population. Natural field experiments can in this way be seen as the ultimate experiment, where the subjects are randomly chosen, representative of the population and in that way perfectly generalizable, the problem with natural field experiments is the loss of control and the problems concerning deception (Harrison and List 2004).

Despite these issues, List (2011) argues that experiments in economics have indeed in the past decade been able to 1. Measure key parameters to test theory and, when the theory is rejected, provide information to inform a new theory, 2. Extend to both nonprofit and for-profit firms, 3. Aid in bridging laboratory and no experimental data, and, 4. Inform policymakers. This said one must be careful when drawing conclusions based on field experiments alone, there are many possible pitfalls both in planning, conducting and analyzing field experiments.

List (2011) mentions some crucial points in the experimental journey that are important to account for to get as accurate results as possible, we will also discuss these points in the light of our own field experience in chapter five.

1. *Theory*

First of all List (2011) mentions the importance of theory. He argues that experimental results are most generalizable when based on economic theory. Empirical theories do not tell us much in isolation, and that one should be careful going to the field, if there is no real theory to test.

2. *Interest*

The second point mentioned by List (2011) is to really be interested in the field you are setting out to study; to really be able to understand and interpret data collected in the field, one must understand the inner workings of the specific field.

3. *Sample size*

A sufficient sample size might make or break any field study. If the sample size is too small, there is no real data to analyze at all (List 2011).

4. *Communication*

According to List (2011) the communication between the researcher and the subject is crucial. To have the people of a certain field on board with your experiment from the beginning is very important. If the communication is bad from the beginning, the experiment is more likely to fail. Related to this is the fact that there might even be people in the field that resist the conducting of the experiment.

5. *Time*

List (2011) also mentions the importance of conducting the experiment as early as possible. There are several problems that might arise if waiting too long in conducting the experiment. There might be cancellations, or your contact in the firm might not be present at a later time.

6. *Cost*

List (2011) also mentions cost as an important factor; the people you intend to have participating in the experiment might be concerned with the costs of the experiment. The experiment might not cost them money, but it might cost them time. The other concern is how to pay the participants in a proper way. The experiment might not have a big budget and it might be a problem to get people enough incentives to participate.

7. *Answers*

You might face situations where you do not have all the answer and hence some questions might remain unanswered at that point of time. List (2011) mentions the importance of not acting as if you know everything; the importance lies in explaining the reason for the study as understandably as possible, aiming to give the participants reasons to believe that you might have the answers to a certain problem one day, even if it is not in the short run and that a certain task might require much more research until conclusions can be made.

The subjects

Along with the criteria mentioned above, one needs to remember the importance of the subjects participating in experiments. When conducting an experiment, the interests and goals of the participants are not necessarily the same as the investigators. This reveals that by prescribing certain constraints on the participants, there is a chance that the outcome turns out to be misleading and hence not useful for further investigation (Dufwenberg and Harrison 2008). In addition to this, one needs to consider the social setting around the experiment, like culture, language and relations when conducting an experiment. Some might consider them less relevant and even neglect them, especially in laboratory settings as these experiments are designed to control and reproduce. But especially in field experiments cultural aspects are of great relevance and are extremely multi-dimensional concepts (List 2011).

Experiments across nations and culture groups follow different sets of moral rules and are hence less likely to determine which aspects of the culture that affects the different

experimental outcomes (List 2011). In other words, comparing results drawn from different societies might be misleading. Further, language barriers might introduce a whole set of new problems, among them communication that shapes the behavior of the participants. Despite the knowledge of the foreign language, there will exists a risk that the participants do not interpret the questions the way they were intended, so one needs to be very cautious with the presentation of the experiment. The interest of the investigator and the subject might be alike, but hindered due to the language barrier (List 2011).

The points above are the basis on which we discuss our own experimental experience and as will see, the experimental journey is not an easy one. This chapter ends by covering some previously conducted experiments in economics, this to shed a light on the broad usage of experiments, and how they are actually used in the science of economics.

2.8 Examples of experiments in economics

We hope that presenting a few of the experiments conducted will clarify the understanding of experimental economics as a practice and might further contribute to the discussion throughout this chapter. We will start with an experiment evolving around psychology and following this we will draw a few examples from previous experiments in economics that cover lotteries, game theory, incentives and behavior.

Our first illustration is an experiment performed by Bryan and Test (1967) from the Journal of Personality and Social Psychology. They focus lies on individual decision-making and the changes in social manners when the subjects are observing others activity. It was performed as a natural field experiment, meaning that the subjects were unaware of being a part of an experiment. The experiment took place outside a shopping center, where a person with a collection box was raising money for the Salvation Army. He was not allowed to make any verbal contact with people passing by, but was given a bell to signal his presence. In the first round the experiment was arranged such that every sixty seconds a person from within the store would approach the collection box and donate money, while in the second round the same person would donate money in an interval of only twenty-seconds (Bryan and Test 1967). In total each round lasted for 365 minutes. What they found was that in the twenty-

second period there was a total of sixty-nine donations, while in the sixty-second only forty-three donated money (Bryan and Test 1967). With such significant results the hypothesis was not rejected, and they reached a conclusion that observing others' contributing more often increased the contributions.

The second experiment we present was performed by Selten et al. (1999) and published in Theory and Decision. The investigator focused on behavior towards risk neutrality and whether binary lotteries induced more or less risk compared to actual money. Subjects were chosen randomly for each of the two groups, where the first group received actual money and the second received points that could in the end of the game be exchanged to money if they won. At the end of each round the subjects depending on the group received either money or points. The amount earned could either be used to buy more lotteries, or in the case of binary lotteries the points could be invested in the grand lottery (Selten et al. 1999). All participants had access to measuring tools that could help them establish the gamble's expected value. To improve the data analysis they used a measure that would help them evaluate how each individual's choice varied from the expected value of maximization. The conclusion reached was that using binary lotteries actually led to a bias, as those who received real money departed less from the expected value of maximization (Selten et al. 1999). This experiment points out the fact that was mentioned earlier in this chapter namely that the stakes of a game might have an influence on the results.

Our third illustration examines public goods, game theory and their contradictions. The experiment was performed by Fehr and Gächter (2000) and was published in the American Economic Review. As most common in public good games, the investigators look at the behavior of individuals, especially on how they cooperate and the choices they make between dividing endowments. The subjects in the game could either spend the endowments on private goods or contribute to public goods, but the payment received depended strictly on the actions of the whole group. Optimally all the participants would have been better off by donating the total endowment to public goods, but they observed a slightly different pattern.

What distinguishes this public game from the other mentioned is the ability for the participants to punish each other. Subjects were divided into two groups: strangers and partners. The strangers-group changed with each round, while the partners-group remained the same throughout the game. The first round was played without punishment for both groups, while in the second round the players could give punishment points to those

contributing less to public goods. Each of these points was equal to a decrease in the payoff by 10% (Fehr and Gächter 2000).

Results from the experiment show that in both the stranger- and the partners-group, everybody contributed to public goods in the start when there was no punishment, but later on the contribution decreased and some ended up free riding (Fehr and Gächter 2000). In the second round with punishment allowed, the results were divided. Fehr and Gächter (2000) could not observe stable behavior in the strangers-group, but noted that in the partners-group the contributions no longer went towards free riding, but rather towards full efficiency. We will also discuss trust and communication in more detail in the next chapter when we discuss experiments in common-pool resource economics.

Our last example-experiment was performed by Peter Bohm and illustrated by Dufwenberg and Harrison (2008); this experiment illustrates the critical factors of institutions and self-selection. The purpose of the experiment was to investigate whether a new transport route would be beneficial for the public, and was to be tested on people that were naturally affected by it. This experiment differs from the rest, as the participants would have to pay to use this public good and only those that the investigator believed would contribute were given information. But at the day of the experiment nobody showed up. It turned out that the participants chose to boycott the experiment, in the fear of losing a transport route that already existed. These results demonstrate that when imposing certain institutions on the participants there is no guaranty that the interests of the investigator will be the same as the participants (Dufwenberg and Harrison 2008). It also shows how vulnerable an experiment might be.

The examples above show the broad aspect of experiments in experimental economics and some of the points that have risen in this chapter. When deciding on the experiment one is set out to perform, it is crucial to choose an approach that fits the specific environment, regardless of whether it is a replication of an earlier study or a new one. Further the illustrations show that sometimes the answers that the investigator looks for don’t follow the incentives of the participants. Last but not least we have seen that the way in which the participants act, depends on whether they are aware of being a part of the experiment or not.

Before moving on to our own experiment, the following chapter will cover previous experiments within common-pool resource economics; it is important to mention some of the main findings within this field, to get the right understanding of experiments within that field.

3 Experiments within common-pool resource economics

3.1 The tragedy of the commons

Field experiments have been applied to many different areas of economics, common-pool resource economics is no exception. Since our own field experiment concerns this area of economics, it is appropriate to spend some time investigating previous results from this area of research. This chapter begins with a discussion regarding common-pool resources and the common-pool resource dilemma. We then continue by discussing the importance of communication in these types of experiments and some of the results previously found, we also discuss the cultural and social factors affecting these experiments. Further we mention the importance of information and review the information layers proposed by Cardenas and Ostrom (2004). The chapter ends with a discussion on the importance of the laboratory emphasized by Ostrom (2006).

3.2 A definition of common-pool resources and the common-pool resource dilemma

The definition of a common-pool resource is the following; if one person is using the resource or parts of the resource these cannot be used by another person, and the use of these resources is hard to restrict. Examples of such resources are fishing grounds and forests.

In a highly cited article by Hardin (1968), "The tragedy of the commons", it is argued that the individual as a user of a common-pool resource will try to maximize merely his own utility and since every user will act the same way, the resource will be extracted until it is depleted and the resource will therefore not be socially beneficial in the long run. This article has gained such wide acceptance not only because it is consistent with traditional game theory but also as a result of the many examples of overharvesting of resources throughout the world (Anderies et al. 2011). Traditionally the solutions for ending overharvesting that have been

proposed have been external regulations that are set on these resources (Ostrom et al. 1999). The field studies which have been conducted in the past decade on common-pool resource dilemmas have questioned whether the tragedy of the commons really is unavoidable and the evidence seems to point to that it is actually not (Cardenas and Ostrom 2004; Ostrom 2006).

As Ostrom et al. (1999) mention, the dilemma faced by common-pool resource users is the fact that to make the resource socially beneficial in the long run, some users have to sacrifice their own short term benefits and extract less of the resource. An individual can choose to overharvest and destroy the resource in the long run, or reduce their usage of it in the short run and make the resource last longer (Cardenas and Ostrom 2004). The main problem here is that there are always free-riders that share the benefit of someone else restricting their usage of the resource, which will be costly for the one restricting the usage but costless for the free-rider (Anderies et al. 2011).

The Nash equilibrium predicted by non-cooperative game theory is that there will not be cooperation between two players of a basic game. This can be shown in the following simple payoff-matrix:

	Player 2, Strategy A	Player 2, Strategy B
Player 1, Strategy A	(3,3)	(1,4)
Player 1, Strategy B	(4,1)	(2,2)

Figure 2 Game matrix

The Nash-equilibrium of a game is a point where none of the players can get a better payoff by changing their move individually. The non-cooperative Nash equilibrium in this game is strategy B for both players, but as we can notice, both players would be better off if they chose strategy A. But as this would require cooperation, which is not allowed in traditional non-cooperative game theory, this will not be the equilibrium of this game. But we will soon see that allowing cooperation will to a high degree change the outcome of a game.

