

Adding up the job impact of offshoring | The market for office space

The Federal
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of Boston

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Regional Review

BIOTECH FOODS: *Is the time ripe?*



this issue

IN A TIME of rapid change, it becomes important to look outward as well as inward to understand how business decisions and policy choices affect the economy.

Boston Fed economist Jane Sneddon Little considers how much firms' outsourcing of jobs overseas has affected U.S. employment growth in this issue's

Perspective. Contrary to many media reports, Little argues that while job loss can be painful to the individuals involved, domestic factors—not outsourcing—explain the vast majority of the job losses in the most recent recession.



The subject of genetically modified foods remains controversial and engenders strong feelings both at home and abroad. In **Seeds of Change**, Molly Leshner reviews the arguments and evidence concerning the impact of genetically modified foods on farmers, consumers, and the environment. Leshner concludes that deeply rooted emotions where food is concerned may make it hard for consumers to change their attitudes about biotech crops.

In **Running in Cycles**, Jane Katz investigates the factors that produce the cycles of boom and bust in the market for downtown office space. Although high vacancy rates and falling rents are never desirable, the most recent cycle was not nearly as severe as the enormous bust in 1989-92. Katz offers a number of reasons that may account for this phenomenon.

Finally, in **Rules of the Game**, Boston Fed economist Peter Fortune reviews *Trading & Exchanges: Market Microstructure for Practitioners* by SEC Chief Economist Larry Harris. Fortune praises the book for clearly explaining the instruments, institutions, rules, and motives that define the world of the equity trader.

Cathy E. Minehan

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PRESIDENT, FEDERAL RESERVE BANK OF BOSTON



Perspective 2

By Jane Sneddon Little A rash of media stories has heightened concern about foreign outsourcing of U.S. jobs. But analyses show that many of these reports may have exaggerated the extent and economic impact of jobs moving overseas.

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By Peter Fortune In *Trading & Exchanges: Market Microstructure for Practitioners*, SEC Chief Economist Larry Harris has written a must-read for anyone interested in the good, the bad, and the ugly of securities trading.

Seeds of Change 12

By Molly Leshner It's been eight years since genetically modified seeds first came on the market. Farmers have seen some advantages, but certain consumers, particularly those abroad, are still resisting the technology.

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By Jane Katz As the market for downtown office space recovers from yet another boom and bust, are there reasons to think that future cycles may be less volatile than in the past?

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observations

Playback plus?

AMERICAN CONSUMERS can't seem to get enough of the DVD. Only seven years after their introduction, DVD players have become the fastest-adopted consumer electronic device since the television. They have overtaken VHS cassettes in movie sales and rentals, and over half of American households now own one. Yet DVD recorders, despite having the obvious advantage of being able to both play back and record, have sold much more slowly. Introduced in 2000, today they account for only 7 percent of all DVD devices on the market.

Why aren't DVD recorders selling as quickly as DVD players? For one, Americans already have the ability to record (or timeshift) television; by 1997, nearly 90 percent of American households owned a VCR, making DVD players' inability to record irrelevant. In fact, DVD technology surpassed VHS precisely because the DVD is designed as a player, delivering high-quality picture and sound that doesn't degrade over time. The additional benefit of recording onto a DVD doesn't seem necessary to most consumers.

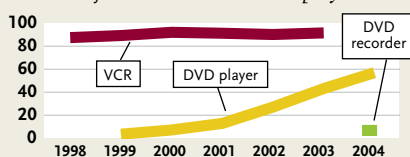
In addition, DVD recorders face significant competition from both other technologies and from an internal format war. First, consumers can now timeshift programs not



CARL TREMBLAY

Digital vroom

Percent of U.S. households with player



NOTE: VCR ownership was not asked in the 2004 survey. SOURCE: Forrester Research, Inc.

only with their VCRs, but also with digital video recorders (DVRs, such as TiVo). And soon they will be able to do so with video-on-demand from their cable or satellite provider. Second, DVD recorders currently use three different—and mostly incompatible—formats for saving data, and still more formats that allow for high-definition recording are on the way. With so many

options, consumers may be skeptical about purchasing a device lest they get stuck with the modern equivalent of the Betamax.

Then, there's the cost barrier. The price of DVD recorders, now averaging between \$300 to \$500, will likely need to fall substantially before most consumers feel justified in buying one. Indeed, DVDs may follow the path of the compact disc, which comfortably coexisted with audiocassette recorders for well over a decade before the price of CD recorders fell enough to push the tape deck out of the market.

One way manufacturers could speed up the DVD recorder market is to phase out play-only devices, but consumers may balk. In the meantime, don't expect DVD recorders to kill off VHS any time soon.

—Brad Hershbein



ADAM MCCAULEY

Top-heavy job loss

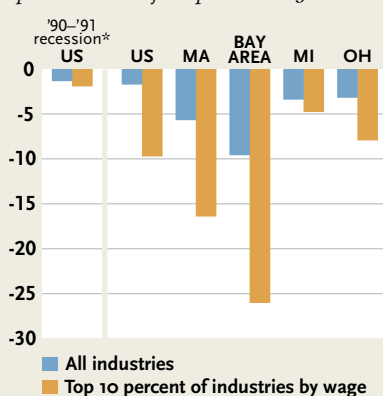
After robust employment growth in the late 1990s, the U.S. lost 1.6 million jobs from the peak to the trough of the latest recession. Employment continued to fall well after GDP bottomed out in late 2001, for a net loss of 2.7 million jobs—2.1 percent of non-farm employment—by August 2003.

This size of decline is neither abnormally large nor without precedent. In the recession and "jobless recovery" in 1990–91, employment dropped by 1.4 percent. In 1981–82, the loss was 3 percent.

What is different this time is its distribution. In 1990–91, losses >>next page

Unequal declines

Percent change in employment from first quarter 2001 to first quarter 2003



*Change in employment from Q2 1990 to Q3 1991. SOURCE: Bureau of Labor Statistics

Observations

CONTINUED FROM PREVIOUS PAGE

<< were fairly evenly spread across all wage levels. But this time, the job downturn has fallen heavily on the highest wage industries. Ranking U.S. industries from highest to lowest pay, the top-paying 10 percent (such as telecom, software, finance, and certain segments of durables manufacturing) accounted for over a quarter of the total job losses.

