Published Quarterly by the Federal Reserve Bank of Minneapolis

June 2013

The Region

Susan Athey

Achieving the Dual Mandate, Together

New Manufacturing Investment & Unions

Paradox of Thrift, Revisited

Research Digest:

Declining Interstate Migration

Income Risk in Recessions

Job Loss & Skill Sets

Volume 27 Number 2
June 2013
ISSN 1045-3369

The Region

2 Ninth District Notes
Achieving the Dual Mandate, Together
Narayana Kocherlakota

6 New Manufacturing Investment and Unions
U.S. labor unions are still a big factor in corporate decisions on new investment
Thomas J. Holmes

16 Interview with Susan Athey
Douglas Clement

30 "Paradox" Redux
Might household frugality help explain the Great Recession?
Douglas Clement

36 Research Digest
Whose Earnings Fall in Recessions?
Skill Types and Job Loss
Why Interstate Migration Is Dropping
Phil Davies, Douglas Clement and Sam Schulhofer-Wohl

The Region
Federal Reserve Bank of Minneapolis
P.O. Box 291
Minneapolis, MN 55480-0291

Email: letters@mpls.frb.org
Web: minneapolisfed.org

Cover photograph by Peter Tenzer

NINTH DISTRICT NOTES

Achieving the Dual Mandate, Together

Designing effective, appropriate policy to balance price stability and maximum employment

Narayana Kocherlakota

President
Federal Reserve Bank of Minneapolis

Editor's note: This column is based on remarks presented at the 57th Economic Conference of the Federal Reserve Bank of Boston in Boston, Mass., on April 13, 2013.

The media pay a great deal of attention to Federal Open Market Committee deliberations and decisions. This scrutiny tends to focus on the differences among Committee participants' views on appropriate monetary policy. Too often lost in this media conversation are the elements of monetary policy that FOMC participants whole-heartedly share. One such common element is the goal of monetary policy: our dual mandate.

Making monetary policy is, of course, the primary reason we come together regularly at FOMC meetings. More specifically, we aim—in concert—to formulate policy to achieve our congressionally mandated objectives of promoting price stability and promoting maximum employment.

Beyond those high-level objectives, the Committee has established common principles that underlie its long-run goals and strategies. These principles, expressed in just five paragraphs, are described in a document released last year.[1] All of these principles enjoyed broad FOMC support from participants when the statement was first adopted in January 2012, and they have since been reaffirmed, in January 2013.

[1]See the press release at federalreserve.gov/newsevents/press/monetary/20120125c.htm.

I believe that anyone interested in U.S. monetary policy should read this statement. In part, the statement matters because of its substance. But it also matters because so many FOMC participants approved the document. These truly are our common principles in pursuit of our dual mandate.

One piece of this document that has received a lot of attention—and quite rightly so—is that it establishes a longer-run goal for inflation of 2 percent per year. I believe that this numerical target has served and will continue to serve the Commit-

tee well in keeping inflation expectations anchored.

In this note, I'll discuss my views on how we as policymakers should seek to achieve, or operationalize, these commonly held FOMC principles. And in particular, I'll focus on the last paragraph in the statement, which I view as its most operational. That paragraph is duplicated below:

Final paragraph of FOMC principles statement

> In setting monetary policy, the Committee seeks to mitigate deviations of inflation from its longer-run goal and deviations of employment from the Committee's assessments of its maximum level. These objectives are generally complementary. However, under circumstances in which the Committee judges that the objectives are not complementary, it follows a balanced approach in promoting them, taking into account the magnitude of the deviations and the potentially different time horizons over which employment and inflation are projected to return to levels judged consistent with its mandate.

Setting policy if the Fed had a single mandate

I'll start this discussion by focusing on part of that paragraph's first sentence:

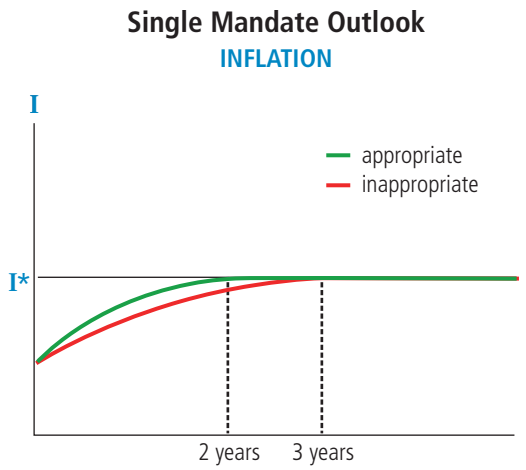
"The Committee seeks to **mitigate deviations of inflation from its longer-run goal** …" (emphasis added).

For the sake of discussion, I'd like to pretend, initially, that the Federal Reserve is a central bank with a *single* mandate: promoting price stability. If that actually were the case—if the Fed had only the one mandate of promoting price stability—then I think this sentence would be an adequate description of the FOMC's longer-run strategy. That is, to promote price stability we would seek to mitigate all deviations of inflation from our long-run target of 2 percent.

So, if that were an accurate description of the Committee's long-run strategy under a single mandate, how could it distinguish between appropriate and inappropriate policies?

The chart at right is very helpful along these lines. It depicts the evolution of inflation under two very distinct monetary policy stances. According to one position for monetary policy, the outlook for the future is described by the red line, the one I've labeled here as "inappropriate." Under the other policy stance, the outlook is described by the green line, labeled "appropriate."

Why have I chosen those terms—appropriate and inappropriate—to describe different stances for achieving the (hypothetical) single mandate? Let's look at the red line first, and consider the monetary policy stance that gives rise to it. Under that policy,



the inflation rate returns to its desired level (shown here as a black horizontal line and labeled I*on the y-axis) within three years.

The I* here is a rather abstract description of the desired inflation rate, but as I mentioned earlier, the FOMC's principles statement establishes a desired long-term rate of 2 percent per year. So, under the red policy stance, we're returning to that long-run target three years after the policy is put into operation.

Given the time lag inherent in implementing monetary policy, we generally think of policy as being effective if it achieves its goal(s) in one to two years. Therefore, a policy that takes a full *three* years is relatively ineffective, and is thus an "inappropriate" choice.

A better choice under a single mandate

What would be a more appropriate policy decision in this single-mandate scenario? By increasing monetary accommodation—that is, lowering interest rates—we could get back to target more rapidly, within the one- to two-year time frame. That's shown in the chart with the green line. Under this policy stance, inflation returns to its long-run goal of I*—or less abstractly, 2 percent annually—within two years.

Therefore, with *this* policy stance—a higher level of monetary accommodation—the Committee is doing *a more effective job* of mitigating deviations of inflation from its long-run objective. Why "more effective"? At any point in time, the outlook for inflation under this second monetary policy stance, as shown by the green line, is closer to the long-run target of I* than it would be under the policy stance that results in the red line—except, of course, after three years when both policy stances have achieved the same inflation rate level.

So, this kind of outlook chart helps sort out what kinds of policy stances are appropriate and inappropriate. In particular, the chart clarifies that the red stance is inappropriate because policymakers could more quickly "mitigate deviations of inflation from its longer-run goal" by increasing monetary accommodation.

Now, I want to emphasize again that this entire discussion was under the deliberate pretense that the Fed has only a *single* mandate. Of course, Congress has actually given the Fed a *dual* mandate. I'll turn to that more realistic scenario now.

Setting policy under a balanced, dual mandate

The FOMC principles statement is very alive to the fact that the Fed has a responsibility to meet a *dual* mandate. The final paragraph says "the Committee seeks to mitigate deviations of inflation from its longer-run goal *and* **deviations of employment from the Committee's assessments of its maximum level**" (emphasis added).

Now, generally, as the principles statement says, these are "complementary" objectives. That means that policies that lead inflation back to 2 percent within two years will also lead employment to return to its maximum level within that same time frame. Achieving one objective is consistent with achieving the other.

But I'd like to address a more interesting case, in which these objectives are *not* complementary. What should policymakers do in that case, when achieving one of the mandates—maximum employment, say—appears to conflict with the other—achieving price stability? Well, the Committee's principles statement clearly states that "it follows a balanced approach" to the mitigation of deviations of inflation and the deviations of employment. What does "a balanced approach" mean?

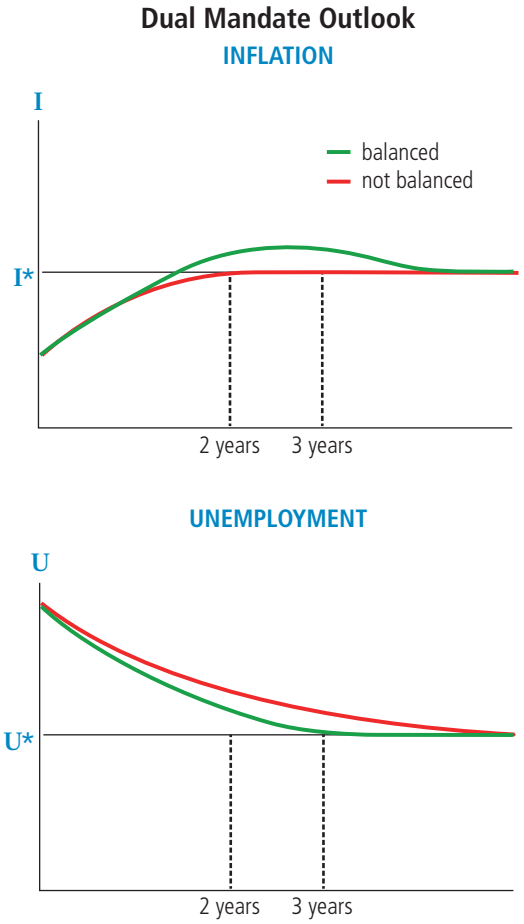
The statement leaves room for judgment among policymakers along that dimension. One thing it certainly does mean, I think, is that we're putting weight on both mandates. We're not focusing exclusively on maximum employment, or entirely on price stability. Rather, we're looking at both mandates in making decisions about the appropriate policy stance.

Given this language of the Committee's strategy—that it will follow a balanced approach in promoting the employment and price stability mandates if it judges them not to be complementary—how do we distinguish between policy stances that are appropriate and those that aren't? Again, I think economic outlook charts similar to the one just discussed are very informative.

Balancing mandates

At right are two such charts. The first describes the evolution of inflation, the other shows the outlook over time for unemployment. And each of these charts looks at evolution under two distinct monetary policy stances, a stance that corresponds to the red outlooks and another corresponding to the green outlooks.

Let me begin with the red outlook, for both the inflation and employment charts. Under that monetary policy stance, inflation is returning to its long-run objective within two years. If the Fed had only a *single* mandate, we would judge that policy stance to be "appropriate" because inflation is getting back to the desired target within a two-year time frame.



But in reality, we have *two* mandates, maximum employment as well as price stability. The second chart considers a metric corresponding to the employment mandate—the usual metric we use is the unemployment rate. Here the chart indicates a desired unemployment rate level, consistent with maximum employment, by a black horizontal line and a U* on the y-axis (similar to the inflation target in the inflation chart.)

We see that under the red outlook, the unemployment rate approaches its desired level at some time well beyond three years. This monetary policy, the red stance, is therefore *not* balanced in its approach to the two mandates. It's focusing exclusively on price stability and mitigating deviations of inflation from its longer-run goal, but it doesn't pay equal attention to mitigating deviations from the unemployment goal.

A *balanced* approach, in contrast, would be willing to concede a bit on the price stability mandate in order to get a faster return of unemployment to its desired level.

That approach is what the green outlook indicates in these charts. By adding accommodation relative to the policy stance that generates the red outlook, policymakers are able to return unemployment more quickly to its longer-run objective.

There is a cost associated with that: The higher level of accommodation pushes inflation above its desired level for a time. But that, of course, is what "balanced" means. You're willing to ease up slightly on achieving the mandate of price stability in return for a faster return of unemployment to what's assessed as consistent with maximum employment.

How big is this gap in the upper chart between target inflation and the highest point of the green curve? In other words, what is the cost in inflation of a balanced approach?

Deciding what that gap or cost should be is up to policymakers' judgment. But it's crucial to understand that there *should* be a gap. If there is no gap, then policymakers are not using a balanced approach to the two mandates. The gap indicates a degree of compromise that policymakers must make by deviating from one mandate to more quickly achieve the other.

Clarity for the FOMC and the public

In this essay, I've described a central part of the FOMC's principles statement, which outlines its long-run goals and strategies. I've suggested that the statement provides a great deal of clarity about how to assess what kinds of monetary policy stances are appropriate and inappropriate under our dual mandate. This clarity should serve the Committee in its deliberations. And it should serve the public as well, as it seeks to understand the reasons underlying Committee actions. R

New Manufacturing Investment and Unions

Though weak, U.S. labor unions remain a significant factor in corporate decisions about new investment

Thomas J. Holmes
University of Minnesota and
Federal Reserve Bank of Minneapolis

ABSTRACT

Despite recent media stories about both labor unions and the potential revitalization of U.S. manufacturing, most current policy discussions about improving business climate to foster manufacturing neglect the role of unions. This, plus the continued decline in U.S. union membership, might lead one to believe that unions matter little for *new* investment decisions.

This essay argues that, in fact, unions remain an extremely significant factor in decisions by U.S. manufacturers about where they will or will not make new investments. Both unions and manufacturing are discussed in an analysis that distinguishes between new investment at *new* plants and at *existing* plants. Two central arguments are presented:

(1) Union success (or lack thereof) in organizing *new* plants is a reflection, in part, of an intentional strategy by firms to choose locations that have historically not been receptive to unions, in the South and in rural areas. This well-established historical process continues today. That is, unions *still* make a difference for new investment in manufacturing because they influence where firms decide to open new plants.

(2) Unions also remain relevant for corporate decisions about new investment at *existing* plants. Many such facilities are hubs of interaction between unionized blue-collar workers and nonunion white-collar workers, including researchers and engineers in research and development labs. To continue this valued interaction at a new nonunion plant, the firm would have to shift white-collar workers, at potentially high cost. The firm might instead consider adding new investment to an existing facility. In this way, the new investment keeps alive a union established long ago.

Through its influence on the ease of labor organizing, policy can therefore influence both the location and the amount of new investment in U.S. manufacturing.

Introduction

With the decline of labor union membership in the United States over recent decades, discussions of policy toward unions usually show up in the back pages of newspapers, if at all. But recently, labor union policy has been front-page news. One major story is that in 2011, the National Labor Relations Board (NLRB) began proceedings to block Boeing, the largest manufacturing exporter in the United States, from opening a billion-dollar plant in South Carolina, due to alleged labor law violations. That the (now-resolved) dispute even made headlines is significant news in an era of supposed union irrelevance.

Another major labor story involves efforts in several states to pass "right-to-work" laws, anti-union statutes that prohibit making union membership a requirement of employment. In December 2012, Michigan, a traditional center of union power, enacted a right-to-work law, joining the ranks of anti-union states in the South that passed such laws over 50 years ago. Indiana did so in February 2012, and Wisconsin enacted a related law for public sector unions in 2011.

Also on the front page are discussions of a potential revitalization of American manufacturing. The automobile industry has been in recovery since the 2009 crisis. General Electric's (GE's) "reverse offshoring" of water heater production from China back to Kentucky got substantial media attention, as did Boeing's rollout of the new fuel-efficient 787 Dreamliner, which it hopes will be a key source of competitive advantage for years to come.

Despite these stories, overall gains in manufacturing have been meager relative to the broad de-


Union

cline of U.S. manufacturing since the 1970s, and many, including President Barack Obama, argue that it should be an important policy priority to promote U.S. manufacturing. For example, a recent presidential report urges improvements in the business climate for manufacturing (President's Council of Advisors on Science and Technology, July 2012).

