Journal of Economic Dynamics & Control 33 (2009) 1719–1738

Contents lists available at ScienceDirect

Journal of Economic Dynamics & Control

journal homepage: www.elsevier.com/locate/jedc

Behavioral heterogeneity in dynamic search situations: Theory and experimental evidence

Daniel Schunk *

Institute for Empirical Research in Economics, University of Zurich, CH-8006 Zurich, Switzerland

ARTICLE INFO

Article history:
Received 18 January 2008
Accepted 24 March 2009
Available online 10 April 2009

JEL classification:
D83
C91

Keywords:
Dynamic choice
Behavioral heterogeneity
Reference points
Individual differences
Loss aversion

ABSTRACT

This paper presents models for search behavior and provides experimental evidence that behavioral heterogeneity in search is linked to heterogeneity in individual preferences. Observed search behavior is more consistent with a new model that assumes dynamic updating of utility reference points than with models that are based on expected-utility maximization. Specifically, reference point updating and loss aversion play a role for more than a third of the population. The findings are of practical relevance as well as of interest for researchers who incorporate behavioral heterogeneity into models of dynamic choice behavior in, for example, consumer economics, labor economics, finance, and decision theory.

1. Introduction

Dynamic choice situations are prevalent in our everyday lives, for example, when we go shopping, search for a new job, or trade on the stock market. Existing research finds that people are very heterogeneous with respect to their behavior in dynamic choice situations (see, e.g., Boswijk et al., 2007; Hommes et al., 2005a; Sonnemans, 1998, 2000), and economic theory suggests that this heterogeneity in dynamic choice situations is reflected in preference heterogeneity. For example, we would expect systematic differences in dynamic choice behavior between very risk averse and very risk seeking types of people. This raises the following questions: Does information on individual preferences help us predict how people behave in dynamic choice situations? Is there further heterogeneity in dynamic choice behavior that differences in individual preferences cannot explain, for example, because behavior is not consistent with the predictions of standard preference-based economic models? The answers to these questions concern the foundations of dynamic choice behavior. However, while there is an enormous experimental literature on the foundations of decision behavior in static decision situations, the foundations of behavior in dynamic decision situations, despite being equally important, remain largely unexplored.

This paper explores the foundations of dynamic choice behavior by answering the questions above. I do so by using laboratory experiments that test various models of dynamic choice behavior, providing evidence on the link between preferences and real observed dynamic choice behavior. The specific contributions of this paper are as follows: first, I develop a new dynamic choice model that involves sequential updating of utility reference points. Second, I provide evidence from two experiments that this reference point model explains heterogeneity in individual search behavior better

* Tel.: +41 44 634 3704; fax: +41 44 634 4907.
E-mail address: dschunk@iew.uzh.ch

0165-1889/$ - see front matter © 2009 Elsevier B.V. All rights reserved.
doi:10.1016/j.jedc.2009.03.006

than search models based on expected utility theory. And third, I show that while heterogeneity in search behavior can be systematically linked to heterogeneity in individual preferences for many subjects, there is also a considerable fraction of subjects, whose search behavior is inconsistent with the predictions of utility-based economic models. In other words: preference heterogeneity alone cannot explain all heterogeneity in search behavior.

Economic science assumes that preferences are the key determinants of behavior. Therefore, knowing which preferences are related to real observed behavior is of inherent interest for the field. In fact, structural knowledge about the link between preferences and behavior is an important requirement for normative as well as for positive economics. More specifically, the findings of this paper are of interest for researchers who are building models of behavior in dynamic choice situations, and they are relevant for decision theory, since they help to understand the determinants and properties of individual search behavior in markets (e.g., Zwick et al., 2003). The findings also serve as a guide to theoretical and structural econometric specifications that explicitly allow for individual heterogeneity in applied search theory; these specifications are being developed in many fields, including research on consumer search and job search (Eckstein and van den Berg, 2007). Finally, since little is known about reference point formation over time in dynamically risky decision situations, my findings are relevant for numerous theoretical and applied issues in finance, e.g., when it comes to stock selling decisions (Baucells et al., 2007; Gneezy, 2005; Grinblatt and Han, 2005), as well as for life-cycle savings decisions (Bowman et al., 1999).

The experimental and theoretical investigation of dynamic choice behavior requires a decision task that is representative of dynamic choice situations in our real life as well as implementable in the laboratory without loss of control. Such a task is a search task. First, the simple decision structure of search tasks masks a complicated optimization problem that – comparable to dynamic choice situations in our everyday lives – cannot be solved without a computer; at the same time, these tasks occur often in our everyday life, e.g., when we look for the best price for a certain product or when we search for a new job. Second, search tasks are attractive for laboratory investigations, because participants in a laboratory experiment understand immediately their simple sequential decision structure.

It is thus no surprise that decision behavior in search situations has been intensively investigated both theoretically and experimentally in the fields of economics, mathematics, and psychology since the 1950s. Simon (1955) and Stigler (1961) completed seminal theoretical work in the economic strand of this literature. Since then, numerous authors (e.g., Cox and Oaxaca, 1989; Harrison and Morgan, 1990; Hey, 1981, 1982, 1987; Houser and Winter, 2004; Kogut, 1990; Schunk and Winter, 2009; Sonnemans, 1998, 2000) have investigated variations of search problems, and they have focused on examining which search strategies exist. However, the central question addressed by this paper, the extent to which theoretical models explain the link between individual heterogeneity in search strategies and heterogeneity in preferences, remains unexplored. Finally, it is also worth mentioning that there is a growing literature on dynamic models with heterogeneous expectations (see, e.g., the survey by Hommes, 2006); the behavioral foundations of this literature are also investigated experimentally (Heemeijer et al., 2009; Hommes et al., 2005b). While the price process is endogenous in this literature, the price distribution is exogenous in my experimental setup, i.e., it is neither affected by individual expectations nor by individual decisions. This allows me to focus only on the question how preference heterogeneity and dynamic choice strategies are linked.

This paper proceeds as follows. First, I develop various search models, in particular the reference point model, in order to discuss the links between individual preferences and search behavior (Section 2). Then, the experimental designs (Section 3) and the methodology for drawing inference about search behavior and preferences based on data from two experiments are described (Section 4). Next, the link between elicited preferences and observed search behavior is investigated (Section 5): I present descriptive information, a correlation analysis, and a structural econometric analysis that exploits the discrete time-to-event panel nature of the data. The methodology and possible explanations for the findings are discussed in Section 6. Section 7 concludes.

2. Models of search behavior

In this Section I first derive the optimal search behavior of an expected utility maximizer (Section 2.1). For the derivation of the decision rules, two cases are considered: in the first case, the cost of each completed search step is treated as sunk costs; in the second case, I derive the finite horizon optimal stopping rule assuming that subjects do not treat past search costs as sunk costs. Finally, in Section 2.2, I develop the reference point model.

2.1. Optimal stopping behavior in search tasks

Assume that a searcher's goal is to purchase a certain good that she values at €100. The searcher sequentially observes any number of realizations of a random variable X, which has the distribution function $F(\cdot)$. In the current experiment, $F(\cdot)$ is a discrete uniform distribution with lower bound €75 and upper bound €150. Let the cost of searching a new location be €c. Assume that at some stage in the search process, the minimal price that the searcher has observed so far is €m.[1] Basic

[1] For the remainder of the paper, the currency units are skipped whenever possible. All monetary values are in euros.