Thus, regions with heavy shares of high-wage technology industries, which benefited greatly from the boom of the late 1990s, are now paying a heavy price. A full 16 percent of Massachusetts jobs are in the high-paying industries that comprise the top 10 percent of the nation's employment. Because of this high concentration, and because job losses in one sector spill over into other sectors, the state lost nearly 6 percent of its employment—the largest statewide decline in the nation. Even worse, the San Francisco Bay Area, where 22 percent of jobs are in the top decile, has seen almost a 10 percent overall drop in employment. Still, despite the heavy toll, these job losses are no worse than would be expected given the nationwide weakness in top-paying industries. As these sectors improve, it's likely that the local economies dependent upon them will strengthen, too.

But not all hard-hit regions are like Massachusetts. Heavily industrial Michigan and Ohio have also been hurt by losses in traditional manufacturing sectors such as metals, plastics, machinery, and auto parts—industries in the 50th to 80th percentiles of wages. They have lost more than 3 percent of their employment statewide, double the national average. The combination of large overall employment losses and a lower concentration of the highest-wage industries has placed these states in perhaps a more difficult position. Indeed, as the national jobs recovery continues to gather momentum, states like these may find it harder to share in the nation's growth.

—Yolanda Kodrzycki and Nelson Gerew

Outsourcing jobs overseas: perspective

ALMOST DAILY, the press alerts us that yet another major U.S. company has laid off several thousand U.S. workers while moving back office or skilled programming work, a call center, or even the whole corporate HR function to China, India, or other low-wage countries. Media analyses claim that anywhere from 250,000 to 500,000 business service jobs moved abroad between 2001 and 2003, at the same time that total U.S. nonfarm employment remains down almost 500,000 from its most recent peak. Indeed, although the U.S. economy has finally begun creating jobs—2.1 million in the past 12 months—this recovery has witnessed the weakest job growth of any upturn since World War II. Voters, policymakers, and the media are all calling for measures to stem the job flow.

Outsourcing work to foreign countries, *per se*, is nothing new. We understand that this is part of

Professional jobs are starting to migrate overseas, as manufacturing jobs did before them. But this only accounts for a small portion of job losses in the recent recession.

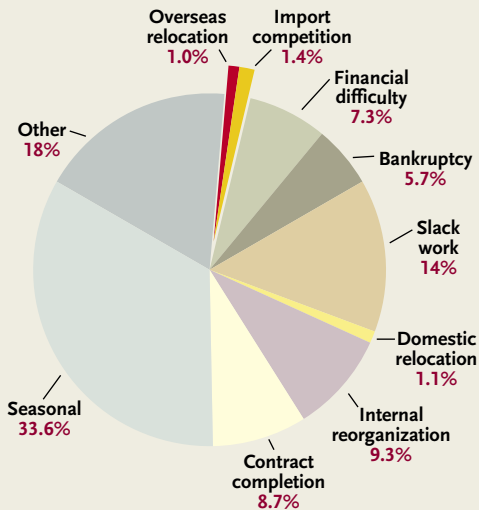
By Jane Sneddon Little

Illustration by Dan Page

A cause for concern?



Home-grown job loss



Domestic, not international, economic changes are behind most layoffs. Only 2.4 percent of extended mass layoffs during 2001 to 2003 were due to overseas relocation or import competition.

SOURCE: Bureau of Labor Statistics

the economy's evolution as employment shifts from agriculture to manufacturing to services and knowledge-based activities and as products mature through their life cycles. Historically, at each successive stage, U.S. workers have shifted to "better," more productive, higher-wage jobs in burgeoning industries or the high-value-added parts of mature industries.

What is raising new concerns is the shift to foreign outsourcing in services, including the export of moderately high-skilled, white-collar jobs. As countries like China and India have accumulated human capital, at least some of the jobs going overseas are the better jobs—the professional jobs in programming or software design, in accounting or microeconomics or radiology, in the "new" service industries where the United States was supposed to have a comparative advantage.

But a careful analysis shows that media reports may have exaggerated the economic impact of foreign outsourcing. Many conflated the *gross* number of jobs lost through outsourcing with the *net* number lost economy-wide, overlooking the jobs created here in the U.S. thanks to outsourcing abroad. In fact, outsourcing can probably only explain a small share of our slow "job-loss" recovery. To explain why job growth was so long delayed in the current upturn, we need to look much further.

Between 2001 and 2003, 143 million U.S. workers were separated from their jobs—56 million due to involuntary layoffs and discharges, plus 87 million due to quits and other reasons. The separations were largely offset by 141 million hires, but given the recession and sluggish recovery, the outcome was a small negative—a net decline of 2 million jobs over the period.

How much of this job loss was due to foreign outsourcing

of business and professional services—the kinds of job losses attracting the most attention? It's difficult to say precisely, but we do have some clues. One comes from the Bureau of Labor Statistics, which collects data on mass layoffs—those layoffs involving 50 or more workers within a five-week period and lasting more than 30 days. According to the BLS, import competition and job relocation overseas explained just 2.4 percent of all mass layoffs in 2001 through 2003 (about the same share, incidentally, that these two factors accounted for in the boom years of 1998 and 1999). Some outsourcing-related layoffs, of course, may have been mistakenly attributed to other causes. But even tripling or quadrupling the 2.4 percent share still leaves domestic developments like business restructuring and slack demand explaining the bulk of recent mass layoffs.

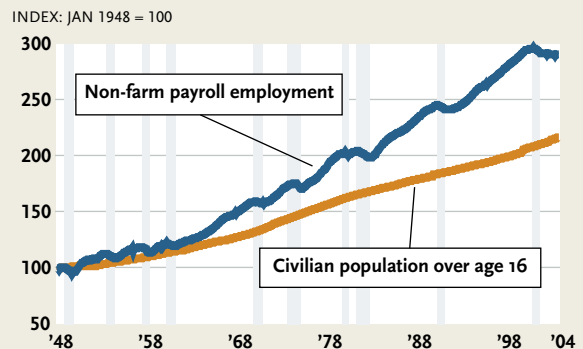
Now assume that job relocation and import competition accounted for 2.4 percent of all 56 million layoffs made in 2001, 2002, and 2003. This suggests that outsourcing led to about 1.3 million layoffs over those three years, of which perhaps 200,000 or so were in business and professional services. Add to this some outsourcing-related job loss that may have occurred through attrition, and it's no wonder that everyone knows of someone whose job has gone to India or the Philippines.

But, to put that 200,000 figure in perspective, the business and professional services industry experienced 8.5 million layoffs during the last downturn. Foreign outsourcing only explained a small share of them. And while hiring rates fell more in business and professional services than in the average U.S. industry, they also fell more quickly than average in wholesale and retail trade, transportation, entertainment and recreation, and accommodations and food services—all industries not well suited to foreign outsourcing. Once again, it appears that domestic forces, not outsourcing, are largely to blame.

