

**Experimental Economics:
The Increasing Application of Psychological
Concepts and Methods to
Economic Problems**

**Maria Jennings
4/5/02**

I Introduction

The over-specialization of modern academia is at times a significant detriment to progress, especially in the social sciences. Economics and psychology are two fields that hold important insights for each other, but have until recent decades remained relatively disconnected. Economics, which studies the movement of scarce and desired resources, bases much of its theory on specific assumptions about the actors that move these resources. The assumptions attempt to explain and predict the choices of “economic man”. Psychologists and researchers have increasingly criticized these assumptions. They claim that real people seldom act like the described “economic man”. Human behavior, they argue, is more complex than has been presented in traditional theories.

In an attempt to address this critique, economists have increasingly employed psychological methods of experimental testing to examine and improve economic theory. The methodology they adopted has become known as experimental economics. In this paper I give an overview of the history and scholarship of this movement. Secondly, I include original research that measures to what degree psychology is being incorporated into mainstream economic scholarship. My goal is to create a more objective timeline of this economic movement and to simultaneously measure its mainstream acceptance or marginality.

II The Assumption of Rationality

Traditional economic theory generally consists of mathematical models, which depend on strict assumptions, to explain and predict the movement of goods between firms and nations. Economists began to develop these models at the beginning of the 20th Century in response to the criticism that the discipline was too unscientific (Lewin 1996).

Originally economics' most influential scholars were philosophers (e.g., Aristotle, John Stuart Mill, David Hume and John Locke). Critics often noted how the writers' ethical and political views intermingled with their economic theories. The discipline therefore was replete with normative conclusions and policy suggestions. Economics was able to solidify into its own branch of social science in the 18th century by introducing increasingly complex mathematical methodology that allowed economists to model markets using generalizations about human behavior. Thus began a preoccupation with states of equilibrium and a reduced interest in the process of reaching equilibria (Schwartz 1998).

Traditional economic theory assumes that humans are rational in that they act in a self-interested manner to maximize their wealth. The need for this assumption appears first and most unavoidably in price theory. Market prices are determined by the relationship between the demand and supply of goods. In order to demonstrate this basic tenet one must explain the negative correlation between the price of a good and the quantity purchased, that is, the downward-sloping demand curve. Economists theoretically predict this relationship based on the assumption of rational wealth maximization. This assumption lies at the base of nearly all of the discipline's microeconomic, macroeconomic, and game theories.

The prolific use of this assumption caused concern amongst theorists even early in the century. There were several dissenting economists including J. M. Clark (1918) who argued that the models of marginal utility and product demand were too static. He writes that a deductive system that attempts to determine maximization or equilibrium levels is unrealistic, and therefore inappropriate. Models need to account for the commonplace

phenomena of uncertainty, regret, and the effect of advertising. This is especially true in light of modern studies that show nearly a quarter of the GNP is spent on advertising attempts to influence consumers' selection of goods (McCloskey and Klamer 1995). The effects of these phenomena, Clark believed, were altogether unrecognized by traditional theories of choice due to their reliance on rationality assumptions.

A.L. Macfie (1955) notes that traditional price theory only shallowly addresses the effect of expectations and limited knowledge about goods. For example, Pigou described purchase prices as a measure of the desire for a good at the time of purchase, which is equivalent to the *anticipated* satisfaction the good will provide. This framework almost entirely denies the existence of real choice by ignoring the process of information gathering and the costs associated it.

The final fault that economists find with traditional theory is that it fails to acknowledge the effect psychology has on the economy at a macro level. Frank Katona (1978) discusses this flaw in terms of consumer confidence. He notes that the general outlook of a nation can often have considerable impact on its economy. This impact is largely unexplainable and unpredictable by traditional models that are based on rationality assumptions. According to Katona, employing simple psychological principles such as the effect of mass uncertainty and consumer confidence can improve economic predictions. Katona's critique is especially relevant given the historic and recent inability of economists to predict business cycle changes. He suggests that this dismal track record alone calls for an inspection of the traditional methodology.

