

The Assumptions Economists Make

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THE BELKNAP PRESS OF
HARVARD UNIVERSITY PRESS

Cambridge, Massachusetts, and London, England

2012

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The Metaphor of the Invisible Hand

Adam Smith's remark that individuals seeking their own self-interest in markets are led "as if by an invisible hand" to promote the good of society has received mixed reviews—beginning with Adam Smith. His most important work, *An Inquiry into the Nature and Causes of the Wealth of Nations* (1776), paints markets as powerful engines of growth but also of harm. If British banks in his day were allowed to charge exorbitant interest rates of 8 to 10 percent, he warned, they would lend only to "prodigals and projectors."¹ The ensuing speculation would end in financial crashes, like the one caused by the 1772 collapse of the Scottish Bank of Ayr. He therefore urged that regulation limit interest rates to 5 percent, so banks would seek only "sober" clients who made sound investments: "The obligation of building party walls, in order to prevent the communication of fire, is a violation of natural liberty, exactly of the same kind with the regulations of the banking trade which are here proposed."²

Unlike Smith, most economists in the 1990s and 2000s seemed blithely unaware of even the possibility that banking deregulation might lead to financial crisis. Barry Eichengreen, an economic historian at the University of California, Berkeley, who has written extensively about the

dismal history of financial crises and who was not himself nearly as naïve as he makes out, sums up the consensus view of the profession: “We thought that because changes in central-bank policies had delivered low and stable inflation, the volatility of the pre-1985 years had been consigned to the dustbin of history; they had given way to the quaintly dubbed ‘Great Moderation.’ We thought that financial institutions and markets had come to be self-regulating—that investors could be left largely if not wholly to their own devices.”³

“Finance economics”—formal financial models developed since the 1960s that won their authors half a dozen Nobel Prizes—contributed directly to this complacent thinking. In 2003 the editors of the standard encyclopedic volume on the field crowed that it had “influenced public policy throughout the world in a major way, played a crucial role in the growth of a new \$100 trillion derivatives industry”—the industry that would generate so many toxic assets by 2008—“and affected how firms are managed everywhere.”⁴ That’s \$100 trillion, not a mere \$100 billion. And the encyclopedia editors didn’t present this accomplishment as a possibly mixed blessing, but as an unalloyed good.

Economists in government weakened financial regulations. Treasury secretary Lawrence Summers, Federal Reserve chairman Alan Greenspan, and Republican senator Phil Gramm championed, among other things, the Commodity Futures Modernization Act of 2000, deregulating financial instruments that often turned toxic.⁵ All hold Ph.D.’s in economics. Gramm isn’t a serious economist, and Greenspan is a practitioner, not an economist’s economist. But Summers, one of the youngest professors ever tenured at Harvard, is a bellwether of the economic mainstream.⁶ It was left to Brooksley Born, head of the Commodity Futures Trading Commission—and not coincidentally a lawyer—to try to head off disaster. For her efforts, she was muscled out of the administration.⁷

At the January 2009 meeting of the American Economic Association, I attended a panel of five luminary economists discussing the global

financial crisis that was then raging. They had discovered instant explanations blaming greedy Wall Street bankers, inept Washington regulators, and clueless American debtors. So what else is new? Were they born yesterday? But they didn't even ask whether their own thinking might have contributed. In talks by economists to economists, that question was not on the agenda. I would have hoped for a little more reflection about their own thinking.

In this book I discuss how we think about economies, why we often disagree about them, and ways we might understand them better, but I focus particularly on the thinking of economists. As John Maynard Keynes wrote in 1936, "Practical men, who believe themselves to be quite exempt from any intellectual influences, are usually the slaves of some defunct economist."⁸ It is dangerous to be slaves of economists (or anybody else), but it is useful to know what they have said. Economists living and dead have espoused an extraordinary range of ideas, clashing head-on across decades and ideologies, and have often developed the clearest formulations for disputing economic ideas, right or wrong. In this account of how we think about economies, I therefore turn back two centuries to Adam Smith and bring the discussion, sometimes leaping forward, sometimes backward again, toward the present.

Before turning back, in this chapter I examine the metaphor of the invisible hand: the notion that decentralized market trading leads, as if by an invisible hand, to a stable and optimal economy. It is a mere metaphor because, weird as it might sound to some readers, economists have never developed a rigorous model—a model that theorists themselves would accept according to their own criteria—showing how decentralized markets could lead to any stable economy at all, let alone an optimal one. The invisible-hand metaphor is hardly the alpha and omega of economic thinking. There have been generations of economists who did not believe in it; there are cutting-edge theorists who have decisively rejected it. But the invisible-hand metaphor seems a useful focus for the first chapter because it has shaped many central economic claims.