Furthermore, it's easy to forget that outsourcing has led to U.S. hiring as well. Foreign call centers rely on U.S. software, U.S. communications equipment, and U.S. air conditioners, while their newly affluent young workers buy U.S. jeans and

Job growth in the long run

Despite growing exposure to trade, U.S. jobs have always grown faster than the population.



NOTE: Shaded areas represent recessions as dated by the National Bureau of Economic Research.
SOURCE: Bureau of Labor Statistics



Chinese firms now export electronic components and back-office services that we once produced at home. What does this mean for the U.S.?

The China question

In the debate about outsourcing work to foreign countries, China has emerged as a particular concern. The specter of almost 750 million Chinese workers, eagerly competing for a wide spectrum of U.S. jobs, weighs heavily on the minds of politicians, media analysts, and the American workforce. The fact that China has around a \$137 billion annual trade surplus with the U.S. and accounts, by itself, for one-quarter of our huge trade deficit just adds to growing concerns about U.S. workers' ability to compete with China's increasingly skilled but low-cost labor force. China caused a further stir recently when it (briefly) became the top destination for foreign direct investment flows in 2002, displacing the United States from its traditional first-place position.

But let's keep China in perspective. For one thing, China's large share of our trade deficit is not really that unusual. Western Europe commands a 20 percent share today. And in the mid 1980s, Asia's Newly Industrialized Countries (the NICs) accounted for about the same share that China does now, while Japan's share was almost 40 percent. But as China's share has grown over time, Japan and the NIC's shares have shrunk—in part because Asian firms have also been outsourcing to China. Chinese workers now assemble components imported from the rest of Asia and export these goods to the United States—goods that Japan and the NICs once exported directly.

What's more, China's huge labor cost advantage probably won't last. In the mid 1980s, Japanese manufacturing wages

and benefits were about half of their U.S. equivalent, but lower labor productivity meant that its unit labor costs (which take into account both compensation and productivity differences) were about 70 percent of U.S. levels. Korean compensation measured 10 percent of U.S. manufacturing compensation, while its unit labor costs were only 40 percent of the U.S. level. Fifteen years later, in 2000, Japan's unit labor costs had risen to match those in the United States, and Korea's unit labor costs had closed to within 80 percent of the U.S. base. China's unit labor costs may be low today, but it is a good bet that they will not stay that way.

Just as economic development in the U.S. and Japan helped to raise global living standards, so too should China's emergence as a developed economy be widely beneficial to the U.S. economy. Many individuals will inevitably face painful adjustments as some jobs and industries continue to move offshore. But the resulting increase in U.S. real incomes should allow the many who benefit to help those who are harmed. Such measures might include broadening the scope of trade adjustment assistance, increasing the portability of pension and health benefits, and encouraging firms to invest in human as well as physical capital.

By contrast, the large gap between Chinese and U.S. students' skills in math and science probably should raise concerns about this country's ability to maintain its technological lead in future years. But we cannot blame China for that.

U.S. DVDs. And foreign computer and business service firms are now “insourcing” to the United States; for instance, buying or establishing a U.S. affiliate so that they can better manage their interactions with U.S. customers.

Foreign outsourcing has also helped U.S. firms to lower their computer hardware, software, and other input costs by obtaining these items offshore. These cost reductions have given the U.S. economy an indirect boost by allowing firms to attract business they otherwise would not have had and therefore to employ people they otherwise could not have employed. Analysts do not know how many outsourcing-related hires have offset the 1 million outsourcing-related layoffs over this period. But it is clearly wrong to compare the estimated 1 million gross layoffs caused by outsourcing with the net loss of 2 million jobs between late 2000 and late 2003. That would be like comparing an apple with half an orange.

In truth, it should be no surprise that the economic impact of these recent job shifts has been pretty modest to date. For one thing, imports of “other private services,” which include the business and professional services of most interest in the current debate, amounted to only 0.7 percent of GDP in 2003, while U.S. imports of “other private services” from all of developing Asia (not just China) amounted to less than 0.1 percent. That’s far too small to have a significant impact on U.S. output or job growth.

Second, while the U.S. is running a huge trade deficit overall, the nation continues to export more services than we import. Indeed, our trade surplus in “other private services” is growing not just overall but vis-à-vis developing Asia as well. Clearly, U.S. workers remain highly competitive in high-value-added services—even in Asia.

Most important, these job flows must be viewed in the context of the truly extraordinary dynamism of the U.S. economy—an economy in which almost 1 million people leave an old job and almost 1 million people start a new one every week. From time to time, over periods of a year or two, job separations may slightly exceed hires, and employment falls. But over the long haul since World War II, hires have exceeded separations and employment has grown decade after decade, despite our increased exposure to international trade. This relationship held during the period of U.S. business expansion in Europe in the late 1960s and 1970s, when the Europeans were sure that Americans would wind up owning all of Europe. The relationship also held in the 1980s, when the land under the Emperor’s palace in Tokyo was worth as much as the state of California and Americans thought the Japanese might buy up much of the U.S. And it held in the NAFTA years, despite that giant sucking sound. None of these episodes had any perceptible lasting impact on long-term U.S. job growth. The same will surely be true of the developing world’s emergence as an economic power. *

Rules of the game

TRADING & EXCHANGES: Market Microstructure for Practitioners is hefty both in size and in merit. Written by Larry Harris, a prominent financial economist at the University of Southern California currently serving as the chief economist for the Securities and Exchange Commission (SEC), *Trading & Exchanges* is a must-read for anyone interested in the good, the bad, and the ugly of securities trading. It clearly explains the details of the instruments, the institutions, the rules, and the motives that define the world of the equity trader. Harris illuminates the features of an interactive system in which the often-conflicting interests of traders and the market’s institutional arrangements affect the prices of securities and define the winners and losers in the trading game.