The rationality assumption was intended as a simplification necessary to narrow the field of economic study and to shift its focus away from individual behavior to the

behavior of firms and national economies. Critics argue however that these institutions can only function based on human behavior, which, at any level of aggregation, is still a function of human cognition. This topic, having been abandoned by mainstream economics, was adopted by psychologists around the 1950's, who began to examine it in the context of economic action. It makes sense that they should take up the reins since, as economist Amartya Sen pointed out, "rationality is necessarily a psychological interpretation of observed behavior. But it is also only one interpretation, and if economists offer no justification for choosing this interpretation, it cannot be assumed arbitrarily"(Sen 1973 pg. 241). Naturally these researchers used the methodology associated with cognitive and behavioral psychology, which is laboratory experimentation. Their findings have shed new light on the ubiquitous assumption of rationality and have become a center of controversy between and amongst psychologists and economists.

III An Alternative Theory of Behavior

One of the leading economic theorists who supported this research was Herbert Simon, (also a professor of psychology and computer science) who won the Nobel Prize in economics in 1978. Simon wrote that the presumption of objective rationality "allows strong predictions to be made about behavior without the necessity of observing people"(Simon 1959 pg.254). He also noted that classical econometrics uses only one-period change models. These models compare real time series data to hypothetical time series produced through a regression of explanatory parameters. The drawback of one period change analysis is that it does not account for learning or address the motivation of market agents. Even when these models *are* able to capture what was done, they do not

reflect enough of the reasoning or source of the expectation behind the action. Simon argued that, “standard decision theory has absolutely nothing to say about the search for alternatives- the whole process of designing possible courses of action-... there is no operational theory of optimization that deals with this process”(Schwartz 1998 Pg. 22). Therefore these models are generally unable to predict beyond the short run or in different environments

Simon was the first to make the distinction between *substantive* rationality, which was used to describe the actions of “economic man” and *procedural* rationality, which focuses on the process behind the action. Simon outlined the theory of “bounded rationality”, which emphasizes the cognitive limitations that impede individuals from always choosing what is in their best interest. Since it is usually not possible to obtain or process all the information relevant to a decision, he defined an aspiration level, such that once this level is met by an agent, the corresponding solution is deemed adequate, or “satisficing”(Simon 1955). Therefore, humans are most likely profit satisficers as opposed to optimizers. He posited that people use heuristics and mental shortcuts that can cause systematic errors. Therefore, bounded rationality has a significant effect on many types of economic inquiries. Simon was one of the first to explore the subjects of goal conflict, uncertainty, and executive (verses employee) motivation. His advances in theory paved the way for the modern proliferation of experimental economics and the increasing application of psychology to economics.

IV Modern Experimentation

Vernon Smith, an economist at the forefront of experimental research, argues that, in order to be viable, economic theory must take into account the fact that thinking,

learning, transacting, information processing, and interpretation are all costly acts for human beings (Smith 1991). The importance of these costs should not be underestimated given the extremely dynamic nature of economic environments. Economic turbulence such as uncertainty compounds these costs making it even more difficult for actors to make choices consistent with their goals (Earl 1990). The main problem Smith finds with traditional theory is that it ignores these costs that influence the decisions that seek to maximize utility. Simulated market experiments give researchers insight as to the incentives that humans respond to, which are often quite different than what is theorized by the canons of economic and game theory. Smith writes, “It turns out that people are often better, and sometimes worse, at achieving gains for themselves and others than is predicted by standard forms of rational analysis. These contradictions provide important clues to the implicit rules that people may follow”(Smith 2001).

With that introduction, I will summarize some experimental results that vary in their critique of rationality and compatibility with traditional economic theory. Though some are conducted by economists and some by psychologists, all of the experiments employ psychological theory and methods. I have divided them into two groups. First, I will discuss experiments with results that demonstrate subjects achieving gains better than is predicted by standard theory and how this may relate to multiple objectives. Secondly, I will look at research that shows worse than expected behavior caused either by conflicting objectives or by the limitations of human rationality and the subsequent use of heuristics in decision-making.

V Better than Expected

Vernon Smith (1982) conducted an experimental study that tests the necessity of the technical conditions assumed necessary to achieve competitive equilibrium in a market setting. Traditional “pure” or “perfect” competition hypotheses insist that a large number of buyers and sellers with complete knowledge about supply and demand is necessary to achieve competitive equilibrium. In a series of stationary double auctions used to simulate markets, Smith is able to debunk these hypotheses. His results strongly support the Hayek hypothesis that subjects quickly reach equilibrium even in small numbers and knowing only their own preferences. This study reinforces the argument that equilibrium prices are best understood not as static states but as the result of a process of behaviors based on incentives and learning. Smith insists that his research demonstrates most importantly that the equilibrating process is not a consciously cognitive process as is assumed by traditional theorists.