This metaphor underlay the misguided thinking that helped to cause the 2008 financial crisis, but I am interested less in the specific causes of this crisis, or its viral spread across other nations, or the sovereign debt crises threatening Greece, Ireland, and Portugal as I write, than in the ways economists think. Until invisible-hand thinking changes, we cannot devise workable ideas to solve a range of problems. One obvious problem is that of re-regulating financial industries. But even if the authorities manage the intellectual reversal of expunging the invisible-hand metaphor from their minds and do bring some stability to the global economy, other problems that this metaphor has helped to create are only now emerging for all to see, like rocky shores as the tide recedes.

For example, the notion that markets best determine the distribution of income—who earns how much—depends on the invisible-hand metaphor because, absent this metaphor, markets alone cannot determine *any* wage at all, let alone an optimal one. In the mid-1980s, Paul A. Samuelson, one of the world’s most influential economists, declared that unions and minimum-wage laws cause unemployment, while “a labor market characterized by perfectly flexible wages cannot underproduce or have involuntary unemployment.”⁹ How such a prominent and often thoughtful economist could have fallen so decisively for a mere metaphor is a puzzle I will take up shortly. But with Democratic economists like Samuelson, the Reagan revolution met little opposition as it attacked unions, minimum wages, and the very concept of a living wage that might help to equalize workers’ power in bargaining with multinational corporations. This attack on labor impelled decades of worsening income inequality, as economists such as Frank Levy and Peter Temin of MIT have recently agreed.¹⁰ Stagnant earnings, prompting members of the middle class to borrow against the supposed equity of their homes, arguably contributed to the 2008 crisis. In any event, ever since the crisis deflated that borrowing, income inequality has loomed as a continuing social threat.

The Financial-Deregulation Fad

Financial deregulation was part of a broader deregulatory wave—of airlines, communications, energy, and other industries—that emerged in the 1970s. This innovation was bipartisan. It was not the Republicans but a Democratic economist, Alfred E. Kahn, director of the Civil Aeronautics Board under President Jimmy Carter, who principally launched deregulation in the United States. “I really don’t know one plane from the other,” he famously declared. “To me, they’re all marginal costs with wings.”¹¹

Some deregulation proved useful, but the most intrepid gamble was surely in finance. In the 1989 edition of the best-selling textbook *Economics*, Paul A. Samuelson and his co-author William D. Nordhaus showed none of Adam Smith’s qualms about deregulating interest rates. “In earlier times, lending at interest was a crime,” they announce, referring to medieval usury laws.¹² They lament the idea of imposing any legal maximum on interest rates: “While 18 percent a year might seem high for a credit-card or a car loan, this high rate might barely cover administrative costs and the risk of default. What is the result of too low a ceiling on interest rates? Funds dry up.” A decade after the fact, they didn’t even consider the possible downsides of a 1978 Supreme Court ruling that knocked down those medieval restrictions on credit card rates. After the ruling, credit card companies pushed up interest rates, and as a result, a study by the Federal Deposit Insurance Corporation concluded, the rate of bankruptcy filings quadrupled.¹³ In line with Samuelson’s view, President Carter signed a law lifting interest rate ceilings on bank accounts and prohibiting states from capping mortgage interest rates.¹⁴ President Ronald Reagan signed the Garn–St. Germain Act deregulating savings-and-loan banks. Both laws helped to lay the ground for the savings-and-loan crisis of the late 1980s and for the 2008 financial crisis.

The developing world proved fertile ground for financial experiment. After General Augusto Pinochet grabbed dictatorial power in Chile in 1973, for lack of any idea what to do about the economy, he turned to “los Chicago boys,” Latin Americans’ nickname for the famously free-market economists from the University of Chicago.¹⁵ (They like the English word “boys” in the phrase, as it rolls off the tongue better than the Spanish equivalent.) Los Chicago boys deregulated finance, inflating a financial bubble. Business conglomerates known by epithets such as the “Piranhas” and the “Crocodiles” used loans from banks they owned to buy stock in firms they owned, luring in foreign speculators.¹⁶ When this financial house of cards collapsed in 1982, leaving Chile an “economic disaster,” as the *Economist* categorized it, the government declared that the foreign speculators had gambled and lost.¹⁷ Not so fast: the International Monetary Fund (IMF) and New York banks forced Chile to bail the foreigners out. While Socialist president Salvador Allende had left Chile with \$7 billion of debt in 1973, los Chicago boys saddled it with three times that much by 1982.¹⁸ After firing four finance ministers in a row, Pinochet finally found one who seemed to know what he was doing.¹⁹ Chile kept proclaiming its free-market credentials—and preserved some useful free-market reforms alongside some useful state industrial policies—but quietly instituted controls on international financial flows. The economy did splendidly.

