



THE NEW PALGRAVE

Behavioural and experimental economics

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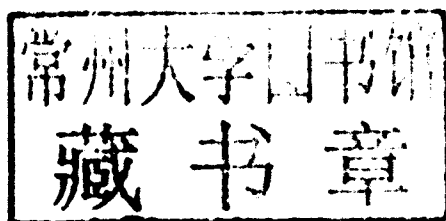
Steven N. Durlauf and
Lawrence E. Blume



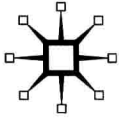
Behavioural and Experimental Economics

Edited by
Steven N. Durlauf
University of Wisconsin-Madison, USA

Lawrence E. Blume
Cornell University, USA



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List of Contributors

LISA ANDERSON

College of William and Mary, USA

JAMES ANDREONI

University of California San Diego, USA

SHERYL BALL

Virginia Polytechnic Institute and State University, USA

B. DOUGLAS BERNHEIM

Stanford University, USA

ROBERT BLOOMFIELD

Cornell University, USA

IRIS BOHNET

Harvard University, USA

ROB BOYD

University of California Los Angeles, USA

COLIN F. CAMERER

California Institute of Technology, USA

JEFFREY CARPENTER

Middlebury College, USA

CHRISTOPHER F. CHABRIS

Harvard University, USA

YAN CHEN

University of Michigan, USA

RACHEL T. A. CROSON

University of Texas at Dallas, USA

DOUGLAS D. DAVIS

Virginia Commonwealth University, USA

JOHN DUFFY

University of Pittsburgh, USA

ARMIN FALK

University of Bonn, Germany

DANIEL FRIEDMAN

University of California Santa Cruz, USA

SIMON GÄCHTER

University of Nottingham, UK

JACOB K. GOEREE,

California Institute of Technology, USA

FRANCESCO GUALA

The University of Exeter, UK

FARUK GUL

Princeton University, USA

WILLIAM T. HARBAUGH

University of Oregon, USA

GLENN W. HARRISON

University of Central Florida, USA

TECK H. HO

University of Pennsylvania, USA

CHARLES A. HOLT

University of Virginia, USA

DANIEL E. HOUSER

George Mason University, USA

GEORGE LOEWENSTEIN

Carnegie Mellon University, USA

JOHN H. KAGEL

Ohio State University, USA

DAVID I. LAIBSON

Harvard University, USA

JOHN O. LEDYARD

California Institute of Technology, USA

DAN LEVIN

Ohio State University, USA

JOHN A. LIST

University of Chicago, USA

GRAHAM LOOMES

University of East Anglia, UK

JACK OCHS

Indiana University, USA

THOMAS R. PALFREY

California Institute of Technology, USA

ANTONIO RANGEL

California Institute of Technology, USA

DAVID REILEY

University of Arizona, USA

SCOTT RICK

The University of Pennsylvania, USA

RAJIV SETHI

Columbia University, USA

JASON F. SHOGREN

University of Wyoming, USA

JONATHON P. SCHULDT

University of Michigan, USA

VERNON L. SMITH

George Mason University, USA

CHRIS STARMER

University of Nottingham, UK

LISE VESTERLUND

University of Pittsburgh, USA

RICK K. WILSON

Rice University, USA

General Preface

All economists of a certain age remember the “little green books”. Many own a few. These are the offspring of *The New Palgrave: A Dictionary of Economics*; collections of reprints from *The New Palgrave* that were meant to deliver at least a sense of the *Dictionary* into the hands of those for whom access to the entire four volume, four million word set was inconvenient or difficult. *The New Palgrave Dictionary of Economics, Second Edition* largely resolves the accessibility problem through its online presence. But while the online search facility provides convenient access to specific topics in the now eight volume, six million word *Dictionary of Economics*, no interface has yet been devised that makes browsing from a large online source a pleasurable activity for a rainy afternoon. To our delight, *The New Palgrave*’s publisher shares our view of the joys of dictionary-surfing, and we are thus pleased to present a new series, the “little blue books”, to make some part of the *Dictionary* accessible in the hand or lap for teachers, students, and those who want to browse. While the volumes in this series contain only articles that appeared in the 2008 print edition, readers can, of course, refer to the online *Dictionary* and its expanding list of entries.