It's telling, perhaps, that this report doesn't mention unions in its discussion of business climate, consistent with a view that unions are largely irrelevant to corporate decisions about investment in manufacturing. The share of the manufacturing workforce in unions has been in free fall for many years, only 9.6 percent in 2012, compared with 38.9 percent in 1973.[1] This statistic actually understates current union weakness, because factories that are unionized today, to a remarkable degree, are the legacy of union victories over 50 years ago.

These facts might lead one to the view that while unions were relevant to *old* investment decisions (in locations where unions were established decades ago under a more favorable environment), they matter little for *new* investment decisions. In discussions of business climate, policymakers and businesspeople think about *new* investments, of course, not investments made years ago. Given today's small union membership numbers, it might seem sensible to leave unions out of the discussion about current business climate and *new* investment.

I believe that this conclusion is ill founded, and in this essay, I will argue that in fact unions remain an extremely significant factor in decisions by U.S. manufacturers about where they will or will not make new investments. To make this point, I discuss both unions and manufacturing, and I present an analysis that distinguishes between new investment at *new* plants and at *existing* plants.

I argue first that low union success in organizing *new plants* is not an accident, but rather a reflection, in part, of an intentional strategy by firms to choose locations that have historically not been receptive to unions, in the South and in rural areas. True, this is an old story, a process that has been going on for decades.[2] My point is that this process continues *today*. That is, unions *still* make a difference for new investment in manufacturing because they influence where firms decide to open new plants.

Second, I argue that unions remain quite relevant for corporate decisions about new investment being considered at *existing* plants. Many such facilities are significant hubs of interaction between unionized blue-collar workers and nonunion white-collar workers, including researchers and engineers in research and development (R&D) labs. These facilities are old (in some cases 100 years or more!), and unions at them were generally organized just after the National Labor Relations Act of 1935 provided a favorable environment to do so.

If a firm with such a facility were to shift production workers to a new nonunion plant, it would have to shift the white-collar workers as well, if it wants to continue the interactions. It might be costly to break up an existing successful research center, and so the firm might instead consider adding new investment to an existing facility.[3] In this way, the new investment keeps alive a union established long ago. Public policy that affects such a firm's interactions with the incumbent union and its bargaining strength then potentially affects the business climate in which the decision about new investment is made.

To illustrate the continuing relevance of unions to investment decisions, consider again GE's decision to bring production back from China to its appliance plant in Kentucky. The Kentucky plant is old and has long been union. It is also the headquarters for GE's appliance business and the R&D center. In public statements, including comments by CEO Jeff Immelt, GE makes explicit the high value it places on having innovation and production at the same location.[4] GE sustained this co-location by choosing to add new investment to its already unionized plant. However, it is important to emphasize the role recent weakness of unions potentially played in providing a favorable climate for the investment. As part of the deal, the union made a concession that the new workers be paid $10 less per hour than existing workers.[5] This kind of two-tiered wage structure is anathema to union solidarity, and a concession like this was rarely made in earlier periods when unions were strong.

Economic Policy Papers *are based on policy-oriented research by Minneapolis Fed staff and consultants. The papers are an occasional series for a general audience. Views expressed are those of the authors, not necessarily of others in the Federal Reserve System.*

Consider also the NLRB's 2011 case against Boeing. Historically, Boeing's base of production is its heavily unionized facilities in Washington state. (I say "heavily" because even engineers there are in a union.) Boeing has had a rocky relationship with its unions over the years, and strikes are a regular occurrence. In 2010, Boeing began opening a second Dreamliner production line in a South Carolina nonunion plant; "only the third site in the world to assemble and deliver twin-aisle commercial airplanes," according to Boeing.[6] CEO Jim McNerney explained that Boeing was doing this because the company was tired of "strikes happening every three to four years in Puget Sound."[7] Based on these remarks and others like it, the NLRB filed its case accusing Boeing of an illegal labor practice regarding threats firms can make about how they might respond to strikes.

I offer the Boeing CEO's expressed motivation for moving to South Carolina as "Exhibit A" for my case that big manufacturers even today are choosing locations to avoid unions. However, company officials have to be very careful about public statements on this issue because these statements have legal ramifications. Hence, for the analysis I will focus on what firms *do*, rather than on what their officials *say*. By observing the choices firms make when they decide where to make new investments, I can draw inferences about what matters to them most.

The main work of this paper is an analysis of recent investment behavior by GE, which will serve as "Exhibit B." Putting GE under the microscope reveals a picture with a great deal of clarity. In the recent period that I look at, whenever GE has built a brand new plant, it has picked a location unlikely to be unionized. And when GE has invested in an existing unionized facility, for the vast majority of new jobs involved, the facility was one with significant R&D presence, and new workers were hired at a lower wage tier than existing employees.

This is a case study of two firms. While these are two very important firms—the two largest manufacturing exporters in the U.S.—as in any case study, there is always an issue of the broader applicability of the results. I believe the insights of this analysis hold more broadly for large U.S. companies in heavy industry, and I give two quick examples to back this up. First, Caterpillar, the construction-equipment manufacturer, is another firm high on the list of top exporters. Union avoidance in this firm's investment decisions has been very much in the recent news.[8] Second, if I had included the auto industry in this study (and, in particular, the site-selection decisions of foreign-owned firms), I expect that many of the conclusions would be similar. Foreign automakers in every case have chosen plant locations where they have been able to remain nonunion.

Background

Several key points about firms and unions will aid discussion of the case studies that follow.

1. *Unions are organized at the plant level; once established, they seldom disappear.*

   Generally speaking, union organization takes place at the plant level, involving a representation election supervised by the NLRB. Once a union gets in a plant and, in particular, is able to negotiate a first contract, it becomes entrenched over time. An NLRB mechanism for decertifying a union does exist, but it affects only a trivial number of cases. In 2005, for instance, unions representing 11,000 workers were decertified, but out of a base of 9 million represented private sector workers, this is a decertification rate of only 0.13 percent.[9] Hence, once a union becomes entrenched at a plant, it is generally there for good, until the plant shuts down.

2. *Unions spread to neighboring establishments, so firms often build new plants in distant areas.*

   Unions tend to spill out of organized plants into nearby businesses; that is, to some degree unions are "contagious." In Holmes (2006), I provide evidence on this point, showing how unions in steel mills, auto plants and coal mines found their way into neighboring grocery stores and health care facilities. If a union can spread from an auto plant to a nursing home down the street, it can likely extend to a neighboring auto plant. Aware of this, firms understand that starting a new nonunion plant generally requires geographic separation from existing unionized plants.

3. *Manufacturers may augment existing unionized plants if benefits outweigh costs.*

   If a manufacturer invests and adds produc-

tion worker jobs to an existing unionized plant, the new workers usually join the current union. The manufacturer may make this decision, rather than open a new nonunion facility elsewhere, if the initial site has advantages, like proximity to R&D labs, that offset the disadvantage of being unionized. In this way, a unionization event from many years ago is kept alive.

General Electric

With that as background, I'll now turn to the meat of the essay where I analyze what key manufacturers are doing. I focus on GE, but I also come back to Boeing.

GE is one of most influential U.S. companies. It is the second largest U.S. manufacturing exporter (after Boeing). It is the third most innovative U.S. firm, measured in terms of patent counts (after IBM and Microsoft).[10] It is at the center of discussion about revitalization of U.S. manufacturing. Immelt is highly visible in this discussion and serves on the Council on Jobs and Competitiveness set up by Obama.

GE is also interesting for my purposes because it has a long history of having both union and nonunion operations. It has long held a reputation of taking a tough stance in dealing with unions. (See the discussion in Meyer (2001), for example.) Here, I take a look at its recent behavior regarding plant openings and new investment.

GE publicizes its new plant openings and investments in an internet series called "GE Reports," under the category "jobs."[11] I reviewed all announcements in the series published over the four-year period Jan. 1, 2009, to Dec. 31, 2012, and created a data set of new plant openings and expansions. I restricted attention to announcements in which new jobs were added and excluded announcements for GE Capital and GE Corporate, in order to focus on the manufacturing divisions. When multiple expansions occurred at the same location—for example, the appliance factory in Louisville, Ky., mentioned in the introduction had three expansions during this period—I combined the records. After going through 93 announcements and combining information this way, I found 24 locations in which new investment and job growth were announced over the four-year period, with a total of 8,344 new jobs. The 24 locations are listed in Tables 1, 2 and 3.

In constructing the tables, I first categorize locations as *new* or *existing*.[12] In my definition of existing, I include brand new buildings and facilities that are part of a larger preexisting GE campus. For example, there is battery factory in Schenectady, N.Y., that was described as new in the announcement, but I classified it as preexisting because it was added to GE's main campus in Schenectady, which serves as its headquarters location and the site of a number of existing facilities.[13] Using this classification system, I determined that of the 24 locations receiving new investment, eight were new locations and 16 were existing locations. Table 1 lists the new facilities.

Take a look at the locations of the eight new plants. With one exception, a plant in Michigan discussed below, they are *all* in locations where unions are weak: two aviation plants in Mississippi, a locomotive plant in Texas, other locations in the South. A partial exception: a non-South location in Colorado, a state where unions are relatively weak. The full exception: GE's new facility in Michigan, in the Detroit area, a center of union power. But this, as it turns out, is an R&D center, with only white-collar labor;[14] unionization is thus a nonissue.

Of course, union avoidance is only one of many factors considered in a plant location decision. For example, states in the South getting the new plants may have offered better tax incentives than other

Table 1

GE Investment in New Facilities

Announced 2009-12

Location	Division	Announced New Employment
Van Buren, Mich.	Global Research	1,230
Fort Worth, Texas	Transportation	905
Atlanta, Ga.	Energy	400
Aurora, Colo.	Energy	355
Auburn, Ala.	Aviation	300
Batesville, Miss.	Aviation	300
Ellisville, Miss.	Aviation	250
Greenville, S.C.	Energy	136

Source: Author's calculations, following the procedure discussed in the text and endnotes

Table 2
Nonunion Existing GE Facilities Receiving New Investment
Announced 2009-12

Location	Division	Announced New Employment
Greenville, S.C.	Aviation	240
Grove City, Pa.	Transportation	150
Slater, Mo.	Energy	115
La Fayette, Ga.	Appliances	100
Troy, N.Y.	Healthcare	100
Dayton, Ohio	Aviation	100
Muskegon, Mich.	Aviation	90
Durham, N.C.	Aviation	40
Rochester, N.Y.	Energy	15

Source: Author's calculations, following the procedure discussed in the text and endnotes

potential sites in northern states. In fact, GE's CEO is on record as saying that tax incentives matter in site selection.[15] But this is why GE's choice to put the R&D center in the Detroit area is interesting. If taxes are the primary consideration and taxes are lower in the South, I might expect the R&D center to be put in the South as well. With a case study of only eight data points, I cannot draw definitive conclusions. Nonetheless, it is striking that a simple theory that GE picks nonunion locations when unions matter gets it right eight out of eight tries. Along with the other evidence from Boeing, it suggests a pattern of behavior.

I next turn to new investment at the 16 locations where GE already had facilities. I classify these plants as "union" or "nonunion" depending on whether the location has workers represented by a union (based on various public sources).[16] The nine nonunion facilities are listed in Table 2, and the seven union plants are listed in Table 3.

Two comments about the nine nonunion facilities. Note first, there is a nonunion GE aviation plant in Michigan. As this is a production facility with blue-collar workers, it might be surprising that it has remained nonunion in Michigan. However, the plant is in western Michigan, where unions are not as strong. Next, note the nonunion GE transportation facility in Grove City, Pa. The plant makes engines for a locomotive plant in Erie, listed in Table 3 in the "union" category. The Erie locomotive plant dates from 1913 and has been a union plant since 1940.[17] The engine plant in Grove City dates from 1971 and has remained nonunion, despite the connection with the union plant in Erie.[18] Apparently, the 85-mile distance between the two locations has been enough to keep the union in Erie out of the Grove City plant.

I now turn to the seven union plants that received new investment, listed in Table 3. The plants are sorted from the highest number of *new* jobs to the lowest, and I focus on the top three, highlighted

Table 3
GE Facilities with Unions Receiving New Investment
Announced 2009-12

Location	Division	Number of New Employment	Division Headquarters	R&D Lab	Number of Patents 2000-11
Schenectady, N.Y.	Energy	1,200	Yes	Yes	4,348
Louisville, Ky.	Appliances	1,130	Yes	Yes	280
Erie, Pa.	Transportation	610	Yes	Yes	351
Bloomington, Ind.	Appliances	200	No	No	0
Baltimore, Md.	Aviation	200	No	No	17
Bucyrus, Ohio	Lighting	130	No	No	0
Madisonville, Ky.	Aviation	48	No	No	23

Source: Author's calculations, following the procedure discussed in the text and endnotes

in bold. These are the GE energy facility at Schenectady, with 1,200 new jobs, the GE appliance facility in Louisville, with 1,130 new jobs, and the GE transportation facility in Erie, with 610 new jobs. Together they account for the vast majority of new jobs in union plants, 2,940 out of 3,518.

The last three columns of Table 3 reveal interesting facts about these three facilities. First, each is the respective headquarters for its division. Second, each of these three locations has an R&D lab on site.[19] Third, each of the three locations is a successful producer of a large number of patents. I base this on calculations with publicly available U.S. patent data. I extracted all granted patents assigned to GE over the period 2000-11. In the data for each patent, the location of each inventor is provided. The last column of Table 3 reports the number of GE patents over this period with at least one inventor in each of the given locations.[20] Schenectady, the overall GE headquarters, has 4,348 granted patents over the period, while Louisville has 280 and Erie has 351. This is an impressive amount of innovative output.

Earlier, I argued that if production workers are unionized at a facility, the location disadvantage for new investment of the existing union could potentially be offset by beneficial co-location with R&D activity and other white-collar work. I see evidence for this claim in GE's investment behavior. The vast majority of new investment in unionized facilities has occurred in plants with significant R&D and connections to headquarters.

I consider one last issue for the seven union plants receiving new investment: What is happening to the *net* number of union jobs at each of the facilities? The "GE Reports" series mentions expansions leading to *new jobs* to publicize GE's contribution to U.S. employment, but it doesn't publicize job *cuts* through efficiencies or *outsourcing*. To look at the net effect on union jobs, I use data from the Department of Labor on union membership for each of the union locals at the respective plants.[21] Membership by local and year are reported in Table 4, and the bottom row tabulates the sum across all seven union plants receiving new investment. Membership at these seven facilities between 2010 and 2011 increased from 7,592 to 8,710 workers, consistent with GE's message that it is increasing production worker employment at these plants.

However, the recent gain is not enough to offset the fall from 2007. Moreover, these are the selection of union plants getting new investment. I have looked at some of the other large unionized plants *not* getting new investment, and membership is falling in these plants. One takeaway point is that even though GE is putting some new investment in unionized plants that for historical reasons are connected to headquarters and R&D facilities, this force is not strong enough to offset continual decline of the unionized workforce at GE.

Table 4

Union Membership 2006-11 at GE Union Facilities with Announced New Investment

		Membership of Local Union by Year					
Plant Location	Local Union	2006	2007	2008	2009	2010	2011
Schenectady, N.Y.	IUE-CWA 301	1,228	1,378	1,440	1,251	1,159	1,294
Louisville, Ky.	IUE-CWA 761	2,298	2,606	2,303	1,909	1,928	1,862
Erie, Pa.	UE 506	3,494	3,574	3,786	3,422	2,602	3,530
Bloomington, Ind.	IBEW 2249	914	869	756	680	544	570
Baltimore, Md.	UAW 738	485	571	653	515	651	651
Bucyrus, Ohio	IUE-CWA 704	148	152	151	153	193	294
Madisonville, Ky.	IUE-CWA 701	660	675	640	506	515	509
Total		9,227	9,825	9,729	8,436	7,592	8,710

Source: Author's calculations with LM Filing Data, as discussed in the text

Boeing

Let's get back to the earlier story about Boeing, where I noted that the NLRB had filed a complaint against Boeing in 2011. The complaint alleged that Boeing had engaged in an unlawful labor practice, by making public statements that it was moving production to a nonunion facility to avoid strikes.[22] As a remedy, the acting general counsel sought a court order that Boeing be forced to open the second production line in a union facility in the Washington state area instead of the nonunion facility in South Carolina.