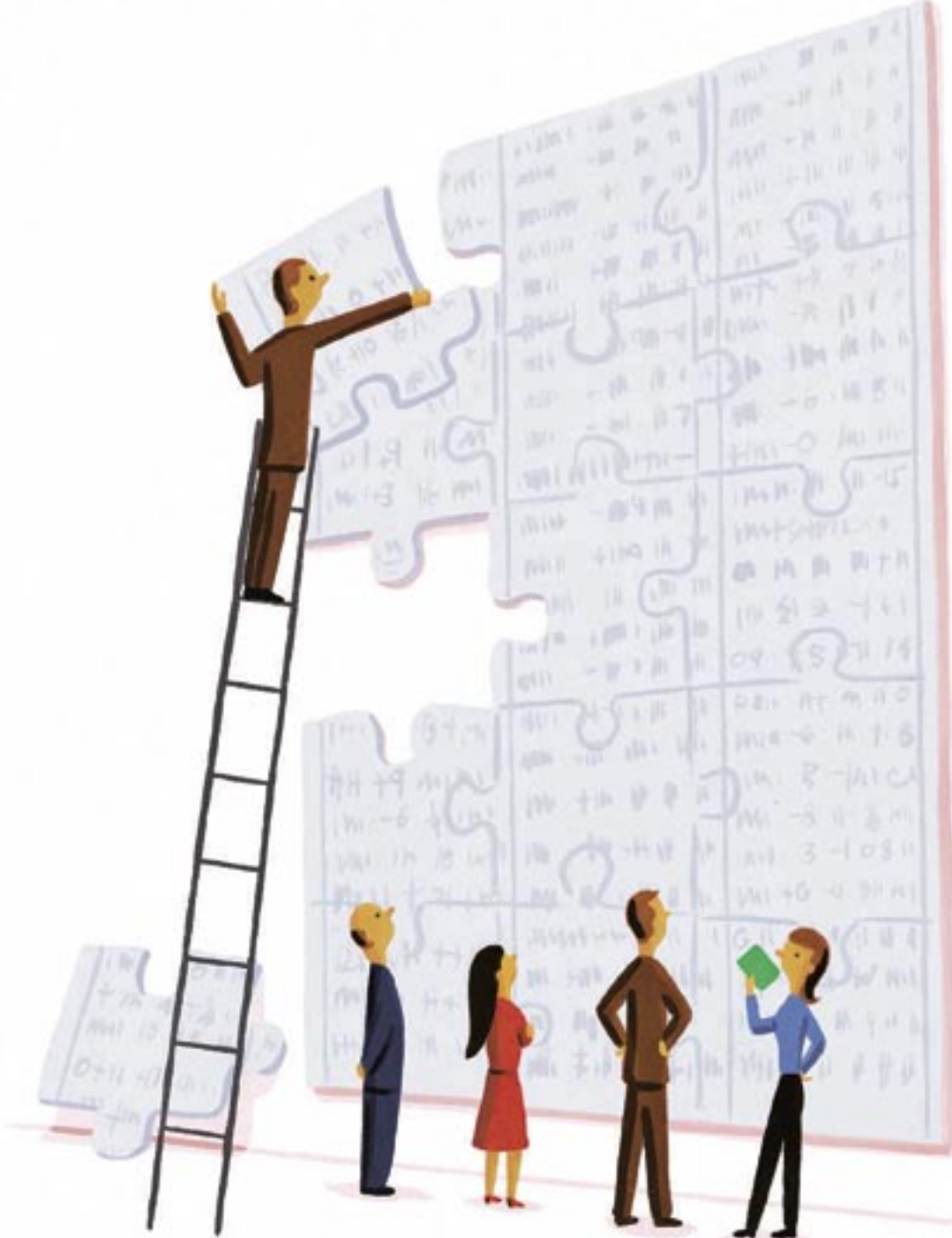
Trading & Exchanges: Market Microstructure for Practitioners

By Larry Harris

599 pages plus extensive bibliography and index
Oxford University Press,
2002

By Peter Fortune

Illustrations by Dan Yaccarino



Trading & Exchanges explains the instruments, rules, and motives that define the world of the equity trader

The book is well timed, coming in the midst of investigations of trading activities at mutual funds and at major exchanges, at a time of intense competition between different exchange mechanisms (the New York Stock Exchange's specialist system and Nasdaq's electronic system), and in an atmosphere of debate about the fundamental rules that have long proscribed traders' decisions. A thorough reading will enhance the practice of the practitioner, the economics of the economist, and the finances of the financier. Whatever one thinks about the recent travails of the SEC, it clearly has a remarkably well-informed chief economist for these trying times.

While it certainly has a scholarly foundation and a bit of algebra, the book is written for practitioners; a Ph.D. in economics or finance is not required. Rather, Harris guides the reader skillfully through an extremely complicated subject.

Each chapter begins with a clear statement of its goals and ends with a clear summary of its achievements. Meaningful terms are italicized to let the reader know that they will be used in subsequent discussion. In the early chapters, for example, the reader is introduced to a taxonomy of trading motives, such as *hedging*, *bluffing*, *arbitrage*, *news trading*, *utilitarian trading*, and so on. This taxonomy is not gratuitous—the terms define and highlight the different trading styles that exchanges and trading institutions must incorporate and serve, and the italics provide road signs that keep the reader on track. Harris has obviously thought carefully about how to help the reader carry a heavy load without unnecessary huffing and puffing.

The book is also liberally dosed with examples—real and hypothetical—that illustrate the concepts developed in the text. Many are anecdotes about market manipulations, deals gone



good or bad, and trading experiences. Want to read about *front running*? Or *quote matching*? You will find simple, clear examples in the sidebars, with supporting details in the text. Just reading the sidebars is an education.

So much for style. What can a reader get from this book? The answer is, more than any reviewer can report. The first quarter of the book sets the background by identifying the key elements of market microstructure—the instruments (primarily equity-related); the institutional arrangements and actors that facilitate trades (dealers, brokers, exchanges, specialists, floor traders, clearing and settlement agents); the key trading styles (investor, speculator, bluffer, hedger, arbitrageur, news trader); the types of orders that exist (market, limit, stop, market-not-fill, fill or kill); and the acronymic parties that regulate the securities industry (the SEC, the SROs, the CFTC). This portion of the book is not unique—plumbing diagrams for markets and transaction mechanisms are covered in many books. What makes Harris's treatment so valuable is the depth of the detail, the careful crafting of concepts used throughout the book, and his skillful application of economic insights.

One way to convey the flavor of the rest of this encyclopedic volume is to highlight some of the lessons that can be learned.

The trader's bread and butter is the ability to mask motives and hold information close to the chest

the price at which they are willing to sell too low, and selling when dealers set the price at which they are willing to buy too high. Uninformed traders, among whom Harris would count *dealers* (because they make their living on trade-making, not on special knowledge), *utilitarian traders* (who trade for reasons unrelated to knowledge of futures prices, such as diversifying a concentrated portfolio), and *noise traders* (whose trades are conditioned by whim, enthusiasm, and irrelevant information), will lose money in the long run to informed traders. Because trading is a zero-sum game—one gets above-average returns

This review focuses on insights that crop up repeatedly in Harris's book. One is the crucial role that information plays in shaping trading behavior and setting prices. Each trader is in competition with every other trader, and the ability to mask motives and hold information close to the chest is a trader's bread and butter. The second is the role that exchanges and other institutional arrangements play in providing liquidity—they make their money by giving traders a way to convert a security to a more liquid asset (such as cash) quickly and at low cost.