3.3 Field experiments and communication between the users of a resource

The crucial point that is raised as one of the main counterarguments against traditional game theory in the experimental approach to common-pool resource dilemmas is that it is the communication between users of a resource that could cause the users to behave differently than the traditional non-cooperative Nash-equilibrium predicts (Cardenas and Ostrom 2004). Field experiments have become a valuable research method in investigating common-pool resource dilemmas; with field experiments one has the opportunity to observe the behavior of the actual resource users by changing the level of interaction between them. As Ostrom (2006) mentions, results obtained in the laboratory without allowing communication between the subjects is as predicted by the Nash-equilibrium of a non-cooperative game; the individual acts only to his own best interest. But when groups are allowed to interact with each other during the game there are other results to be observed (Ostrom 2006).

Observations from the field have revealed examples of social-ecological systems, such as fishing grounds, where the users have in fact managed to restrict the usage of a resource without external regulations as the driving force (Castillo and Saysel 2005). What are then the important factors that make certain groups succeed in keeping the resource extraction at a certain level? Another valid question to be posed at this time is whether results from seemingly simple experiments in a trustable manner can reflect the behavior of people outside the experiment. Anderies et al. (2011) list some common-pool resource experiments done in the field and find that many of the predictions based on traditional game theory do not hold.

3.4 Cultural context and social factors

Whereas it is not taken into account in the laboratory setting, the social factors that might affect the results of an experiment are some of the most important reasons for moving out to the field (Cardenas and Ostrom 2004). Also, and particularly in common-pool resource experiments social factors are important to account for. As discussed in chapter two, to overcome some of the social aspects many researchers have moved from the laboratory, out to the field and changed their subject group from students to actual resource-users. But the new and important challenge discussed by Cardenas and Ostrom (2004) is then to decide whether or not these resource-users actually act in the experiment as they would in the real-life resource extraction process. The importance in doing field experiments concerning common-pool resources is thus to understand how individuals that are part of a group using a certain resource make their decisions and how these groups sometimes actually manage to self-sustain the resource without the help of external regulations (Cardenas and Ostrom 2004).

As mentioned by Cardenas and Ostrom (2004) one of the main challenges now lies in the fact that we are no longer talking about private goods in fully informative markets, but about non-private goods that are not easily excludable.

3.5 Information

An important factor affecting people's behavior is the information about others that are using a resource that surrounds them. Cardenas and Ostrom (2004) provide a framework for showing how the information is layered and how it affects the individual's decision to cooperate.

They start out with an individual that faces a collective-action dilemma. If the individual and the others taking part in the game only take into account their own benefit, the result would be that no one cooperates. But everyone would be made better off by cooperating, and as Cardenas and Ostrom (2004) mention, usually about half of the individuals start cooperating in these types of games, either due to the lack of understanding of the game, but also because of certain information being available. If the players gain enough information about the other

participants, they can learn to trust the others and cooperation might be an opportunity to achieve a better outcome for everyone (Cardenas and Ostrom 2004).

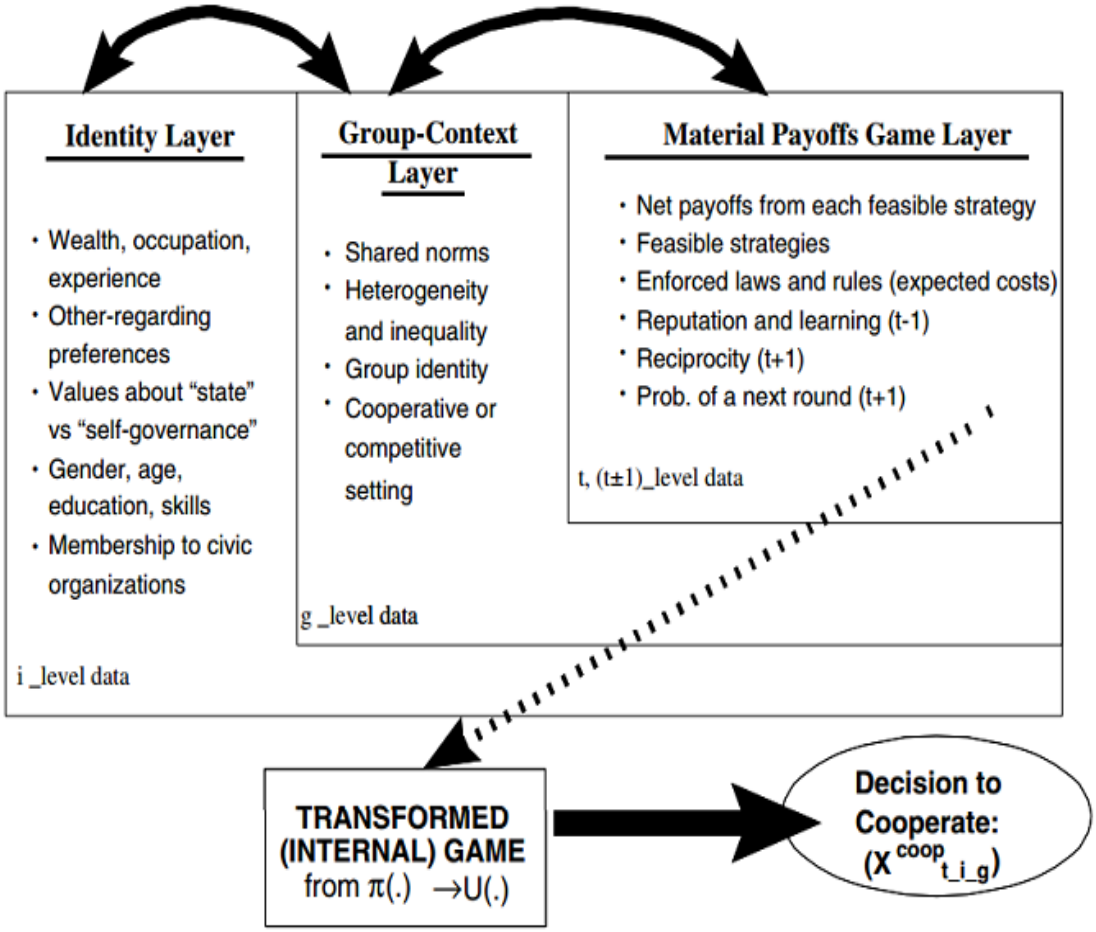


Figure 3 Layers of information

Cardenas and Ostrom (2004) divide the layers of information into the material payoffs game layer, the group-context layer, and the identity layer. They then argue that the single player in the material payoffs-layer wants to know what payoffs himself and the others might gain from the game if not cooperating. In the next layer, the group-context layer, the single player wants to know whether the other players of the game can be trusted. In the final layer, the identity layer, the player must decide whether or not he cares about his decision to defect or cooperate. Based on this framework, Cardenas and Ostrom (2004) argue that social-dilemma games

ultimately might change, depending on the information levels, ending up with less conflict between the collective and individual interests.

Field experiments are suitable for investigating the group-context and identity layers of a game; these are social-context layers that involve both culture and personal identity, which Cardenas and Ostrom (2004) argue are hardly possible to mimic fully in the laboratory. They tested the hypothesis about information layers out in the field and did indeed find evidence for the fact that individuals use diverse layers of information depending on the type of game they are playing and the specific context that they operate in (Cardenas and Ostrom 2004).

The attributes that Cardenas and Ostrom (2004) mention as the most important ones in common-pool resource dilemmas are trust, reciprocity and reputation. As already explained in the framework, if there is no trust, reciprocity or if someone has a bad reputation it is less likely that the individuals would actually start cooperating. According to Castillo and Saysel (2005) social groups with the characteristics mentioned above have a better chance of managing a resource in an effective way; if the group is relatively small, trust and reputation are very important, as in smaller rural communities. If there are common interests in the group, there should be growing reciprocity norms in the long term (Castillo and Saysel 2005). They also mention the fact that in a relatively small community where there is a higher chance of face-to-face communication the norms have a greater chance of becoming broadly socially accepted norms. Castillo and Saysel (2005) even argue that when there is a local community that in a successful way has managed to regulate their resources, too much external restriction might destroy the cooperation.

3.6 The importance of the laboratory

If it is in fact so that cooperation depends heavily on social and cultural context, it is of great importance to take this into account in the experimental design and to a high degree locate the experiments to the field when this is possible. When this is said, Ostrom (2006) points out the importance that the laboratory still has to the value of a full experimental process. As already pointed out the laboratory can provide replicability and control to the experiment, which is never achieved in the field in the same degree. As was already discussed in the previous

chapter there is a higher confidence in the results if a researcher can provide both methods to the same theoretical questions. To be able to have at least the needed amount of control over the several variables in the field, the laboratory is the place where one can study simplified versions of an experiment to decide which variables to focus on in the field. When moving to the field it is important to allow for different participant populations and natural tasks, and to have an understanding of the environment to interpret the results in a proper way and to get an understanding of the interactions and contexts in common-pool resource dilemmas (Anderies et al. 2011).

Ostrom (2006) wanted to test what factors that were the important ones in the field, affecting the decisions to cooperate in the laboratory and since face-to-face communication is something prominent for small groups, this was the first factor brought into the laboratory experiment. The results were in line with the findings of many others; the subjects showed a capacity to interact and in fact solve many social dilemma problems when allowed face-to-face interaction (Ostrom 2006). She also mentions the importance of replicability, and points to a replication study done by Cardenas (2000) who used rural villagers in Colombia instead of university students as she had done. And Cardenas could in fact report similar results about the importance of face-to-face communication among the villagers as among students (Cardenas 2000). In the next chapter we will discuss how communication among other things affected the outcome of our field experiment.

4 Method

The motivation for our field experiment was a discussion paper (work in progress) by Therese Lindahl, Ann-Sophie Crépin and Caroline Schill from the Beijer Institute of Ecological Economics. In the paper they present a laboratory experiment that investigates whether or not an endogenously driven abrupt and persistent change, also known as a regime shift, might influence the amount of cooperation between resource users in the management of a certain resource. While their focus is whether or not subjects will cooperate more when facing the threat of a regime shift, our own focus will be more on the behavioral aspects and the challenges encountered when moving to the field. It will nonetheless be of value to explain the laboratory experiment in more detail, since our field experiment is based on the same experimental design. Lindahl et al. (2012) used framed laboratory experiments with students as the starting point when investigating the question. Before moving to the results of the laboratory experiments and to our own field experiences, it is worth mentioning some background for their research and go through the experimental design.

4.1 Background

In their paper Lindahl et al. (2012) point out that in a lot of the previous literature concerning common-pool resources, the main focus has been on the institutional aspects, but in their paper they want to focus on the resource dynamics *per se* and the influence it has on the cooperation between the resource users. As mentioned in chapter three there is a wide range of literature pointing out the importance of communication as a driving factor for successful cooperation between resource users, hindering the tragedy of the commons, and Lindahl et al. (2012) wanted to take this aspect one step further by including a potential regime shift in their experimental design. With a regime shift they mean a large, abrupt, persistent change in the structure and function of a system and they point out that since these are becoming more and more common in many systems, ranging from epidemiological to economic systems, it is an important area of further study (Lindahl et al. 2012).

In their research they focus on these possible regime shifts and want to find out whether they trigger more effective communication between users. The main point they make is that if there is a potential endogenously driven drastic drop in the renewal rate of a resource of this kind, this might lead the resource users to a more cautious resource use and that more effective communication might be obtained because of the possible threat (Lindahl et al. 2012).

Further they argue that it is of high relevance to include experiments in these types of studies, since as mentioned earlier, experiments can help close the gap between theory and empirical research.