In the end, the issue was resolved by Boeing agreeing to add additional union jobs in Washington state in return for the union dropping the charges, enabling Boeing to go ahead with the South Carolina plant.[23] The story illustrates both kinds of investment highlighted in this essay. First, there is new investment at a location where unions are weak, at a site where Boeing did not have a previous facility.[24] Second, there is new investment at an existing unionized facility, at a site close to Boeing's R&D infrastructure and other white-collar activity.

The story has two epilogues. In January 2012, Boeing announced that it was closing its entire operations in Wichita, Kan., a unionized facility. (Kansas is not known as a strong union state, but the facility in question dates to 1927, and old facilities in heavy industry are generally union, no matter where they are located.) Many of the jobs were shifted to nonunion facilities in Texas and Oklahoma, some to union facilities in Washington state and some cut altogether. Various news articles report cutbacks in defense spending as the driving factor behind this closure.[25] Even so, it is also clear that this decision has implications for the "chess game" of labor management relations going forward, with a longstanding union outpost eliminated and nonunion activity expanded.

The second epilogue is that Boeing's main union is currently trying to unionize the South Carolina plant.[26] Clearly, Boeing has an incentive to try to keep the workers happy enough that they won't want the union. And it is reasonable to expect that the workers would be familiar with earlier statements by company officials that a nonunion workforce is why Boeing came in the first place. (Public officials in South Carolina have actually reminded the workers on this point.[27]) If the South Carolina workers were to vote in the union, they will be giving up the competitive advantage they hold over union workers in Washington state in future competition for new plant investment. Obviously, this situation puts the union in a weak position.

Remarks about Labor Relations Policy

Public policy affects the extent of unions. For example, the 1935 passage of the National Labor Relations Act was followed by a huge surge in the share of unionized workers. (See Freeman 1998.) Think of there being a policy lever, where how high the lever is pushed determines how easy it is for unions to organize in a workplace. For example, in 2009 at the beginning of Obama's first term, when the Democrats controlled both houses of Congress, there was discussion of the "Employee Free Choice Act," a bill to allow unions to substitute the secret ballot in an NLRB supervised election with a system where union organizers collect signed cards from workers.

This policy, called "card check," would be a significant upward push on the policy lever. (With the new Congress, it is currently not under consideration.) The NLRB recently made administrative rule changes to speed up union representation elections.[28] This is an upward push on the lever, because employers have less time to respond. The right-to-work laws recently enacted in Michigan and Indiana push the lever down. In addition to the direct negative effect on unions in these two states, there will likely be a broader negative effect on unions throughout the country. These laws make it harder to collect union dues, and this can potentially lessen the resources available for organizing in other states. For example, when the autoworkers union conducts organizing drives at nonunion auto plants in the South, they are funded by autoworkers' dues in states like Michigan and Indiana.

Suppose the pro-union organizing policy lever gets pushed up so high that the union gets into Boeing's new South Carolina plant, and Boeing expects that this will be true for other new plants it might open in the South. Based on the findings above, how will this policy change affect new manufacturing investment?

The analysis above presents evidence that even today, big firms like Boeing and GE are selecting locations to avoid unions. If Boeing were to get a

union even in South Carolina, it will have less incentive to shift production from Washington state to South Carolina. Thus, an increase in the policy lever potentially affects *where* new investment goes within the United States.

In addition to *where*, the policy lever can potentially affect *how much* overall new investment there is in this country. If one accepts the proposition that firms choose locations within the United States to avoid unions, then one has to consider the possibility that a change in policy might lead the firm to not invest in the United States. That is, if policy changes so that the firm gets a union no matter where in this country it goes, it might consider investing abroad or not investing at all. In the NLRB case referred to above, the NLRB notes that Boeing has experienced strikes by production workers in 1977, 1989, 1995, 2005 and 2008. In December 2012, Boeing's engineers union leaders in Seattle said that "the likelihood of a strike is very high," and though negotiations continued in early 2013, prospects for settlement on a contract remained distant.[29] Dealing with strikes on a regular basis can only make Boeing less competitive in the world marketplace, diminishing the returns to new investment. R

Endnotes

[1] Statistics on union membership share are based on the Current Population Survey conducted by the U.S. Census Bureau and were obtained from tabulations published at unionstats.com.

[2] Fuchs (1962) is an early work arguing for the important role of unions in the migration of industry to the South. See also Holmes (1998) for a discussion of the role of anti-union policies pursued in Southern states.

[3] I note two costs in particular. First, key researchers might be unwilling to move. Second, there is much discussion in the economics literature for how R&D centers potentially benefit from knowledge spillovers from other researchers in the vicinity. If the R&D center is moved, it might lose access to these beneficial spillovers.

[4] See, in particular, Immelt's comments in the *Harvard Business Review*, Immelt (2012). He highlights the Kentucky appliance plant and writes, "Our success on the factory floor rests on human innovation and technical innovation." He adds, "Engineering and manufacturing are hands-on and interactive … at a time when speed to market is everything, separating design and development from manufacturing didn't make sense."

[5] In discussing GE's decision to invest in the Kentucky plant, Immelt writes, "The third element in human innovation is a new model for labor relations. ... The union accepted a lower wage for new hires, we pledged to create new jobs" (Immelt 2012). For more on the story, see "G.E. to Add Two New U.S. Plants as Unions Agree on Cost Controls," *New York Times*, Aug. 6, 2009.

[6] This is how Boeing's website describes the South Carolina facility. The other two are the Boeing facility in Everett, Wash., and the airbus facility in Toulouse, France.

[7] The CEO is quoted in the case document, NLRB Case 19-CA-32431, dated April 20, 2011. The brief also quotes similar comments made by other company officials.

[8] For a story about Caterpillar closing a union plant in Ontario and transferring jobs to a nonunion plant in newly right-to-work Indiana, see "As Unions Lose Their Grip, Indiana Lures Manufacturing Jobs," *Wall Street Journal*, March 18, 2012.

[9] This statistic is based on the author's calculations with the raw NLRB election data. The statistic includes cases where unions were decertified and replaced with an alternative union. Dickens and Leonard (1984) report an analogous estimate with earlier data that is the same order of magnitude.

[10] The patent count figure is as reported for 2012 by IFI CLAIMS. The claim about exporting is one regularly made by GE. See, for example, GE Reports.

[11] See GE Reports.

[12] I use GE's records in the *Million Dollar Directory* of Dun and Bradstreet to build a database of GE's manufacturing plants. I merge this with plant information over the 1987-2010 period in the Toxic Release Inventory published by the Environmental Protection Agency, which can be used to determine when a plant is emitting pollution and is therefore in operation. I combined these data with the GE announcement information to distinguish new and existing plants.

[13] See "New York powers up with new GE battery plant," GE Reports, May 12, 2009.

[14] See "GE to bring research center and 1,100 jobs to Michigan," GE Reports, June 26, 2009.

[15] See comments in Immelt (2012).

[16] The master 2007-11 GE contract lists all facilities party to the contract that were represented by IUE-CWA, the largest union at GE. I also used government data from the Federal Mediation and Conciliation Service, which publishes information about the location of facilities with expiring union contracts. I resolved ambiguous cases through web searches, including inspection of various websites of local and national unions.

[17] See *A Brief History of UE Bargaining with GE: Seventy Years of Struggle*, United Electrical, Radio and Machine Workers of America (undated manuscript), and GE Transportation BusinessWire news release, "GE Transportation Celebrates 40 Years in Grove City," Aug. 6, 2011.

[18] The age of the plant is based on "GE Transportation Celebrates 40 Years in Grove City." Given Pennsylvania's tradition of strong unions, the fact that GE has a nonunion plant there may come as a surprise. Two points are worth noting in addition to the geographic separation with the Erie plant noted in the text. First, the Grove City plant did not exist in the 1940-70 era when labor organizing at plants was easier. Second, it is in a rural area away from other unions.

[19] Specifically, each location cited is listed in the *Directory of American Research and Technology*, 23rd ed., R. R. Bowker, Reed Elsevier, New Providence, N.J., 1998.

[20] The patent data report the city and state of a given inventor, but generally not the address. Table 2 reports the count of patents with at least one inventor in the given city and state.

[21] The data are the LM Filing Data, published by the Office of Labor-Management Standards at its website. For all but two exceptions, I used the disaggregated membership information in the file, which is useful for separating out membership in the local not in a GE bargaining unit. For the Bucyrus and Madisonville units, only total local membership is available, but this should not be a problem because both appear to represent only GE employees.

[22] The complaint is NLRB Case 19-CA-32431, dated April 20, 2011.

[23] See, "Union Seeks to Dismiss Complaint Against Boeing," *New York Times*, Dec. 9, 2011.

[24] For brevity, I am glossing over details. In July 2009, Boeing purchased a supplier plant in South Carolina that already had a union. The plant workers voted to decertify the union in September, and subsequently in October Boeing announced it was going to build the second line in South Carolina.

[25] See "Boeing to Shut Wichita Plant, Citing Cuts at Pentagon," *New York Times*, Jan. 4, 2012.

[26] See "Boeing faces union drive at 787 plant in South Carolina," Reuters, Oct. 12, 2012.

[27] *Seattle Times*, Oct. 22, 2012, quoted Sen. Jim DeMint, R-S.C., as saying, "It would blow me away if the employees of Boeing here were so foolish as to unionize when that was one of the key reasons that this plant was built."

[28] See "Labor Board Adopts Rules to Speed Unionization Votes," *New York Times*, Dec. 11, 2011.

[29] See "Boeing's engineer unions says strike is likely, prepares workers," Reuters, Dec. 10, 2012. See also "Boeing, engineers set to resume contract talks Wednesday," Reuters, Jan. 14, 2013.

References

Dickens, William T., and Jonathan S. Leonard. 1984. "Accounting for the Decline in Union Membership, 1950-1980." *Industrial and Labor Relations Review* 38: 323.

Freeman, Richard B. 1998. "Spurts in Union Growth: Defining Moments and Social Processes," in *The Defining Moment*: *The Great Depression and the American Economy in the Twentieth Century*." Michael D. Bordo, Claudia Goldin and Eugene N. White, eds. Chicago: University of Chicago Press, pp. 265-95.

Fuchs, Victor R. 1962. *Changes in the Location of Manufacturing in the United States since 1929.* Yale University Press.

Holmes, Thomas J. 1998. "The Effects of State Policies on the Location of Industry: Evidence from State Borders." *Journal of Political Economy* 106 (August): 667-705.

Holmes, Thomas J. 2006. "Geographic Spillover of Unionism." Research Department Staff Report 368. Federal Reserve Bank of Minneapolis.

Immelt, Jeffrey R. 2012. "The CEO of General Electric on Sparking an American Manufacturing Renewal." *Harvard Business Review* 90 (March): 43-46.

Meyer, Douglas. 2001. "Building Union Power in the Global Economy: A Case Study of the Coordinated Bargaining Committee of General Electric Unions (CBC)." *Labor Studies Journal* (Spring): 60-75.

President's Council of Advisors on Science and Technology. 2012. "Report to the President on Capturing Domestic Competitive Advantage in Advanced Manufacturing." Manuscript.

Susan Athey

If federal tax rates change, how will that affect a firm's production decisions? Engineers develop a new drilling technology: What impact might that have on global oil prices? Suppose American teenagers suddenly decide that balloons are very, very cool. Will that significantly alter U.S. helium reserves and extraction?

Such problems—how will an equation's variables respond to a shift in their economic environment?—are solved with "comparative statics," a type of analysis that compares outcomes before and after an external change to an otherwise untouched (that is, static) model.

The questions may sound simple, but solving them with precision long required an unwieldy freight of questionable assumptions and abstractions. Stanford economist Paul Milgrom and colleagues improved the process considerably in the early 1990s with "monotone" comparative statics, showing that fewer assumptions were necessary.

Then, in 1994, Milgrom's graduate student Susan Athey advanced into a far more complex realm: uncertainty. Forecasting in an uncertain world is intuitively difficult, and mathematically the puzzle seemed "just too hard" to Milgrom and others. But Athey solved it, identifying the surprisingly small number of assumptions about risk preferences and types of risk that would "guarantee robust … predictions" in the context of uncertainty.

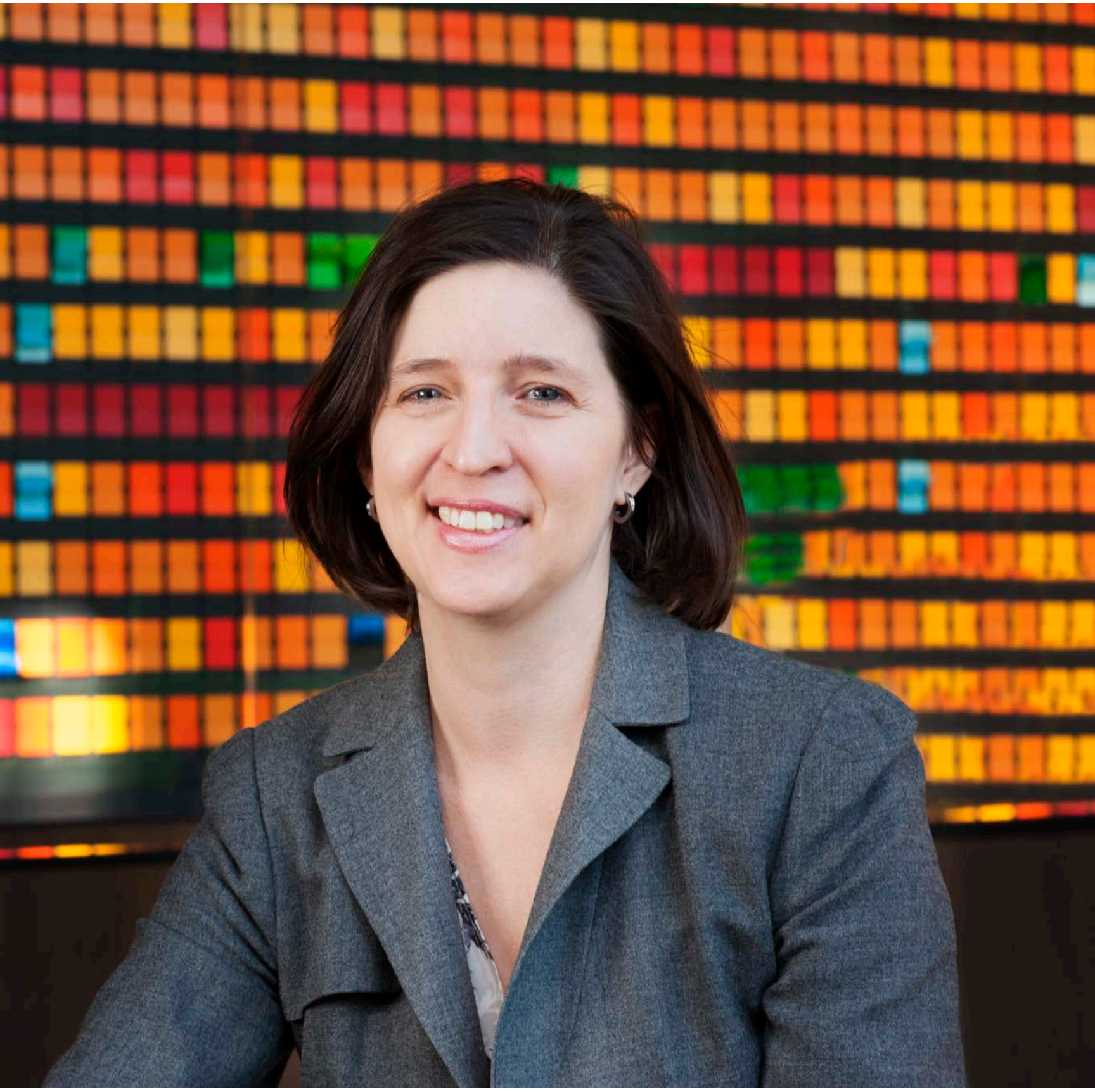
Athey now refers to this methodology as a simple "black box," but her elegant solution astounded her colleagues. "I remember being just totally stunned," Milgrom said years later, in a *Wall Street Journal* interview.