Smith insists that, surprisingly, experimental results demonstrate that rationality-based theory often performs best in ‘nontransparent’ (low information) environments (Smith 1982). Perhaps, as markets become more transparent subjects are better able to understand their objectives in the game and compare them to other objectives they may have. Rationality-based economic theory mentions only one objective that influences economic activity, which is utility maximization. In reality, humans base their actions on many objectives that can conflict with utility maximization including cultural and political considerations, as well as social norms about behavior. This corresponds to George Akerlof’s analysis (1983) of decision-making and his hypothesis that people

arrange their “loyalty filters” to sort through their possible actions according to their priorities.

VI Worse than Expected –

The effect of conflicting objectives has also been analyzed experimentally using coordination games between two or more subjects. These experiments originated to examine abnormalities in the traditional game theory experimentation. Researchers in this field had noticed that certain game designs produced biased results, that is, results that deviated from the predictions under rationality. Unsymmetrical games were considered better because “there is no obviously fair method of arbitrating the game and avoiding competition”(Kagel and Roth 1995 pg.11). It seems that subjects would often consider other objectives during the game despite instructions, monetary rewards, or both.

James Andreoni (1995) discusses the effect of these objectives in the context of public goods and externalities. The free rider problem of public goods has often been shown to be absent from most experimental setups and often in real life. Such results challenge traditional theory. Subjects violate the free rider principle when they behave “altruistically” by inexplicably sharing their profits with fellow subjects. They tended to do this when experimenters phrased options in the context of their effect on others. Andreoni concludes that the subjects’ actions are based not only on the profit objective but also on a desire to increase the warm-glow (or decrease the “cold-prickle”) associated with their behavior. Both guilt and self-satisfaction are psychological concepts but they do describe behavior in public goods markets such as anonymous donations and tipping where rational theories fall short. Further Andreoni findings demonstrate the importance

of framing by showing how phrasing markets situations as dealing with either public or private goods could easily sway actions.

Multiple objectives may not be the only cause of less-than-rational behavior. The findings of psychologists Daniel Kahneman and Amos Tversky suggest this behavior is due to the difficulty of being rational even in a single-objective context. They base their experiments on Herbert Simon's early theoretical analysis of "bounded rationality". Their findings show that people commonly have cognitive misperceptions or illusions that cause behavior to diverge from what is predicted by rational theory. The most notable of those misperceptions results in loss aversion, which contradicts the very basic rational assumption of wealth fungibility (Frank 2000). Instead of judging a combination of events based on a their total effect on utility, people define events as either gains or losses based on a their beginning reference point.

Repeatedly, Kahneman and Tversky (1991) show that subjects place more importance on losses than on gains, which suggests an asymmetrical value function. When reference points are randomly manipulated by the experimenter, subjects act to minimize "losses" even at the expense of greater "gains", demonstrating what researchers coin as the endowment effect. Most interesting is the systematic nature of the subjects' loss aversion tendencies for, if the bias is systematic, they can be incorporated into models to better predict human behavior. These results demonstrate that people often make selections with great difficulty and without strong convictions. This corresponds with earlier studies that documented a lagging emphasis on optimization by consumers at all income levels and even amongst successful producers. On the producer side the phenomenon became known as organizational slack or x-inefficiency (Schwartz 1998).

Whether “better” or “worse”, all of the experimental results I have discussed demonstrate behavior that is significantly *different* from what is expected by rational theory. Therefore it is safe to conclude, as did Earl (1990), that economists can benefit from; investigating the ways decision-makers uncover the nature of the problems they must solve; learning how to model the constraints actors face; and detecting areas of irreducible uncertainty. But to what extent are scholars doing this and what is the general impact of experimental research on mainstream economics? My research on this topic should help to answer these questions.

VII Assessing the Impact-

Aside from giving an overview of the history of experimental economics, I wanted to quantify the recent increase in experimental economic research determine to what degree psychology is being incorporated into mainstream economic scholarship. By doing this I am able to present a more objective timeline of this economic movement and measure the degree of its acceptance or marginality. I gathered this information using three different methods that produced complementary results. The first method involved researching the establishment dates of journals and research centers that focus specifically on experimental economics. The second method employs keyword searches in EconLit for terms likely to indicate the influence of psychology. The third method counts the number of citations to the psychology journals in the two leading general interest journal in economics, *The American Economic Review* and *The Quarterly Journal of Economics*.

