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What can economic experiments tell us about institutional change in social–ecological systems?

Jens Rommel*

Humboldt-Universität zu Berlin, Department of Agricultural Economics, Unter den Linden 6, 10099 Berlin, Germany

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ABSTRACT

Today, economic experiments are well accepted in mainstream economics. They are also widely applied in ecological economics, often focusing on institutions. Yet, many empirical studies in this field lack a sound theoretical foundation of institutions and institutional change. In this paper, I show that in a structure–agency framework three theoretical viewpoints on institutions can be distinguished. They can be viewed as (1) structures that shape incentives, (2) cognitive media, embedded in beliefs and cognition of agents, or (3) evolving from a process of agents' choices and structural aspects. Using examples from the empirical experimental literature, I argue that all three viewpoints are mirrored in experimental practice, and that these can be organized into an institutional typology of economic experiments. Placing special emphasis on experiments with endogenous institutional choice and their relationship to evolutionary economic theory, I discuss under which conditions experiments are a useful method for the analysis of social–ecological systems, concluding that methodological and methodical innovations are an important prerequisite for challenging the dominant paradigm of neoclassical economics.

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1. Introduction

In the economic literature there are at least three ways in which institutions are distinguished in a structure–agency framework. First, institutions can be understood as *structures* that enable or constrain agents' choices. Second, institutions can be understood as embedded in *agents*, for example through norms, which may be socially or culturally determined, eventually being responsible for behavioral differences. Third, institutions may evolve as the result of both agents' choices and the impact of structures on agents' preferences for institutions. This *evolutionary* viewpoint implies that institutions are ontologically inseparable from structures and agents (Hodgson, 2004).

Implicitly, these three different conceptualizations of institutions are mirrored in the empirical practice of experimental economics. For example, classical market experiments involve the exogenous variation of trading rules (*structures*) to test subjects' behavior under different auctioning mechanisms (Ketcham et al., 1984). The much-cited ultimatum game experiments, conducted across fifteen small-scale societies, assume that culturally determined fairness norms embedded in game participants (*agents*) are reflected in experimental play (Henrich et al., 2004). More recent experiments also allow subjects to change the rules of an experiment (within certain limits), while at the same time investigating the *evolution* of participants' preferences for institutions as the result of their past choices, game outcomes, or initial institutions (Botelho et al., 2005).

* Tel.: +49 30 20936179.

E-mail address: jens.rommel@hu-berlin.de.

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The aim of this paper is to spell out more explicitly these relationships between the theoretical work on institutions and the empirical practice of experimentalists by means of an “institutional typology of economic experimentation,” which allows for the classification of economic experiments by their conceptualization of institutions. By accentuating these links, it is possible to expatiate on the connection of institutional economics to experimental methods. Ultimately, a sound theory–method link will be important in attracting more empirical projects in the relatively young field of economic experimentation, which would allow for “endogenous institutional choice.” As I will argue, this is related to the debate on the endogenous evolution of institutions in the economic system (Bowles, 1998; Brousseau and Raynaud, 2011; Field, 1984; Herrmann-Pillath, 2013; Nelson and Winter, 1982; van Bergh and Stagl, 2003).

Although the typology developed here is more generally applicable, my examples are drawn mostly from the field of ecological and environmental economics, for at least three reasons. First, empirical applications in environmental management have been among the first to use experiments with a specific focus on the role of institutions (Ostrom et al., 1994). This initial study has encouraged a large empirical literature using experimental methods in this field (List and Price, 2013). The importance of institutions for governing global ecosystems is also of high practical relevance, with humanity facing potentially disastrous global environmental change (Young, 2002). Second, experiments in ecological economics often combine the interaction of participants’ behavior with temporal and spatial dynamics of ecological systems, making them more prone to a dynamic and evolutionary perspective than experimental work based on mainstream economic theory. Third, the field is currently witnessing a particularly lively debate on methodology and methods, including an ongoing debate on the use of qualitative vs. quantitative methods and the use of mixed methods, often also explicitly referring to economic experiments (Beckmann and Padmanabhan, 2009; Ménard, 2001; Poteete et al., 2010; Robin and Staropoli, 2008; Schlüter, 2010).

The remainder of the paper is structured as follows. First, starting with a definition of social–ecological systems, I briefly review theories of institutions and institutional change and organize them into a structure–agency framework. Second, following a short introduction to the use of experiments in economics, I present some examples of the empirical literature in light of these theories. Next, I discuss how the developed concepts may facilitate insights from experimental research on institutional change in social–ecological systems. Finally, I summarize and conclude.

2. Social–ecological systems and institutions

In the most general way, a social–ecological system (SES) comprises a social system, an ecological system, and the interactions between the two. Traditionally, ecosystem analysis has studied the impact of human and geophysical drivers of ecosystem change in isolation. The definition of a SES goes beyond this view. SESs are defined as coherent systems with multiple (often non-linear) interactions that

span across (hierarchically linked) scales, which consist of critical resources, whose flows and uses are affected by both social and ecological factors, and which are dynamic and adaptive (Redman et al., 2004).

According to Ostrom (2009), a SES can also be viewed as comprising four “first-level core subsystems,” namely: (1) a resource system, (2) resource units, (3) a governance system, and (4) users. A set of “second-level” variables that are useful for SES analysis, and which can be sorted by these core subsystems, has also been identified. Institutions are part of both social sub-systems, i.e. the governance systems and users. More specifically, the overall property-rights system, operational, collective-choice, and constitutional rules are variables of the governance system, while norms are a variable of the user system (Ostrom, 2009). Focusing on this point, and in the spirit of structuration theory (Giddens, 1984), the following sections will focus on understanding the structure–agency dynamics of institutions and institutional change.

2.1. Institutions between structure, agency, and evolution

There is still relatively little agreement on the basic concepts in institutional economics, or in the words of Vatn (2005): “Just as there are many theories of what institutions are and what they do, there are certainly also many different ways of explaining their development and change.” It is not the aim of this paper to present an exhaustive review of this ongoing debate; others have already done this (Hodgson, 1998, 2006; Schmid, 2004; Vatn, 2005; Zikos and Thiel, 2013). Rather, I would like to show that it is useful to distinguish between (1) structural, (2) agent-based, and (3) evolutionary approaches of institutions (Hodgson, 2004), with the aim to better understand the concept of institution on which particular, empirically grounded economic experiments are based.

Vatn (2005) distinguishes two ways of defining an institution. Institutions can either be viewed as “external reward structures” that constrain (North, 1990) or enable (Bromley, 1989) agents, or as “internalized motivations” of economic agents (Berger and Luckmann, 1967). The structural view is most prominently represented by Douglass North, who defines institutions as “humanly devised constraints that structure political, economic and social interaction” (North, 1991). To the contrary, Berger and Luckmann (1967) view institutions as embedded in economic agents, representing a “reciprocal typification of habitualized actions by types of actors.” The two viewpoints are sometimes combined, resulting in an understanding of institutions as consisting “of cognitive, normative, and regulative structures and activities” (Scott, 1995).

Evolutionary economic theory emphasizes that institutions are endogenous to the economic process (Herrmann-Pillath, 2013; Hodgson, 1998; van Bergh and Stagl, 2003) and ontologically not reducible to their structural or agent-based aspects (Hodgson, 2004). Both economic agents – with their shared beliefs and (limited) cognition – and structures play a role in the establishment and change of institutions. It has been pointed out that especially the cognitive aspects have been much neglected in (institutional) economics. A psychological or even neurological perspective on context-dependence, framing of decisions, habitualization, and their temporal dynamics could

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