The selections in these volumes were chosen with several desiderata in mind: to touch on important problems, to emphasize material that may be of more general interest to economics beginners and yet still touch on the analytical core of modern economics, and to balance important theoretical concerns with key empirical debates. The 1987 Eatwell, Milgate and Newman *The New Palgrave: A Dictionary of Economics* was chiefly concerned with economic theory, both the history of its evolution and its contemporary state. The second edition has taken a different approach. While much progress has been made across the board in the 21 years between the first and second editions, it is particularly the flowering of empirical economics which distinguishes the present interval from the 61 year interval between Henry Higgs’ *Palgrave’s Dictionary of Political Economy* and *The New Palgrave*. It is fair to say that, in the long run, doctrine evolves more slowly than the database of facts, and so some of the selections in these volumes will age more quickly than others. This problem will be solved in the online *Dictionary* through an ongoing process of revisions and updates. While no such solution is available for these volumes, we have tried to choose topics which will give these books utility for some time to come.

Steven N. Durlauf
Lawrence E. Blume

Introduction

Modern economics has flirted with psychology since its inception at the hands of Jevons, Edgeworth, Pareto and others. Much of Edgeworth's *Mathematical Psychics* was devoted to a careful examination of the Weber-Fechner law and its generalization, while Wicksell thought it would ultimately lead to a principal of interpersonal utility comparisons. The connection between psychophysics and economics continues to the present day, and can be seen in the influence of work in measurement theory by Luce, Tversky and others on decision theory and social choice. The connection between experimental psychology and economics, however, has been fitful. The first true choice theory experiments were done not by an economist, but by the psychologist L.L. Thurstone (1931). Thurstone, to whom we owe the random utility model which has been so fruitful in empirical microeconomics and which ultimately produced a Nobel Prize for Daniel McFadden, was urged on in this enterprise by Henry Schultz, who was greatly interested in the estimation of consumer demand. Thurstone presented this paper at a 1932 meeting of the Econometric Society, but it seems to have had little subsequent impact. The work of von Neumann and Morgenstern and subsequently Savage led to some interesting attempts to elicit preferences and beliefs such as those of Mosteller and Noguee (1951), and to some early and important criticisms of the emerging theory (Allais (1953), Ellsberg (1961)) but again this led to no sustained interest in experimental methods. Perhaps even at the time of *The New Palgrave: A Dictionary of Economics* (1987) one could write, as one contributor did, '... it may be said that scientific experiments (experimenta lucifera) are a very slight resource in economics.'¹ Today, however, modern social psychology brings much more to the table than psychophysics alone ever could. The relationship between economics and psychology has finally been consummated, and behavioural economics is its fruit. The limits of simple versions of rationality and the exploration of alternative behaviourally-based decision models is a thriving field of research. The increasing sophistication of brain studies in psychology has opened up the new frontier of neuroeconomics. In *The New Palgrave Dictionary of Economics, Second Edition*, John Dickhaut and Aldo Rustichini state that, 'Neuroeconomics aims at improving the science of major economic phenomena such as the formation of prices and the design and performance of institutions.' (See 'neuroeconomics', not reprinted here.) We expect a subsequent edition of the *Dictionary* will report on progress towards this goal. The subject of economics is more the group than the individual, and the relationship between experimental research and theories of interactive decision making has been more steady, and until recently more fruitful than that between psychology and choice

theory, perhaps because some of the same people were involved on both sides of the relationship. One of the most influential pieces of research in modern social science is a game experiment conducted at the Rand Corporation by Melvin Dresher and Merrill Flood. This experiment introduced the prisoner's dilemma, so named by Albert Tucker, which is perhaps the only game with name recognition outside the community of social scientists. Market experiments have also been consistently present in economics, beginning with Harvard's Edward Chamberlin (1947) and Berkeley's Austin Hoggatt (1959). Vernon Smith reports in his entry, 'experimental methods in economics', reprinted here, that he began the work leading to Smith (1962) in 1956. Since then, the experiments have been very influential in the development of game theory (see 'individual learning in games'), mechanism design (see 'mechanism design experiments') and the design of markets (see 'matching and market design', not reprinted here). As the design of institutions has become an ever more central part of economics, experiments have become increasingly important as a means of probing their behaviour. With new modalities of instrumentation becoming available through PDA's and cellular phones, the boundaries between laboratory and field experiments will begin to blur, and perhaps to change entirely the face of empirical microeconomics.