4.2 Experimental design

4.2.1 The model

To describe a system with no regime shift Lindahl et al. (2012) use a logistic growth model which is often used when modeling the harvesting of renewable resources (Lindahl et al. 2012). The following dynamic equation represents the stock dynamics without a regime shift:

$$\frac{dx}{dt} = rx\left(1 - \frac{x}{K}\right) - h \qquad (1)$$

Here x is the resource stock at time t with a logistic growth rate r and carrying capacity K, h is the harvest at time t (Lindahl et al. 2012). The resource stock x is derived with respect to time t, this equation represents the growth of the resource stock x when there is no regime shift.

To incorporate a regime shift to the model, Lindahl et al. (2012) present a model originally developed by Ludwig et al. (1978). According to Lindahl et al. (2012) harvesting is a typical control variable that could cause the regime to shift.

$$\frac{dx}{dt} = rx\left(1 - \frac{x}{K}\right) - b\frac{x^{\theta}}{a^{\theta} + x^{\theta}} - h \qquad (2)$$

In equation (2) above they added a Holling type III predation term to the logistic stock dynamics, here b is the maximum uptake rate, a is the half saturation and the exponent θ represents non-convexity. It is the non-convex term that causes the potential multiple steady states (Lindahl et al. 2012).

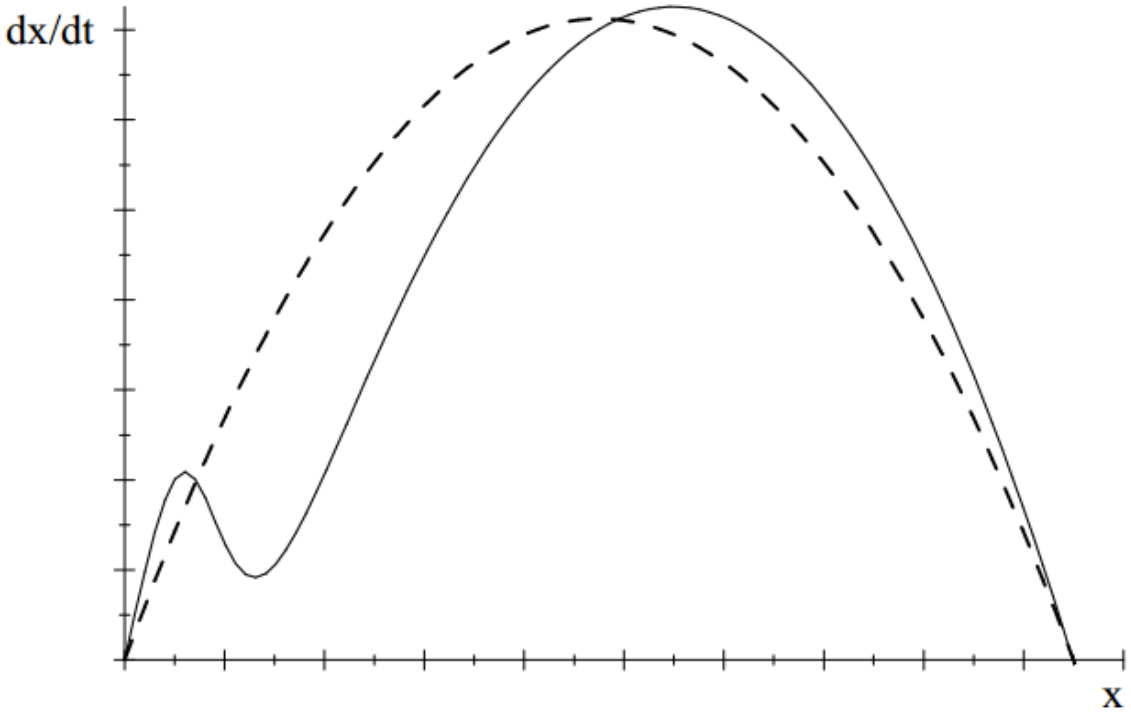


Figure 4 Logistic growth function (dashed curve) and resource growth as in Ludwig et al. (1978) (Solid curve).

The solid curve represents the resource growth with a potential regime shift for different sizes of the stock , here the parameter values are set to: r=1, K=11, a=1, b=1.3, h=0 and θ=4 (Lindahl et al. 2012). The threshold might make the system move from one domain of

attraction to another as can be seen in figure 4 above. Lindahl et al. (2012) argue that in the case of a regime shift the critical threshold for the new regime is not the same as the threshold for going back to the original regime, this because the new regime has internal feedback loops, making it difficult to go back to the old regime.

They further argue that the influence that resource users have on the natural dynamics depend on what strategy the resource users choose. The resource users can maximize their welfare by cooperating, and harvest the resource together, Lindahl et al. (2012) formulate the problem as follows:

$$\max_{h \geq 0} \int_{t=0}^{+\infty} U(h,x) e^{-\delta t} dt \tag{3}$$

s.t. (1) or (2)

Here one resource user maximizes his welfare and this is shared equally by the others, *h* denotes harvest and *U(h,x)* denotes the utility derived from consuming the harvest and the standing stock (Lindahl et al. 2012). With constraint (1) there is one unique interior solution and one boundary solution that is unstable, with constraint (2) the problem is more complex and has more than one interior solution, which one depends on the parameter values (Lindahl et al. 2012).

If the resource has *n* users of *i* amount of the resource, the problem is formulated as:

$$\max_{h_i \geq 0} \int_{t=0}^{+\infty} U(h_i,x) e^{-\delta t} dt \tag{4}$$

$$\text{s.t.:} \frac{dx}{dt} = rx\left(1 - \frac{x}{K}\right) - \sum_{i=1}^{n} h_i \tag{1}$$

$$\text{or: } \frac{dx}{dt} = rx\left(1 - \frac{x}{K}\right) - b\frac{x^{\theta}}{a^{\theta} + x^{\theta}} - \sum_{i=1}^{n} h_i \tag{2}$$

Again the solution will depend on each resource user's strategy (Lindahl et al. 2012). Lindahl et al. (2012) point out that the solution to (4) with the more complex constraint (2) which involves a regime shift is difficult since it depends on the strategies of individual players and these are not known, but they also point out that the aim of their paper is to try to solve these difficulties by including experiments in the research.

In figure 3 Lindahl et al. (2012) presented the stock dynamics both with and without a potential regime shift. In the experiment they present the same logic, but in a discrete version which is easier to present to non-scholar audiences, this is illustrated in figures 5 and 6 below.

Figure 5 Without threshold

Resource stock size	Re-generation		Resource stock size	Re-generation		Resource stock size	Re-generation
50	0		32	7		14	3
49	1		31	7		13	3
48	1		30	7		12	3
47	1		29	9		11	3
46	1		28	9		10	3
45	1		27	9		9	1
44	3		26	9		8	1
43	3		25	9		7	1
42	3		24	7		6	1
41	3		23	7		5	1
40	3		22	7		4	0
39	5		21	7		3	0
38	5		20	7		2	0
37	5		19	5		1	0
36	5		18	5		0	0
35	5		17	5			
34	7		16	5			
33	7		15	5			

Table 1 Regeneration for each stock without a threshold

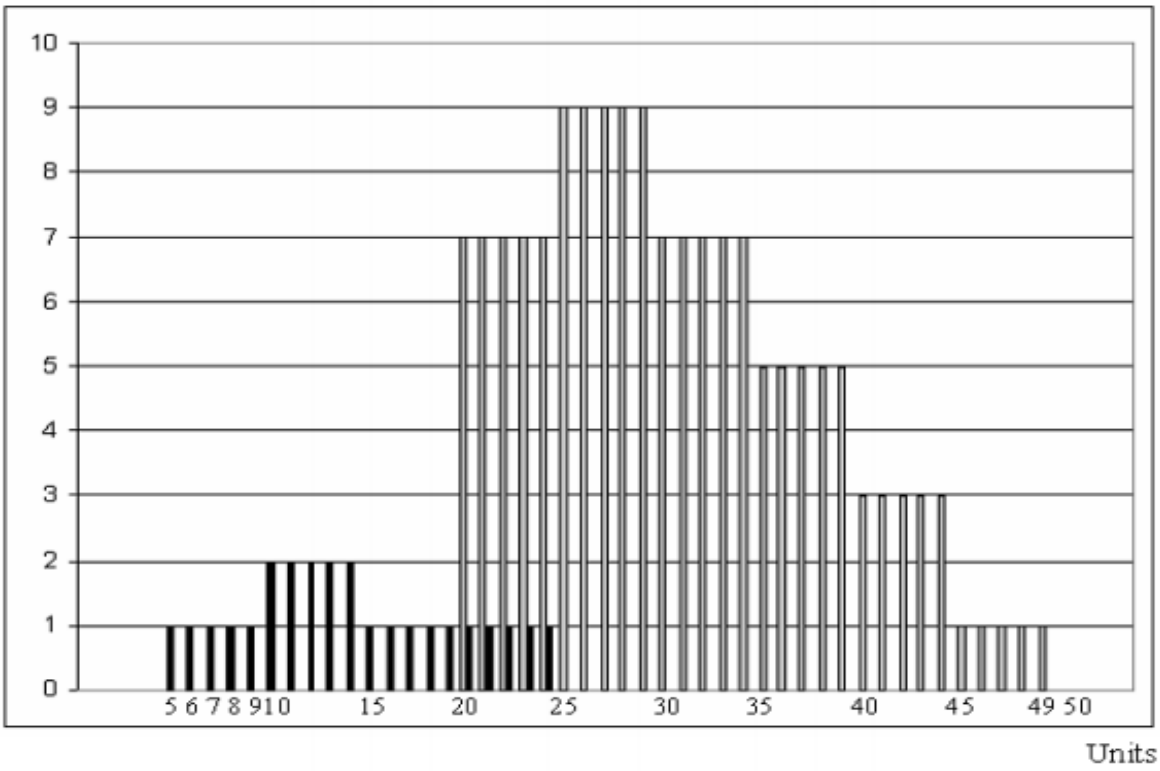


Figure 6 With threshold

Resource stock size	Re-generation	Resource stock size	Re-generation	Resource stock size	Re-generation
50	0	32	7	14	2
49	1	31	7	13	2
48	1	30	7	12	2
47	1	29	9	11	2
46	1	28	9	10	2
45	1	27	9	9	1
44	3	26	9	8	1
43	3	25	9	7	1
42	3	24	7 alt. 1	6	1
41	3	23	7 alt. 1	5	1
40	3	22	7 alt. 1	4	0
39	5	21	7 alt. 1	3	0
38	5	20	7 alt. 1	2	0
37	5	19	1	1	0
36	5	18	1	0	0
35	5	17	1		
34	7	16	1		
33	7	15	1		

Table 2 Regeneration with threshold

Lindahl et al. (2012) start out with a maximum stock size of 50 units. 5 units is the minimum stock size to allow reproduction. The maximum sustainable yield was set to 9. This can be seen in figure 5. With a regime shift the dynamics are the same, until a critical threshold of 20, where the renewal rate drops drastically as can be seen in figure 6. If the users want to recover the resource when dropping below this threshold, they must let the resource rebuild to 25 units (the regeneration rates can be seen in tables 1 and 2 above). Lindahl et al. (2012) refer to their treatment groups as the threshold treatment if a regime shift is a possibility and the no threshold treatment if the resource dynamics are logistic.

Lindahl et al. (2012) recruited 150 subjects that were students from Stockholm University in May 2010 and fall 2011, the students formed random groups of three or four subjects. They finally got 20 observations for the threshold treatment and 21 for the no threshold treatment.

The subjects were told that they were acting as fictive resource users, and that each group would be managing a common resource stock. They had to choose a certain amount of the total 50 units to harvest individually and anonymously, each unit having a value of 5 SEK. The subjects were not told for how many rounds the game would continue, since it's a good

approximation of an infinite amount of rounds when players think the game goes on for one or more periods with a high probability (Lindahl et al. 2012). Most groups kept the game going for about 14 rounds, but some depleted the resource in lesser rounds and thus the game ended.

