

## Susan Athey

Every two years, the American Economic Association awards the John Bates Clark Medal to “that American economist under the age of 40 who is adjudged to have made the most significant contribution to economic thought and knowledge.” Susan Athey of Harvard University was awarded the Medal in 2007. Past winners include a host of economists who have gone on to greatly influence the profession, including Paul Samuelson, Milton Friedman, Kenneth Arrow, Robert Solow, and Gary Becker; more recent recipients include Paul Krugman, Kevin M. Murphy, and Andrei Shleifer.

Athey’s research is hard to sum up in a few words. She is perhaps best known for her methodological work. But as she describes in the interview, many of her methodological contributions stem from looking at applied problems, finding the existing tools to answer those questions, and then developing new methods to solve them.

Her applied work has touched many fields, from the economics of organizations, where she has looked at how firms might improve their mentoring systems for talented young employees, to auction design, where she has examined how the government could more efficiently run procurement auctions and auctions for natural resources such as timber. She also has helped us better understand the conditions under which collusion among firms might be expected and the possible welfare effects of such cartelization. And, of interest to monetary economists, she has considered why it is often desirable to limit the discretion of the central bank so that price stability can be achieved.

Athey has long ties to the Fifth District, having grown up in Maryland and then attending Duke University as an undergraduate. Aaron Steelman interviewed Athey at her office on the Harvard campus on Oct. 9, 2007.

**RF:** You have worked across several fields using many different approaches to answer important questions. Can you explain how your basic and applied work fit together or complement each other?

**Athey:** What I find most exciting about economics is the fact that real policy issues and problems always can point the way to interesting research questions. But I also tend to be an abstract thinker and I like to understand the limits of an answer — and how particular or general that answer is, depending on different circumstances. That tends to take me from a situation where I am, on the one hand, immersed in a policy problem and trying to understand the answer, to where another part of my brain is trying to find the abstractions which that problem fits into — for instance, what other problems might be like this one. So while working on the policy paper I might have learned something along the way that is more broadly applicable and that might bring me to write a methodological paper subsequently. I haven’t tended to take a tool and apply it to lots of different applications. I tend to have an application



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and then develop the tool. To me, it's a natural process of trying to understand a problem, recognizing the shortcomings of the existing methods, and then developing new tools to better answer similar problems.

**RF: Can you give an example of the interplay between your methodological work and your work on policy problems?**

**Athey:** Probably the best example comes from a case where I started working on a very applied problem — collusion in auctions. To get at that problem, I developed tools for analyzing ongoing relationships in dynamic models with private information. That methodological work led me to connect with macroeconomists who were interested in the issue of discretion in monetary policy. I knew nothing about that issue from an applied perspective, but I did understand a lot about providing incentives to privately informed agents. So that was an example where I got to learn about a new applied problem but my contribution was more on the methodological side. So, ultimately, it came full circle — from one applied problem to another. And that's a bit unusual for me. But it can work well, because if you have different conceptual insights, you might attack a long-standing problem in a different way. Plus, in this case, I got a great chance to learn a little bit about macroeconomics.

**RF: How did you become interested in the topic of mentoring from a research perspective?**

**Athey:** The question of how mentoring affects diversity in organizations was the first problem that I posed independently as a scholar. I started on it in my second year of grad school. The work was motivated by a simple observation. A lot of male graduate students played in regular basketball games with male faculty members. But women and nonathletic males were not particularly welcome. It turned out that a pretty high share of the students who played in these games got plum research assistant positions over the summer. So I started thinking about why that was happening and what the impact was on eventual outcomes for students, schools, and the profession. I also thought that a lot of things I was seeing weren't really entering the debate about affirmative action and why firms might want to actively manage the process of diversity.

I developed a model that included the idea that people might have more effective mentoring relationships with people of the same type. The model had competing forces. On the one hand, if people are more efficient at monitoring people of the same type, then there could be some benefit to having a homogenous organization. On the other hand,

talent is scarce and so it could be that your star student or your star young employee is of an opposite type, and if that is the case, you might lose out on that talent. It also seemed that there were probably diminishing returns to

having a huge majority of one type. For instance, even if men were more effective at mentoring men, the last man you add to your faculty might not add that much value to mentoring the existing men.