INFORMATION, ADVERSE SELECTION, AND THE BID-ASKED SPREAD

There are many economic situations where buyers and sellers are aware that they have access to different information. For example, a health insurance company knows that its customers have more information about their own health and habits than does the company. It also knows that customers who decide to buy insurance are more likely to have poor health than those who do not—an example of what economists call *adverse selection*. At a given premium, the insurance company would rather transact with healthy customers; but since it can't always distinguish them from unhealthy customers, it must charge a higher premium to everyone.

A security dealer is in a similar position. Its customers include both *informed* and *uninformed* traders. Informed traders have special information about the fundamental value of a security, perhaps from access to inside information or from highly developed forecasting skills. Informed traders typically profit from their information by buying when dealers set

only because someone else gets below-average returns—the money that informed traders make comes from uninformed traders.

Harris uses these insights to analyze the *bid-asked spread*—the spread between the price at which a dealer will buy (the bid price) and the higher price at which he or she will sell (the asked price). He identifies two components to the spread. The first is the minimum spread that covers the dealer's expenses: If the cost of financing inventory, renting space, acquiring trading technology, setting up shop, and the opportunity cost of time is 25 cents per share traded, the bid-asked spread can't long fall below 25 cents or the dealer will go out of business.

But to this the dealer adds an extra amount to reflect the differences in information that exist because the dealer trades with informed and uninformed traders, often without knowing which type is on the other side of the trade. That is, the dealer faces an adverse selection problem similar to the one faced by the health insurance company. Dealers would rather trade with uninformed traders and avoid informed traders—the mere fact that someone wants to trade with the dealer might reveal that the dealer's quotes are out of line. But when asked for a quote, dealers typically don't know if the other trader is informed or uninformed (although they do their best to find out). To be compensated for the risk that the trader is informed, the dealer will widen the bid-asked spread and collect more from both informed and uninformed traders. In effect, uninformed traders are paying the dealer for his losses on trades with informed traders. Moreover, trading costs are higher than in a world where informed traders are easily identified, and the volume of trading is lower. Differences in information result in markets that don't always work efficiently.

LIQUIDITY, LIMIT ORDERS, AND EXCHANGES

Exchanges exist to facilitate trades and provide liquidity to traders. But if the traders who supply valuable liquidity don't receive compensation, they are likely to provide less of it than is efficient. So exchanges have an incentive to set rules that encourage those trades to provide liquidity—although in some instances, these rules have other consequences as well.

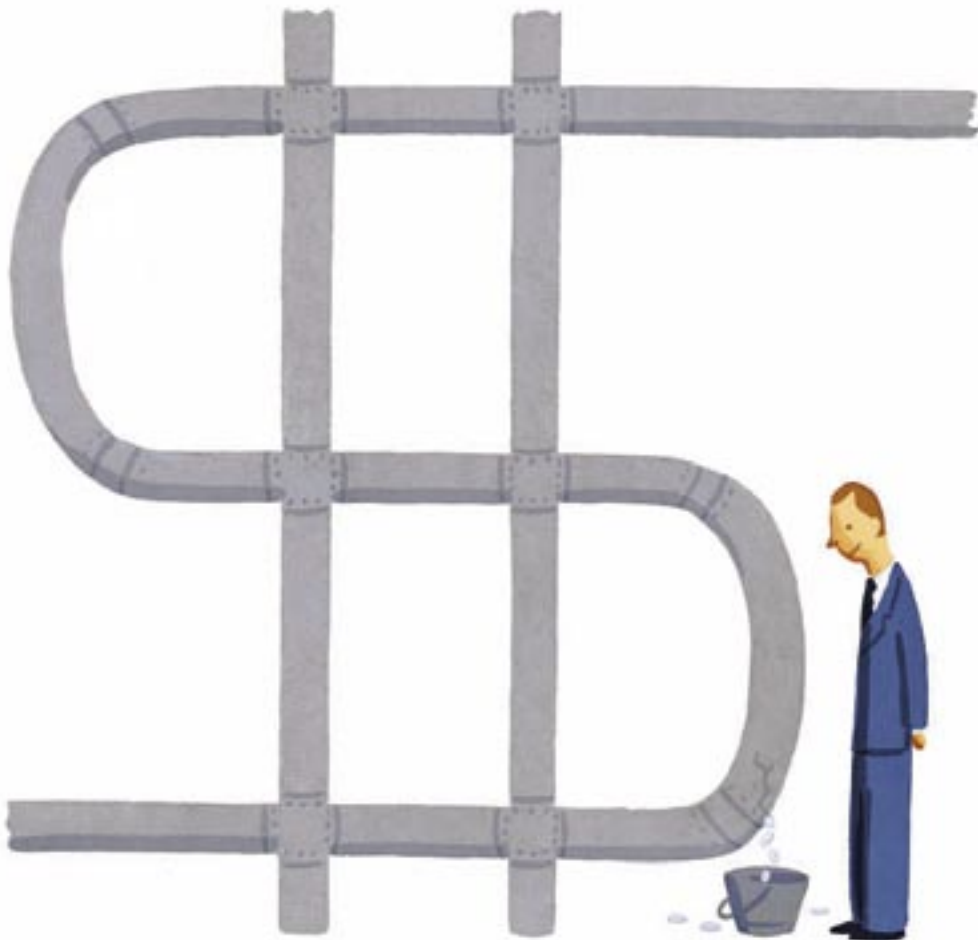


Dealers want to avoid informed traders and trade with uninformed traders, but can't always tell them apart

Market orders for securities, Harris notes, represent a demand for liquidity—traders submitting them want to trade quickly, and they are willing to pay a price to be able to do so. When there is an imbalance between market buy and market sell orders—more buys than sells, or the reverse—the demand for liquidity exceeds the supply. The missing liquidity can be provided by a *limit order book* that lists the orders to buy or sell specified quantities at specified prices.