The optimal solution to the game in both treatments is for the group to harvest 25 units in the first period, and then harvest the maximum yield of 9 units in each following round. If the players let the resource get below 25, they need to let the resource recover to 34 units until then harvest the maximum of 9 units (Lindahl et al. 2012). The joint efficiency of the players is measured as the share of joint earnings over the maximum possible earnings (Lindahl et al. 2012).

Lindahl et al. (2012) show the expected payoff outcome $P_c(n,T)$ for a cooperating player (given that the other players cooperate as well) as follows:

$$P_c(n,T) = \frac{25}{n} + (T-2)\frac{9}{n} + \frac{34}{n}; \lim_{T\to\infty} P_c(n,T) = +\infty \quad (5)$$

The payoff thus depends on the number of players *n* and the time *T*, this is true both for the threshold and non-threshold cases.

As argued by Lindahl et al. (2012) it is challenging to predict the outcome of non-rational resource users, but it is of interest to make predictions. The optimal outcome for a player that does not cooperate (when assuming all other players cooperate) is presented as follows:

$$P_D(n) = \frac{50}{50 + 25(n-1)} x50 = \frac{50^2}{25(n+1)} \quad (6)$$

This is the outcome for a player who assumes that the others cooperate, this player optimally should harvest the whole stock and the stock is then divided between the players, depending on their claims (Lindahl et al. 2012). This again states that to deviate profitably, the following must be true for both threshold and non-threshold dynamics:

$$P_C = (n,T) < P_D(n,T) \Leftrightarrow T < \left(\frac{100n}{n+1} - 59\right)\frac{1}{9} + 2 \quad (7)$$

Lindahl et al. (2012) also see it as important to look at a situation where one player deviates only partially, not depleting the stock, but harvesting more than the others. As an example they present a game where the payoffs in the threshold and the non threshold treatments differ. In their example one player takes 10 units more than the others in the first period assuming that the others cooperate, this players payoff will then be:

$$P_{RS}(n,T) = \frac{25}{n} + 10 + (T-11)\frac{9}{n} + \frac{34}{n}$$

Or

$$P_{NS}(n,T) = \frac{25}{n} + 10 + \frac{2}{n} + (T-3)\frac{9}{n} + \frac{34}{n}$$

Where the first is with a regime shift and the second is without a regime shift. They assume that the player who deviates is assuming that the others are keeping to the most rapid strategy, which leads to that deviation is only profitable if the following is true:

$$P_C(n,T) < P_{RS}(n,T) \Leftrightarrow n > 9{,}9$$

Or

$$P_C(n,T) < P_{NS}(n,T) \Leftrightarrow n > \frac{10}{7}$$

Therefore they argue that a partial deviation is more likely without a regime shift.

Since it has been observed that face-to-face communication enhances the resource management, the groups were allowed to communicate orally, an important point being that they did not have to (Lindahl et al. 2012). The players also got information about the stock

level between each round so that they had the opportunity to gain some information about the actions taken by the other players. Thus the information about the others' actions was about the only thing they had to base their own strategy on.

Following the experiment there was a questionnaire to be filled out by the participants. There were basic questions about age, gender, education etc. in addition to questions about the experiment, such as how well they understood their role as a resource user and how they felt the communication was in their particular group. As is mentioned by Anderies et al. (2011) it is common to use questionnaires to help the researchers understand why the subjects have answered or acted in a certain way.

4.2.2 Hypothesis

Lindahl et al. (2012) expected the threshold treatment groups to over-exploit less than the no threshold groups. Also the average efficiency and communication was expected to be better in the threshold groups. But if the groups cooperated they expected the no threshold treatments to act as the threshold treatments.

The first hypothesis stems from the fact that in the threshold treatment when being below the threshold between stock sizes 10 and 19 (see figure 6) there is a higher incentive to deviate from an equilibrium, this because the regeneration rate has dropped and is now harder to sustain than in the no threshold treatment (Lindahl et al. 2012). According to Lindahl et al. (2012) the idea behind the second hypothesis is that if the group understands the positive effects of communication at an early stage, they will keep up the communication and keep up the sustainable yield, regardless of treatment.

4.2.3 Results from the laboratory

We will not go in depth in all the specific results from the laboratory experiments since our own focus is on the behavior of the subjects and the challenges encountered when moving from the laboratory to the field. But we do believe it is of importance to mention some of them, and specifically in the more behavioral sense of the results, looking at the understanding of the resource dynamics and the communication between the subjects.

In line with their first hypothesis Lindahl et al. (2012) did in fact observe that the threshold treatment cooperated more than the no threshold treatments. Almost none of the threshold treatments over-exploited the resource, while more than half of the no threshold treatment groups did. When it comes to the second hypothesis regarding efficiency, they did in fact find that the threshold groups were more efficient as well, which is not explained by factors such as age, gender or group size, but rather by the fact that groups that were in the threshold treatment, and that cooperated well and understood the resource dynamics were on average more efficient than others.

This is an important thing to note also when moving on to the field studies; the overall understanding that the group has of the resource dynamics plays an important role for the experiment. But Lindahl et al. (2012) argue that this is only true for the cooperating groups. If the groups behave individualistically, then the fact that some of the players understand the resource dynamics, does not reflect to the others in the group, which was well noted in the field studies explained later. While efficiency depends on cooperation, cooperation depends on communication; Lindahl et al. (2012) present an explanation to this which is that the threat of a regime shift makes the communication between the resource users more effective, and this leads to cooperation, and sharing of the understanding of the resource dynamics and thus improves the performance of that particular group.

In line with other researchers Lindahl et al. (2012) thus argue that when there are no internal or external rules imposed, it is in fact the face-to-face interaction that is the driving force in managing a resource efficiently. It is in particular these aspects that we will focus on in the analysis of our field studies; the subjects' understanding of the resource dynamics and the efficiency of communication.

4.3 Moving to the field

As has been mentioned several times above, combining the laboratory findings with field studies is a natural next step in the experimental journey. We came in contact with Therese Lindahl and Ann-Sophie Crépin from the Beijer institute of Ecological Economics in the spring of 2012. Lindahl and Crépin, with the assistance of Caroline Schill, did their common-pool resource experiments with students in Sweden and were now interested in doing the same experiments on real resource users, and had therefore chosen Norwegian fishermen as the new target group. They had contacted Nofima, the Norwegian Institute of Food, Fishery and Aquaculture, who contacted our professor at the Tromsø University business school, since Lindahl et al. needed the help of Norwegian students to conduct the experiments. We thought the experiment sounded very interesting and that it would be a good starting point for our master thesis.

Next follows a discussion of the experimental design and how it was implemented on the new target group. After follows a description of our experiences when going out to the field, meeting the fishermen and the challenges we faced on the experimental journey, especially in recruiting subjects. We found that these challenges were in fact much in line with what List (2011) describes and that they were bigger than we could have imagined prior to the start of our experimental journey.

4.3.1 The experimental design and the new subjects

The first thing we needed to do was to change the experimental material to fit the new target group. In cooperation with Lindahl et al. we changed the questionnaires to better fit the new target group; there were new questions implemented, with questions about how long the subjects had worked in fisheries, how the decisions on the boat are made and other questions related to their daily work. The questions concerning how well the subjects understood the resource extraction process, and the game itself was kept the same, to keep the experiment as similar to the original design as possible. Lindahl et al. then sent us all their material so that we could translate it from Swedish to Norwegian. The questionnaire and the explanation sheets can be found in the appendix.

Another factor that needed to be changed was the payment of the subjects. As List (2011) mentions, it is important to have a proper payment to give the subjects enough initiatives to participate. The students had been paid with actual monetary rewards, and since students actually have the incentives to participate for quite a small amount, incentivizing the students had not been a problem in the laboratory experiments. Norwegian fishermen are a quite different affair, since they earn a high salary. We guessed that a few hundred Norwegian kroner would not make the incentives to participate very high, so we concluded that lottery tickets would be the next best alternative, since there at least is some chance of getting a high reward. Still, we were quite aware of the fact that lottery tickets would not alone help in getting people to participate, so we relied mainly on people having enough personal interest to do this without really getting much in return. In line with what we discussed in chapter two regarding incentives, we relied to a high degree on intrinsic motivation. And as it turns out, to get people to do things almost for free is quite a challenge indeed. Experimental research is often conducted in less developed countries, with for example rural villagers in Namibia, South Africa, Thailand and Colombia (Anderies et al. 2011). To get high enough incentives for the subjects in less developed countries is easier than it is in for example Norway, and the cost of travelling might still be less than it might be to get high enough incentives for the subjects in more developed countries.

4.3.2 Recruiting subjects

When the preparations were done, it was time to start planning how to get in touch with local fishermen; this was easier said than done. Already at this point we started facing some of the challenges mentioned by List (2011), concerning the communication with the subjects. He mentions the importance of good communication as crucial to the experiment from the beginning; if the communication is bad from the start, the experiment is more likely to fail.

At first, everything looked quite promising; Lindahl had already been in contact with people within the Norwegian fishermen's sales organizations, and they had shown some interest in having us on one or more of their yearly meetings, located in different parts of Northern Norway. The plan was to go on some of these meetings together with Lindahl and Schill to reach as many of the subjects at the same time as possible. At the meetings we would have

potentially gathered quite some observations. But unfortunately, one by one, the bad news and cancellations started coming, ending up with no meetings having the time for us at all. And so we were back at the drawing board. It turned out that getting in contact with fishermen in a region that is ironically full of them, would be the biggest challenge of them all.

We had some local connections in the Tromsø area and these connections were our next hope. Lindahl and Schill planned a trip to Tromsø in October 2012, and we worked hard to get hold of subjects for the few days Lindahl and Schill were staying in Tromsø. Once again we got some promising news, and when Lindahl and Schill arrived, we had potentially no less than four or five groups of subjects and we felt hopeful. We met Lindahl and Schill on the day before the experiment to plan the trip and to do what was needed prior to the experiment. We carefully went through the experiment, how it should be explained to the subjects, what we could and could not tell the participants during the experiment and double-checked the questionnaires. The lottery tickets were also bought and a car was rented for trip. The initial plan was to start with a boat located in Tromsø, continuing to Finnsnes to the second boat and ending up at Senja, an island located three hours from Tromsø for a third boat. We confirmed with our contact persons on the boats and everything was settled for the trip the next day.

Image 1 Map of Troms

4.4 Our journey to the field

The day of the experiments started early. We met Lindahl and Schill at their hotel and went to pick up the rental car and were thereby all set to go. But we had already encountered the first bad news of the day earlier in the morning; the boat located in Tromsø had cancelled, so now we were down to the two other boats. Since we suddenly had the morning off, we took the opportunity to do a bit of sightseeing in Tromsø and enjoy the nice weather, which was about the only thing that turned out to be on our side that day. But not long after the first bad news came the next. When calling to confirm that at least the second boat, located two hours away would be ready for us, the captain of the vessel wanted to confirm that they could work on the boat while we asked them questions. We tried to explain that this was not doable since this was a pen-and-paper type of game and it was crucial to let the subjects sit down to properly participate. Unfortunately the boats of this type have a tight schedule, and after loading of their fish at a certain location, they go back to sea immediately. This was of course understandable, but a big disappointment for us. The captain even called back to tell us that they had a twenty minute lunch break during which they could participate. Unfortunately twenty minutes was still not enough, and we had to reject the captain's nice offer to sacrifice their lunch for our purpose. This again shows how very important communication is, and that it is important to explain what is needed from the subjects from the beginning, so as to avoid misunderstandings and pitfalls even before the experiment has really started. But when this is said, the task of explaining an economic experiment on the phone or via an email to someone you have never met and try to get them on board is indeed a harder task than one might imagine.