An unsoubered IMF, staffed by Ph.D. economists (albeit tarred as third-rate graduates of top schools), along with rest of the “Washington Consensus” and enthusiastic politicians in developing countries, set about “liberalizing” finance.²⁰ Economists spoke of “liberalizing” rather than “deregulating,” since, in their fanciful world, developing countries weren’t just supposed to lift interest-rate ceilings and free global financial flows, but were to institute “prudential” supervision. The idea was that they would ensure banks complied with frameworks to limit exposure to risk.²¹ Of course, most developing countries did no such thing. But then, neither did the United States, which economists supposed had already

instituted state-of-the-art prudential supervision. Carlos Díaz Alejandro, an unorthodox economist, wrote a prescient article in 1985 titled, “Goodbye Financial Repression, Hello Financial Crash.” Just to mention some highlights, the 1994 Mexico crisis, the 1997 Asia crisis, the 1998 Russian crisis, and the 2001 Argentine crisis were the worst such events that had struck those economies since the 1930s.

Financial liberalization was an important cause of these crises. In 1998—the first time economists seem to have done a comprehensive study of the results of the financial-liberalization wave—John Williamson and Molly Mahar found that there was “ample reason to believe that the process can spawn financial crisis.”²² Williamson is none other than the economist who coined the term “Washington Consensus.”²³ The World Bank, itself a sometime promoter of financial liberalization, found that this policy had helped to exacerbate crises by fueling “rapid growth in credit to weak public and private enterprises and the government, as well as real estate.”²⁴

Undaunted by failures of poor countries that obviously didn’t get “prudential” supervision, the Clinton administration passed two seminal pieces of financial deregulation. I’ve mentioned the sorry tale of the Commodity Futures Modernization Act of 2000. Prominent economists also championed the repeal of the major Depression-era law intended to safeguard the banking industry, the 1933 Glass-Steagall Act. “At the end of the 20th century, we will at last be replacing an archaic set of restrictions with a legislative foundation for a 21st-century financial system,” Lawrence Summers proclaimed.²⁵ Glass-Steagall had separated commercial banks (the kind we used to deposit our savings in) from investment banks (the kind that used to trade financial instruments). The repeal allowed commercial banks, as well as insurance companies such as the suicidal American International Group (AIG), to go into high-profit, high-risk speculative adventures.

Economists broadly supported the repeal of Glass-Steagall, the *Washington Post* and the *New York Times* reported. Economists ridiculed the

old canard, going back to Adam Smith, that letting banks charge whatever interest rates they chose might lure them into making bad loans.²⁶ And they insisted that banks' financial speculation had not caused the 11,000 bank failures that occurred during the Great Depression.²⁷ In *A Monetary History of the United States*, the Nobel laureate Milton Friedman and the economist Anna J. Schwartz had argued that the Federal Reserve's inept policies, not unregulated private finance, caused the Great Depression.²⁸ This view had swept the profession.²⁹ For example, in 2002, a financial economist by the name of Ben Bernanke, on the Federal Reserve Board though not yet its chairman, lauded Friedman at a conference honoring his ninetieth birthday: "I would like to say to Milton and Anna: Regarding the Great Depression. You're right, we did it. We're very sorry. But thanks to you, we won't do it again."³⁰ Imagine Bernanke's surprise in 2008, when Friedman's theory blamed him, as chairman of the Fed, for doing just what he had promised not to and causing the financial crisis. In the wake of the crisis, governments made some effort to re-regulate finance, though the results have been criticized as insufficient. In any event, conventional thinking will trump what's written on paper. If conventional thinking fails to reject the invisible-hand metaphor, it will prepare the way for future crises.

The Invisible Hand That Couldn't Be Found

As a few members of the profession have charged, including the *New York Times* columnist Paul Krugman and the New York University professor Nouriel Roubini, some bad models led economists astray. But the problem goes deeper. The really strange thing is that economists had developed some useful models that should have warned of the danger of crisis. These were not obscure models. They belonged to a prominent line of research—"general-equilibrium theory"—about the fundamental nature of markets. It concluded decades ago that the invisible hand is just a metaphor. Even perfect markets do *not* lead an economy to equi-

librium. They are unstable. This conclusion is as decisive as any in economics has ever been.

I am not voicing my own opinion here but just reporting consensus conclusions. To be sure, economists always hoped to reach the opposite conclusion. Beginning in the 1870s, theorists sought to build a model of the invisible hand. They wanted to show how market trading among individuals, pursuing self-interest, and firms, maximizing profit, would lead an economy to a stable and optimal equilibrium. Those theorists never succeeded. Quite the contrary: in the early 1970s, after a century of work, they concluded that no mechanism can be shown to lead decentralized markets toward equilibrium, unless you make assumptions that they themselves regarded as utterly implausible.