For example, suppose that a market order to buy 100 shares of ABC Corp. remains unexecuted for want of a matching market sell order. If a trader places a limit order to sell 200 shares of ABC at \$75, the 100-share market buy order will be matched with the limit order and executed at \$75 per share; a limit sell order for 100 shares at \$75 will remain in the book awaiting a future market buy order for 100 shares or more. If no limit orders existed, ABC's price would rise to whatever level is necessary to generate a market sell order for 100 or more shares to match the buy order. Just as market orders represent a demand for liquidity, limit orders are a source of liquidity. Without limit orders, liquidity would be reduced and market buy orders would generate greater price volatility.

These limit orders have value to other traders—a limit order to buy 1,000 shares at \$50 is a put option (the right to sell a security



at a specified price) for a trader who owns the security or wants to sell short; he knows that he can submit a market sell order for at least 1,000 shares that will be executed at a price no lower than \$50. Similarly, a limit order to sell 1,000 shares at \$50 is a call option (the right to buy a security at a specified price); a potential buyer knows she can buy at least 1,000 shares at a price no higher than \$50. The limit orders have an option value because they allow market-order traders to make trades quickly—that is, to obtain liquidity—and diminish risk. But limit-order traders receive no compensation for this value, and thus they submit fewer limit orders than if they did receive compensation. This raises the number of market orders relative to limit orders—in other words, increasing the demand for liquidity while reducing its supply. As a result, the market is less liquid and prices are more volatile than is desirable.

But because exchanges compete with each other for business, they have an incentive to adopt rules that increase the supply of liquidity and reduce the inefficiency. In the case of limit orders, there are a number of ways to accomplish this. Harris not only gives a flavor of the different methods, but also discusses some of their unintended consequences.

The approach adopted by the New York Stock Exchange and some others is to introduce a trader responsible for smoothing

Exchanges
make
money
by providing
liquidity—
they let
traders convert
securities into
cash

prices—a *specialist*. The specialist matches market buy and sell orders and keeps a limit order book. During periods when liquidity is especially low, the specialist is supposed to enter buy or sell orders for its own account, thereby directly providing liquidity. But the specialist's services are not without potential adverse consequences. Recently, some specialist firms have been charged with using the information at their command to extract unseemly profits from traders. One way of doing this is to use their monopolistic knowledge of the order book—of the options provided by limit orders—to their advantage, as in *quote matching*. Another technique is *front running*—knowing that a large market buy order has been placed, the specialist might buy for his own account ahead of the customer, execute the market buy order to drive the price up, then sell the shares he had just bought. In short, a specialist system can enhance liquidity, but at some cost—unless the exchange's rules and policing are sufficient to rein in the specialist's greed.

Another way to enhance liquidity is to halt trading during periods when demand for liquidity is high. Prior to 1987, trading halts were informally managed by the individual exchanges. Since then, formal *circuit breakers*, quantitative rules triggering trading halts, have become standard. While the effect of trading halts is controversial, a debate that Harris discusses in detail, they do allow new information to be obtained and assessed, and the reopening of trading can create more stable prices than if trading had continued. Why? Read Harris's sections on the differences between *call markets* and *continuous trading markets*.

Yet another way to encourage liquidity is to reduce the value inherent in limit orders. This might seem counterintuitive, but traders are more likely to submit uncompensated limit orders if the information they provide is less valuable.

One way to reduce the value of a limit order is to increase the *tick value*, the minimum price difference at which trades can occur. A tick value of $1/8$ (12.5 cents per share) was once common; at present, a tick is a mere penny a share. At a penny, traders can make money more easily off the limit orders of other traders, because it is more likely that quotes will change by one cent

than by 12.5 cents, and thus more likely that an option will be exercised. In spite of this, major exchanges recently voluntarily “decimalized,” reducing their ticks to a penny, after a price-setting scandal brought the threat of Congressional action.

Finally, the value of a limit order depends upon other traders knowing that the order exists. If a trader can place a limit order without revealing its size, he or she has a chance to improve the average price received by selling first to the most optimistic and highest bidders, then to successively lower bidders until the block is gone. Alternatively if a trader wants to use limit orders to sell a large block of shares but is required to place a single order in the book, other traders know that buy orders can be executed at a price no higher than the price in the limit sell order. To encourage large orders, some exchanges, such as the Euronext Paris Bourse and two major Electronic Communications Networks (ECNs), Archipelago and Island, allow traders to hide the size of their limit orders.

EXCHANGE RULES AND ETHICAL BREACHES

Harris also devotes time to outlining the ways that breaches of ethics affect market prices and trading rules. Major exchanges have adopted rules to limit abuses by brokers and specialists. The *public precedence rule* prohibits a broker from placing an order for its own account ahead of an order for a public customer’s account; this prohibits front running. The *time precedence rule* prohibits execution of a market order before an earlier-submitted order has been executed for another customer; this prevents brokers from allowing one client’s order to front-run another’s. Brokers also are prohibited from *fraudulent trade assignments*, in which orders from different clients are executed at different prices, but the broker assigns the more profitable trades to favored clients (the allegation against Hillary Clinton’s commodity broker). In short, brokers cannot favor their own accounts or the accounts of preferred clients. Nor can a broker engage in *tipping* one client to the activities of another (think Martha Stewart). Sometimes honored in the breach, these practices will get the attention of the SEC—or of Eliot Spitzer.

Harris also documents practices classified as market manipulation. *Gunning a stock* occurs when a trader buys either the stock or a derivative of it (such as a futures contract) with the intent of triggering others to buy and to drive up the price. *Stop orders* facilitate stock gunning because they become market orders if the stock price reaches the stop level. Similarly, any strategy that introduces momentum into the demand for stocks, such as portfolio insurance, will serve the same purpose.

Harris does a thorough job of laying it all out. There are plenty of useful lessons in this book for the reader who is willing to pay attention, to be patient, and to read carefully—or who is looking for an excellent reference book when questions about market microstructure arise. *

Trading Shenanigans

FRONT RUNNING A broker-dealer receives a large buy order but executes a buy order for its own account or for a favored client before executing the first order, thereby profiting from price changes induced by that order.

GUNNING A STOCK A trader who knows that stop-buy orders¹ have been submitted buys the stock or a related derivative to trigger the stop-buy orders, then sells the stock after the price rises.

BLUFFING A trader with a large long position to sell submits a buy order hoping that other traders will interpret this favorably, creating a price increase after which he/she can sell his/her large position. Bluffers might also use wash trades² to create the appearance of increased volume.

TIPPING Also called inappropriate order disclosure, this is a form of insider trading in which a broker feeds a client privileged information, such as that a large order has been submitted by another client who is a senior manager of the company. Tipping of stop orders can also lead to gunning the stock.