In 2007, this and other research earned Athey the John Bates Clark Medal. She was the first woman to win the prestigious honor, then given every other year to the best American economist under 40.

The Clark citation noted that Athey's "powerful techniques … have been profitably used in applied problems." Portfolio investment decisions, for example, pricing and production choices by risk-averse firms, a worker's quandary about going back to school, everyone's dilemma about spending or saving—difficult choices seemingly swamped by uncertainty—are all now approachable due to her research.

Now back at Stanford after professorships at MIT and Harvard, Athey continues to develop powerful tools, make empirical discoveries and foster theoretical advances. She's a pioneer in the economic analysis of auctions. She uses game theory to understand decision-making by businesses and central banks. She has analyzed mentoring and diversity, how staff training and new technology jointly raise productivity, and the Internet's impact on print media. In the following conversation, Athey touches on a number of these topics and others, always bringing greater certainty to complex realms in economics.

Photographs by Peter Tenzer



FORESTRY AUCTIONS

Region: Let me begin with your work on forestry auctions. You wrote a paper, published in 2011 with Jonathan Levin and Enrique Seira, which compared revenue outcomes for open- and sealed-bid auctions. It reexamined Vickery's 1961 work. Would you describe that work for us?

Athey: Sure. Our work, as you mention, departs from this famous and extremely surprising theorem of Bill Vickery that was Nobel prize-winning research. His basic theorem says that these two different ways of auctioning anything, like timber, under some conditions will yield exactly the same outcomes.

One way is an open outcry auction, where bidders get in a room and keep outbidding each other until the last bidder drops out and the auction ends. The second way is a first-price, sealed-bid auction where the bidders submit their bids in writing. The highest bidder wins and pays his bid.

These two auctions are quite different. In the first, the winner pays the price at which the last competitor drops out, so that the second-highest bidding competitor determines the price. In the other one, the winner pays exactly how much they bid. What's really surprising is that in theory those two methods produce exactly the same outcomes.

Region: But you looked at data, as well as theory.

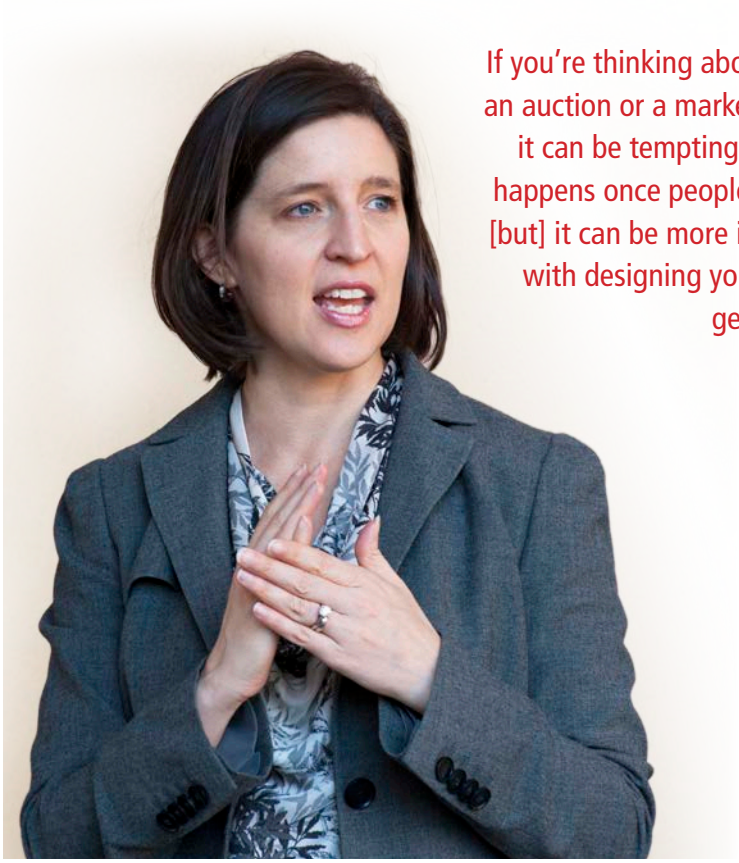
Athey: Yes. The paper picks up from the fact that in practice the assumptions of that theory don't hold exactly. What kind of auction format you use can matter if you have asymmetric bidders. If you have, for example, small bidders who on average have lower values for the thing that's being auctioned, they can be discouraged from even entering an open auction. They know if they show up, another (larger) bidder can just outbid them.

In contrast, in a first-price, sealed-bid auction, they can hope that the strong bidders might shade their bids a lot, trading off a reduced chance of winning the auction against paying less when they do win. So the small bidders have a chance to sort of "sneak in" and win the sale, even if they don't have the highest value for the object. As a result of those kinds of dynamics, you expect that more small bidders will show up at a sealed-bid auction.

Region: So it changes participation.

Athey: Yes. And so our paper was trying to document both the effects of the asymmetries on what happens in the auction, conditional on who shows up, but especially whether the participation effects were actually important. One of the interesting findings was that participation is a more important factor than what happens once you get to the auction. So if you're thinking about how to design an auction, or how to design a market more generally, even though it can be tempting to focus on what happens once the people are in the room, it can be more important to start with designing your marketplace to get people to come, to start with.

This insight is one that I've brought to other settings. I think, for example, it applies in online auctions. When a large company like eBay or an online advertising firm is designing its marketplace, for example, it can be more important to design your marketplace to attract bidders and make sure they're there to participate than it is to try to extract every last cent out of them once they get there. If potential bidders are not making enough profit to make it worth their time to come, they won't come. And thin markets can be much more problematic.



If you're thinking about how to design an auction or a market more generally, it can be tempting to focus on what happens once people are in the room, [but] it can be more important to start with designing your marketplace to get people to come.

POSITION AUCTIONS

Region: This leads to your research on position auctions. You've done a lot of that work as a consultant with Microsoft, I believe.

Athey: That's right.

Region: And your research has modeled position auctions, initially as one-sided markets, and later, in your *Quarterly Journal of Economics* paper with Ellison, as two-sided markets, where the search engine is the market maker between the consumers and the advertisers, just as a credit card company brings together retailers and buyers.

Athey: Right.

Region: It's intriguing and complex as a two-sided market. But also intriguing in that these auctions are a very new market—so it's liquid, it's dynamic and there's a ton of new data coming in every day. It's also a growing market, generating a lot of revenue.

What have you discovered about position auctions in terms of basic findings and how best to design them?

Athey: I started working on Internet search advertising auctions from a theoretical perspective, and then I got the opportunity to work with Microsoft to design their real world search advertising auctions. I should say that economists who consider themselves market designers are really attracted to opportunities to take theory to practice and to do the engineering of making a market work. So this was a great opportunity.

Let me start with the theoretical side. For the *QJE* paper we wrote together, Glenn Ellison and I observed that the first couple of theory papers that tried to analyze Internet-advertising auctions really focused on the advertising side of the market.

Region: For clarity, these are auctions for ad location on a web page, often seen in the right-hand margin, correct?

In this particular model, there was not a trade-off between overall producer welfare and consumer welfare. … When you show fewer ads and improve the[ir] quality, consumers increase their clicking [in proportion] to improvements in quality, which are, in turn, proportional to the surplus being created for advertisers.

Athey: Exactly. So when you do a search on an Internet search engine …

Region: Whether it is Bing or Yahoo or Google …

Athey: Yes, Bing, Yahoo or Google. Usually you'll get some ads at the top of the page and some ads on the side. The top positions get a lot more clicks than the bottom positions. And because clicks from users are valuable, advertisers are generally willing to pay more per click to get more clicks. So you might pay a lot per click in order to get the top position and get a lot of clicks, or an advertiser can choose to pay a lower price per click, but then they don't get as many clicks.

So the first couple of papers to try to tackle this problem started at a very natural place, which is to say, imagine we have these positions on the page. The higher ones get more clicks. The lower ones get fewer clicks. How will bidders bid in this auction? And the auction rules—well, actually it was a new *set* of auction rules invented by the companies in this industry—were designed so that bidders' prices were determined by the bids of the bidder below.

What Glenn and I noted was this focus on just the advertisers' side of the market left out some really important aspects of the market design. In particular, we wanted to incorporate the fact that users are going to be more likely to click on ads, and more willing to *keep* clicking on ads, if they believe those ads are high quality.

We were partly motivated by the fact that at the time, in the mid-2000s, a lot of Internet search advertising was really fairly poor and irrelevant. You might have a lot of ringtone ads, say, or ads for firms that weren't really selling what you were looking for, but were trying to be misleading.

Region: So they were a waste of money for the advertiser and of time for the consumer.

Athey: Those ads weren't really generating a lot of value for the advertiser, and the harm to the user side of the market outweighed the benefits to the irrelevant advertisers. Yet it can be very challenging for a search engine to decide to remove those ads because, in the very short run, those ads are making money. Your first-pass intuition might say that if you take an ad away, you can't possibly make more money.

So what we needed was a model that incorporated the fact that you can, in fact, make more money by showing fewer ads. And that's because we expect consumers to update their beliefs about the quality of the ads and be willing to engage more. So we presented a full equilibrium analysis of both sides of the market. It incorporated the advertiser-bidding behavior as well as the consumer-clicking behavior and then looked at questions about market design from that perspective.

Region: And that enabled you to evaluate the distribution of benefits among those three parties: search engine, advertiser and consumer.

Athey: Exactly.

Region: Meaning that auction design therefore affects *overall* welfare—not just advertisers' welfare?

Athey: Absolutely. Generally, there's going to be a trade-off between efficiency and revenue. The auction designs that make the most money for the auctioneer are generally not going to be the ones that are maximizing welfare.

But we showed the somewhat surprising result that in this particular model, there was not a trade-off between overall producer welfare—that is, advertisers plus the search engines—and consumer welfare, but rather that those were proportional. That was one of the insights into figuring out, well, how many ads should you actually show?

And the reason those things moved in sync, if you like, is that when you show fewer ads and improve the quality of ads, the equilibrium rate at which consumers increase their clicking is proportional to the improvements in quality you're providing, which are, in turn, proportional to the surplus that's being created for advertisers.

This doesn't mean that's what a profit-maximizing search engine will do, however, because a *profit-maximizing* search engine cares how much surplus the advertisers get versus the search engine. As a result of that, a monopolist search engine will tend to raise reserve prices [meaning the lowest price they'll accept] too high in order to extract more surplus from the advertisers even if it means eliminating ads that the consumers might have liked to see.

In contrast, a *competitive* search engine—one that's competing for advertisers and users—will be more likely to choose the welfare-maximizing point.

A more realistic model would also incorporate the other content that gets crowded off the page by the ads; such a model would be more likely to see a monopolist search engine put up too many ads relative to what consumers would like, but again competition would typically push a firm closer to welfare maximization in order to keep both sides of the market participating.

REGULATING INTERNET SEARCH

Region: There have been discussions in Europe, specifically concerning Google, about the possibility of regulating Internet search. Do you have any thoughts on that question, given what you've just said about monopolistic practices by search engines?

Athey: One argument that could be made about Internet search engines, a naïve argument, would be that because they're auctioning off positions, and prices are determined by the outcome of an auction, that competition doesn't affect prices or advertiser welfare.

Now, advertisers typically disagree with that argument. This theory we just discussed would help interpret why advertisers believe that competition does matter. First of all, when you realize that a search-advertising platform has choices to make, like reserve prices, that affect the distribution of welfare, then it's natural to realize competition will induce them to put less weight on their own profits and more weight on the welfare of the participants they're trying to attract to the marketplace.

So it's really a theory for understanding why this market is no different than other markets where competition causes firms to put more weight on their customers' welfare and less on their own profits. In a multisided market, though, sometimes the complexities obscure the fact that basic economics still applies. [Laughter.]

THE AUCTION CONTINUUM

Region: You've done a great deal of work on auctions generally, in settings as different as forests and the Internet, and ranging from very basic theory to applied research, and very empirical studies. As you've written, "It's possible to study auctions from pretty much every point on the basic-to-applied continuum." Why does that continuum appeal to you, and do you tend to prefer one over

It's really a theory for understanding why this market is no different than other markets where competition causes firms to put more weight on their customers' welfare and less on their own profits. In a multisided market, though, sometimes the complexities obscure the fact that basic economics still applies.

When you approach a new design problem, the space of things to consider is so large that without a clear theoretical framework, you'll just get lost in the weeds. The theoretical framework helps you understand what to focus on. … Empirical work may show you that some effect you thought was small is actually big, and that can motivate changes in the theory.

another—theoretical research more than applied, for example, or vice versa?

Athey: I think that the one common theme that unites many people interested in designing markets is that they want to design a market that *works*. So you're motivated by the outcome: building something. And so, just like anything you would build, you need a theoretical framework to come up with a good design. And you also need to have evidence about whether that design will work.

So in some sense, solving the problem *requires* all of the tools. Personally, I enjoy, for different reasons, all of the different ways of approaching a problem. It's therefore very appealing to do research that brings all those skills to bear.

I think when you approach a new design problem, the space of things to consider is so large, and the set of complexities is so large, that without a clear theoretical framework, you'll just get lost in the weeds and you won't really know what's important. The theoretical framework helps you understand what to abstract away from and what to focus on.

But once you've gotten there, the answer to most theoretical questions is, "It depends." [Laughter.] One choice might be better if certain things about the world are of a certain magnitude, and if the magnitudes are different you might make a different choice. And so the empirical measurement …

Region: Helps shape the theory as well.

Athey: Well, first, the empirical measurement allows you to quantify the size of competing effects and determine what the best choice is. But, yes, along the way the empirical work may also show you that some effect that you've abstracted away from or you thought was small is actually big, and that can motivate changes in the theory. Or you might see people behaving in ways that are completely inconsistent with the theory. And then you need to modify the theory, either the theory of the game or the theory of the motivations of the agents or perhaps the theory of the computational constraints that the players are operating under.

For example, in Internet search advertising, you have a nontrivial fraction of your revenue coming from advertisers or campaigns who receive less than 100 clicks per month. If clicks are on the order of a dollar or so, they're not doing a large amount of business with you. And, of course, they're also not receiving a lot of data about the performance of their campaigns.

In that environment, it's not realistic to expect that they will spend the time and effort to fully and rationally respond to market design changes that you make. They might respond very slowly. They might not respond at all until one day they wake up and decide they don't like your system, and then they might quit. But it would be hard to know why they quit because they're responding to something you did six months ago.

But you also have hyperrational bidders. Large Internet retailers will have teams of people and computer algorithms finding every penny of profit opportunity and responding instantaneously to small changes.

So you have this huge range of behavior, all or most of it rational in some sense, but very different in terms of its responsiveness to changes in economic primitives. To understand how to manage that marketplace you really need to account for the diversity and heterogeneity, and the only way to learn about that is to do empirical studies, so you don't simply assume their behavior, but really learn what their behavior is.

These observations motivate a research project I'm working on right now, to try to estimate from data what kinds of objectives advertisers are considering, rather than assuming that they're all hyperrational and hyperattentive moment by moment.

Region: Perfect economic agents.

Athey: Right, well, they're all economic agents. They're just agents with different costs of time and economic incentive to optimize their bidding.