The canonical effort along these lines is the general-equilibrium model published in 1954 by the Nobel laureates Kenneth Arrow of Stanford University and Gerard Debreu of the University of California. It is called a *general*-equilibrium model because it seeks to understand the interaction of all markets across an economy. Arrow and Debreu did prove that, if you make assumptions intended to characterize competitive markets and rational actors, there is always a set of prices at which supply would equal demand. However, no one was ever able to demonstrate that some invisible hand would actually move market prices toward this level. It is just a set of prices that might balance supply and demand if by some chance it happened to occur. Since there is an infinite number of possible sets of prices in the model, the probability that such a special set of prices would occur is zero.

Frank Hahn, a general-equilibrium theorist at Cambridge University, sums up efforts to model the invisible hand: "We have no good reason to suppose that there are forces which lead the economy to equilibrium."³¹ Of course, economists tell a story about the "law of supply and demand," Hahn hastens to add. "Here the invisible hand is actually set in motion. When demand of anything exceeds its supply the price will go up, and vice versa when supply exceeds demand." But the story is not credible:

“In taking this account seriously, one finds oneself studying a rather complex dynamic system. It is a fact that this study has not led to the conclusion that this behavior of prices must guide the economy to its tranquil equilibrium. Indeed, almost the converse is true: only very special assumptions seem to ensure this happy outcome.”³² By “very special” assumptions, Hahn means assumptions that are not generally credible.

An engineering analogy may help to illustrate the point. The invisible hand sees market economies as being like passenger planes, which, for all the miseries of air travel, are at least aerodynamically stable. Buffeted by turbulence, they just settle back into a slightly different flight path. General-equilibrium theory showed that economies are more like military jets. Buffeted by the slightest gust, they wouldn’t just settle into a slightly different path but would spin out of control and break asunder if “fly-by-wire” computer guidance systems did not continually redirect their flight paths to avert disaster.

Stranger and Stranger

A closer look at general-equilibrium theory and the metaphor of the invisible hand is useful. Any serious economics theory text, such as Hal Varian’s *Microeconomic Analysis*, includes several chapters on general equilibrium, but the noneconomist could be excused for having heard little about it. While physicists incessantly debate the foundations of their field in the press, even if at a simplified level that the rest of us can pretend to understand, economists just issue pronouncements. My search of the *New York Times* index since 1981 turned up 199 hits for “string theory” but only 11 for “general equilibrium,” most of which were just book titles or other passing mentions. Twice the phrase was used as a synonym for geeky and incomprehensible, and only one reporter tried to explain it—in two sentences. Why hasn’t general-equilibrium theory trickled down? I expect because it failed to develop the coherent basis for the invisible-hand metaphor that economists wanted.

General-equilibrium theorists assumed perfect markets, but not because they believed that markets actually are perfect.³³ Rather, they hoped to build an idealized invisible-hand model that would provide a framework for more realistic models incorporating observable “imperfections” such as monopolies, trade unions, protectionism, or what-have-you. Kenneth Arrow has said that his Ph.D. exams were focused largely on imperfect competition, and he believed that “competitive equilibrium was not a good description of the economy.”³⁴ Rather, in building a general-equilibrium model, he “wanted to clear up what the theory was.” Precisely what did you have to assume to get a perfect-market economy to work?

Arrow and Debreu made about a dozen assumptions aimed at characterizing what economists mean by “competitive markets” and “rational actors.” There are many different individuals, firms, and goods.³⁵ “Rational” individuals can have almost any preferences they want, no matter how whimsical. I might like to eat at McDonald’s, and religion might dictate your diet. But if we’re “rational” actors, we must be consistent—if I prefer A to B, and B to C, I cannot turn around and prefer C to A. Firms can have a variety of production technologies. But if one assumes “competitive markets,” then increasing returns to scale, important in any actual economy, are ruled out. Increasing returns occur, for example, when automakers can produce 100,000 cars at a lower per-unit cost than they can if they produce only 10,000. Increasing returns allow a few firms to capture a market and charge monopolistic prices, so they are assumed away to create the theoretical conditions for competitive markets.

According to Arrow and Debreu’s assumptions, goods are distinguished by place and date. For example, toothpaste delivered in Boston on January 1, 2020, is a different commodity from toothpaste delivered in the Australian outback on the same date—it would presumably cost more in the outback. Goods also are distinguished by the “state of nature.” An umbrella delivered when it’s raining is a different commodity from the umbrella delivered when the weather is clear. You can agree to

purchase goods depending on the state of nature. You can even contract for payments at a future date if you are unemployed: your job status is treated as an aspect of the state of nature. In other words, you can insure against anything.³⁶

How does the Arrow-Debreu model economy based on these assumptions operate? There is actually no trade between individuals, but, rather, an imaginary auction at the beginning of time. Before any production or consumption occurs, an “auctioneer” calls out proposed prices for every good. All “agents” report back how much they would freely produce or consume at those prices. The auctioneer might raise the price of a good if the demand for it exceeds supply, and might lower the price if the supply of it exceeds demand.