FRAUDULENT TRADE ASSIGNMENT A broker receives multiple buy orders that are executed at different prices, but gives best prices to favored clients rather than assigning correct prices to each order.

RUMOR MONGERING Creating misinformation about stocks to profit from price changes.

PREARRANGED TRADING A broker arranges a trade with another broker without exposing the order to other traders who might give better prices. Allowed in some markets under certain conditions.

KICKBACKS A broker sends an order to be filled at a poor price, then takes a cut of the gains enjoyed by the other broker.

UNAUTHORIZED TRADING A broker trades on a client’s behalf without informing the client.

CHURNING A broker advises a client to buy or sell in order to increase commission revenues. Inattentive clients can be victimized by churning through unauthorized trading.

QUOTE MATCHING A quote matcher has information on the order book and uses it to limit losses. If he/she knows that there is a limit order to buy at \$75 or less, he/she can buy at \$75.05. Potential profits are unlimited but potential losses are capped at five cents per share.

Examples used are buy orders, but the same tactics work with sell orders.

¹ A stop-buy order becomes a market order to buy when the price of the last trade rises to the stop price. Stop-buy orders tend to create upward momentum by inducing price increases after prices have increased. Stop-sell orders work in the opposite fashion, becoming market-sell orders when the price falls to the specified stop price.


² Wash trades are the prearranged simultaneous submission of buy and sell orders for equal quantities. They create an illusion of increased volume without affecting prices or traders’ net positions.



Genetically modified seeds came to market eight years ago, yet producers and consumers still debate their costs and benefits.

By Molly Leshar
Photographs by Kate Swan

Seeds of

A man in a light blue shirt and dark pants is walking through a field of young corn plants. The field is filled with rows of green corn seedlings growing in sandy soil. The man is in the foreground, slightly out of focus, looking towards the right. The background shows a clear blue sky and a distant horizon line.

In 2003, U.S. farmers
grew two-thirds of the
world's biotech harvest.
So, consumer acceptance,
both at home and abroad,
affects the country's
producers.

change

FOR CENTURIES, scientists have found ways to refashion the foods we eat to make them healthier, tastier, and easier to grow. And these innovations benefited both farmers and consumers. So, when scientists introduced gene-altering biotechnology techniques into food production, it didn't take long for farmers to start planting the seeds. In the mid 1990s, U.S. farmers began widely cultivating genetically modified grains—particularly soybeans and corn. Farmers believed in the technology's potential to reduce costs and chemicals, and U.S. consumers did not voice many complaints about the new products. Today, the majority of U.S. processed foods contain at least some genetically modified ingredients.

But a number of consumers in other countries and environmental groups reacted differently. In the late 1990s, Greenpeace and Friends of the Earth made genetically modified crops a signature issue, intensively lobbying public opinion and governments. Some took an even more militant stance, vandalizing labs engaged in “Frankenfood” research and disrupting field experiments. European consumer sentiment turned hostile, and E.U. authorities responded in 1998 with a temporary ban on most imports of genetically modified crops. Likewise, Japanese officials limited the percentage of genetically modified content allowed in the country's grain imports.

This opposition directly affects U.S. farmers—especially farmers of soybeans and corn. The United States exports more soybeans and corn than any other country in the world, with about one-third of U.S. soybean and one-fifth of U.S. corn production bound for other countries. And while much of the global grain harvest goes into animal feed, where consumers accept genetically modified content more readily, the European Union and Japan still significantly decreased their importation of U.S. soybeans and corn due to strong consumer resistance.

But as U.S. farmers plant more acres of genetically modified seeds, the world moves further away from an easy choice about biotechnology in our diet. Cross-pollination and imperfect grain-handling procedures further scramble the food chain, as conventional and organic crops increasingly test positive for genetically modified content. As time passes, creating truly segmented markets for conventional and genetically modified grains becomes more difficult and more costly.

It's been eight years since genetically modified seeds first came on the market, yet consumers abroad are still wary. This sustained resistance compels decision-makers to think carefully about the relative costs and benefits of genetically modified foods.

Have farmers seen significant cost savings? What are the key environmental and food safety concerns? Why do some consumers reject genetically modified foods and how changeable are these attitudes?

All of us—farmers, consumers, seed companies, food processors and distributors, and government regulators—need to understand these issues to make informed choices about the future of biotechnology in the food supply.

SLICING AND SPLICING GENES

Biotechnology was born almost 150 years ago in the monastery garden of Gregor Mendel, who bred and crossbred pea plants to create new combinations of height, color, and shape. The insights he derived about genetic inheritance eventually allowed plant breeders in the twentieth century to create higher-yielding “hybrid” seeds. When combined with chemical inputs, hybrid seeds increased many crop yields dramatically.

In the 1970s, scientists pushed past Mendel's crossbreeding techniques when they discovered how to remove genes from one organism and insert them into another completely unrelated one, creating life forms that could not otherwise occur. This new, more precise approach opened the door to a wide range of possibilities for new and improved agricultural products by gene swapping among plants, animals, and organisms such as bacteria. Modern biotechnology now allows lab technicians to implant an Arctic flounder gene that resists cold temperatures into a strawberry plant to defend against frost. Similarly, scientists can also

Biotechnology was born 150 years ago in Me

insert daffodil genes that induce vitamin A production into rice to help prevent blindness in the developing world.

Yet the technology also raised concerns. In 1994, a small biotech company introduced the first genetically engineered food into U.S. supermarkets—the FlavrSavr tomato. The novelty of this tomato was that it would continue to ripen after being picked, without softening and while maintaining a deep red color and sweet taste. But, as with many genetically modified organisms,



ndel's garden; today, gene guns have replaced his cross-pollination techniques.



Reinventing the Atlantic salmon

Genetic modification of agriculture is not restricted to plants. Since the 1980s, scientists have been altering the genes of animals for medicinal purposes (cows that produce anthrax antibodies), industrial uses (goats that form spider silk in their milk), and human consumption (faster-growing fish). U.S. regulators classify genetically modified animals as “new animal drugs,” and unlike plant biotechnology, a single agency approves them for consumer use—the Food and Drug Administration (FDA). Currently, no genetically modified animals are authorized for human consumption in the United States. But the FDA is reviewing several applications, and a decision could come soon.

It is likely that the first genetically modified animal to hit supermarket shelves will hail from the sea. Fish are popular animals for scientists to alter genetically because they produce a large quantity of eggs that develop outside of the body. Aqua Bounty Technologies, headquartered in Waltham, Massachusetts, is at the forefront of genetic modification of fish. The firm has a pending FDA application for its AquAdvantage salmon, a genetically modified Atlantic salmon designed to

grow to market size in half the time of its conventionally farmed cousins.