COLLUSION AND ANTITRUST POLICY

Region: In several papers, you've studied the relationship between firms that have a profit-maximizing incentive to collude and antitrust policy that seeks to curb collusion in order to protect consumers from price-setting and restricted output. In a paper with Kyle Bagwell, you wrote that under certain conditions, "antitrust policy can have perverse consequences." You found, I believe, that in particular circumstances, policies restricting communication among firms can actually reduce consumer well-being.

Could you explain that result? What are the potential benefits of collusion among firms? And do you know if this finding had any effect on current antitrust policy, in the United States or elsewhere?

Athey: Sure. Well, to start with, I wouldn't recommend that all prohibitions on communication be lifted. This research was highlighting that once firms are colluding, that they would collude more efficiently through information exchange.

Consumers would certainly be better off if you can break down collusion, and collusion may very well be more likely to break down if it's less efficient because it's providing less profits to the firms. So

I don't actually recommend eliminating those policies.

But really the focus of that work was on the role that private information plays in cartels. The idea is that a naïve cartel might just divide up market shares or fix prices. And that's bad for consumers because it leads to high prices. But it's also bad for productive efficiency, because it's not responsive to market conditions.

What is the beauty of competition?

What is the beauty of competition? Low prices for consumers, but *also* allocative efficiency. Getting the production by the right firms at the right times. … Cartels *don't* have that kind of responsiveness. … Communication can help [some] cartels achieve efficiency. … But the ideal world, for welfare, is that the cartel breaks down altogether.

Low prices for consumers, but *also* allocative efficiency. Getting the production by the right firms at the right times. If one firm gets a good deal on input costs, they should cut prices, which will also shift all the production to them, which will lead to lower average production costs.

One of the less-emphasized costs of cartels is that they *don't* have that kind of responsiveness, which also feeds into incentives to reduce costs and so on. Collusion has lots of consequences on the production side.

Our research was about how firms might try to get around that through more sophisticated collusive agreements. We were partly motivated by some of the sophisticated international cartels that did, in fact, have mechanisms in place to try to be responsive to some kinds of market conditions.

One of the things we show along the way is how communication can help those cartels achieve efficiency and that if they try to get there without communication, they will generally be less efficient and also potentially have more risk of the cartel breaking down. So the cartels may then end up with a less efficient outcome as a result of the restrictions on communication.

But the ideal world, for welfare, is that the cartel breaks down altogether. So really, from a policy perspective, I think that my work is better used to help understand what we might see firms do, why we might see them take antitrust risk by communicating, and to interpret the findings of when you break up a cartel or when you look at evidence about a cartel. It's an example of looking at the richness of real-world behavior and trying to modify theory to incorporate and explain that richness.

DISCRETION IN MONETARY POLICY

Region: Let me push you in a different policy direction now: monetary policy. I'm sure you're aware that the Fed is trying to refine its communication policy toward greater transparency and effective forward guidance. In 2005, in *Econometrica*, you published a paper on the "optimal degree of discretion in monetary policy." In it you used some of the same tools you did in your paper on collusive firms and antitrust policy: mechanism design, game theory and the role of private information. [See "Veil of Discretion" in the June 2004 *Region* online at minneapolisfed.org.]

There's a cost-benefit trade-off to discretion. … We show that the costly incentives that you have to provide to keep the Fed from overreaching are *proportional* to the benefits, and because of that, actually the cost almost always outweighs the benefits. So the theory weighs against full discretion.

Would you briefly describe that paper and its results? I believe you recommended something akin to inflation targeting as optimal policy. And also, could you share your thoughts, given this work, on the evolution of Fed policy since the financial crisis?

Athey: Let me start with the paper. Like many economic theory papers, it tries to isolate just one aspect of the problem. It's not attempting to provide a holistic solution that incorporates all the costs and benefits, but rather to really bring one particular trade-off into really sharp focus.

The trade-off we were looking at starts by considering the motivation for allowing the Fed to have discretion. Why not just have a mechanical policy?

Region: A monetary policy rule.

Athey: Right, why not just have a rule? A big motivation for having a Fed is that we need smart people who either have access to special information or might have a special ability to aggregate lots of different information and understand it in a deep way, and that could result in beliefs about what's best for the economy. And further, that combination of information and expertise could give us a policy more tailored to particular circumstances [than a simple monetary rule would].

If you believe that that motivation is there—you know, perhaps after the financial crisis, things have changed; the world you had before isn't the same as the world you have after. So you need the discretion of a privately informed expert individual.

If you hold that belief, then you have to immediately confront the fact that that entity would have an incentive problem, which is that they would like to take advantage of people's expectations in order to help the economy grow. So they would like to do a surprise inflation in order to stimulate the economy. Of course, as long as they have the ability to do that, it's going to be very tempting to say that circum-

In this Enhanced 911 paper I was able to show and measure the productivity impact of new technology and measure its impact on people's health outcomes. But I think that, still to this day, it remains difficult to accurately measure all the benefits that computers bring us.

stances dictate that this is a good decision.

So, then you're confronted with the problem of how to provide good incentives to this institution to which you've granted discretion. How can you rein them in? And the result of our paper is that it's actually extremely hard to provide good incentives to an institution that's out there trying to maximize welfare.

If you imagine that you have a benevolent Fed, so they're trying to do the right thing, but they realize that they can, in the short-term, abuse their discretion, which will then lead to higher inflation expectations in the long run. It's very difficult to provide those incentives without causing more harm than help.

There's a cost-benefit trade-off to discretion, where you might think the resolution would be, "it depends." The benefit of discretion is that you can fine-tune policy using the Fed's private information. The cost is that you have to have some future consequence from inflation today; otherwise you'll be tempted to do too much.

In our theoretical model, we show that the costly incentives that you have to provide to keep the Fed from overreaching are *proportional* to the benefits, and because of that proportionality, you can say that actually the cost almost always outweighs the benefits.

So the theory weighs against full discretion and maybe suggests that putting some constraints on is a better approach.

But I should emphasize that the model just focuses on one aspect of the problem, and I actually don't have an opinion about what the Fed should do now.

Region: Fair enough. You're one of the few without. [Laughter.]

ORGANIZATIONAL COMPLEMENTARITIES

Region: Robert Solow famously said that "computers are found everywhere but in the productivity data." [See September 2002 *Region* interview online at minneapolisfed.org.] But when you examined the "Enhanced 911" program, you found productivity gains from that new technology that were literally lifesaving. To do that you developed a new methodology to analyze "organizational complementarities," or interactions among practices adopted by organizations. Can you describe that methodology and tell us a bit about your findings?

Athey: Sure, so I did this work in the 1990s. Going back to that time, one puzzle was that it was very difficult to actually see evidence in the data that computers had really done very much for the economy.

Region: Right, and Solow wrote that in '87.

Athey: Yes. Computers, on the one hand, seemed to be an amazing innovation, but on the other hand, by the mid-1990s, what had they really accomplished? One reason it was hard to measure the effect of computers was that organizations were often choosing to change in other ways when they adopted computer technology. In manufacturing, for instance, they might move to a different kind of automation and, at the same time, use different methods to motivate the employees and to organize their work.

Region: Conditions weren't the theorist's "everything else equal"; things were changing more or less at the same time.

Athey: Exactly. And not just that things *happened* to be changing but that, in fact, certain types of practices tended to go together with technology. So if the cost of technology fell, you would choose to simultaneously change multiple other aspects of a firm's organization and HR practices. So, in fact, you shouldn't expect to see out there in the world a lot of people adopting technology *without* making other changes. That means you would be unlikely to have a lot of data about such firms.

If you want to isolate and measure the effect of *just* the technology, you'd like to see the technology change and nothing

else change. But once you think about the organization's choices, you realize the ones who adopt a technology change and don't change anything else are actually probably a little bit weird and may not be representative for measurement.

This introduces a very large challenge for measuring the effects of technologies that also affect organizations. The methodology that I developed tried to take very seriously the idea of these coordinated changes, by figuring out that if you *did* have data about firms' decisions about technology as well as their organizational practices, and you tried to do statistical analysis on it, what kinds of biases would come out? And under what conditions would your naïve results give you overestimates or underestimates of the benefits of technology?

The first part was just saying, basically, this is really hard: If you take the naïve approaches to the problem, you're not going to get the right answer. But you might be able to use what you get to provide some directional insight if you can get some particular kinds of supplementary information about what's actually happening in that particular industry.

So I identified the information you would need to have to tell you whether you've got a lower bound or an upper bound of the benefits of technology. I then introduced a methodology that could, under some conditions, solve these problems, but the conditions were quite difficult to meet: There might not be many settings that really had the right data structure to measure the effects.

One type of ideal environment would be a situation where the costs of the technology are changing at the same time that perhaps some labor regulation was happening. So, for instance, you might have some states introducing a labor regulation that makes certain policies difficult or some states having different types of union regulations. Using that kind of data, you can start to disentangle the effects.

Region: So you're looking for the right sort of natural experiment?

Athey: Right. I identified the kinds of natural experiments that would allow you to disentangle the effects while being cautious that those experiments would be difficult to find because you basically need *two coinciding* natural experiments in different dimensions if you want to measure the effects of two complementary inputs.

Region: And you looked at this in a program called "Enhanced 911." Where was that being implemented?

Athey: I looked at the effects of Enhanced 911 in Pennsylvania, and there I used the fact that a new technology was introduced, so the prices were falling and the availability changed during my sample. Because of that, I was able to see the same organizations before and after the adoption of this technology.

I *also* had a simultaneous introduction of a certain set of training protocols for the 911 operators. Because both of those were newly introduced, I did have two different natural experiments coinciding.

The training was called EMD; it was a protocol for 911 operators to give instructions on CPR and other types of first aid over the phone. Topical in the last week.[1]

Region: Yes, really.

Athey: Without those instructions, the operators really weren't able to help a caller very much and there were concerns about liability and so on. In this Enhanced 911 paper I was able to show and measure the productivity impact of new technology and measure its impact on people's health outcomes.

But I think that, still to this day, it remains difficult to accurately measure all the benefits that computers bring us. Some of the benefits are priced, but how do I measure [the benefit of] the fact that it used to take a minute for a web page to load on your mobile device and now it takes 10 seconds, and so you're able to get the information a little bit faster? As a result maybe you get to the restaurant faster or you choose a better restaurant for you. A lot of consumer surplus is generated in terms of getting a better match or a more timely match between what you, the consumer, want and what's out there.

It's the same thing with a search engine. Without a search engine you would go to the same old website you already always go to. With the search engine you might go to a new website you'd never heard of, and presumably you're happier as a result of having more choice, but how much happier? How do I measure how much surplus is created by the better matching?

The E911 case was a specific example where getting the service customized to you—the ambulance driver knows where to go the second you call—saves you time, and in the particular case of heart attack patients, we can translate minutes into mortality probabilities. And that gave us a welfare benefit of people's time. But most of the time faster access to information is *not* life and death, which is good for the consumer, but not so good for the econometrician trying to measure it!

So comparing today to the 1990s, I think, there are very few people left who are skeptical that computers have led to fundamental changes and have impacted our economy. But we *still* don't have that many measures of it. [Laughter.] Now it's just so obvious that we don't question it, but actually measuring it remains hard.

BUILDING BETTER MODELS

Region: You've just given a great example of the difficulty of building a good model.

Some of your earliest work sought to help economists in that regard, by taking advantage of what economists call "monotonicity assumptions."

[1] On Feb. 28, 2013, a nurse at a senior living facility in Bakersfield, Calif., refused to give CPR to an elderly woman despite repeated requests from a 911 dispatcher, citing a facility policy prohibiting staff from doing so. The woman died later that day. See the blog at latimesblogs.latimes.com/lanow/2013/03/nurse-refuses-to-give-cpr-to-elderly-woman-who-later-died.html.

The work on monotonicity was about trying to develop tools that allow people to focus more on the problem and less on the tool. … I tried to simplify everyone's work by allowing them simply to formalize a set of arguments that people were having to make over and over again. … I kind of packaged all that up in a nice "black box."

Athey: Right, it did.

Region: And the Clark award certainly recognized that. But, "monotonicity," "single crossing properties," "hypermodularity"—these are difficult terms …

Athey: Supermodularity.

Region: *Super*modularity, thank you—well, that illustrates my point, no? [Laughter.] For me, clearly, and perhaps nontechnical audiences generally, this is pretty impenetrable work. The terms themselves are daunting.

Yet it's landmark research that has allowed economists to simplify models by clarifying which assumptions are essential and which aren't. In the words of the Clark award citation, by "exploit[ing] monotonicity assumptions" your work has "… facilitate[d] the development of more robust empirical results" and "powerful techniques."

Can you explain that outcome? How does that body of work help economists develop better methods and models, and more robust results?

Athey: You can think about a hierarchy of economic theory. Some work is really intended to improve the tools that people use, and other work is about using those tools to solve a problem. The work on monotonicity was about trying to develop tools that allow people to focus more on the problem and less on the tool.

Part of this work was just noticing a pattern: that lots and lots of papers trying to solve problems would start by having to establish certain properties of the problem in order to make it tractable to analyze.

What I tried to do was find those common themes and simplify everyone's work by allowing them simply to formalize a set of arguments that people were having to make over and over again, each depending on the special features of the problem. And, instead, allow them to just establish some simpler conditions and then apply my results to say, OK, the things I want to do are automatically going to follow.

So you can think of having 20 different specific problems. And you have 20 researchers really interested in each of those problems. Each researcher has to spend a lot of time dealing with little technical details that can be quite frustrating and hard that distract them from the actual problem. I kind of packaged all that up in a nice "black box" where they could simply establish the things that were more intuitive, reference my results and then move on with the economics of the problem.

Region: That's a very simple and modest way to put it. Thank you.

BIG DATA

Region: "Big data" has been in the news a lot lately. Some might wonder if it's a fad, in a sense, given all this publicity. Because you've done a wide range of work from deep theory to applied economics using large databases, your perspective on this would be valuable. And, of course, you're deeply involved in the Internet and its dynamics. What are your thoughts about big data? Does it portend, as some have suggested, an "end to theory"?

Athey: Absolutely *not* an end to theory. In fact, the need for theory is in some ways magnified by having large amounts of data. When you have a small amount of data, you can just look at the data and build your intuition from it. When you have very large amounts of data, just taking an average can cost thousands of dollars of computer time. So you'd better have an idea of what you're doing and why before you go out to take those averages. The importance of theory to create conceptual frameworks to know what to look for has never been larger, I think.

Region: And yet some have argued that because data exist in increasingly large quantities, all you really need is to "see what the data say."

Athey: I think what *is* true is that when you have large amounts of data, if you ask it the right questions, you have a greater ability to let the data speak, and so you can be much less reliant on assumptions. But you still need a strong conceptual framework to understand what's coming out.

And I would say in the business world, this is where there's an enormous scarcity of talent. I see that there are a fair number of statisticians out there, not nearly enough, but a fair number of data scientists out there. There's a huge demand for them still.

But among data scientists, the ones who can define a question and introduce a new way of looking at the data—those data scientists are rock stars. They're pursued by every company and they move up the hierarchy very quickly. They're giving presentations to top executives and are extraordinarily influential. And there are never enough of them.

I think that the data scientists should take a little more economics. That would help; economics puts a lot of emphasis on the conceptual framework. And I also think that economics should be paying a lot more attention to the statistics of big data.

Right now, economics as a profession has *very little* market share in the business analysis of this big data. It's mostly statisticians. We're just not training our undergraduates to be qualified for these jobs. Even our graduate students, even someone with a Ph.D. from a very good economics department really doesn't have the right skills to analyze the kinds of data sets that big Internet firms are creating.

Region: But there are economists like you and others with this expertise, who have a lot of grad students, and you're intensely interested in training them in the right direction, of course. But still, that's not enough? Do neither students nor enough professors see the opportunity?

Athey: Well, not that many people have the access to the data. We're not teaching courses that reflect this. We're a little bit behind. Econometrics, at the undergraduate level, is not appreciated as much as an expertise that's extremely important for future employment, and we certainly don't see a lot of economics majors going on to take extra steps beyond what's required.