Given their assumptions about individuals, firms, and markets, and using the auctioneer mechanism, Arrow and Debreu prove that there always exists at least one set of prices for all goods that the auctioneer need not change. At those prices, the amount of each good that consumers report they will freely demand, given their preferences, exactly equals the amount that firms report they will freely supply, given their efforts to maximize profits. This is an “equilibrium.”

The proof involves applying a remarkable piece of mathematics: the “fixed-point theorem” of topology. To give a physical example, the fixed-point theorem says that if you pour coffee into a cup, swirl it around, and let it settle down again, at least one infinitesimal point in the coffee must end up in exactly the same spot where it started. It is a fixed point. When I first saw the application of this theorem to economics, it struck me as somehow both fascinating and appalling. How could a type of geometry be twisted into implying this central proposition about economies? But mathematics is the ultimate abstraction: the same theorem can describe utterly different phenomena.

Arrow and Debreu invented an imaginary shape—a sort of multi-dimensional coffee cup—representing an economy. Each point in the shape corresponds to some set of prices. Moving a point, say, one unit to

the right corresponds to raising the price of some good by one unit. In effect, if agents tell the auctioneer they would demand more of that good than firms say they would produce at a given price, the auctioneer might move the point to the right to increase its price. In response to reports from firms and consumers, the auctioneer thus keeps stirring points around. At least one point must remain fixed. If the auctioneer calls out the set of prices corresponding to that point, consumers demand exactly as much of each good as producers supply. This is an economic equilibrium. Q.E.D.

The equilibrium is “Pareto optimal,” a concept invented by the nineteenth-century Italian economic and political theorist Vilfredo Pareto. Suppose everyone owns some goods. The situation is Pareto optimal if no individual can be made better off by acquiring goods that he or she considers preferable without another individual’s being forced to accept goods that he or she considers worse. Given the Arrow-Debreu free-trade setup, the conclusion about optimality seems little more than a fancy way to restate the obvious: If you have something I want, and I have something you want, we can gain from free exchange. When no one can gain from free exchange, the economy is optimal.

So powerful is the invisible-hand metaphor, that economists supposed that the auction process would lead to a stable economy: they thought that as the auctioneer cried out prices, agents responded, and the auctioneer adjusted prices, the economy would inexorably move toward a tranquil equilibrium.³⁷ Indeed, the model makes assumptions that seem calculated to help markets lead toward an equilibrium. Among other things, it prohibits destabilizing speculation. In the real world, you can buy pork belly futures as a bet that the price will go up, but in Arrow-Debreu if you buy pork belly futures, you’re going to get a truckload on your doorstep. And you can’t even sell it because all sales were final at the auction at the beginning of time. There is no second auction.

However, not long after Arrow and Debreu published their model, theorists began to suspect that the auctioneer’s process—and by implica-

tion competitive markets—might not drive an economy to equilibrium. In 1960 Herbert Scarf of Yale invented an Arrow-Debreu economy that was unstable, cycling among different sets of prices.³⁸ The prospects for carving out some plausible assumption that could make an Arrow-Debreu economy stable steadily dimmed, until, in the early 1970s, three seminal papers, one by none other than Gerard Debreu, eliminated “any last forlorn hope” of proving stability, as the MIT theorist Franklin Fisher says.³⁹ “The extremely relevant ‘stability problem’ has never been solved either rigorously or sloppily,” agrees the economic historian Mark Blaug.⁴⁰ “Cycles of any length, chaos, or anything else you can describe” could disrupt the economy, says the Tufts University economist Frank Ackerman, a critic of general-equilibrium theory: “Not only does general equilibrium fail to be reliably stable; its dynamics can be as bad as you want them to be.”⁴¹

It’s worth noting *why* the single-point theorem does not imply that the auction process should lead, as if by an invisible hand, toward equilibrium. The theorem merely says that, among the infinite number of points in the multidimensional coffee cup representing the economy, there happens to exist one that is fixed—at which the supply of each good would balance the demand for it. If by sheer accident the auctioneer happened to call out that set of prices, he, she, or it would find that supply would perfectly balance demand. But the fixed-point theorem does *not* say that the auctioneer’s rules for adjusting prices would ever lead prices to that magic level. As the auctioneer pushes prices of multitudinous goods up or down, the economy might just keep swirling forever. Choosing the right prices to balance supply and demand for all goods would be comparable to divining, before the cup was stirred, which infinitesimal point in the coffee would wind up exactly where it started.

