

Virtual field experiments for a digital economy: a new research methodology for exploring an information economy

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Abstract

Many researchers are concerned about the appropriateness of traditional research approaches and methodologies in the analysis of a digital economy. Using the Experimental Digital Economy (EDE), a new technology infrastructure that we have developed for a digital economy, we propose a new research methodology, a *virtual field experiment*, which makes it feasible and effective to test research hypotheses with the desired level of experimental controls and to probe successful business strategies in a real business world. Three summaries of research on a digital economy, like the efficiency of a digital market, the effectiveness of digital markets (posted-price markets and auctions), and the impact of quality certifications, address the implications of virtual field experiments. © 2002 Elsevier Science B.V. All rights reserved.

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1. Introduction

Laboratory experiments, in economics, are often used to understand and analyze various types of the economy. We focus our research on a digital economy, a special economy where all goods and services traded are in digital format. As with physical products, a digital product also needs an outlet or marketing channel through which it can reach the consumer from the producer or seller. The most common mar-

keting medium by which digital products are sold on the Internet today is through a storefront in the form of a web site. Most companies selling software, information, etc., provide an Internet shopping storefront (outlet) as a part of their web pages, allowing consumers to purchase their products directly. Unlike traditional marketing channels, the cost of establishing a storefront on the Internet is relatively minimal and, thus, one can find almost every manufacturer providing its services on the Internet. As a result, consumers are provided with a richer set of choices in terms of prices and features.

Many researchers are concerned about whether traditional research approaches and methodologies are appropriate in analyzing the digital economy. Thanks to advances in information technology and

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the distinctive features of this new economy, we propose a new research methodology for a digital economy, a *virtual field experiment*, which makes it feasible and effective to test research hypotheses with the desired level of experimental controls and to probe successful business strategies in a realistic business setting.

In traditional laboratory experiments, a researcher defines preference and value for each participant in the way that these sets of information shape the whole economy and the experiments. Subjects in a normal market experiment trade a commodity that has no intrinsic or use value. That is, subjects engage in paper transactions. The commodity is given value by the experimental rules governing the redemption values for buyers and the terms on which sellers can acquire the units they wish to sell. By allowing for the preferences and values of participants known to the researcher, it is possible to conduct more powerful tests of various hypotheses; this is not available in typical field experiments. Conversely, the result of a laboratory experiment becomes applicable if and only if the business environment meets pre-defined conditions that can be very artificial and focused.

In the virtual field experiment, participants' preferences and utilities for each product they produce or consume are naturally determined in parallel to the real business environment. Unlike field experiments, under which it is nearly impossible for a researcher to collect this level of information, researchers using this new approach can observe or monitor participants' preferences and utilities, using proper measurements and technological infrastructure over an extended period of time. That is, this new approach provides powerful instruments to a researcher, allowing hypotheses to be tested while not sacrificing parallelism to the real business world. The term design parallelism is used to indicate closeness to natural situations rather than closeness to the theories that economists have devised.

2. Review of experiments

This section reviews research methodologies that can be used to explore and understand the digital economy. For research on market environments and mechanisms, commonly adopted methods include

theoretical modeling, laboratory experiments and field experiments that are motivated by industrial organization issues.

Despite the contrast between the relative simplicity of the laboratory experiment and the complexity of most naturally occurring markets, there is a well-established tradition of experimental research in the field of industrial organization (IO) or market organization. Thus, we start this section by reviewing these experimental approaches.

2.1. Laboratory experiments in economics

A laboratory experiment is an experiment conducted in a setting expressly prepared for the research control [22,32]. It is theoretically possible to achieve total control of effects that are due to extraneous variables. In reality, the control that is achieved is not total, but is thorough relative to field experiments conducted outside a laboratory.

Experimental economics has made significant progress by recognizing the key role of incentives and by emulating real-world conditions in the laboratory. In contrast to experiments in psychology that focus on individual perception and behavior, experiments in economics create markets to test economic theories that have been developed through the application of microeconomic theory.

A market or institution is created by specifying appropriate rules and incentives. Experimental economics deals with a system involving multiple relationships, rather than addressing a problem in isolation from the environment, within which phenomena of interest are likely to be observed. These features allow experiments in economics to create settings that are similar to their real-world analogs. Since Chamberlin's first market experiment in 1948, experiments in market organization and competitive equilibrium seek to test theories of exchange that can be formulated in terms of the aggregate supply and demand curves of the market. These experiments are induced in the laboratory using Chamberlin's technique of giving each buyer and seller a reservation price for each unit they demand or supply.

Similarly, most laboratory experiments in economics are based on simplified and focused experimental settings. Subjects in a normal market experiment trade a commodity that has no intrinsic or use value [34].

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