But then they don't seem to realize that that kind of training is really crucial for being successful if they want to work at companies like Google or Facebook or Microsoft, Yahoo or eBay, Twitter or LinkedIn. It's very difficult to be influential in those companies if you are not very savvy with statistics. So the old sort of economics undergrad who gets an M.B.A. but doesn't know a lot of statistics? A few people with that kind of background will be successful at these large tech firms, but they're going to be handicapped.

I really think we need to make some changes in education. What happens at the top Ph.D. programs isn't going to really impact the overall workforce. But what we do at the undergraduate level and whether we start offering more advanced or master's level courses becomes more important—because, really, with just an undergraduate degree it's hard to be very successful on the technical side at any of these firms.

The question is, how can economics reach a larger set of people? And, again, why is that important? It's because the economic intuition helps you ask the right questions of the data, which is *extremely* important.

The need for theory is in some ways magnified by having large amounts of data. … [With] large amounts of data, if you ask the right questions, you have a greater ability to let the data speak, and so you can be much less reliant on assumptions. But you still need a strong conceptual framework to understand what's coming out.

I guess one other part of your question was, is big data a fad? It's not a fad; it's a fact. Companies in all sorts of different industries are starting to generate large amounts of data. The Internet companies were built from the ground up on that data. Other companies are just *starting* to think about what they do with the data.

If you think about these kind of general purpose innovations like the computer, it took us a while to figure out what to do with the computer. It replaced the secretary and the typewriter, but it took another 15 years before the personal computer really changed the way we do commerce, which you would say really comes with the Internet and businesses being built around it.

With the big data, of course, the Googles and the Facebooks and so on were born on that. But if you take, say, a car manufacturer that might be getting real-time information from monitoring devices within the cars, there's a first level of things you can do with that data. Like you can look at aggregate failure rates, or something, for certain types of things. You can identify problems.

But there's a whole other level of optimizations that can be done. And I think that idea will apply across many industries. They'll start with just the basics of, let's figure out how to prioritize problems. For example, with software you can get telemetry data about, where are the bugs? What's causing crashes? That's sort of the first level of what you do with data: You use the data to identify problems and make priorities. The more frequent the crash, the higher you prioritize in fixing that problem.

But there's a next level, which includes real-time machine learning, customization, personalization, optimization, where industry as a whole is just inventing what to do with it. And there could be some really radical breakthroughs in different industries. They're just very hard to anticipate as they start to use these data.

How are the new ways of consuming news affecting the *types* of news that are being produced? The incentives for the creation of content are fairly fundamentally altered. The incentives for producing cute pet videos might go up at the expense of international news coverage.

THE INTERNET AND THE NEWSPAPER INDUSTRY

Region: Let me ask about one industry in particular that you've studied recently: the newspaper industry. Your initial title for one such paper was "*Will the Internet Destroy the News Media?*" You've softened that some, I think, in a subsequent draft. But how has the Internet affected newspaper advertising, and therefore industry revenue? And to what degree is the industry responding in a way that *might* assure its survival?

Athey: Well, it's fairly clear to everybody that the advent of the Internet has been very bad for newspaper profits and that online advertising revenue has not been nearly enough to replace the loss from advertising in the traditional print. And that, furthermore, just the advertising revenue *per newspaper bought* has gone down a lot.

My research has focused on just a few aspects of that. One of the things I focused on both theoretically and empirically is the effect of the Internet on loyalty—the fact that the Internet makes it much, much easier to switch across news outlets. I've shown empirically that news aggregators cause users to greatly broaden the set of outlets they look at and to become much less loyal to their old favorites.

And then I've studied what the implications of that switching are for advertising markets. That switching, it turns out, should theoretically lower equilibrium advertising prices. That suggests that those advertising dollars are gone and they may not come back. You can't just hope that eventually the dollars will follow the readers. Rather, the new medium has changed the competitive conditions and the real fundamentals of the market in a way that's going to lead to less of the surplus created from advertising accruing to the newspapers.

Region: Which previously had a fairly captive market, a specific geographic audience.

Athey: Right, the newspapers had a pretty good deal before. They generally had exclusive access to a lot of users. That's a pretty good position to be in, and that's unlikely to come back. There are a lot of interesting questions, which I haven't answered but that the industry is grappling with, such as, what are the best business models to adopt in the face of this? And how can we preserve journalism?

Another question that I think we're going to confront as a society is, how are the new ways of consuming news affecting the *types* of news that are being produced? So if your news is getting curated through social media and through news aggregators rather than through the editorial page of a major newspaper, the incentives for the creation of that content are fairly fundamentally altered. The returns to establishing reputation for quality are altered. And so the incentives for producing cute pet videos might go up at the expense of international news coverage, which might not be shared as well on social media, for example. So, I'm in the process of trying to study that empirically, but that's still a work in progress.

Region: We look forward to seeing the results. Thank you.

—Douglas Clement
March 6, 2013

More About Susan Athey

Current Positions

Professor of Economics; Professor of Economics (by courtesy), School of Humanities and Sciences, Graduate School of Business, Stanford University, since 2013

Visiting Researcher, Microsoft Research, New England, since 2008

Consultant to Microsoft Research as Chief Economist, since 2007

Research Associate, National Bureau of Economic Research, since 2001

Principal, Market Design Inc., since 2001

Previous Positions

Professor of Economics, Harvard University, 2006-2012

Holbrook Working Professor of Economics and Professor (by courtesy), Graduate School of Business, Stanford University, 2004-06; Fellow, Center for Advanced Study in the Behavioral Sciences, 2004-05; Associate Professor of Economics, 2001-04; National Fellow, Hoover Institution, 2000-01

Castle Krob Career Development Associate Professor of Economics, Massachusetts Institute of Technology, 1999-2001; Castle Krob Career Development Assistant Professor of Economics, 1997-99; Assistant Professor of Economics, 1995-97

Visiting Assistant Professor of Economics, Cowles Foundation for Economic Research, Yale University, 1997-98

Professional Activities

Member, Nominating Committee, American Academy of Arts and Sciences, since 2011

Member, President's Committee for the National Medal of Science (presidential appointment), 2011-13

Co-director, NBER Working Group on Market Design, since 2009

Co-organizer, NBER Information Technology/Productivity Summer Workshop, since 2009

Council Member, Game Theory Society, elected 2009

Associate Editor, *B.E. Journals in Theoretical Economics,* since 2000

Advisory Committee on Editorial Appointments Member, American Economics Association, 2011

Executive Committee Member, American Economic Association, 2008-10

Council Member, Econometric Society, 2007-10

Associate Editor, *Theoretical Economics,* 2005-11

Economics Panel Member, National Science Foundation, 2004-06

Honors and Awards

Society for the Advancement of Economic Theory Fellow, 2013

National Academy of Sciences Fellow, elected 2012

Honorary Degree, Duke University, 2009

American Academy of Arts and Sciences Fellow, elected 2008

World Economic Forum Young Global Leader, selected 2008

John Bates Clark Medal, 2007

Econometric Society Fellow, elected 2004

Richard E. Guggehime Faculty Scholar, Stanford University, 2004-06

Elaine Bennett Research Award, 2001

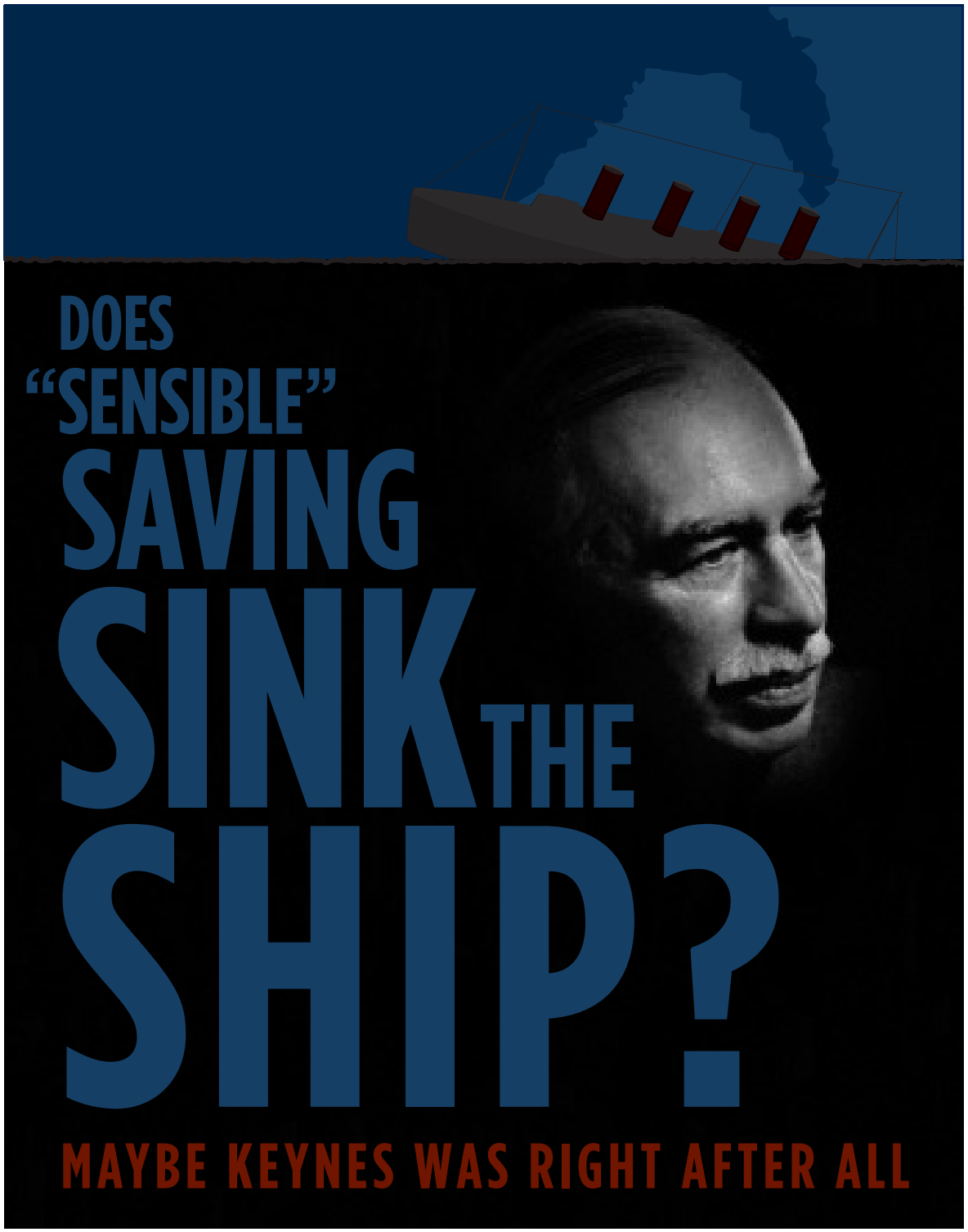
Publications

Published numerous articles in top economics journals on a broad range of topics, including industrial organization, econometrics, microeconomic theory and game theory. Recent publications focus on Internet economics, auction theory and statistical analysis, and market design.

Education

Stanford University, Ph.D., 1995

Duke University, B.A. *(magna cum laude)*, 1991


DOES
"SENSIBLE"
SAVING
SINK THE
SHIP?
MAYBE KEYNES WAS RIGHT AFTER ALL

"Paradox" Redux

Does the seemingly sensible savings behavior of individual households explain the Great Recession?

Douglas Clement
Editor

Like many once-attractive fashions, the "paradox of thrift" lost appeal over time. Popularized by John Maynard Keynes in the 1930s, it is the idea that saving more of one's income (a prudent move for an individual when future earnings are uncertain) is harmful for the economy as a whole. Decreased individual consumption lowers overall demand for goods and services, leading to job loss and decreased economic growth. Ultimately, says the theory, individuals will suffer—along with the broader economy—due to behavior they thought wise.

Keynes used the paradox in his diagnosis of economic ills during the Great Depression.[1] To stimulate the economy, he argued, spending should be encouraged, to boost aggregate demand and hiring. Thrift is counterproductive when economic growth is tepid. The concept held sway for much of the 20th century, promoted in Paul Samuelson's classic text *Economics*, among others.[2]

The idea lost luster in the 1970s, however, along with Keynesian economics generally. The emergence of rational expectations theory and the modern macro models built upon it pointed out that people have greater foresight than the paradox suggests and indicated that, at most, it was a short-term phenomenon. Markets would adjust as needed if people did indeed save more: Prices would drop, and overall demand and production wouldn't decline for long.

Moreover, increased saving by individuals gives banks more money to lend, thereby lowering interest rates and raising borrowing and investment. In addition, falling domestic prices can lead to greater levels of exports, boosting the domestic economy as trading partners increase their imports. The paradox, it appeared, was dead, a myth punctured by modern macro. Indeed, in later editions, Samuelson's text no longer mentioned it. (See Theis 1996.)

But the recent financial crisis and its impact on personal consumption has led economists to again consider the paradox. The U.S. personal savings rate that had plummeted from 10 percent in the 1970s to 3 percent in 2006 rose quickly during the crisis and recession, to 5 percent by 2010. Gross investment relative to gross domestic product (GDP) dropped from a postwar average of 16.1 percent to 12.5 percent thereafter.[3] It appeared that perhaps the paradox had been not a myth since the 1970s, but simply asleep.

In a December 2012 staff report, Minneapolis Fed economists Zhen Huo and José-Víctor Ríos-Rull revisit the paradox of thrift, give it a few twists and suggest that even when viewed through the lens of neoclassical economics, with flexible prices, the paradox may help explain economic patterns seen in the recent Great Recession.

Their paper, "Engineering a Paradox of Thrift Recession" (Minneapolis Fed Staff Report 478 online at minneapolisfed.org), explores an economic model solidly within the neoclassical framework that generates recessions through mechanisms linked to the savings motives and behavior of individual households. It is, thus, a neoclassical model

that embraces the paradox rather than rejecting it.

As Huo and Ríos observe, other economists have developed recent models of recessions triggered by insufficient demand. "Most of those papers have price and wage rigidity at their core," said Ríos. "Our model focuses instead on mechanisms more consistent with standard theory, although nominal rigidities also exacerbate the recessions we engineer."

Two keys, and an extra ingredient

Two features are central to the economists' model, providing what they say is a "very mild departure" from standard neoclassical theory. First, reallocating resources from production of "nontradables" (used only for local consumption) to "tradables" (goods that can be exported and imported) requires costly adjustment; in other words, shifting capital and labor between the two sectors isn't cheap and easy.[4]

Second, although wages are flexible (a hallmark of neoclassical economics), labor markets are somewhat rigid: A friction exists in that firms must spend time searching for appropriate workers, and vice versa. Therefore, while wages are somewhat flexible, this search friction prevents workers from working harder or longer hours whenever they might prefer to do so.

To this more-or-less standard model, the economists introduce a third, novel feature: Households expend time, money and energy searching for the goods and services they desire and, consequently, less economywide consumption results in lower productivity. (More on this below.)

But first: the economists' model and their technique. They begin with a standard, off-the-shelf neoclassical growth model. Households provide labor, consume goods and services, and save for the future. Firms hire labor and purchase inputs, invest in capital, and produce goods and services. There is also a government sector, which taxes and spends. Furthermore, the economy is "open," meaning that it imports and exports. Prices and wages are flexible.

Within this basic structure, the model determines the values of economic variables (for example, wage rates, prices, interest rates, employment, output) and allows for analysis of implications of changes in the environment, one of which is, critically, the discount factor: the level of patience households have for saving for the future rather than spending on consumption here and now.

In particular, the authors "explore the properties of recessions induced by an attempt to save more"—that is, by an increase in household thrift.

The baseline model includes the three features mentioned earlier:

(1) Moderate adjustment costs to reallocating resources from production of nontradables to tradables.