1. C.F. Bastable (1987), 'Experimental methods in economics (i)'.

Steven N. Durlauf
Lawrence E. Blume

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addiction

Economists were latecomers to the study of addiction, a concept which researchers in other disciplines usually define as including a loss of self-control, continuation of behaviour despite adverse consequences, and preoccupation or obsession with the substance or activity one is addicted to. Economists came late to the subject perhaps because the first two of these characteristics seem inconsistent with economists' rational choice paradigm.

This may be exactly what spurred Gary Becker, along with coauthor Kevin Murphy, to propose, in 1988, a 'rational account of addiction', which stimulated much subsequent research and theorizing by economists. Although not the first economic account of addiction, Becker and Murphy's model (referred to henceforth as B&M) was certainly the most influential, and has spawned a very lively line of research, theorizing and debate about addiction by economists.

Contributions of disciplines other than economics

Prior to B&M, scientists in a range of disciplines had already developed a rich tradition of research on addiction. For example, early studies by psychopharmacologists identified the actions of addictive drugs in the brain, and subsequent research by neuroscientists has uncovered the neural pathways through which addictive activities derive their motivational power (see, for example, Gardner and James, 1999; Lyvers, 2000). Sociologists have also been major contributors, conducting ethnographic and life-course studies of drug users that have identified many of the social influences on drug use. Psychologists have studied the widest range of different facets of drug abuse, including biological underpinnings and social, cognitive and emotional dimensions, and have also been in the forefront when it comes to treatment. Psychologists, as well as other health professionals, have tested a great diversity of treatments for addiction, including residential treatment, counselling, psychotherapy, drug therapies such as methadone, nicotine patches and antidepressants, aversive conditioning, and hypnosis. Taken together, these diverse lines of research have yielded a number of important, and often counter-intuitive, findings.

- Historic use of different types of drugs exhibits 'fads', rising then falling in popularity, sometimes repeatedly for a specific drug.
- Most drug users do not just use a single drug, but many different drugs.
- Many if not most drug abusers also suffer from other psychiatric conditions, such as anxiety or mood disorders, schizophrenia or antisocial personality disorder.
- Much if not most quitting occurs outside of treatment.
- It is not short-term withdrawal from drugs (for example, for a few days) that most addicts find difficult, but long-term abstinence, which tends to be punctuated by episodes of 'craving' which create an almost overwhelming motivation for drug use.

- Episodes of craving are often triggered by ‘cues’ – people or other stimuli that the addict associates with drug use.
- While approximately 20 per cent of a sample of veterans reported being addicted to heroin in Vietnam, and 45 per cent reported narcotic use, only one per cent remained addicted, and two per cent reported using narcotics after returning home (Robins, 1973); this finding radically changed prevailing views of the incidence of recovery from heroin addiction.
- Humans and other mammals voluntarily self-administer most of the same chemical compounds. (Hallucinogens, which some humans seek out but most animals avoid, are a major exception.)
- Although a small number of intense users account for a large fraction of drug use, most drug users consume at moderate or low rates, and do not become addicted in the sense of losing control, suffering adverse consequences or becoming obsessed with drug-taking.
- Many of the adverse health effects of illicit drugs, such as opiates, do not stem from physical effects of the drugs themselves, but from the difficulty of financing an illegal, and hence typically expensive, habit.
- Most addictions begin when people are in their teens or early twenties, and addicts often ‘mature out’ – quitting when they reach middle age. People rarely become addicted for the first time in middle or old age.

In addition to generating a wide range of interesting and important findings, researchers in disciplines other than economics have proposed a variety of theoretical perspectives on addiction. Some perspectives place great importance on the pleasure of drug-taking, the pain of withdrawal, or the motivational force of ‘cue-conditioned’ craving, while others view drug use as a form of self-medication for psychiatric conditions such as depression.

