# Susan Athey

Susan Athey is an applied theorist who has made important contributions to economic theory, empirical economics, and econometrics. She has built a research program strongly focused on using theory to understand substantive economic issues, especially in industrial organization. She has developed tools and techniques that provide the basis for empirical work strongly grounded in sound economic theory. She has made particularly important advances in developing and applying tools that replace strong functional form assumptions in models with more plausible conditions such as monotonicity, thereby facilitating the development of more robust empirical results.

**Monotone Informational Models**

A great deal of economic theory is agnostic about functional form. For empirical work, however, functional form is crucial, but strong assumptions such as linearity are implausible and in many cases theoretically impossible. Weaker assumptions such as monotonicity are often quite plausible in applied settings. Athey has played a major role in rewriting economic theory to exploit monotonicity assumptions. Her 2002 *Quarterly Journal of Economics* and her 2001 *Econometrica* papers are fundamental steps toward that goal. The first paper demonstrates how a monotonicity assumption can be used to derive "expected" comparative statics results in a model with informational imperfections. The second paper uses a monotonicity-like condition, the single crossing property, to derive strong results about equilibrium — in this case the existence of a pure strategy equilibrium. The powerful techniques developed in these papers have been profitably used in applied problems by Athey and others.

**Industrial Organization: Auctions**

Athey has also made important contributions to the economic analysis of auctions. Her 2001 *Journal of Political Economy* paper with Levin examines the role of private information in timber auctions. Most work on auctions makes an assumption about whether there is private information, and whether this information is private value or common value, and proceeds from those assumptions. Through the use of innovative theory and by carefully analyzing the structure of bids, Athey and Levin are able to identify private information. This work draws on Athey's earlier work on monotone existence and demonstrates the power of that work. It also develops techniques that are likely to be valuable in a variety of economic problems.

**Macroeconomics**

In joint work with Kyle Bagwell and Chris Sanchirico (*Review of Economic Studies* 2004), Athey examined a setting in which a set of firms repeatedly interact. Broadly speaking, she shows that the optimal collusive equilibrium requires no price wars on the equilibrium path and rigid prices. With Andrew Atkeson and Patrick Kehoe (*Econometrica* 2005), she uses a similar insight to provide conditions under which optimal monetary policy is static and does not depend on shock reports that the government has made in previous periods. The basic trade-off in monetary policy design is well-understood: allowing discretion leads to the temptation to inflate in the short-run. Absence of discretion means the inability to respond to information that is private to the central bank. The solution is a legislated inflation cap to limit discretion. The greater the problem of time-inconsistency, the tighter the constraint has to be.

**Econometrics**

Athey has made significant econometric contributions to nonparametric structural analysis and to the estimation of difference-in-differences models. Inference in the empirical literature on auctions has typically rested on a mix of nonparametric and parametric assumptions on bidder information and behavior. The nonparametric assumptions are suppositions about bidder information sets, preferences, and strategic behavior drawn from the theory of auctions. In contrast, the parametric assumptions are ad hoc functional form specifications made for "convenience." In joint work with Phil Haile (*Econometrica* 2002), Athey strips away the parametric assumptions and examines the identification and testability of various auction models using only the nonparametric assumptions of auction theory. The paper applies basic probabilistic properties of order statistics to show how the inferential possibilities depend on the institutional structure of the auction and on the data available on participants' bids. This work is a valuable contribution to the growing body of econometric research on nonparametric structural analysis.

The standard linear difference-in-differences model for analysis of treatment response supposes that an intervention is applied to a treatment group in the second of two time periods. The outcome of interest is assumed to vary linearly with group membership, the time period, and a group-time interaction. In joint work with Guido Imbens (*Econometrica* 2006), Athey addresses concern about the credibility of these linearity assumptions by developing a nonparametric *change-in-changes* model. This replaces the assumption of linearity with the assumption of monotonicity of outcomes in a person-specific scalar unobserved variable and with time-stationarity of the distribution of this variable within groups. The paper is an important advance over the existing linear differences in differences approach.

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