So the only boat left was the one located three hours from Tromsø, and this boat was not going to be back in the harbor until later in the evening. There was a lot of waiting, but due to the small and not so pleasant roads that lead to Senja, we were on the road early, after double checking that our last subjects were really on board. After the good news the spirits were up again and we took off.

But the challenges did not end there. After over two hours on the winding roads of Northern Norway, we were almost at our destination, when suddenly we faced a closed tunnel, and this was the only tunnel leading to our destination. The tunnel was to be closed for two hours due to construction work. And even after trying to convince the construction workers to let us

through, we had to give in to the idea that we were stuck. Luckily for us, the boat was late as well, and would not arrive at the harbor until a few hours later, so we had all the time we needed and some more. After watching the northern lights for about two hours, we were on the road again. We reached the destination a good while before the fishermen did, and there was some more waiting to be done at the local kiosk. Finally we got the call, and headed down to the harbor and after loading of the days catch the fishermen were tired but ready to participate in our experiment.

4.4.1 The experiment

We were hoping to get two groups of subjects since there were six fishermen on the boat, but already before moving inside, one of the fishermen got cold feet and cancelled and never even stepped out of the boat. We were told that this was due to the fact that there were four unknown women present. So we were now down to five subjects, which was a problem, since we needed at least six to even get two small groups. Despite this we had to keep going with only one group, which was disappointing since we were hoping to get one threshold group and one group with no threshold. Instead of going on board the boat we decided to go inside the cantina of the fish factory due to the small space inside the boat. It was agreed on that the fact that the experiment would not take place inside the boat would probably not make the results any different.

We had quite a lot of material with us, and while the two of us were explaining why we were there and the purpose of the experiment in more detail, since we spoke Norwegian and were the ones who had previous contact with the subjects, Lindahl and Schill got the paperwork ready. Already at this point there was some skepticism to be noticed from the fishermen, they asked a lot of questions and wondered about the purpose of the experiment, the situation could even be called a little chaotic at the time. They obviously did not expect the amount of paperwork to be present. We handed out the sheet explaining the problem and the game they were going to play and gave them some time to read it through. At this point, the captain of the boat, an older man, decided to drop out. Even after a pursuit to explain the experiment orally he had decided that it was not something he could be able to do and apparently was intimidated by all the papers and numbers that were present. He told us that he would rather

participate in an interview answering questions about resources, which is a quite interesting turn of events; it points to the fact that he did indeed have knowledge of both resource usage and a long experience in the particular field, but the experimental approach was not the right one for him.

So we were down to four subjects, but since we were already down to one group this did not affect us too much. Still the fact that the captain dropped out at this stage shows how the cultural issues can actually make or break an experiment. This will be analyzed in more detail later, but it can already be mentioned that the cultural barrier between the academic world, the world of for example a fisherman, and the fact that the subjects were all men and the researchers were all women, seemed to have a big impact on the conducting part of the experiment. Having worked at the particular fish factory, and being around fishermen before, this came as no surprise to some of us and we understood that we needed to simplify the explanation of what was going to happen next if we were going to be able to conduct the experiment at all. So we dropped the explanation sheets and tried to explain the experiment orally, as simply as possible and even adapting the way they were speaking, meaning that we dropped as much of the academic language as we could, perhaps making the experiment sound less intimidating. As List (2011) mentions, it is important to explain what your aim is and that you do not necessarily have all the answers to the problem, but that you value the time that the subjects put in when helping you get the answers that might potentially lead to important results. The importance lies in working with the subjects, not above or against them and to reach a level of discussion that fits both parties.

Still being a bit uncertain of whether the subjects understood the essence of the game or not, we decided to begin the experiment anyway. We handed out the answer sheets and the subjects were told how much of the stock they had to begin with and that they could communicate if they wanted to. At first they were spread around the cantina area, but were told that sitting together would be preferable, so it could actually be observed that there was almost a bit of competitive behavior present at first. We chose to let them play the no threshold game, since it was at least a bit easier to explain the game without the possible threshold. In the first round there was a bit of confusion and talking between the subjects, but no real communication or team-work could be observed and there were still signs of competitive behavior. It could seem like they believed the main point was to outperform the others. After playing another round, they had already depleted the resource, which strongly indicated that some of the subjects did not in fact understand the rules of the game. So it was

decided that they would get another chance at the game, and we tried to explain it even more carefully. This time around it could be noted that at least one of the subjects started to understand the game; he actually tried to harvest zero in some rounds to save the stock. But since there still wasn't very good communication, the subject that understood the game did not get through to the others, so the game ended quite quickly this time as well. The fishermen were paid their lottery tickets, and we headed back to Tromsø. On their way back to the boat, we could hear how the results were discussed and apparently our presence had raised quite some interesting questions between the subjects. The subject who earned the least amount of lottery tickets tried to explain to the others that even though he had won the least, he understood the game the best. He only won the least tickets since he tried to save the resource, whether or not the others eventually understood this remains a mystery. The day had been quite disappointing in many ways, but we were happy about getting one group and we had made many interesting observations about the challenges in the field. Getting an email from our Swedish colleagues a few days after the trip, saying: "Thank you for a crazy road-trip!" might be the best and simplest way to describe our first encounter with field experiments.

5. Research results and discussion

What are then the results that can be drawn from our field experiences? The first part of this chapter focuses on comparing the advantages and disadvantages of the laboratory and the field, this on basis on our own experiences when doing field experiments as well as the laboratory experiments conducted by Lindahl et al. in addition to the factors mentioned in chapter two concerning economic experiments. We will in the second part of the chapter compare our experiences in the field with the six factors that might affect an experiment described by Harrison and List (2004) in chapter two. The third part of the chapter focuses on the main challenges when conducting field experiments mentioned by List (2011) in chapter two, and based on these we will discuss whether or not we found our experiences to be in line with the ones mentioned and whether we feel there is more to be mentioned in terms of some of the points raised. In the last part of the chapter we will revisit the information layers mentioned by Cardenas and Ostrom (2004) in chapter three, discussing the importance of trust, reciprocity and reputation and how communication between the subjects might enhance the managing of a resource, and how communication between the subjects affected our experiment. We will also discuss some possible improvements on the basis on our own experimental journey.

5.1 The laboratory and the field

As discussed in previous chapters the laboratory provides a sense of control and replicability, and thus laboratory experiments might be seen as easier to compute than field experiments. Because of their properties laboratory experiments are a typical starting point when setting out to do experiments in economics, and as mentioned, especially the combination of laboratory and field experiments can help in providing more convincing results (Ostrom 2006).

When mentioning replicability and control, which are seen as two of the main arguments for conducting laboratory experiments, and comparing laboratory experiments with field experiments, it is quite obvious why the laboratory is seen as the more easily replicable type

of experiment. Also when it comes to recruiting and incentivizing subjects, the typical laboratory setup has its advantages. According to Lindahl et al. (2012) recruiting students for the laboratory experiments was not a too hard of a task, and as students are quite readily available at the university and are easier to incentivize with a certain payoff, one can see why students are a well used group in experiments. As described in chapter four, recruiting fishermen has been quite another story. They are certainly not readily available and also the incentives to participate are much lower. One group of subjects were only willing to participate if they were able to work while they were participating in the experiment, also in other cases, where we have contacted people, time or lack of interest has been one of the biggest issues, ending up with no participation at all. Time as a cost is another point mentioned by List (2011), which will be discussed later in this chapter.

So when choosing to replicate a study, the laboratory seems perhaps more easily doable especially in the short term interest. In addition to replicability, the laboratory offers control; there is a possibility to change certain factors if one is of the opinion that something is initially wrong with the chosen variables. This is the other main reason why the laboratory is sometimes preferred; with the control one has in the laboratory one can choose to exactly replicate the study already done by others, or one can alternate some of the variables, to make the study even better and more exact, providing it with internal validity.

But as discussed in chapter two, the laboratory might not be enough if one wants to convince a broader audience of critics. This is also one of the reasons why Lindahl et al. wanted to conduct their experiment on subjects out in the field; if the results in the field differ from the results in the laboratory there is something in the study, which is apparently depending on the field context. It was a natural starting point to conduct the experiment in the laboratory first, which made the preparations for the field easier. But despite the fact that the experiment had been done in the laboratory previous to our field experiment, the field experiment was to be a big challenge, and what we think the main reasons for this was will be discussed in the following parts of this chapter.

5.2 The six factors that might influence an experiment

In the discussion regarding different types of experiments in chapter two, Harrison and List (2004) point out six factors that might influence the experiment; the nature of the subject pool, the information the subjects bring to the task, the nature of the commodities, the nature of the task, the nature of the stakes and the environment in which the subjects operate in (Harrison and List 2004). All of these are possible factors that might have influenced also our field experiment. We will therefore go through each of them below and describe our opinion of how they could be related to our experiment.

5.2.1 The subject pool and the information they bring to the task

One of the biggest differences between the laboratory and field experiments in our case was the subject pool. Even without much knowledge of experiments, one might guess that a student at the university in Stockholm, compared to a fisherman out on an island in Northern Norway, could be distinguished in quite many aspects. As mentioned by Harrison and List (2004) the non-standard subject might bring knowledge to the task that the students do not have. As mentioned by Anderies et al. (2011) non standard subjects own certain knowledge about the industry they work in which the standard student does not have. As discussed in chapter four, one fisherman would have been willing to discuss resources and seemed to have opinions about them, but was not willing to participate in the experiment. The fishermen are also aware about the fact that overharvesting their resource might lead to a depletion of the resource. But whether they actually think of this in their daily work and whether it shows in the experiment is uncertain. Since there are external regulations for fishing already set in Norway, one can question whether the non-standard subjects can then implement the possible threat of a depletion of the resource when answering the questions in the experiment. Since there are in fact already external regulations for the resource, which might as well be considered trustworthy by the subjects in the field, this might make the subjects care less about a possible threat of depletion. In other words the subjects might not take the threat seriously enough in the experimental setting.

While students at the university might not be familiar with the resource situation in Norway, they might still have certain knowledge and an understanding of games and of situations where they answer questions in the same manner as in the experiment.

The point being that these factors might lead up to the students performing better than the actual resource users in a certain resource game, even if the knowledge of the particular resource is actually higher in the non-standard subject group.

5.2.2 The nature of the commodity and the nature of the task

Harrison and List (2004) also mention the commodity that is used as a possible influence in the experiment. In our case neither in the laboratory experiment or the field experiment was a real commodity used, but the game was rather based on a fictive resource on paper, in our case fish (actually harvesting fish from the sea would have been quite cumbersome to manage). Regarding the students, the resource in the game could probably have been another resource as well, without that affecting the results as such. But when changing the subject group to fishermen, the fact that the fictive resource used in the game was fish probably made the understanding of the game easier for them, but still remembering that the overall understanding of the game did not seem to be totally clear for them, regardless of the fish as a resource.

This brings us to the nature of the task; while fishermen are familiar with the actual task of harvesting the resource in real life, putting it in pen-and-paper form did make the task unrealistic for them, and the big amount of paperwork we brought with us, seemed to be quite confusing. Students on the other hand might be quite lost if put on a fishing boat, but are used to being tested in pen-and-paper form, making it easier for them. So in addition to the understanding of a resource as mentioned by Lindahl et al. (2012) we found that the understanding of basic game-playing is important, and this aspect will be discussed further below.