So we looked at these trade-offs and how both a myopic organization might fare, as well as how a farsighted organization might evolve. We derived conditions under which there might be multiple steady states for a profit-maximizing organization. If it

started out relatively homogeneous, the firm might find it profitable to discriminate against the minority because they will have a hard time succeeding. But if they happen to find someone of the minority type who is so talented and such a good fit that they do succeed, then that might make it worthwhile to hire more employees of the minority type and move toward a diverse steady state. At that point, the organization might implement a voluntary and profit-maximizing affirmative action program as an investment in the ability to mentor future minorities. One of the key assumptions in such a model is that there is a scarcity of talent for people who match an organization's needs. To find that talent, firms might have to look for people who by some characteristics do not tend to fit the profile of their existing workers. Initially, that can cause some problems but ultimately be beneficial to the firm. So you might take some short-term hit in profits but over the long-run it can be a good investment.

This goes beyond my model, but I think it's important to note that social conventions are often arbitrary. For instance, a Southern law firm might have a hunting trip for its annual retreat. But young associates, and perhaps especially young female associates, might have no interest in hunting. So if they changed the retreat to something that was more gender-neutral, in a couple of years, only a few of the long-standing partners might care and you would appeal to a broader pool of talent. So that's outside of my model, but my model does have these trade-offs in diversity, where you are not as effective at mentoring majorities of either type when you are diverse. In the long run, though, my belief is that people get better mentoring those from another type as social norms change and they get a little experience doing it.

**RF: How did you get interested in auction design?**

**Athey:** When I was heading off to college I needed a summer job, so I worked as a receptionist for a company that sold computers to the government at auction. My family also

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sells timber and cattle at auction. So I had some exposure already, but it was while working at that summer job that I recognized that the way the government ran its procurement auctions led to some inefficient behavior. One of my friends introduced me to Bob Marshall, a professor at Duke who was working on defense procurement. I shared with him what I had observed, because while I knew that the procurement process could be improved, I did not know how to put this issue into formal models or how to conceptualize what was happening. I wrote a paper about the topic that gathered a lot of the institutional information and with his guidance put it into an economic framework.

I was fascinated by observing Bob's work on theory models that seemed to hit the nail on the head: They were right, insightful, and I learned something that I hadn't known before. As a result of this research, he was asked to testify before Congress about changes in the procurement system. A lot had happened in the few years since I took that summer job as a receptionist. Senators were listening to the suggestions we had to reform to the process and that was very gratifying.

**RF: What were some of the flaws in the bidding process that you observed?**

**Athey:** With auctions, the problems are often not just in the design of the auction itself. You have to design a market, and there are a whole set of rules in a market — for instance, who can participate, what gets sold, and how it is divided to be sold. So the design decisions of a market are much broader than the auction itself. In this particular context, there was no problem with the auction; there was a problem with the regulatory environment. The government had created a very streamlined process for protesting a procurement. If a bidder thought that a procurement had been misallocated — perhaps a procurement official had been biased or there was some error in the process — the costs to appeal were very low and the procurement would immediately be delayed for 45 days while a board reviewed the protest. This seemed like a good idea, but what they hadn't taken into account was that many of the smaller procurements had very short delivery dates, and you had to immediately start delivering on the procurement when it was awarded. So a small business might have brought in a couple of million dollars worth of inventory, and then 20 days into the procurement, the award would be protested, at which point everything would be frozen with the company sitting on this relatively large amount

of inventory for 45 days with an uncertain resolution to the protest.

This could potentially pose some serious problems for the company with the winning bid, which everyone knew. So the protesting bidder would often approach the awardee and ask for a settlement. This type of side payment

was encouraged by procurement officials because they just wanted their computers and from their perspective, the faster a protest was resolved, the better. A few companies came into existence that were not legitimate — they saw how the protest system was handled and made money just by asking for bribes, in effect, from legitimate companies that had been awarded procurement contracts. These protesting companies could have never fulfilled the contracts themselves.

So it was a very inefficient system where companies were regularly being held up and pressured into side payments. We saw that we could develop a model which could capture what was going on and guide policies for improving incentives while preserving the original intention of the protest system.

The tools of economics allowed us to develop a formal analysis of the issue. That was what really got me interested in auctions. The theme that emerged from this case runs through a lot of my applied work. In the end, yes, the auction rules are important but you also have to get the broader context correct.