For better or for worse, economists’ focus on addiction has been much narrower, at both the theoretical and the empirical levels. Most empirical work has involved estimating price elasticities of demand for drugs (often using aggregate consumption data), and most theoretical work has involved some type of generalization of Becker and Murphy’s perspective.

Becker and Murphy’s model

In Becker and Murphy’s rational model of addiction, utility from an addictive good, $c(t)$, is assumed to depend on consumption of that good and on the degree of addiction $S(t)$. $S(t)$ changes according to the function $\dot{S}(t) = c(t) - \delta S(t)$, where the first term represents the impact of engaging in the addictive good on one’s level of addiction, and the second represents the natural decline in addictedness when one desists. The individual is assumed to trade off consumption of the addictive good against consumption of other (non-addictive) goods, discounting for time delay in the conventional (exponential) fashion. The central insight of B&M is that people treat addictive goods no differently from the way they treat any good whose utility depends

on consumption over time, trading them off against other goods based on current and future (anticipated) prices.

This model can accommodate a number of features of classical addiction, such as that being addicted lowers instantaneous utility $u_s < 0$, that it increases the instantaneous marginal utility of taking the drug $u_{cs} > 0$. Solving the model yields a number of implications, most importantly that it can be rational for an individual to maintain a positive rate of consumption of an addictive good.

Empirical tests of B&M have focused on the strong prediction that anticipated changes in future prices affect the current behaviour of addicts, which is counter-intuitive given that addicts are commonly seen as behaving myopically. The model is therefore typically tested by estimating what could be called the 'forward price elasticity' of various addictive substances. Consistent with Becker and Murphy's model, negative forward price elasticities have been found for alcohol, cigarettes, marijuana, opium, heroin and cocaine (for a review, see Pacula and Chaloupka, 2001), although the effect appears to be more consistent for adults than for youth.

Moving beyond Becker and Murphy

In proposing their rational account of addiction, Becker and Murphy initiated the study of addiction among economists, and made the key point that it is useful to think of addicts as solving a forward-looking optimization problem. However, the B&M model fails to incorporate a number of important features of addiction, and is either inconsistent with or fails to predict many salient features of addiction, including some of the stylized facts listed above. Responding to these limitations, economists have built upon the B&M model by relaxing some of its most extreme assumptions or incorporating more realistic assumptions that are often inspired by research in other disciplines.

One important generalization has been to examine the implications of relaxing the assumption of exponential time discounting. Gruber and Koszegi (2001; 2004), for example, propose a model in which time-inconsistent addicts have self-control problems: they would like to quit using but cannot force themselves to do so (see also O'Donoghue and Rabin, 1997). As in B&M, Gruber and Koszegi's model predicts that a rise in current or anticipated excise taxes will reduce use of addictive substances. However, although the models make similar behavioural predictions, they interpret the hedonic consequences of altered usage behaviour differently. B&M predicts that taxes on addictive substances – 'sin taxes' – make addicts worse off since the price of a good that they enjoy has risen. Gruber and Koszegi's model, on the other hand, predicts that the tax makes time-inconsistent addicts better off since it provides a valuable self-control device.

Since behavioural data cannot distinguish between the models, Gruber and Mullainathan (2005) bypassed the standard practice of measuring the impact of policy interventions by estimating price elasticities in favour of directly examining the impact of these interventions on subjective well-being. They did so by matching cigarette

excise taxation data to surveys from the United States and Canada that contain data on self-reported happiness. Consistent with Gruber and Koszegi's model, Gruber and Mullainathan (2005) found that excise taxes on cigarettes make smokers happier.

Another implication of time inconsistency involves purchasing patterns. The B&M model predicts that addicts will behave in a time-consistent fashion and hence will buy in bulk to save time and money in satisfying their anticipated long-term habit. Wertenbroch (1998; 2003), however, found that consumers – even those who are not liquidity-constrained – often purchase 'vice' items, such as cigarettes, in small quantities in an attempt to control their intake of the harmful substance.