5.2.3 The nature of the stakes

The fifth factor mentioned by Harrison and List is the nature of the stakes. Students that participated in the laboratory could earn actual money and for a student even a small amount might mean a lot, so the threshold for students to participate is not very high. But one of our main problems when moving out to the field was to get the same sort of incentives for the fishermen. If deciding to pay them in actual money, one would have had to have very high payments, which is rarely possible in research on this level, and thus we had to much more rely on the goodwill of people, which we unfortunately found out was not very high at times. Even though we used lottery tickets as payment, we felt like this was on the verge of being too low, facing the problem mentioned in chapter two; too low incentives might actually be worse than no incentives at all. Our field experiment was quite time consuming and this seemed to be one of the main problems when explaining it to possible participants. We discussed intrinsic motivation in chapter two, where Bardsley et al. (2010) argued that sometimes intrinsic motivation might be enough and that one might be able to get good results based on intrinsic motivation. In our case the motivation to give away time almost for free, was unfortunately not very high.

5.2.4 The nature of the environment

The last factor mentioned by Harrison and List (2004) is the nature of the environment, and this factor has gained much attention in the discussion on laboratory and field experiments. One of the main reasons for moving to the field has been the argument that the role-playing behavior that is argued to be prominent in the laboratory might possibly disappear when moving to the field. According to our own experiences, though bringing the experiment to the field, the natural environment of the fishermen, this did not in fact take away all the role-playing behavior. Knowing quite well from previous encounters with this group of people, about how they usually behave, one could observe that the awareness of being part of an experiment was very prominently to be seen. Facing four unknown people carrying a pile of papers after a hard day at work seemed to make the subjects more than well aware of the fact that they were part of an experiment and the natural environment was far from soothing. One

can then ask whether it would have mattered if the non-standard subjects were in familiar surroundings or whether it would have been equally fine to bring them into the laboratory settings. Here it is important to note what is argued by Harrison and List (2004); the definitions of experiments are blurred, and the lines between for example framed field experiments and artefactual field experiments are not thick. Our experiment could be said to be an artefactual field experiment, since it contained real resource users and it was located in their natural environment. But yet again, whether the part of being in the field actually changed anything or not is uncertain, we argue that it probably did not.

5.3 A comparison with List

In the article by List (2011) introduced in chapter two, we were presented with some important points in the experimental journey which need to be accounted for when heading out to the field; theory, interest, sample size, communication, time, cost and answers. There might of course be several points of equal importance, but when performing our own field experiment, we found these seven points to be the most challenging. From this point on this part of the chapter will attempt to compare List's suggestions with our own experiences from the field. It has been argued that the main obstacles lie in the interpretation of the results. But despite of that being true as well, our experience showed us that the challenges that one faces before the actual interpretation of the results might be even bigger than the challenges that the interpretation of the results offers, since these obstacles might lead to there being no results to be interpreted. Next follows a discussion of each of the factors mentioned by List (2011).

5.3.1 Theory

As mentioned in chapter two, economic experiments do not always tell us much in isolation, and in order to get appropriate and generalizable results in addition to a good starting point for interpretation, an experiment is often based on some economic theory. The field experiment

performed in this paper is as mentioned a continuation of an earlier laboratory study. One of the main differences between our experiment and the experiment in the laboratory were the subjects that were used, which differed from the student subjects used in the laboratory. We did however provide our participants with the same knowledge of theory, and investigated how the results differed in using standard and non-standard subjects. The challenges we faced were as already discussed in chapter four, mainly based on making the theory work in connection to the fishermen and their previous knowledge of theory and game-playing. As they look at this field from a professional point of view, our challenge was rather the explaining of the effects in terms of economic theory and not so much the resource itself.

5.3.2 Interest

One of the focal points for researchers is the interest for what one is investigating. Both in lab and field experiments the investigator must understand how the inner mechanism of that specific field works. This gives further advantages for correctly collecting data and interpreting results. In the field this point is even more crucial than in the laboratory. When performing an experiment in the laboratory, the knowledge and information in that specific area might serve as satisfying for the subjects. If one however moves out to the field, the subjects might even have more knowledge than the investigator and therefore the investigator must be an expert in the field himself. The critical point is not only to read about the specific environment but if possible also be a part of it. A well-informed subject should be able to get answers to questions he might ask the experimenter that are based on facts. In a case where a researcher cannot back up his statements, the whole experiment might fail, as the participants will experience mistrust towards the investigator.

While performing our experiment we believe that the subjects were provided a lot of information, but the challenges were rather in making them actually read the instructions and trying to understand them. As the instruction paper was originally made for student subjects, who are possibly more familiar to these kinds of tasks, our participants had a hard time reading through it all and some even rejected it. One could argue that the result was a lack of both enough interest and communication, which we will look at further below.

5.3.3 Sample size

To obtain trustworthy results, the sample size used has to be sufficient enough to base it on real data. At the beginning of this research we believed the sample size would be the least of our problems, as it turned out, it became one of the biggest. As this study had already been conducted in Sweden, our initial goal was to compare the results between standard and non-standard subjects. Along the way we discovered that this had become practically impossible, so the focus turned to analysis of the main challenges in experimentation in general, based on our experiences.

As already mentioned, when living in the high north, we are surrounded with fishermen, so finding them was not our problem, making them participate was the hardest task. Since our experiment required full attention, the fishermen could not work during the experiment and they could neither participate individually. Some just did not show interest, others did but lacked the time, some agreed but as we needed a group and not individuals, it was not feasible. From the experiment we performed, we discovered was as mentioned earlier, that it wasn't the lack of interest in the field itself, but rather the lack of understanding of the game that was the main challenge. From this experience we argue that one of the main reasons why experimental economics does not experience higher popularity among researchers is that as results from small sample size cannot be used in journals and one might spend a lot of time and money and not get sufficient sample sizes, the threshold for setting out on an experimental journey is quite high.

As mentioned by Davis and Holt (1993) researchers try to get as many independent observations as possible in one session, because of both monetary costs and time. But as they mention there is sometimes a problem with the fact that researchers might overstate the amount of independent observations in the experiment. There might be correlations in certain types of experiments, such as in double auctions mentioned by Davis and Holt (1993), where the closing prices in one period affect the prices in the next period. Thus instead of each period providing a new independent observation, one only obtains one independent observation per multi-period (Davis and Holt 1993). They mention graphical illustrations and footnotes as possible solutions to the reporting of possibly non-independent observations. But since graphical illustrations are quite imprecise way of presenting results, Davis and Holt (1993) also suggest some econometric tools, but these have some disadvantages as well, since they include auxiliary assumptions. Therefore, as their last suggestion they mention the

importance of a good experimental design to avoid interdependencies in observations, their main point being not to use more data than there actually is, and that the best solution is to try to gather as many clearly independent observations as possible (Davis and Holt 1993).

5.3.4 Communication

As in the everyday environment, communication is the key to many problems, and as discussed in detail in chapter three, communication is important especially in experimental economics where the investigator might not be familiar with the subject. If one manages to obtain good communication between the participants and the researcher, the results provided are more likely to be true. To manage this, the language one uses has to be familiar to the participants, and if possible the experiment should be performed in a familiar environment for the subjects. Further there should be a "we" and not a "them versus us" mentality. It should also be indicated that the investigator does not have all the answers straight away, but that with the help of the subjects there might be new answers to obtain. Hopefully this might make the subjects willingness to contribute even higher as this could make the subjects feel like they enrich us with new information. As already mentioned, we observed some "them versus us" behavior in our experiment and we feel like the lines between the academic language and the setting in the field was too thick at times.

5.3.5 Time

Depending on what type of experiment one is performing, time might be crucial. List (2011) Argues that one should not waste ones time, but perform the experiment today rather than tomorrow. One might experience cancelations or contact persons might not be available on the day of the experiment. In our own experience time was also an issue, as mentioned before we had cancellations even the same day as the experiment was to be performed. With fishermen we also faced another kind of time problem; since fishermen work in seasons, there

are some periods that would be more appropriate than others, and we might have been turned down because our experiment was to be conducted in the high season and there was no room for us at that point of time.

5.3.6 Cost

As discussed above, time is also a cost, subjects participating in experiments use their personal time, which might affect working hours or time spent with family. In addition there are the monetary costs; an experiment might have a small budget that makes it harder to use payment as an incentive for getting participants. As mentioned earlier, as our subjects were fishermen we knew upfront that the budget would probably be too small to provide the fishermen with sufficient monetary rewards. Fishermen earn a good amount of money and we therefore chose to use lottery tickets, as this would give the subjects at least a fair chance to win some money. And as our experiment could not be conducted while the subjects were working, we needed some of their spare-time; we performed the experiment after working hours, right after their shift. Our challenges were therefore to get the subjects to use their time on us, as neither lottery tickets or the experiment itself seemed to serve as motivation enough.

5.3.7 Answers

To make an experiment appealing under all conditions, one needs good arguments. First of all List (2011) argues that the participants need to be aware of the fact that the experiments might in the long run benefit their field of work. If the results are robust, the company or subjects in a specific field might gain by participating. Secondly, as was pointed out earlier, the researcher needs to make sure that the subjects understand that the researcher does not have all the answers, but with the help from the subjects, there might be more answers in the end. One should never promise short-run effects or immediate gains, but rather make the subjects think in long turn and more abstract terms. In our case, there was some questions regarding the use of the results, and we tried to our best knowledge explain why we were there, but

there was a feeling that the subjects did not really believe this could affect them in any way, so whether they took it seriously or not remains uncertain.

What we also discovered was that some of our subjects were well aware of the resource and the possible problems in terms of it, we argue that there might be three possible reasons why this did not show in the experiment; they either did not care to implement this in the experiment, they did not know the appropriate way the problem could be solved in the form of an experiment, or they might just have enough trust in the external regulations already set.

5.4 Information and communication between the subjects

As mentioned in chapter three, Cardenas and Ostrom (2004) divide information into layers consisting of the identity layer, the group context layer and the material payoffs game layer. These affect the individual's decision to cooperate. As discussed in chapter three, if the players gain enough information about the other participants, they learn to trust each other and cooperation between the subjects becomes more likely. In our experiment, the players did not cooperate, which might be argued to be either due to the fact that they did not trust each other or due to the fact that they did not understand the game, but knowing that the subjects knew each other from before and work together on an daily basis, we argue that the latter is perhaps more probable.

Cardenas and Ostrom (2004) also mention reciprocity and reputation as important attributes, and argue that groups that have these characteristics have a higher chance of cooperation. Castillo and Saysel (2005) argue that in a relatively small community where face-to-face communication is more likely, norms have a higher chance to be socially accepted. Again looking at our own experiment, even if our group was small, and the members knew each other from before, there was not enough communication for them to manage the resource effectively. Also Lindahl et al. (2012) mention the importance of communication, and particularly face-to-face communication; they argue that efficiency depends on cooperation and cooperation depends on communication. As could be observed in our experiment, the communication was lacking, so therefore also the cooperation was lacking and thus the

managing of the resource was not very efficient. The question thus turns from the effects of communication on cooperation to why there was no communication in the first place.

We argue that the lack of communication within our subject group does not stem from lack of trust between the subjects, neither do we think it stems from a lack of understanding of the resource in itself outside the experiment. But it is more possible that the lack of communication, even when the possibility for it was offered, was due to the lack of understanding of this type of game-playing. As mentioned earlier there seemed to be a lack of understanding when the subjects were presented with the material; even after explaining the experiment orally, there seemed to be confusion amongst the subjects about what they were supposed to do. We argue that if one of the subjects in our group would have been more familiar to this type of a situation, and had tried to share this information in a language understandable for the other subjects, these skills could have been shared within the group and the outcome might have been different. But the situation seemed to be previously unknown to all of the subjects, which led to uncertainty in terms of answers, which again led to none of the subjects sharing information with the others, perhaps with the fear of being wrong. So in the end perhaps the lack of communication was due to the fact that the subjects decided it was best to concentrate on their own answers and not really putting all effort in understanding the game, not so much because they wanted to gain a larger payoff for themselves as predicted by non-cooperative game theory. But this also enhances the fact already mentioned; communication is a key aspect, whether it is in terms of understanding the question itself or in the understanding of a game-playing situation in general.