**RF: Can you discuss your work on timber auctions? What did the U.S. Forest Service do incorrectly that the Canadian government seemed to improve upon?**

**Athey:** My papers are not directly about that second question, but I think they can help shed some light on it. The U.S. Forest Service doesn't raise revenue, generally. That's a problem. But that's not a problem of auction design. It's a problem of market design and incentives facing the agency. Because the Forest Service has not been run with the goal of revenue maximization, lots of tracts get sold that do not generate much revenue for the government. In many cases, the government would reimburse the firms for road construction and essentially the value of the timber was not much more than the cost of building the roads. There also have been a lot of issues of regulatory capture.

In Canada, timber is such an important natural resource that the government cannot afford to essentially subsidize the timber industry in this way. The government needs the

## Susan Athey

### ► Present Position

Professor of Economics, Harvard University

### ► Previous Faculty Appointments

Massachusetts Institute of Technology (1995-2001) and Stanford University (2001-2006)

### ► Education

B.A., Duke University (1991); Ph.D., Stanford University (1995)

### ► Selected Publications

Author or co-author of papers in such journals as the *American Economic Review*, *Quarterly Journal of Economics*, *Journal of Political Economy*, and *Econometrica*

### ► Awards and Offices

Winner, John Bates Clark Medal, 2007; Fellow, Econometric Society; Co-Editor, *American Economic Journal: Microeconomics*

revenue and there is significant public interest in the program, so it does operate a revenue-generating enterprise. The Canadian problem is that the government owns a very large fraction of the resource. So they have worked hard to design a system that could deliver the best possible incentives for efficient behavior, such as getting the right trees cut at the right time, getting the right timber replanted, and getting the right mills built, as well as bringing in revenue for the government.

To illustrate the issues that have to be solved regarding market design, nobody is going to build a mill if they don't have some idea of future supply. So the Canadian government engaged in various forms of long-term contracting, which is a very sensible thing to do. But once you have the mills built, you have to find a way to price the timber that is going to those mills. Historically, they used various forms of administered prices. The United States complained about that. So British Columbia introduced a system where they used auctions to create spot markets for timber, and the prices on that spot market were used to calibrate prices for timber harvested under long-term contracts.

**RF: In which industries — or types of industries — is collusion most common? And how can policymakers respond to such noncompetitive behavior to improve the functioning of those markets?**

**Athey:** Collusion often occurs in markets where you tend to have homogeneous products, fairly inelastic demand, and high fixed costs and low marginal costs. Examples include the lysine and vitamin industries. There is a small number of firms that have made big investments in plants. They need a markup to survive and they are continually bidding on business from big customers.

There have been some firms that have been in a number of markets where collusion might be desirable and they got very good at colluding. For instance, Archer Daniels Midland (ADM) was in both the lysine and vitamin markets and they helped to organize fairly effective cartels. In those kinds of environments, you expect strong pressure for those firms to find some way to soften up their price competition because the underlying conditions of the marketplace are so severe.

It is common in procurement to have a fairly small number of firms consistently bidding against one another. So we have seen it in school milk and road construction. And some things that the government does can actually make it easier for firms to collude. In order to maintain transparency, the government tends to reveal a lot of information about procurement and also tends to break things up into smaller procurements, creating lots of auctions. That creates the conditions where firms can more easily arrive at tacit collusion.

The auction design can make a difference. For instance, it's much easier to collude in an open-bid auction than in a sealed-bid auction. That's something my empirical research

confirms. In my work, open auctions do not yield as much revenue as you would expect, and that is consistent with the theory that collusion is easier in that environment. It's certainly possible to collude in sealed-bid auctions. But it's especially easy to collude in open auctions, because there really isn't much gain from deviating today. To see why, imagine that a bunch of bidders have all agreed to bid low in an auction and then you show up and you deviate. As soon as you start bidding above the agreed price, your competitors can respond. They can outbid you. In a sealed-bid auction, however, a firm can deviate and their competitors cannot immediately respond. They can only respond in the future.

In an open auction, if you are not the most efficient firm, you cannot gain at all by deviating to win the auction. If you are the most efficient firm but you were not designated by the cartel to win, then you can gain in the present day by deviating. But you might not gain that much, because your opponents can bid you up. At best, you can gain the competitive profit today while in a sealed-bid auction you can gain the collusive profit today.