Assumptions can be invented to ensure that the Arrow-Debreu model is stable. One possibility is to assume that all goods are “gross substitutes.”⁴² For example, butter and margarine are plausibly gross substitutes, in that if the price of butter increases, people are likely to demand

more margarine as a substitute. An Arrow-Debreu economy is stable if *every* good is a gross substitute for *every other* good—for example, if the price of gasoline quadruples, people will demand more SUVs as a substitute. But no one believes that idea. The assumption that all goods are gross substitutes, Fisher told me, is known in the field as the “Santa Claus” condition.⁴³

Some economists might call the fighter-jet analogy I suggested a polemic, or might object to Ackerman’s tone, but no knowledgeable theorist would claim that Arrow-Debreu is stable. Thus, economists have misappropriated the very word “equilibrium” to describe a situation that is not an equilibrium, either in plain English or in engineering. This is more than a semantic quibble. Economic equilibrium—a stable state toward which an economy would move—reveals a hope on the part of economists, not a mechanism that they have captured in a credible model. Continuing to speak of “equilibrium” allowed them to fool themselves—and others—into thinking they had shown that perfect-market economies were stable.

What Were Economists Thinking?

How did macroeconomists, who study the operation of economies as a whole, manage to ignore general-equilibrium theorists’ negative conclusions about the invisible hand? To begin with, macroeconomics established a foothold in the 1950s and 1960s, while most economists still assumed that some invisible hand was at work in the economy. So-called Keynesian economists constituted the mainstream. (Whether their models had much to do with what Keynes actually said is a debate I will avoid for the moment.) They held that markets are self-regulating but that various impediments prevent them from moving toward an optimal equilibrium. Among other things, wages and prices are “sticky”—they do not adjust as rapidly as a strong invisible hand might ensure. As a result, economies can badly underperform. Governments could play an impor-

tant role in “fine-tuning” economies, speeding their otherwise halting course toward optimal equilibrium.

It was never quite clear why sticky prices and wages should cause such outsized trouble. As James Galbraith of the University of Texas puts it, in the fall semester “microeconomics” class about optimizing agents, you learned how prices and wages automatically adjust to balance supply and demand. Over winter break, those lessons sank into oblivion. In the spring semester “macroeconomics” class, you learned that sticky prices and wages cause serious recessions.⁴⁴

Robert Lucas won the Nobel Prize in economics for noticing winter break. He challenged the idea of sticky prices. If there is some shortfall in demand for widgets, and widget makers aren’t selling their product, why don’t they just cut prices? He couldn’t understand sticky wages either. Why would workers refuse pay cuts that would lower production costs, boost sales, and save their jobs? There must be a reason that business cycles occur even if people respond sensibly to the forces of supply and demand. In 1972 Lucas published a model that assumes the invisible hand is at work. Firms instantaneously adjust prices to balance supply and demand as they perceive it. They try to push markets to instantaneous equilibrium. But the central bank messes things up. It fools firms by tampering with the money supply and inflation, so they misjudge real prices. To the extent that firms are fooled, they adjust prices suboptimally, causing booms and busts. Thus, inept government efforts to smooth business cycles actually cause them. Lucas’s model supports Friedman’s argument that the Fed caused the Great Depression.

Macroeconomists began to build models attempting to show how the “microeconomics” of firms and consumers making optimal decisions in an invisible-hand economy might be reconciled with the “macroeconomics” of business-cycle booms and busts that hardly look optimal. So long as markets are competitive, these models depict perfect invisible-hand economies. However, various factors can impinge on the invisible hand. External shocks—moments of technological dynamism followed by mo-

ments of stagnation—can drive cycles of growth and decline. Alternatively, market imperfections, such as a central bank that ineptly manages the money supply or monopolistic firms that refuse to cut prices, can cause business cycles.

If general-equilibrium theorists were unable to model an invisible-hand economy, how did macroeconomists manage to build models with an underlying invisible hand? Unlike the Arrow-Debreu model, their models do not depict distinct consumers, firms, and commodities, but rather aggregate—or homogenize—them. For example, they aggregate corn seed, machine tools, software, and all other productive inputs into one uniform quantity of stuff that they call “capital” and label “K.” Most important, they homogenize diverse individuals into one “representative agent,” or perhaps two or three agents, such as one worker and one retiree. Thus, although macroeconomists claimed to base their models on the “microfoundations” of optimizing individuals—the very label sounds like a Good Housekeeping seal of approval—it was less than truth-in-advertising. If you homogenize all individuals and commodities in aggregate models, it is mathematically easy to build stability into the defining equations as a pure assumption. But it is a pure assumption. If you want, you can just as easily build instability into the model’s defining equations.