5.5 Possible improvements

In this thesis, we have discussed several important points regarding the conducting of experiments in economics and in doing that, we have found that in many areas there are improvements to be made, both concerning the arrangement upfront and the conduction itself. We discovered that in field experiments one of the main issues was the arrangement upfront. Another challenge was the interaction between the subjects and the investigator, along with the interaction gap between the subjects themselves.

In the everyday environment communication and understanding are the keys to improvement regardless of the questions asked. Experimental economics is no exception and since the communication mainly goes on between unknown individuals, this question requires attention. We have already been discussing the fact that the investigator in an experiment needs to be familiar with the area of research and the inner mechanisms of how things work in a specific field. In this way the researcher is able to collect good data and give more accurate results. However it is important not to forget that regardless of the importance of the information and knowledge about a certain field, it is of great importance that the experimenter is able to talk with the subjects in a way that minimizes the gap between academics and "real people". To minimize this gap, academics need to adopt another form of language that does not contain unfamiliar words and expressions. Even if the experiment that one is performing requires some academic phrases, one must try to avoid them. Subjects that participate will lose interest if confronted with unknown sentences and theories or too much information at once, and thereby be less engaged in the research. According to our own experience the communication with the subjects, both in the recruiting face and during the experiment was one of the most challenging parts of the experimental journey.

Secondly, it is important to brief the subjects about the research, as well as the meaning behind it. People engage more when they feel they are doing something for a good cause, like helping students or the future of their own working environment. Subjects also tend to feel more connection and trust, when dealing with people that give something of themselves. If the experiment is long lasting, gaining trust is very important and also serves as a motivation for further research. Subjects need to feel they are in some way contributing to the results and that their results do matter in the long run. The main point being that as an investigator one should not give an impression that one knows everything, but rather find the path that connects and minimizes the world between academics and "real people".

Not only is it the interaction between the researcher and the subject that matters, but as mentioned earlier, also the interaction among subjects participating in the experiment is of great importance. Though many who practice experimental economics are of the opinion that subjects should not be allowed to communicate in a natural way since this is hard to implement in theory (Bardsley et al. 2010). But there are experiments such as ours, where the communication between the subjects is a crucial factor affecting the results, and thus it cannot be made a general claim that communication should not be allowed in any research. In our experiment the subjects made their decisions individually but had the possibility to

communicate. After ending the experiment, the subjects got a question scheme in which they had the chance to inform the investigator about how they felt the experiment had gone. Among these questions were questions concerning communication, and what we observed was that the subjects indicated a good interaction even if we noted that they did not exchange many words during the experiment. Thus the question becomes more complicated; did they not tell the truth on purpose, did they not bother to do so, or did they actually believe the communication was good. If the latter is the case, why did the subjects think differently than the experimenter? Anderies et al. (2011) Mention the fact that if the questionnaire is not correctly formed, there might be a challenge in getting the subjects to answer without inducing the answers to the questions. They also mention that the subjects might have a preference for positive answers, which might make them answers untruthfully on some questions regarding for example the efficiency of communication.

Referring back to what we have mentioned earlier, the subjects' awareness of participating in an experiment is one factor affecting the results, another is the environment that they are operating in, a third one is the subjects' status in the group. When being a part of a learning process as a student your eagerness to learn is different and your confidence might be induced by the approval by others. But the non-student subjects might have a different view and thereby be more comfortable with making individual decisions, not needing this approval. Our observations confirmed just that; when one of the fishermen seemed to understand the logic behind the game, he was so satisfied with it that he didn't even bother convincing the rest of the group. His strategies changed for the good, but overall since the rest of participants lacked the information the game ended quickly. The possibilities of sharing his knowledge did exist, but as it turned out the rest of the group didn't question their decisions making and the cooperation did not emerge.

Whether one then should try to get the subjects to interact more naturally by telling them this, or if this would be to infer in the game too much, is hard to answer and depends on the questions at hand. But we feel that in our case, the subjects do probably communicate quite a lot in their actual resource using, and that in our experiment the communication was lacking more because of the game-playing behavior and the unnatural setting. The point being that it is hard to get the right "mood" into the experimental setting, even though one has located the experiment to the subjects' natural environment, and that the first improvements need to be done already at this point of the research.

6 Summary and conclusions

> In short, we believe that economics is well on its way to becoming an experimental science, and we do not anticipate ever finding complete consistency between theory and behavior.
>
> Davis and Holt (1993, p.554)

As mentioned already in the first chapter, experimental economics has evolved to a great extent in the last few decades, but it remains somewhat divided even among those who practice it. In chapter two it was discussed that this might to some extent be due to methodological issues; because of the fact that experiments in economics are so new, the methodology has not had a chance to settle. Not only is experimental economics debated as a science but there are also specific areas within the field that divide the researchers in favor of it; these debates regard the use of incentives, which types of experiments that should be used, the focus on internal or external validity etc.

In this thesis we started out by explaining the main usage of experimental economics, explaining the role of experiments as both a theory testing device and as more than that. We also explained which types of experiments that are used in economics, a proposed taxonomy by Harrison and List, and we described a few different experiments that have previously been conducted. Further we discussed the use of incentives, compared experiments in psychology and economics and looked at the main challenges in conducting experiments in economics. We continued by explaining experiments conducted in common-pool resource economics and the importance of communication within these experiments. We then moved on to discuss our own field experiment regarding common-pool resources and the experimental journey with all the challenges it brought with it, trying to point out some of the main aspects we felt were the most challenging ones, contributing in this way to the discussion on experiments in economics.

Despite the differing thoughts between economists regarding the question to which extent experimental economics has contributed to the economics science as a whole, there is less uncertainty concerning the fact that experiments have rooted themselves in this science. The fact that experimental articles are often reported in economics journals is a good indication of this. As put by Bardsley et al. (2010, p.331):

> It would be difficult to argue convincingly that a scientific research program had been using sound methods for a protracted period of time without actually achieving anything. Conversely, if such a program had repeatedly made significant discoveries about its subject matter, it would be odd to claim that its methods were completely unsound.

Our goal has not been to argue whether experiments should or should not be conducted in economics as such or that one should implement experiments into every aspect of economics, but rather to describe on basis of our own experiences and the literature different aspects of experiments in economics and the challenges that meet practitioners attempting to implement experiments in the field.

When analyzing our own field experiment in chapter five, we noted that we had faced almost all of the possible problems we had read about in journals concerning experimental economics, among these were: theory, interest, sample size, communication, time, cost and answers. And after our own field experience it came as no surprise that some might choose to avoid experiments, field experiments in particular, if the researchers are not completely convinced of their usefulness. It might not be so much that economists do not agree in that experiments are useful in specific areas of economics, but more in the fact that if an experiment takes too much time and effort without one knowing for certain that it will contribute to the results, one might be easier off without them, relying more on the traditional tools of economics. And as mentioned in chapter two, there might be other boundaries as well, such as financial aspects due to for example the use of incentives.

We concluded in chapter five, that our main concerns from our own experience were mostly communicational, both in terms of communication prior to the experiment and during the experiment, while recruiting the subjects and when explaining the problem to the subjects.

Without good communication from the starting point, the experiment is much more likely to become quite cumbersome, if doable at all. This shows the fact that without efficient communication and trust between the experimenter and the subjects, the focus of the experiment turns from analyzing the results, to getting any results in the first place. One of the most challenging parts of experimental economics is to maintain a simple enough experimental design to get an understandable experiment for the subjects without losing important theoretical aspects on the way.

Despite all the challenges that experimental economics has as a science, one could argue that the broad aspect of things to consider is also some of the beauty of experimental economics. Combining different methodologies to the same problem brings many different aspects to the problem; one can choose to rely on one single theory and its assumptions, or one can use theory, laboratory experiments, field experiments and econometrics to get the broadest possible set of tools, making economics statements much more powerful than what they were before. This might provide a more persuasive argument towards those who claim economics is unrealistic compared to other sciences. The argument would be even more compelling if some of the issues we have been discussing throughout this thesis were resolved to obtain a broader consensus in the field.

7 References

Anderies, J. M., M. A. Janssen, F. Bousquet, J.-C. Cardenas, D. Castillo, M.-C. Lopez, R. Tobias, B. Vollan, and A. Wutich. 2011. The challenge of understanding decisions in experimental studies of common pool resource governance. *Ecological economics* 70:1571-1579.

Angrist, J. D., and J.-S. Pischke. 2010. The Credibility Revolution in Empirical Economics: How Better Design is Taking the Con out of Econometrics. *The Journal of Economic Perspectives* 24:3-30.

Ariely, D. 2009. *Predictably Irrational*. New York: Harper-Collins.

Bardsley, N., R. Cubitt, G. Loomes, P. Moffatt, C. Starmer, and R. Sugden. 2010. *Experimental Economics Rethinking the rules*. Princeton, New Jersey: Princeton university press.

Binmore, K. 1999. Why experiment in economics? *Economic journal* 109:16-24.

Bryan, J. H., and M. A. Test. 1967. Models and helping: naturalistic studies in aiding. *Journal of Personality and Social Psychology* 6:400-407.

Cardenas, J.-C. 2000. How do groups solve local commons dilemmas? Lessons from experimental economics in the field. *Environment, Development and Sustainability* 2:305-322.

Cardenas, J.-C., and E. Ostrom. 2004. What do people bring in to the game? Experiments in the field about cooperation in the commons. *Agricultural systems* 82:307-326.

Castillo, D., and A. K. Saysel. 2005. Simulation of common pool resource field experiments: a behavioral model of collective action. *Ecological economics* 55:420-436.

Croson, R. 2005. The Method of Experimental Economics. *International Negotiation* 10.

Davis, D. D., and C. A. Holt. 1993. *Experimental economics*. Princeton: Princeton University Press.

Dufwenberg, M., and G. Harrison. 2008. Peter Bohm: Father of field experiments. *Experimental Economics* 11:213-220.

Fehr, E., and S. Gächter. 2000. Cooperation and punishment in public goods experiments. *American Economic Review* 90:980-994.

Guala, F. 2012. Experimentation in Economics.

Hardin, G. 1968. The tragedy of the commons *Science* 162:1243-1248.

Harrison, G. W., M. Lau, and E. E. Rutström. 2011. Theory, Experimental design and Econometrics are complementary (And so are lab and field experiments).

Harrison, G. W., and J. A. List. 2004. Field experiments. *Journal of Economic literature* 42:1009-1055.

Keane, M. P. 2010. A Structural Perspective on the Experimentalist School. *The Journal of Economic Perspectives* 24:47-58.

Leamer, E. E. 1983. Let`s Take the Con Out of Econometrics. *The American Economic Review* 73:31-43.

Levitt, S. D., and J. A. List. 2007. What do laboratory experiments measuring social preferences reveal about the real world? *Journal of economic perspectives* 21:153-174.

———. 2009. Field experiments in economics: The past, the present, and the future. *European Economic Review* 53:1-18.

Lindahl, T., A.-S. Crépin, and C. Schill. 2012. Managing resources with potential regime shifts: Using experiments to explore social–ecological linkages in common resource systems: Beijer Discussion Paper Series.