**RF: In your opinion, how effective is antitrust policy in preventing collusion?**

**Athey:** Typically, tacit collusion, where firms do not make formal agreements, tends not to get prosecuted. The prosecutions that take place typically occur because firms have gotten together and done something explicitly illegal — like fixed a bid or met in a smoke-filled room and exchanged side payments. My research addresses the following questions: If that's the main way firms get caught, why do they take that risk? Why can't they do pretty well with tacit collusion? My research suggests that bribes and communication can be helpful for firms in achieving the most efficient cartel. So, in principle, if they are very patient and sophisticated, they may be able to arrive at a scheme of tacit collusion that does allocate efficiently. But if firms are less patient, they may not get there. Bribes can help them settle up today to compensate those who give up market share. So if one firm is more efficient than the others or has extra inventory, it can pay the other firms to hold back production. If you do not have transfers to do that, you just have to make some promise that in the future you will take a turn and let the other firms produce. But that's a long way off, it's not clear that people will follow up on the promise, and things become murky without the side payments.

Tacit collusion also becomes easier when there are many rounds of bidding. If you give firms a lot of opportunity to interact and if any particular action they might take does not have a huge impact on final outcomes, then firms are able to communicate through the marketplace and don't necessarily need to get together to talk. For example, in Federal Communications Commission auctions, Firm B may bid against Firm A in some city that Firm B does not have a natural interest in to signal to Firm A to stay out of those areas that Firm B considers to be its core markets. If it's early

in the process, those prices are not going to be the final prices. So the firms are able to communicate in the early stages of the price discovery process and divide up the markets to decide how the licenses are allocated. Firms can use other techniques, such as putting signals in the trailing digits of their bids. Instead of bidding a round number, they would use patterns of numbers to communicate with each other. But if you have less frequent, larger auctions where there are not a lot of opportunities to communicate through action, firms tend to need to get together and explicitly communicate to arrive at a similar arrangement.

**RF: I would like to return to your research on discretion in monetary policy. Can you discuss your work on inflation targeting — about the possible virtues of and problems with limiting central bank autonomy?**

**Athey:** You might ask: Why does the central bank need discretion at all? Why can't we make rules that depend on publicly available information? You can think of different motivations for having central bank autonomy. A leading motivation must be that you believe the central bank understands something that is difficult to quantify or write down as a function of public observables. It's not that the central bank has access to better raw information, but perhaps there is a lot of subjectivity in evaluating publicly available data and because of that, reasonable experts would arrive at different conclusions based on the same data. If the central bank has some expertise in analyzing those data — and if it has access to some nonpublic data, which it does — then there can be an argument for discretion. The problem is they also have a classic time inconsistency problem. There can be a benefit to a surprise inflation. So the question becomes, how do you provide incentives in a world where the agency you are trying to incentivize has a social objective at heart, but they have private information and a time inconsistency problem?

The fundamental economic insight is that in an environment like that, where the mechanisms you have for providing incentives have social costs, it is often not worth the cost to provide incentives. If the central bank decides it is optimal to increase inflation a little bit today, inflation expectations may go up in the future. How do you weigh the future costs with today's benefits? The answer is not self-evident. In fact, it depends on the nature and distribution of the private information. But for a wide set of circumstances, it is not worth it to try to provide incentives. It is desirable, much more often than you might expect, to simply establish an inflation cap and limit autonomy. The reasons for that are fairly subtle. But that same kind of idea has also arisen in my work on collusion.

In some circumstances, firms collude best by just setting a

fixed price and sharing the market evenly rather than attempting to divide up the market in an efficient way. You need pretty efficient instruments for providing incentives to make it worthwhile to provide those incentives. When resolving the trade-off between suboptimal decisions and inefficient instruments for incentives, you have to account for the indirect effects of the decision policy, because you will have to distort what happens in some states of the world to preserve incentives to make the best decisions in other

states of the world. Those indirect spillovers wind up pushing you toward less efficient decisions.

**RF: What would you consider your most important contribution to econometrics or methodology more generally?**

**Athey:** I would not say that my most important methodological contribution is in econometrics. I think that I, among other people,

have influenced applied practice in industrial organization and the analysis of auction data by paying a lot of attention to non-parametric identification. I have been able to push the ball forward in delineating what kinds of auction environments you could possibly learn the primitives of models and in which kinds of environments that is just not possible. I think that is an important set of facts to know when you go to start a project.