Journals

Beginning around 1980, as the experimental movement in economics gained momentum, new journals were published to meet the demand of scholars who wished to publish and analyze the results of this new research. In chronological order these journals include the following:

The *Journal of Economic Psychology* (Commenced publication 1981) The articles of this journal deal with “preferences, choices, decisions, and factors influencing these, as well as the consequences of decisions and choices with respect to the satisfaction of needs. Studies in economic psychology may relate to different levels of aggregation, from the household and the individual consumer to the macro level of whole nations.” It

focuses on topics such as “inflation, unemployment, taxation, economic development, as well as consumer information and economic behavior in the market place.

The *Journal of Economic Behavior and Organization* (1981). The editors state their objectives are “to foster an improved understanding of how human cognitive, computational and informational characteristics influence the working of economic organizations and market economies.... and promote research with these purposes that explore the interrelations of economics with other disciplines such as biology, psychology, law, anthropology, sociology and mathematics” Articles include the use of diverse methodologies including systematic observation and careful description, simulation modeling and mathematical analysis.

Theory and Decision (1997). Describes itself as an international journal for multidisciplinary advances in decision science.

Classroom Experiments (1992). This unusual publication is a newsletter dedicated to the use of economic experiments as a teaching tool for the classroom.

Experimental Economics (1998). As its title suggests this journal focuses on research conducted using laboratory methods, which it claims, “are uniquely suited to the study of many phenomena that have been difficult to observe directly in naturally occurring economic contexts... Moreover, some of the behavioral and equilibrium assumptions underlying many economic theories can be tested fruitfully in a controlled laboratory setting”. Like *Theory and Decision*, *Experimental Economics* is an international and inter-disciplinary journal.

Research groups

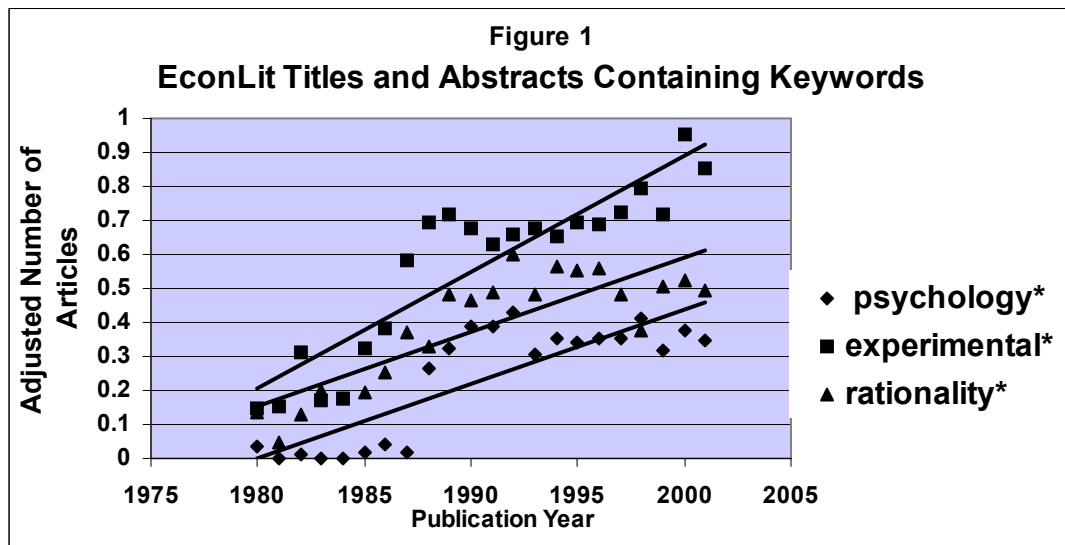
At the same time as new publications were created, groups of scholars from both economics and psychology formed centers for research around the world. These centers formed a natural meeting point for all of those interested in the area where psychology and economics intersect. Most formed at the existing universities and a few were sponsored by one of the aforementioned journals. Membership includes academics and scientists, as well as practitioners in business administration, marketing and consumer behavior. All of the groups use experimental methods to research the fundamental aspects of decision-making in economic situations, and neglected features of real economic agents' rationality. The following is a list of some of these groups in the chronological order of their foundation:

- IAREP- International Association for Research in Economic Psychology, US (1982)
- The Laboratory for Experimental Economic Research at the University of Bonn, Germany (1984)
- ENDEAR- European Network for the Development of Experimental Economics and its Application to Research on Institutions and Individual Decision Making, (1992).
- CREED- Center for Research in Experimental Economics and Political Decision-Making, at the University of Amsterdam, (1992)
- BREB- Bounded Rationality in Economic Behaviour Unit, at Oxford University, UK (1994)
- LINEEX- Laboratory of Research in Experimental Economics, in Valencia, Spain (1998).