Lipsey, R. 1979. *An introduction to Positive Economics*. 5 ed. London: Weidenfeld and Nicolson.

List, J. A. 2011. Why economicsts should conduct field experiments and 14 tips for pulling one off. *Journal of economic perspectives* 25:3-16.

Ludwig, D., D. D. Jones, and C. S. Holling. 1978. Qualitative Analysis of Insect Outbreak Systems: The Spruce Budworm and Forest. *Journal of Animal Ecology* 47:315-332.

Mäki, U. 2005. Models are experiments, experiments are models. *Journal of Economic methodology* 12:303-315.

Ostrom, E. 2006. The value-added of laboratory experiments for the study of institutions and common-pool resources. *Journal of economic behaviour & organization* 61:149-163.

Ostrom, E., J. Burger, C. B. Field, R. B. Norgaard, and D. Policansky. 1999. Revisiting the Commons: Local Lessons, Global Challenges. *Science* 284:278-282.
Rubinstein, A. 2001. A theorist's view of experiments. *European Economic Review* 45:615-628.
Selten, R., A. Sadrieh, and K. Abbink. 1999. Money does not induce risk neutral behavior, but binary lotteries do even worse. *Theory and Decision* 46:211-249.
Smith, V. L. 1992. Game Theory and Experimental Economics: Beginnings and Early Influences. *Journal of History of Political Economy* 24:241-282.

8 Appendix

Appendix 1 Instructions for the experiment

VEILEDNING

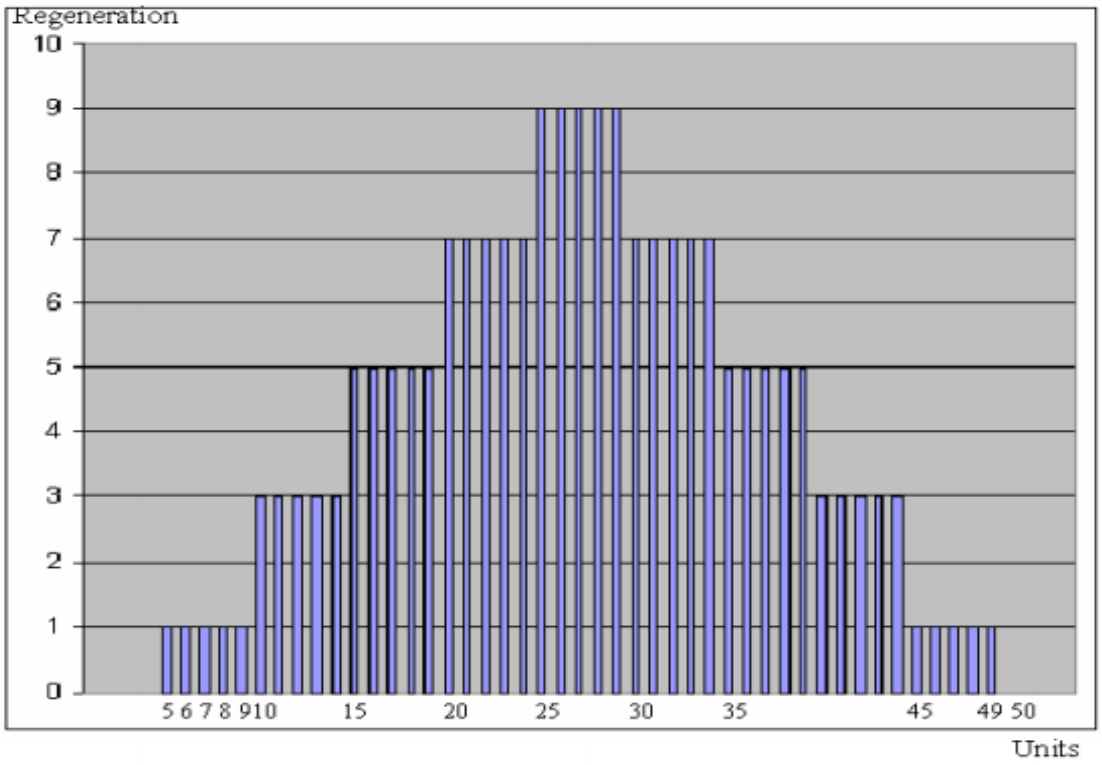
Takk for at du har valgt å delta i dette eksperimentet! Hvis du følger veiledningen nøye og tar gode beslutninger, så kan du tjene penger i form av Flax-lodd. Disse vil du få utbetalt når eksperimentet er avsluttet.

Du danner en gruppe sammen med de andre deltagerne. Du og de andre deltagerne i din gruppe har tilgang til en fiskebestand. Dere kan for eksempel representere hver sin fiskebåt. Hver enhet fisk du fisker er verd 5 kr. Hvis du ved slutten av eksperimentet har fått 20 enheter fisk, så gjøres dette om til 100 kr. Det er viktig å huske at jo mer fisk du har fanget, desto mer tjener du. Det du har tjent (i kroner) gjøres om til lodd ved slutten av eksperimentene.

Eksperimentene vil gjenta seg over flere omganger og i hver omgang skal du ta en individuell beslutning over hvor mye fisk du vil fange. Fiskebestanden vil vokse i forkant av hver ny omgang som spilles. Denne veksten vil avhenge av hvor mye av fiskebestanden som gjenstår fra forrige omgang, som igjen avhenger av den totale fangsten i forrige omgang (summen av din og de andre gruppemedlemmenes fangst i den forrige omgangen). Eksperimentet vil forsetter så lenge det finnes fisk igjen å fange. Jo fler omganger dere er med på, desto mer kan dere fiske (og mer penger kan dere tjene). Det eksakte antall omganger spillet vil pågå er ukjent for dere ved starten. Hvis gruppens totale fangst i en omgang er like stor eller større enn den gjenværende bestanden så vil bestanden ikke vokse mer og eksperimentet avsluttes. Fangsten for den omgangen (X) vil være basert på din prosent del av gruppens totale fangst i den omgangen.

Den eksakte sammenhengen mellom fiskebestandens aktuelle størrelse og vekst er illustrert i Figur 1 under.

Figur 1



I begynnelsen av eksperimentet fins det 50 enheter fisk i bestanden. Hvis dere for eksempel sammen fanger 17 enheter i den første omgangen, så vokser bestanden med 7 enheter. Dermed vil fiskebestanden i omgang 2 være (50-17+7)=40 enheter.

Dette illustreres i Tabell 1 under.

Resource stock size	Re-generation		Resource stock size	Re-generation	Resource stock size	Re-generation
50	0		32	7	14	3
49	1		31	7	13	3
48	1		30	7	12	3
47	1		29	9	11	3
46	1		28	9	10	3
45	1		27	9	9	1
44	3		26	9	8	1
43	3		25	9	7	1
42	3		24	7	6	1
41	3		23	7	5	1
40	3		22	7	4	0
39	5		21	7	3	0
38	5		20	7	2	0
37	5		19	5	1	0
36	5		18	5	0	0
35	5		17	5		
34	7		16	5		
33	7		15	5		

Tabell 1

I spillet tar dere en beslutning om hvor mange enheter fisk (i hele tall, mellom 0 og nåværende størrelse på fiskebestanden) dere vil fiske i hver omgang. De individuelle beslutningene kommuniseres på papir, og er anonyme, men dette hindrer dere ikke fra å kommunisere med hverandre muntlig. For hver omgang summerer eksperimentlederen sammen deres totale fangst. Bestanden vil deretter bli redusert, beregnet, og dere vil få oppgitt størrelsen på den nye bestanden før hver omgang.

Etter den aller siste omgangen bli du bedt om å svare på noen spørsmål. Deretter vil eksperimentlederen be hver av dere å komme frem for å få deres individuelle betaling som vil være basert på den totale fangsten du har samlet gjennom spillets omganger.

Hvis du har noen spørsmål under eksperimentet strekk opp hånden så kommer eksperimentlederen til deg.

Oppsummering:

- Du og de andre deltagerne i denne gruppen deler på en fiskebestand
- I hver omgang skal du ta en individuell beslutning over hvor mye du vil fiske av denne bestanden.
- Gitt at størrelsen på fiskebestanden ligger mellom 4 og 49 enheter vil den vokse i hver omgang
- Veksten bestemmes av hvor stor bestanden er og den totale fangsten siden bestanden deles av dere. Figur 1 og Tabell 1 illustrerer dette.
- Hver fanget enhet er verdt 5kr.
- Gitt at fiskebestanden kan vokse, fortsetter eksperimentet et ukjent antall omganger.
- Din samla fangst vil konverteres til lodd (ihht verdien av fangsten din i kroner) ved slutten av eksperimentet.

Lykke til

Appendix 2 Questionnaire

Miljø økonomisk eksperiment

Alder: ___

Mann: __ Kvinne: __

Nasjonalitet: _____

Utdannelse: _____

Yrke: _____

Heltid: _____ Deltid:_____

Antall år i bransjen:_____

Arbeidsoppgaver:_____

Hvor mange i din gruppe kjenner du fra før? ___

Hvordan kjenner du disse? _____

Har du deltatt i lignende eksperiment tidligere? Ja __ Nei __

I hvor stor grad er du enig med følgende påstander?

Jeg fikk en god innsikt i hvordan ressursene forandret seg over tid.

Uenig 1 2 3 4 5 Enig

Min samarbeidsvilje var høy.

Uenig 1 2 3 4 5 Enig

De andres samarbeidsvilje var høy.

Uenig 1 2 3 4 5 Enig

Min gruppe klarte å sammarbeide.

Uenig 1 2 3 4 5 Enig

Kommunikasjonen i min gruppe var effektiv.

Uenig 1 2 3 4 5 Enig

Min gruppe hadde en ”diskusjonsleder”.

Uenig 1 2 3 4 5 Enig

Deltagerne i min gruppe hadde tillit til hverandre.

Uenig 1 2 3 4 5 Enig

Beslutningene til de andre påvirket mine egne.

Uenig 1 2 3 4 5 Enig

Jeg tenkte på hvordan mine beslutninger, ville påvirke de andre i gruppen.

Uenig 1 2 3 4 5 Enig

Intstruksjonene var tydelige.

Uenig 1 2 3 4 5 Enig

Hvor mange arbeider om bord på <<ditt>> fartøy?_____

Hvordan tas vanligvis beslutningene om hvor dere skal fiske?

Av en person _____Av flere personer_____

Vi fisker oftest i samme områden hvert år.

Uenig 1 2 3 4 5 Enig

Hvis uenig: Området avhenger av:_____

Fiskefartøy kommuniserer ofte med hverandre.

Uenig 1 2 3 4 5 Enig

Hvis ja; Hva kommuniseres det om?

Værforhold_____om fisket_____

Jeg har generelt en god forståelse av hvordan fiskebestander forandrer seg over tid.

Uenig 1 2 3 4 5 Enig

Syns du måten eksperimentet beskriver forandringer i fiskebestanden, tilsvarer virkelige forhold?_____

Hvordan skiller beslutningssituasjonen presentert i eksperimentet seg fra beslutninger som blir tatt i det virkelig livet?_____

Har du noen gang opplevd en plutselig forandring i fiskebestander som beskrevet i eksperimentet?

Ja_____ Nei_____

Jeg tror slike plutselige forandringer i fiskebestanden vil bli mer og mer vanlige i fremtiden.

Uenig 1 2 3 4 5 Enig

Hvis ja, hva tror du er den hovedårsaken?

_____

Ved å delta i dette eksperimentet fikk jeg ny innsikt i vanskelighetene knyttet forvaltningen av felles ressurser.

Nei _____
Hvis ja, hvordan?_____

Kommentarer: _____
_____
_____

Takk for at du deltok!