I also have emphasized specification testing to provide more systematic ways to justify assumptions that you make. Rather than just marching forward with a set of assumptions for a structural model, I have emphasized ways to test those assumptions and have more confidence in your work. I hope that I have focused more attention at the beginning steps of a project, when you are conceptualizing which question you can ask and what assumptions you should make.

Let's assume that you have a very large and good data set, there is a lot of value in determining early on whether you can answer your question with a minimum of extraneous simplifying assumptions. Could I answer the question just using the assumptions that I believe to be good approximations for reality or that are testable, rather than relying on assumptions of functional form or unrealistic assumptions about the environment? I hope that by doing that early work, people will abandon projects to which the answer is no or focus their attention on what additional piece of data would turn the answer from no to yes. For example, if you want to do structural work on common-value auctions, you are going to need some data beyond bidding data, such as information about the underlying value of the object obtained from observations after the auction ends (e.g. how much oil was extracted from an oil lease). So before you even begin a project, you should find that kind of data, otherwise the project will not be fruitful.

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**RF:** I read on your Web site a short article that you wrote for middle-school students about applying math to real-world problems. How do you think economists can help students become more interested in economics and not necessarily scared off by the sometimes very technical nature of the discipline?

**Athey:** I think a big issue is finding the problems that will engage students and showing them that economics can provide real insights. One thing that has made it easier for me to engage undergraduate students is eBay. It is still a relatively new company; someone not much older than the students founded it; they can see how it allows them to buy something they otherwise might not be able to get; and they are forced to think a little bit about bidding strategy and market design when they interact with the system. It allows them to think about which kind of economic institutions you might like and which might be more appropriate for certain goods. There are many things on eBay that might initially seem puzzling but that conform quite well to economic theory. So through this example you can get students engaged and improve their understanding of something they have already encountered and puzzled over. That is quite powerful.

I think another example is the economics of social networking sites like facebook.com and myspace.com. These are also institutions they interact with, yet the design decisions are evolving and the dominant market structure has not yet been determined. They can see how market design matters.

There are other broad topical areas that can get students engaged, such as the economics of sports or the economics of the entertainment industry. Finding the applications that resonate with the students or the population in general and then showing them how a little bit of structured thinking can substantially improve their understanding — I think that's where you get the power of economics. I'm still amazed that in the business world how having a coherent and structured way of approaching problems can allow someone like me to walk into an industry meeting and talk to people who are brilliant people managing large companies and still have unique insights for them. That's because I have these really powerful tools at my disposal. Economics allows you to think several layers deeper. Without that structure, you just get lost in a muddle.

**RF:** You are the co-editor of the *American Economic Journal: Microeconomics*, one of four new journals launched by the American Economic Association. What niche do you aim to fill that is not currently served by the many and varied academic journals already in existence?

**Athey:** There are a lot of journals, but there are not a lot of really good journals. Most of them are fairly secure in their position. So there is not a lot of competition on service. An enormous amount of time is wasted with slow refereeing



processes and revisions that may improve the paper but are not worth the time required to make them. So a big goal for me is to have an outlet for the kind of work that I like, where people can get good service in a general-interest outlet. A secondary issue is that for more technical work there are not that many options from a general-interest perspective. Your papers fall to the field journals very quickly. Basically, what I want is a journal that gets the cost-benefit analysis on revisions right, that turns around papers fast, and that reaches a broad audience with technically rigorous work.

**RF:** How has winning the John Bates Clark Medal affected your life, both personally and professionally?

**Athey:** Receiving an honor like the Clark Medal puts me in the position of being an ambassador for economics to the general public. Given how passionate I am about economics, I view that as an exciting opportunity. Also, when you win the Clark Medal, you get a lot of media attention — and with that, a lot of correspondence from people you may know only slightly or not at all. As the first female winner, I received hundreds of e-mails from women in other male-dominated professions. These people felt compelled to tell their own stories and it made me realize the power of being a role model. Whether you like it or not, graduate students are looking ahead at the people who are leading the profession and it appears to have affected a substantial number of them to look at me. That's not something that I chose — or even can control — but it has happened, and it has been gratifying to know that I may have inspired more women to jump into mathematically oriented professions such as economics. **RF**