Charting the movement

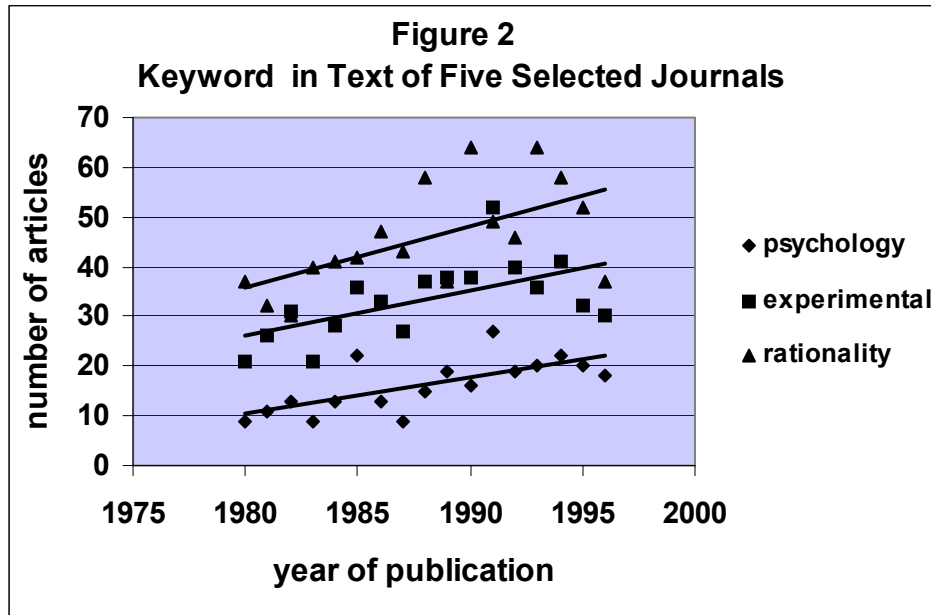
The establishment dates I have cited however are influenced by non-scholarly factors such as technological and economic situations. They may reflect, for instance, an increase in Internet communication or an economic expansion, both of which would

facilitate journal publication and the formation of research groups. The second method I employed controls for these possible biases. I conducted keyword searches on EconLit, an online database, for the appearance of “psychology”, “experimental”, and “rationality” in the titles or abstracts of journal articles. The number of articles containing at least one of these keywords is divided by the total number of articles that year, (and then multiplied by one hundred). This number is shown along the y-axis of Figure 1.



While Figure 1 does show a significant increase in the keyword appearance in journal articles since 1980, there is no control over the quality of journal in which they appear. Considering EconLit includes articles from over 600 journals, some probably do not represent mainstream economics. To correct for this possible bias, I conducted keyword searches on five core economic journals; *Quarterly Journal of Economics*; *American Economic Review*, *Journal of Political Economy*, *Econometrica*, and *Review of Economic Studies*. These were selected according to their ranking by Liner (2002), based on their level of citation in graduate-level economics textbooks. Using JSTOR, another online database, I was able to search the entire text of the journal article. Unfortunately

though, this database only includes these journals up to 1996. Despite this drawback, Figure 2 shows a significant increase, similar to that in Figure 1, in articles that include at least one keyword since 1980.



The problem however with keyword searches is that one cannot control for the context in which the word is used. It is very possible that some of the articles that include our general terms use them in ways completely irrelevant to experimental economics. This obviously is problematic to an argument that an increase in their use demonstrates the acceptance of experimental economics to mainstream economic scholarship. With this in mind I decided the most powerful way to measure the increasing application of psychology to economics would be to compare the number of citations to psychology journals that appear in economic journal articles per year. Specifically, I looked at the *Quarterly Journal of Economics* and *American Economic Review* because they are the most important general interest journals in the field. I defined a psychology journal by its inclusion in the PsycINFO Journal Coverage List, which as of February 2002 included

1774 journals. The following charts display my findings in two ways. Figure 3 shows the increase in the number of QJE and AER articles that had at least one psychology journal citation from 1980 to 2000. Figure 4 charts the increase in the total number of psychology citations in QJE and AER articles that had at least one psychology journal citation from 1980 to 2000.