Other research has questioned the assumption that addicts begin drug taking with full knowledge of the consequences. For example, Slovic (2000a; 2000b) has argued that people take up cigarette smoking in part because they underestimate the health risks, although Viscusi (2000) counters that any error is actually in the opposite direction – that smokers *overestimate* the health risks of smoking. Pointing to a somewhat different type of underestimation, Loewenstein (1999) has argued, based on a wide range of evidence, that potential drug users underestimate their own proneness to addiction because they underestimate the motivational force of drug craving.

Finally, a recent line of theoretical models, while also building on the insights of Becker and Murphy, has incorporated evidence from the psychological literature on cue-conditioned craving and from neuroscience. For example, Laibson (2001) proposes a model of addiction that incorporates the role of cue-conditioned craving. In his model, environmental cues that become associated with drug use, when encountered by an ex-addict, produce surges of craving (like sudden changes in $S(t)$ in B&M). Bernheim and Rangel (2004) develop a model of addiction that is particularly closely grounded in neuroscience research and that is perhaps the most radical departure from B&M. Their model is based on the idea that repeated experience with drugs sensitizes individuals to environmental cues that trigger mistaken usage.

So far, economists are still playing catch-up with researchers in other disciplines when it comes to their understanding of addiction or their influence on policy. Thus, a large fraction of empirical research on drug use by economists has focused on price elasticities. While price is one determinant of drug use, it is arguably not the most important, or even the most amenable to manipulation through the instruments of policy. Nevertheless, economic models of addiction have made great strides, building on Becker and Murphy's seminal contribution with new models that incorporate many of the insights and findings generated by research in other disciplines.

GEORGE LOEWENSTEIN AND SCOTT RICK

See also **intertemporal choice**.

We thank Caroline Acker, Ted O'Donoghue and Antonio Rangel for helpful suggestions.

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altruism in experiments

Unlike experiments on markets or mechanisms, experiments on altruism are about an individual motive or intention. This raises serious obstacles for research. How do we define an altruistic act, and how do we know altruism when we see it?

The philosopher Thomas Nagel provides this definition of altruism: 'By altruism I mean not abject self-sacrifice, but merely a willingness to act in the consideration of the interests of other persons, without the need of ulterior motives' (1970, p. 79). Notice that there are two parts to this definition. First, the act must be in the consideration of others. It may or may not imply sacrifice on one's own part, but it does require that the consequences for someone else affect one's own choice. The second aspect is that one does not need 'ulterior motives' rooted in selfishness to explain altruistic behaviours. Of course, ulterior motives may exist alongside altruism, but they cannot be the only motives.

If this is our definition of altruism, then how do we know altruism when we see it? The answer, unfortunately, is necessarily a negative one – we only know when we do not see it. Altruism is part of the behaviour that you cannot capture with a specifically defined ulterior motive. Experimental investigation of altruism is thus focused around eliminating any possible ulterior motives rooted in selfishness. One of the central motives that potentially confounds altruism is the warm-glow of giving, that is, the utility one gets simply from the act of giving *without* any concern for the interests of others (Andreoni, 1989; 1990). While it is possible that warm-glow exists apart from altruism, it seems most likely that the two are complements – the stronger your desire to act unselfishly, the greater the personal satisfaction from doing so. Indeed, the two may be inextricably linked. Having a personal identity as an altruist may necessarily precede altruistic acts, and maintaining that identity can only come from actually being generous.

In what follows we will highlight the main experimental evidence regarding choices made in the interests of others, and the systematic attempts in the literature to rule out ulterior motives for these choices. Since these serious and repeated attempts to rule out ulterior motives have not been totally successful, the experimental evidence, like Thomas Nagel, favours the possibility of altruism.

Laboratory experiments with evidence of altruism

In describing the games below, we adopt the convention of using Nash equilibrium to refer to the prediction that holds if all subjects are rational money-maximizers.

Prisoner's Dilemma

There have been thousands of studies using Prisoner's Dilemma (PD) games in the psychology and political science literatures, all exploring the stubborn nature of cooperation (Kelley and Stannelski, 1970). Roth and Murnigham (1978) explored PD