(2) Search friction in *labor* markets, which prevents workers from substantially increasing their work effort whenever they may want to do so.

(3) Search friction in *goods* markets, in which households must spend effort finding the goods they want. This means that the economy's full production potential can't be utilized.

Engineering recession

With this baseline model as their laboratory, Huo and Ríos run a variety of experiments, engineering a (theoretical) recession in order to explore how large an increase in household thrift is required to generate specified drops in output (1 percent) and employment (0.5 percent). The goal is not only to determine how large a thrift shock is needed, but also to see the other effects of the recession.

In the first and simplest test, with the bare-bones baseline model, they find that generating these output and employment drops takes a 1.12 percent rise. And beyond the (economist-imposed) drops in output and employment, the increase in thrift results in reduced productivity, dramatic wage declines for nearly a year, a large drop in investment and much higher exports. "To summarize," write Huo and Ríos, "in the baseline economy an increase in savings generates a long-lasting recession with loss of both employment and productivity. The recession is accompanied by an increase in net exports." Many of these effects are transitional, however, with their greatest impact felt over the first year or two. After eight or so years, many variables have returned to their initial prerecession values.

They then explore several optional scenarios by

altering the three key features: adjustment costs, labor market rigidities and goods market frictions. They start by raising adjustment costs to make it harder to expand output of tradables through reallocation of the economy's labor and capital. To generate a 1 percent decline in output in an economy with higher adjustment costs, they find, doesn't need as big a boost in household thrift (just 1 percent instead of 1.12 percent) as needed if adjustment costs are more moderate.

They next look at different wage-setting protocols, such as labor contracts that last for one year, and find that a far lower increase in thrift (just 0.55 percent) is necessary for similar recessionary impact.

Moreover, they find that both factors—adjustment costs *and* labor market frictions—are essential for a neoclassical model to exhibit the paradox of thrift. If adjustment costs are very low, a much greater increase in thrift (1.44 percent) is required to generate a similar reduction in output, but this would happen with an increase in employment.

Why? The chain of events is intricate:

- Low adjustment costs permit fast resource reallocation from the nontradable to the tradable sector, and greater output of tradable goods.

- To get the reduction in overall output that characterizes a (thrift-induced) recession, a very large reduction in consumption of nontradables is required.

- That reduction can be achieved by a greater increase in thrift, which makes people willing to work at a much lower wage.

- That, in turn, increases employment in the tradable sector.

Thus, to engineer a recession when adjustment costs are low, a greater increase in thrift is needed, and employment in the tradable sector will also increase. As for labor frictions, if they're entirely absent, household thrift must actually *decrease* (by 0.50 percent) to create a recession. "The recession is generated by a desire to enjoy utility today," explain the economists, "with households wanting to consume more and work less."

Thus, the Huo-Ríos experiments find, both adjustment costs *and* labor frictions are necessary features for a neoclassical growth model to generate recessions when households save more.

A special ingredient

In their paper, Huo and Ríos draw particular attention to a third, rarely investigated feature: search frictions in the goods market (by contrast, labor market frictions are widely acknowledged and studied). Here they draw from earlier research by Bai, Ríos-Rull and Storesletten (2011), which suggests that increased household expenditure can increase economic productivity and, conversely, increased thrift will result in lower productivity.

Why would less spending diminish measured productivity? The innovative notion is that, particularly in the service sector, employees have too little to do when stores, restaurants and the like aren't filled with customers. Cashiers are too often idle, grocery clerks seldom restock shelves and waiters just wait around. So if consumers don't spend, workers don't produce.

And spending demands not only money (which households are especially reluctant to part with in the thrift scenario), but *effort*. To find the particular product they want, shoppers must sacrifice time and energy they might prefer to spend on other activities. This search effort is indispensable to the creation of economic output—value doesn't exist until the transaction occurs—but the effort is gauged only by the shopper, and this is not noted by government statisticians.

"Firms stand ready to produce, with capital and labor," write Ríos and Sebastian Dyrda in a related paper, "but output occurs only when consumers find the firms and generate demand for that output. The search efforts of consumers are not measured in GDP, and the higher output is imputed to higher productivity" (Dyrda and Ríos-Rull 2012, p. 9). Eventually, less demand might result in layoffs and lower wages, but in the interim, productivity falls.

To determine the quantitative impact of this factor, the economists alter their baseline model by removing the goods market friction. The result is startling. Without this friction, generating a 1 percent output drop requires a nearly 2.6 percent increase in household thrift, or about 2.5 times larger than in the baseline. The recession thus caused reduces employment by 1.25 percent and productivity by

0.20 percent. Consumption drops by 9 percent, over twice the decline in the baseline model.

Extensions and conclusions

The economists' paper extends their theory further, replacing a hypothetical, perhaps far-fetched increase in willingness to postpone consumption with an all-too-plausible financial system shock as the trigger for more thrift. Results are broadly similar. Employment drops by about 0.8 percent, productivity by 0.5 percent and consumption by 3 percent.

They also explore the model's behavior when there is a significant destruction of wealth in the national economy, modeled as a foreign net asset position that changes from zero to largely negative. In this variant, the broad economic changes aren't transitory, as in the initial experiments, but permanent. Wealth destruction requires resource reallocation to tradable goods and causes permanent expansion of net exports and permanent decline in wages.

While this type of recession can happen anywhere in the world, Huo and Ríos point out that it most closely resembles the situation in much of southern Europe (Greece, Italy and Portugal) as well as Ireland. "With the apparent exception of Spain, also in southern Europe, productivity dropped dramatically during the Great Recession in these small and somewhat rigid economies, even though existing technology didn't change," Ríos said. "Our model accounts for this productivity decline through a reduction in consumption."

Moreover, Ríos observed, "These countries each suddenly discovered they were poorer than they thought they were—more so than elsewhere in Europe or the United States—given the desperate nature of their public finances and/or their real estate markets." This, of course, resembles destruction of national wealth from a change in foreign net asset position.

The Huo-Ríos model thus provides a clear and all-too-relevant mechanism by which household frugality results in recession: the paradox of thrift. While its neoclassical bones incorporate flexible wages and prices, functioning credit markets and open borders, other rigidities—resource reallocation costs and frictions in both labor and goods markets—ensure that when households spend less, the broader economy, and ultimately households themselves, may well suffer. R

Endnotes

[1] "Since the expectation of consumption is the only *raison d'ĕtre of employment*, there should be nothing paradoxical in the conclusion that a diminished propensity to consume has *cet. par.* a depressing effect on employment" (Keynes 1936, chap. 16).

[2] "It is a paradox because in kindergarten we are all taught that thrift is always a good thing" (Samuelson 1958, p. 237). Also see: "By attempting to increase its rate of saving, society may create conditions under which the amount it can actually save is reduced. This phenomenon is called the paradox of thrift" (McConnell 1960, p. 261).

[3] See Federal Reserve Economic Data at http://research.stlouisfed.org/fred2/ and the Bureau of Economic Analysis. The ratio of gross investment to GDP averaged 16.1 percent from 1947 to 2007 and 12.5 percent from 2008 to 2011.

[4] Huo and Ríos note that researchers usually consider agriculture, mining and manufacturing industries as the "tradable goods" sector. Their empirical analysis modifies this to include housing and business construction, to account for the search friction feature of their model.

References

Bai, Yan, José-Victor Ríos-Rull and Kjetil Storesletten. 2011. "Demand Shocks as Productivity Shocks." Manuscript. Federal Reserve Bank of Minneapolis.

Dyrda, Sebastian, and José-Victor Ríos-Rull. 2012. "Models of Government Expenditure Multipliers." Economic Policy Paper 12-2. Federal Reserve Bank of Minneapolis. Online at minneapolisfed.org/publications_papers/pub_display.cfm?id=4834.

Keynes, John Maynard. 1936. *The General Theory of Employment, Interest and Money*. New York: Harcourt-Brace & World.

McConnell, C. R. 1960. *Elementary Economics*. New York: McGraw-Hill.

Samuelson, Paul A. 1958. *Economics*, 4th ed. New York: McGraw-Hill.

Thies, Clifford F. 1996. "The Paradox of Thrift: RIP." *Cato Journal* 16 (Spring/Summer): 119-127.

Research Digest

This issue of *The Region* includes three digests of recent Minneapolis Fed research that examine aspects of U.S. labor markets during—but not exclusive to—the Great Recession.

The first piece analyzes a massive database to understand how workers' income patterns changed during the Recession and why lower-income workers fared poorly.

The second develops a model—driven by the notion that employees vary in skill types—to explain unemployment trends during the Recession and, again, why some suffered more than others.

The third explores trends in U.S. worker migration, seeking an explanation for the general decline seen over recent decades and its implications for the economy.

Whose income is at risk during economic declines?

Workers' recessionary fortunes are tied to their earnings before a downturn

What will happen to your income in the next recession? Will it fall because you lost your job or had to take a pay cut? Or could you be among those who thrive despite the downturn, seeing their earnings rise? Recent research by a trio of labor economists, including Fatih Guvenen, a Minneapolis Fed visiting scholar and an associate professor of economics at the University of Minnesota, tries to answer those questions.

"The Nature of Countercyclical Income Risk" (Minneapolis Fed Staff Report 476, online at minneapolisfed.org) investigates

PHOTOGRAPH BY STEVE NIEDORF

Fatih Guvenen

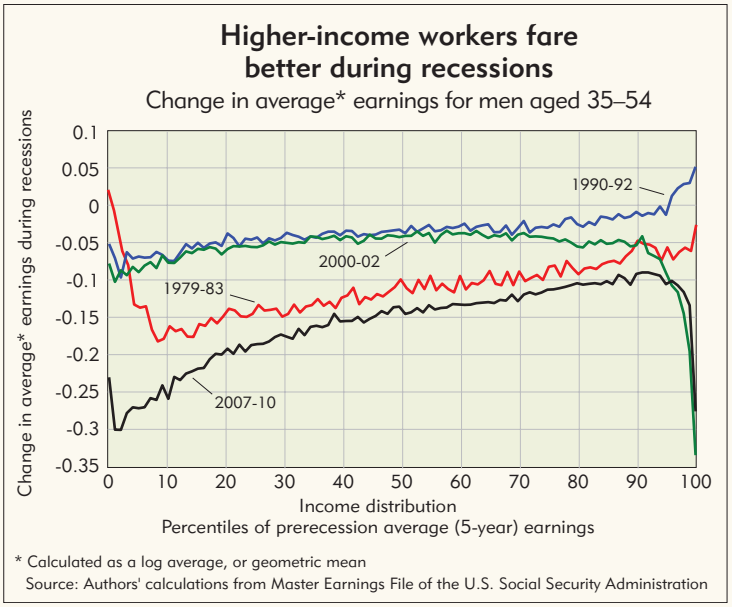
Research Digest

changes in earnings experienced by U.S. workers over the business cycle, from expansion to recession. Joining Guvenen in the study are Federal Reserve Board economist Serdar Ozkan and Jae Song, a senior researcher with the U.S. Social Security Administration.

Using Social Security data to chart the earnings of U.S. men over a 33-year period, the economists find that workers' changing fortunes during recessions are linked to their prerecession earnings. On average, the earning power of low-income workers erodes most during the downturn, while higher-income workers fare better—except, surprisingly, the top 1 percent of earners. The paper also upends some long-standing assumptions about the nature of earnings change during recessions.

How the distribution of income changes during recessions has long fascinated economists. The earnings risks faced by workers when economic output falters—whose earnings are likely to drop, whose are likely to remain stable and even rise—shape the fortunes of tens of millions of households. Recessionary income change also is related to income inequality.

"All labor economists are interested in income risk; that's their starting point," said Guvenen in an interview. "But how do we measure that risk?" Indeed, quantifying income risk—the probability of earnings rising or falling, and by how much—has long proven problematic. Lacking hard data on income changes in the U.S. workforce over time, economists have traditionally used theory to infer changes in income distribution over the business cycle.



Guvenen, Ozkan and Song break new ground by taking an empirical approach to gauging earnings risk. The researchers employ a massive data set—a random sample of Social Security records containing the earning histories of over 5 million U.S. men—to examine workers' changing incomes as they weathered four recessions between 1980 and 2010. (Women are excluded because their rising workforce participation during the study period would have made the data more difficult to interpret.)

The wages of income loss

During the Great Recession, the labor earnings of U.S. men fell an average of 6.5 percent—the sharpest decline of any recession since the 1930s. But that figure obscures wide variation across the workforce; while some workers experienced severe declines in their pay, others saw more modest income losses, while earnings actually rose for some.

Could those outcomes have been foreseen, based on the characteristics of workers evident in the Social Security records? To find out, the

Research Digest

economists analyze recessionary earnings change, comparing the experiences of prime-age (35 to 54) workers with different levels of prerecession earnings. In fact, "the preepisode average earnings level turns out to be an excellent predictor of a worker's earnings growth" for the last recession and three previous downturns, they write.

For most of the workforce, income loss during a recession decreases proportionally with earnings before the downturn (see chart on page 37). During the last recession, the incomes of workers in the 10th percentile of the prerecession earnings distribution fell about 18 percent more than those of workers in the 90th percentile. The implication is that janitors and fast-food workers fare worse in recessions than office managers or engineers. Thus, income inequality increases in recessions: Lower-income workers on average sustain greater earnings losses than the majority of workers with moderate or high incomes.

What is a surprise is the travails of very-high-income workers—the proverbial and literal 1 percent—in recent economic downturns. As the chart shows, people at the top of the earnings distribution saw their incomes nosedive during the Great Recession and 2001–02 contraction. "During the last two recessions, high-income workers experienced enormous and persistent earnings losses … which dwarf the losses of individuals even with slightly lower earnings," the authors write. This fate is confined to the very top: Even those in the upper 2 percent to 5 percent don't share their misfortune.

They don't explain this reversal of fortunes from earlier recessions, when one percenters did better on average than anyone else in the workforce. But Guvenen offers one possibility: Over the past two decades, industries employing high-income workers—finance and real estate, for example—have become more cyclical, with bigger earnings losses during recessions and larger gains in expansions.

Random slings and arrows

A large body of previous research has indicated that increased income inequality during recessions can stem from increased income variance—a spreading out of the overall earnings distribution. Economists have long assumed that during recessions stronger positive as well as negative shocks to income widen the range of earnings changes. Most income dynamics models developed over the past 30 years are based on the premise that income variance due to this random ("idiosyncratic") component of income risk is countercyclical—it increases during downturns.

In contrast, Guvenen, Ozkan and Song find that income variance is not countercyclical—and therefore doesn't contribute to earnings inequality. Rather, large income changes become more negative than positive in downturns, leaving overall variance unchanged. Most U.S. workers experience little change in their earnings over the business cycle. But for workers at every earnings level, the chance of getting a big raise diminishes during economic contractions, while the risk of a large pay cut or layoff increases.

Conclude the authors: "Relative to the earlier literature that argued for increasing variance—which results in some individuals receiving larger positive shocks during recessions—our results are even more pessimistic: Uncertainty increases in recessions without an increasing chance of upward movements."

Guvenen and other researchers continue to plumb Social Security records for further insights into the anatomy of income change. For example, Guvenen and Song are studying the top 1 percent of earners, looking for patterns over their working lives that set them apart from other workers.

— Phil Davies

Research Digest

Erzo Luttmer

Accounting for job loss

A new model focusing on employee skills explains why some suffered greater job loss than others in the Great Recession

During the Great Recession, cautious households spent less and saved more as unemployment rose. The U.S. economy is still trying to recover. But rising unemployment didn't affect everyone equally. Gender, racial and age gaps were large, but variation by educational attainment was also dramatic. Those with less education suffered far higher unemployment rates than those with advanced degrees. Moreover, this disparity was apparent in all sectors of the economy, not only in those most depressed by the downturn in spending.