My graphs demonstrate a general increasing trend in both articles with citations and total citations from the 1980's to the present. In total, my results demonstrate an increasing interconnection between economics and psychology and increasing acceptance of experimental economics in mainstream economic scholarship. The results also suggest that economics are taking the criticisms of psychologists and other behavioral theorists seriously.

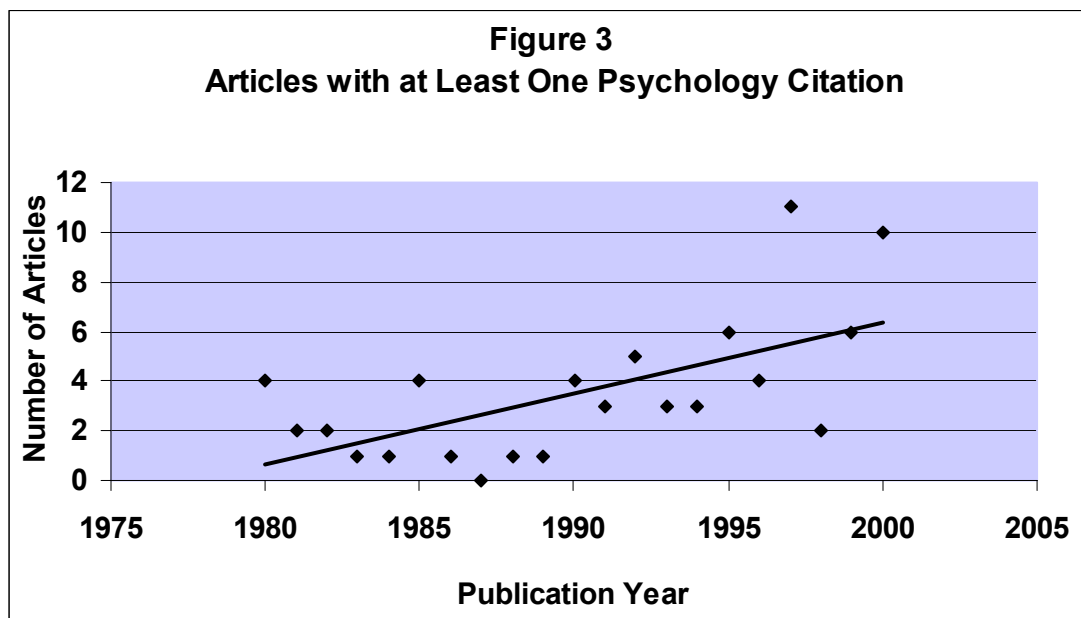
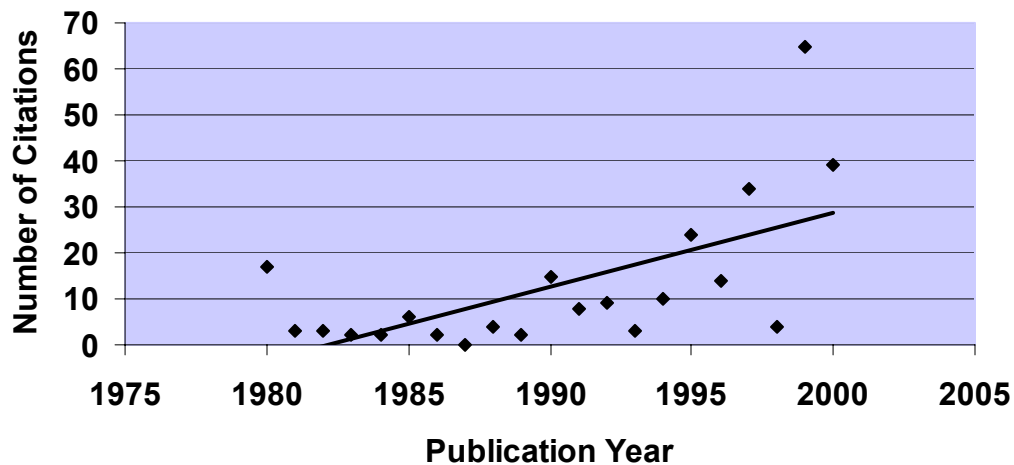


Figure 4
Number of Psychology Citations in Articles



VIII Conclusion

Economics is being significantly influenced by psychology through the increase in economic experimentation. The critique of traditional economic theory that began early in the century led to the use of psychological methods, especially laboratory experimentation, to test the assumptions of these theories. These tests have produced fascinating results, which require the additional use of psychological theory to explain.