Economists boasted of their new “dynamic stochastic general-equilibrium” models—truly a phrase to inspire shock and awe.⁴⁵ The dynamic and stochastic aspects don’t really matter here, but I hasten to allay the reader’s curiosity. The models are “dynamic” in that they attempt to capture not a static picture of an economy, but a movie progressing frame by frame over time. They are “stochastic” in that they suppose economies are hit by random shocks, such as technological dynamism and stagnation. The term “stochastic” comes from *stokhos*, Greek for “target.” A stochastic process throws metaphorical darts at a target and misses by random amounts. Thus, a “dynamic stochastic general-equilibrium” model depicts an economy that changes frame-by-frame

over time, is hit by random shocks, and treats all markets as instantaneously and eternally in equilibrium. It's called a "DSGE model," for short. For once, the acronym is less painful than the term itself. But although general equilibrium is woven into the very name, such models starkly ignore key general-equilibrium instability results. Instead—and perhaps this is the weirdest part of a supposedly scientific theory—they are founded on pure faith in an invisible hand.

These models are mathematically elaborate, despite simplifying assumptions. Perhaps the mathematics lured economists into forgetting that, at a fundamental level, the models are just a tautology: the model economy is stable because it is assumed to be stable. Just looking at results, economists grew ever more optimistic that markets are self-regulating.⁴⁶ Central bankers such as Bernanke used DSGE models, and economists saw the models as anchoring an era of "Great Moderation." They elaborated the study of the Great Moderation into a whole sub-field. Robert Lucas declared in his 2003 presidential address to the American Economic Association that the "central problem of depression-prevention has been solved, for all practical purposes."⁴⁷

Failure to warn of the impending crisis rested on nothing more or less than faith in the invisible-hand metaphor. Alan Greenspan—more cautious about formal economics than some of his colleagues, since he was already a prominent financial consultant before he received his Ph.D. in economics—concedes that not a model but "ideology" led him to believe that "free competitive markets are by far the unrivaled way to organize economies."⁴⁸ Many economists thought the same way without even realizing it.

How Did Economists Forget?

How could macroeconomists in the 1970s incorporate the invisible-hand story ever more tightly into their models, even as general-equilibrium theorists abandoned it? The sociology of the profession is

part of the reason. Macroeconomics constitutes one kingdom of the discipline; microeconomics, another. General-equilibrium theory is only a fiefdom within microeconomics. Even though general-equilibrium theory investigates the operation of an entire economy, it is considered part of microeconomics because it does not aggregate individual consumers, firms, and commodities. Thus, Hal Varian covers general equilibrium in *Microeconomic Analysis*. It is a big step away from macroeconomics.

Furthermore, stability is only one topic within general equilibrium. Varian runs through some mathematical-instability results on pages 398 to 400, but without serious discussion of their significance. And after slogging through 398 pages of calculus, you can easily miss the formal results. I did. In talking with Duncan Foley, a wide-ranging theorist at the New School, I mentioned that I didn't recall anything in Varian about general-equilibrium instability. He assured me it was there, but added, "You would miss it."⁴⁹ Sure enough, I found it on reviewing Varian.

Varian's three forgettable pages on the instability results are about all the typical graduate student who plans to be a macroeconomist will likely encounter. Michael Mandler, a theorist at the University of London, notes that practical economists have very limited knowledge of general-equilibrium theory: "They had three weeks of it in one course in grad school and regarded it as too mathematical and for geeks." As well, academia is not set up to encourage individuals in one subdiscipline to worry about what goes on in another: "There is no professional reward for doing so," as Mandler says. Thoughtful attention to general-equilibrium theory would only get in the way of macroeconomists' ability to publish models in journals and get tenure.

Still, the best macroeconomists are not ignorant of the instability results. How do they respond? "The mathematical failure of general equilibrium is such a shock to established theory that it is hard for many economists to absorb its full impact," suggests Frank Ackerman.⁵⁰ They simply practice several "styles of denial." Sophisticated researchers agree

sotto voce, but do not set down in writing, that “no one” believes general-equilibrium stability anymore. Ackerman adds: “The profession has moved on to game theory, complexity theory, evolutionary frameworks, and other techniques.” Someone should tell those innocents who build general-equilibrium models for the Federal Reserve that the cognoscenti have long since gone on to bigger and better things.

Milton Friedman once told Franklin Fisher that he saw no point in studying the stability of general equilibrium because the economy is obviously stable—and if it isn’t, “we are all wasting our time.”⁵¹ Fisher quips that the point about economists’ wasting their time was rather perceptible. The point about economies being obviously stable was *not* perceptible. Properly speaking, economies are never stable, since prices of goods such as gold or oil are perpetually changing in ways that cannot be anticipated even a moment ahead.

True, economies mostly avoid catastrophic fluctuations—except, of course, when they don’t. But what mostly saves them? Theorists’ failure to model an invisible hand, even if markets were perfectly competitive, is ironically powerful. If economists since the late nineteenth century have failed to model how some invisible hand might move perfect markets toward equilibrium, why should we believe that any such mechanism exists? Something outside markets—such as social norms, financial regulation, or Ben Bernanke in his happier moments—perhaps averts disaster. Friedman’s claim that markets are self-regulating and that only inept government monetary policy caused the Great Depression is not only wrong in practice, but wrong in theory as well.