Unfortunately, standard models of employment fluctuations are unable to explain this pattern. Some models focus on labor reallocation in response to economic surprises in specific sectors; they suggest that because recessions often hit some sectors harder than others, consumer demand and therefore workers will shift among sectors as a recession proceeds. Other models predict that in recessions triggered by a decline in consumer wealth, employment should rise as consumers work more to rebuild their wealth.

This clearly wasn't the case in the 2008-09 Great Recession, when unemployment reached levels rarely seen in the United States. The unemployment rate has declined steadily if slowly since its 2009 peak, but just 58 percent of the civilian adult population had jobs at the Recession's end, and this unusually low employment-population ratio—down from 63 percent pre-Recession—persists today.

A model that works

In a Minneapolis Fed working paper, "The Stolper-Samuelson Effects of a Decline in Aggregate Consumption" (Working Paper 703, online at minneapolisfed.org), Fed

Research Digest

"Viewed from this perspective, it could be that an important aspect of the U.S. financial crisis of the fall of 2008 was that it triggered a highly coordinated realization that previously held beliefs about aggregate wealth were too optimistic."

consultant Erzo G. J. Luttmer develops a theory that is able to account analytically for U.S. consumption and employment patterns experienced during the Great Recession. At its core is the intuitive notion that people have different types of skills, and how much those skills are valued by markets will vary as economies cycle through booms and recessions.

Luttmer begins his paper at an even deeper level: people's expectations about their economic future. "Consider an economy," he writes, in which consumers believe their income will rise significantly at some future date. "But they cannot suppress the nagging feeling that … [this also might] never happen." They also know that if rising income isn't in their cards, they'll eventually receive a signal to that effect.

Under these conditions, Luttmer observes, "a long period without a negative signal will make consumers believe, with a very high degree of confidence, that they will eventually receive the rise in income. They consume accordingly."

Put less formally: If people are quite certain they'll make lots of money in the future, and no one suggests otherwise, they'll spend like there's no tomorrow.

Luttmer then asks: "When an economy has been in this [optimistic] state for some time, what exactly will happen if the negative signal does eventually arrive?" To provide the answer, he studies what happens when tomorrow does arrive in his model, just as U.S. real estate and financial markets suddenly collapsed in 2007 and 2008, to widespread surprise, after a prolonged boom.

Division of labor

Luttmer's paper builds on different foundations than standard models and provides "an analytic exposition of the effect of sudden belief revisions on job creation and destruction." In his model, jobs are a form of capital, and not all employees are capable of creating them. Some employees, termed "workers," provide only the labor needed to produce consumption goods; others can supervise workers who produce consumption goods or develop the new projects that generate new jobs—Luttmer refers to them as "managers." Thus, managers can team up with workers to produce consumption goods, or they can focus on developing new projects without the help of workers. This division of labor, so to speak, drives his results.

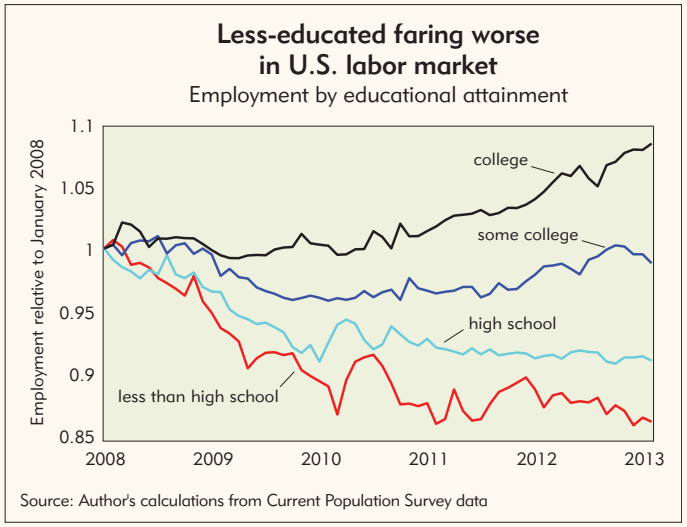
When the economy is doing well and people are spending on consumption goods, worker wages rise relative to managerial wages. This is the Stolper-Samuelson theorem. Briefly stated, it holds that as the price of a given product rises, the prices of inputs used intensively to produce the product will also rise. Conversely, if a good or service experiences a decline in market value, inputs used intensively to create it will be paid less.[1]

So, in Luttmer's model, consumers optimistic about the future will borrow more, thereby raising interest rates; that, in turn, lowers the value of new projects, and their prices fall relative to consumption goods. Wages will rise for workers since they're used intensively in producing (highly valued) consumption goods.

When bubbles burst

But if and when beliefs change—the negative income signal arrives—and consumer spending declines, consumption goods sit on shelves, consumers borrow less and interest rates decline. Workers—the type of employees used

Research Digest



intensively in consumer goods production—are laid off.

Not all employees are affected equally, however. Low interest rates make investment in new projects more profitable. Because only managers (not workers) can develop new projects, they'll be highly prized. Their wages will rise while those for workers decline. This, again, is Stolper-Samuelson: New projects are more highly valued, so the inputs used intensively in their creation (managers), will be paid more.

Finding jobs that pay well becomes increasingly difficult for workers, and the resulting decline in worker employment drives down overall employment. Investors would like to hire more managers and are willing to pay higher wages, but the supply of managers can't increase quickly over a single business cycle in response.

Luttmer offers what he calls "suggestive evidence" in support of this theory: data on employment trends by educational level. During the Recession, he notes, "unemployment among employees without a high school degree rose from about 8 percent to as much as 16 percent, while for college graduates the rise was from 2 percent to only about 4.5 percent." A graph (shown above) of employment levels by education from 2008 to early 2013 in relation to their January 2008 levels shows that for the college educated, employment barely changed, but those without a high school diploma suffered a 10 percent job decline.

"These patterns are precisely what the model in this paper predicts," he writes. One employee type—managers—has a skill with higher value given current product prices. A recession presents an opportunity for new project creation, so managerial skills are treasured. Since less-educated employees tend to be workers rather than managers, they are likely to suffer more job losses when a recession lowers spending on the consumption goods they produce.

Luttmer notes that his model's belief shocks have to affect everyone more or less simultaneously—both the optimism and its collapse. "Viewed from this perspective, it could be that an important aspect of the U.S. financial crisis of the fall of 2008 was that it triggered a highly coordinated realization that previously held beliefs about aggregate wealth were too optimistic."

All bubbles burst, often in one jarring implosion. But fallout scatters unevenly.

—Douglas Clement

Endnote

[1] This theorem from international trade economics explains how domestic input prices of labor and capital are affected by changes in world prices of different types of output.

Research Digest

PHOTOGRAPH AT RIGHT BY STEVE NIEDORF

Greg Kaplan

Sam Schulhofer-Wohl

Why are Americans moving less?

Migration declines are likely due to increasingly similar interstate labor markets and better information about them

Compared with their counterparts in most other countries, American workers have long been unusually mobile, freely migrating around the country to wherever they can find good jobs. Many researchers view that high level of mobility as an important strength for the U.S. labor market: Migration allows the economy to respond flexibly to local shocks, such as the recent oil boom in North Dakota, and suggests that workers will go wherever they are most productive. But as Chart 1 shows, the rate of migration among states has been falling steadily for decades and is now about half of what it was in the early 1990s. Is the labor market losing its flexibility? And will the U.S. economy suffer as a result?

In new research ("Understanding the Long-Run Decline in Interstate Migration," Working Paper 697 online at minneapolisfed.org), we investigate the decline in long-distance labor mobility in the United States. We show that the data rule out many

Research Digest

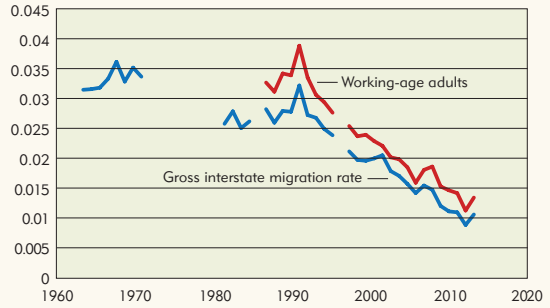
popular theories—an older population with deep roots, for example, or an increase in the number of two-earner couples who won't move unless both earners find jobs—that are linked to decreasing labor flexibility. In fact, the interstate migration rate would have fallen almost exactly as much over the past two decades if American workers' demographics had not changed at all. In place of those theories, we offer two new explanations for the decline in U.S. migration.

Our first explanation is that fewer workers need to move to obtain the best jobs for them, because labor markets around the country have become more similar. We show that the mix of available jobs differs less from state to state than it did 20 years ago, and the income a worker can earn in a particular occupation depends less than before on what state he or she works in. Chart 2 illustrates this decrease in the "geographic specificity of occupations" with a statistic called the Theil index. The index ranges between 0 and 1; when it is 1, each occupation is found in only one state, and when it is 0, every state has exactly the same mix of occupations. The Theil index has fallen about one-third over the past 20 years. That decrease in geographic specificity makes it easier for workers to stay where they most enjoy living and maintain their occupation.

Chart 1

Declining interstate migration, 1970-2010

Gross migration rates as shown in Figure 1 of WP 697 (overall and working-age adults)

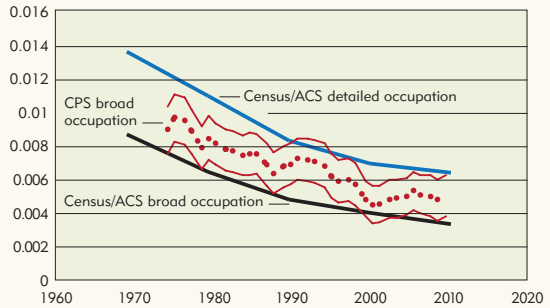


Source: Authors' calculations from Current Population Survey

Chart 2

Declining geographic job specificity, 1970-2010

State-occupation Theil index (Figure 11b of WP 697)



Source: Authors' calculations from Current Population Survey (CPS) micro data, 1977-2011; American Community Survey (ACS) micro data, combined 2006–2010 sample; and decennial census micro data (1970, 1980, 1990 and 2000). Thin lines show 1-standard-error confidence bands around CPS point estimates. Standard errors of census and ACS estimates are too small to be visible.

Our second explanation for low interstate migration is that workers have better information than before about what it's like to live in different parts of the country. Suppose you think you might want to escape Minnesota winters and move to California for the year-round sunshine. Unless you have already spent some time in California or have talked with many people who live there, you can't be very sure

Research Digest

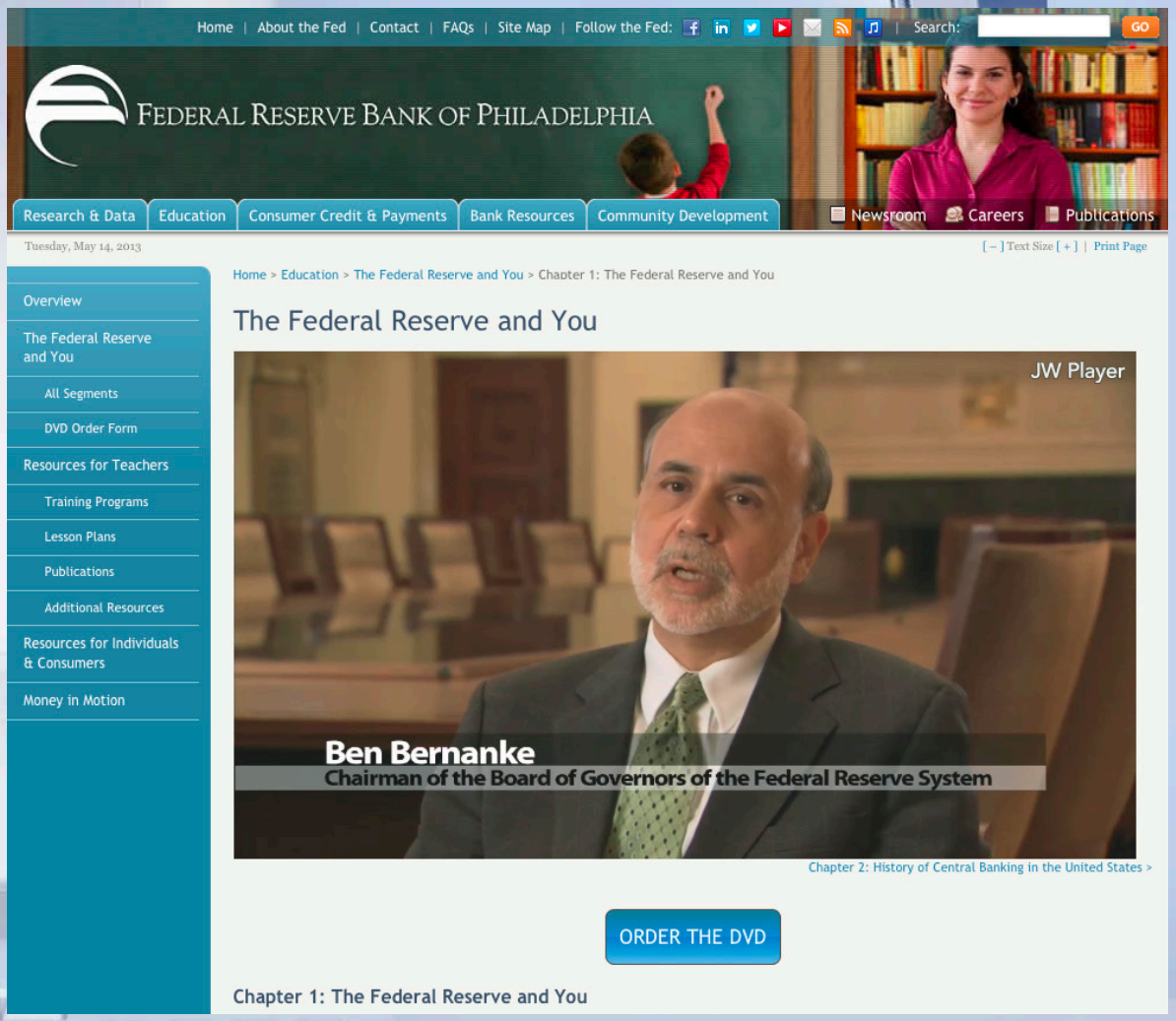
you will like it—and there's a good chance you will either miss the snow and return to Minnesota or try a third state quite soon. (Data show that someone who moves between states in one year has about a 15 percent chance of moving again the next year.)

But in recent decades, improved information technology and decreased market regulation have made it much easier to learn about far-away places without actually moving there. Airline deregulation made it cheaper to take a vacation in a place you might want to live, while telephone deregulation and the Internet help people gather information about distant states. With more information, workers are less likely to make moves they ultimately regret, and the migration rate declines.

In our research, we use a quantitative model to measure how powerful these explanations are. We find that reduced geographic specificity of occupations explains one-third of the drop in interstate migration over the past two decades. Our estimate of the effect of increased information is less precise, but it potentially explains all of the remaining drop. In other words, American workers haven't lost their flexibility. They just don't need to move so much anymore.

—Sam Schulhofer-Wohl

Virtual Fed



Lights, camera and the Fed in action

Do an online search for videos about the Federal Reserve, and many of the results that pop up will be, well, interesting. If you pursue a more "official" version, you're likely to come across *The Fed Today*, the Fed's informational video covering the basics of central banking and monetary policy. Regrettably, this production is more than a dozen years old and has no information about the ways the Fed, or the economy generally, has been affected by the financial crisis.

Fortunately, the Philadelphia Fed, on behalf of the Federal Reserve System, has fixed this gap with *The Federal Reserve and You.* This new informational video is comprehensive, covering the basics but also offering greater detail about the Fed's operations and history, and about money and banking more broadly.

With well over an hour of content, the video is structured in chapters so that viewers can get just a quick overview or go into greater depth about any particular topic. It's available to watch streaming online for free, and those who want a free DVD can order one on the site: philadelphiafed.org/education/federal-reserve-and-you/.

—Joe Mahon