Bibliography:

- Akerlof, George A. "The Market for Lemons: Quality Uncertainty and the Market Mechanism" *Quarterly Journal of Economics*, Vol. 84, No. 3, (August 1970), pp. 488-500.
- "Loyalty Filters". *The American Economic Review*, Vol. 73, No. 1. (March 1983), pp. 54-63.
- Andreoni, James. "Warm-Glow versus Cold-Prickle: The Effects of Positive and Negative Framing on Cooperation in Experiments". *Quarterly Journal of Economics*, 1995, vol. 110, issue 1, pages 1-21
- Clark, J. M. "Economics and Modern Psychology I". *Journal of Political Economy*, Vol. 26, No. 1. (January 1918), pp.1-30.
- Earl, Peter E. "Economics and Psychology: A Survey". *The Economic Journal*, Vol. 100, No. 402. (September 1990), pp. 718-755.
- Frank, Robert H. Microeconomics and Behavior, 4th Ed. New York: McGraw-Hill, 2000.
- Kagel, John H. and Alvin E. Roth (eds.). The Handbook of Experimental Economics. New Jersey: Princeton University Press, 1995.
- Kahneman, Daniel, Jack L. Knetsch, Richard H. Thaler. "Anomalies: The Endowment Effect, Loss Aversion, and Status Quo Bias". *Journal of Economic Perspectives*, Vol. 5, No. 1. (Winter 1991), pp. 193-206.
- Katona, George and Vernon Smith. "Discussion". *American Economic Review*, Vol. 68, No. 2, (May 1978), pp. 75-77.
- Knight, Frank. "Fact and Metaphysics in Economic Psychology". *Quarterly Journal of Economics*, Vol. 39, No. 3. (May 1925), pp. 372-409.
- Kunreuther, Howard: "Economics, Psychology, and Protective Behavior". *American Economic Review*, Vol. 68, No. 2, (May 1978), pp. 64-69.
- Lewin, Shira B. "Lessons from Our Own Day from the Early Twentieth Century". *Journal of Economic Literature*, Vol. 34, No. 3, (September 1996), pp.1293-1323.
- Macfie, A.L. "Choice in Psychology and as an Economic Assumption". *Economic Journal*, Vol. 63, No. 250. (June 1953), pp. 352-367.

- McCloskey, Donald and Arjo Klamer, "One Quarter of GDP is Persuasion", *American Economic Review*, Vol. 85, No. 2, (May 1995), pp. 191-195.
- Schwartz, Hugh. Rationality Gone Awry?: Decision Making Inconsistent with Economic and Financial Theory. US: Praeger, 1998.
- Sen, Amartya. "Behavior and the Concept of Preference". *Economica*, 40(159), (August 1973) pp. 241-59.
- Simon, Herbert A. "A Behavioral Model of Rational Choice". *Quarterly Journal of Economics*, Vol. 69, No.1, (February 1955) pp. 99-118.
- "Theories in Decision Making in Economics and Behavioral Science". *American Economic Review*, Vol. 49, No. 3. (June 1959), pp. 253-283.
- Smith, Vernon. "Markets as economizers of Information: Experimental Examinations of the 'Hayek Hypothesis'". *Economic Inquiry*, Vol. 20, (April 1982), pp. 165-179.
- "Rational Choice: "The Contrast between Economics and Psychology". *Journal of Political Economy*, Vol. 99, no. 4. (August 1991), pp. 877-897.
- "What is Experimental Economics?" web published with permission in 2001, <http://www.ices-gmu.org/experimental.htm>
- Snow, A. J. "Psychology in Economic Theory". *Journal of Political Economy*, Vol. 32, No. 4. (August 1924), pp. 487-496.
- Tversky, Amos and Daniel Kahneman. "Loss Aversion and Riskless Choice: A Reference-Dependent Model". *Quarterly Journal of Economics*, 106(4), (November 1991), pp. 1039-61.