The Rational Speculator

The Arrow-Debreu model is so abstract that it leaves an important question unanswered: Just why is an imagined perfect-market economy unstable? Franklin Fisher, who does practical as well as theoretical economics—he served as chief economist for the Justice Department’s antitrust

suit against Microsoft—developed a more realistic general-equilibrium model that suggests an answer. In short, the answer is speculation. When published twenty-five years ago, Fisher's *Disequilibrium Foundations of Equilibrium Economics* was received favorably but with little fanfare. Why didn't it get more attention? He is a well-respected professor in a top university department. I suppose economists just didn't want to hear more about the problems of so-called general equilibrium.

Fisher makes more realistic assumptions than Arrow-Debreu. Dispensing with the auctioneer, that grand central computer cranking out prices at the beginning of time, he allows people to continue to trade as they produce and consume. He allows for the possibility of monopolistic pricing. He incorporates money, where Arrow-Debreu has only barter. He hoped to show how markets would lead an economy to equilibrium, now in a real sense. His imagined economy is initially out of equilibrium, and he asks whether decentralized trading can lead it, as if by an invisible hand, toward an equilibrium where prices stop changing. He didn't manage to prove that an economy will reach equilibrium, but he missed in a fascinating way.

To think about whether an economy might reach an equilibrium, first consider what might drive it out of equilibrium—why prices might change. For one thing, external shocks to markets can make prices change. The discovery of vast North Sea oil reserves around 1970 and the loss of oil production after the 1979 Iranian Revolution drove changes in oil prices, hence in many other prices. Another possibility is technological innovation. Improvements in the design and production of integrated circuits dramatically lowered computing prices over the course of decades. The dot-coms built a whole new range of Internet services, creating goods and demand for them that had never existed before. The Harvard economist Joseph Schumpeter famously argued that innovation, interrupting what he called the "circular flow" of markets in equilibrium, drives development.

If such external shocks were the only mechanisms that interrupted

the circular flow, they would not undermine the idea of the invisible hand. That idea only needs to suppose that trading in markets drives economies *toward* equilibrium. If innovation or resource discoveries strike from outside markets, and markets themselves move to restore the circular flow of equilibrium, then it would be a good enough invisible hand.

The problem is that, rather than restoring the circular flow, markets may disrupt it further. Consider the dot-coms. One entrepreneur had an innovative idea, persuaded investors, hired workers, and made money. Another entrepreneur had an idea that would flop, but its ultimate fate was not immediately known. This entrepreneur went through the same initial steps, generating activity and helping to inflate the dot-com bubble. There was no clear line showing where innovation stopped and the bubble started. As Greenspan noted in January 2000, imagining what people might say from the vantage point of 2010:

We may conceivably conclude that, at the turn of the millennium, the American economy was experiencing a once-in-a-century acceleration of innovation, which propelled forward productivity, output, corporate profits, and stock prices at a pace not seen in generations, if ever. . . . Alternatively, that 2010 retrospective might well conclude that a good deal of what we are currently experiencing was just one of the many euphoric speculative bubbles that have dotted human history. And, of course, we cannot rule out that we may look back and conclude that elements from both scenarios have been in play in recent years.⁵²

Pure perceptions, right or wrong, operating through markets, can disrupt equilibrium. Suppose a major wheat trader suddenly concludes that a blight will strike the harvest next year, raising prices. The trader buys wheat futures, moving the market. Other owners of wheat futures reap unexpected gains, which they may use to make additional investments. Prices keeps moving, rather than settling toward equilibrium.

Looking at the problem from another perspective, consider how the

rational individuals of economic theory might act to move an economy toward equilibrium. They must realize that it is out of equilibrium—that supply and demand are not balanced at current prices—and try to benefit from price changes they expect.⁵³ If Macintosh apples are piling up on shelves, but Cortlands are disappearing, speculators grab Cortlands to sell at a profit. They may drive the price higher than consumers who just want to eat Cortlands would pay. Such a process happened in the U.S. housing market in the early 2000s, and happens all the time in commodity markets. Financial institutions employ sophisticated techniques to project where prices are heading, and act on these perceptions, right or wrong. These techniques are often developed by Ph.D. mathematicians not notably preoccupied with general equilibrium. The very actions that rational individuals take to move prices out of disequilibrium may inflate bubbles, rather than moving an economy toward equilibrium.

The invisible-hand metaphor was only one factor leading the way to the financial crisis. But if supposedly practical economists had admitted to the rest of us—and to themselves—that it was merely a metaphor, policymakers might not have knocked out all the props that held things somewhat steady. How economists think is an issue that matters. They should clearly say what they don't know, not just broadcast what they think they know. And they should explain the assumptions underlying what they think they know. In the following chapters, I underline at least some of the key assumptions that give rise to disputes over economic ideas.