The AquAdvantage salmon grows faster by producing growth hormone year-round, unlike conventional salmon that produce most of their growth hormone only in the summer months. To ensure continuous growth, scientists construct an artificial gene that contains genetic material from a Chinook salmon (to promote growth hormone production) and genetic material from an Arctic pout (to switch on the growth hormone in the winter). Scientists then insert the artificial gene into the salmon eggs, and breed the fish for four generations to ensure stable inheritance of the trait.

The primary motivation for the AquAdvantage salmon—and most genetically engineered aquaculture—is to lower costs. Fish farmers expect cost reductions from lower overhead, as the fish reach market size in less time, and from lower feed costs, since these fish convert food into body mass more efficiently. This last factor is potentially very important since feed costs rep-

resent one of the biggest expenses in fish farming. Aqua Bounty researchers estimate that costs will fall by about 40 to 50 percent.

But will consumers eat a genetically modified animal? The Pew Institute’s 2003 survey of American consumers shows that 58 percent oppose research on genetically modified animals. As

Americans are less comfortable with scientists altering the genetic make-up of animals than they are with gene swapping in the plant world.

with soybeans and corn, concerns about the environment and food safety come into play, but ethical issues also emerge. It seems that changing the genetic codes of animals strikes a little too close to home, as some envision

a slippery slope into the controversial modification of human genes.

Yet many in the fish farming industry remain sanguine, as they believe cost savings will overcome these concerns. Joseph McGonigle from Aqua Bounty noted, “The AquAdvantage salmon will probably require a price discount—consumer research suggests around 15 percent—but fish farmers will still come out ahead.” Only time will tell whether genetically modified animals pass the consumer taste test.

scientists spliced a gene marker into the tomato to indicate whether the target trait implanted correctly. In the case of the FlavrSavr tomato, the gene marker consisted of the target trait (delayed ripening) and the marker trait (antibiotic resistance). Researchers then grew the tomato plant in a mixture of water and antibiotics; if the plant lived, they knew that the delayed ripening trait had inserted correctly.

But gene markers contain proteins that become part of the plant, and unless processing destroys them, we consume the new proteins in our food. This led some consumer advocates to worry that people eating the FlavrSavr tomato might develop resistance to medication. So while the tomato tasted better than the average grocery-store variety, safety concerns dominated, and the tomato disappeared. Concerns about gene markers largely abated over time, but most research into producing higher-quality foods shifted to the back burner, focusing instead on making production cheaper, easier, and less polluting.

Seed developers fared better with two other types of genetic modifications—herbicide tolerance and insect resistance. Herbicide-tolerant crops contain an extra enzyme that renders the

of U.S. soybean and 40 percent of U.S. corn acreage devoted to some form of genetically modified production.

COST SAVINGS

The expansion of genetically modified crops in the United States suggests that farmers have seen some cost savings from using the seeds. After all, genetically modified seeds cost more, so farmers choose to adopt them only when the anticipated benefits exceed the costs. But how much do genetically modified seeds actually reduce farmers' costs?

Farmers planting herbicide-tolerant soybeans have seen cost savings. Soybean farmers decreased their exposure to the most toxic chemicals and reduced the number of herbicide applications, both cutting labor costs and markedly diminishing harm to themselves and consumers. However, genetically modified soybean yields are currently about 3 percent less than some conventional hybrids because it takes time to integrate the trait into higher-yielding varieties. Moreover, agricultural policy analysts note an increase in the amount of herbicides used in soybean production between 1995 and 1998—the most current data

Current research on biotech foods focuses on weed and insect control.

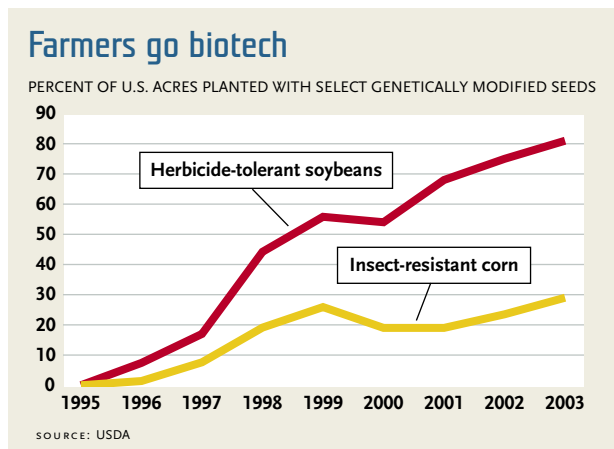
plant resistant to a particular herbicide. This allows farmers to remove weeds by spraying herbicide over an entire field, rather than taking care to distinguish the weeds from the soybean plants. Insect-resistant crops are genetically modified to contain the soil bacterium *Bacillus thuringiensis* (*Bt*), which kills corn borers and cotton worms. Because applying the insecticide can harm farmers, many prefer to plant genetically modified seeds to reduce the danger from spraying and inhaling the chemicals.

Industry analysts expect firms to continue on the current research and development path of breeding herbicide tolerance, insect resistance, and a combination of the two traits into more varieties of the major genetically modified crops. Today, herbicide-tolerant soybeans and canola and insect-resistant corn and cotton dominate genetically modified agriculture. These crops are grown in Argentina, China, South Africa, Canada, and the United States. In 2003, U.S. producers planted two-thirds of the global harvest of genetically modified crops, with 81 percent

available—controlling for the growth in soybean acreage. At least part of this increase could be attributed to the fact that herbicide-tolerant soybean farmers spray herbicide less selectively and thus use more of the chemical. But while lower yields and higher overall herbicide use decreased farmers' anticipated cost savings, farmers still cut costs, as genetically modified soybean acreage continues to increase.

Farmers planting insect-resistant corn, on the other hand, anticipated cost reductions from decreased pesticide use and increased yields. But the evidence on actual cost savings is less clear. These farmers face a complicated cost calculation because corn borer infestations, unlike weed levels, fluctuate widely. From year to year, farmers do not know how much damage corn borers will cause, making it hard to know whether buying the higher-priced seeds will be profitable. Moreover, unpredictable insect levels led U.S. farmers to spray corn borer insecticides on only 5 percent of their fields prior to the introduction of insect-resistant seeds. This may explain why insect-resistant corn seeds have not significantly reduced average pesticide use—and thus average costs.

The uncertainty surrounding insect-resistant corn seeds led the American Corn Growers Association—the largest trade association that promotes the interests of U.S. corn farmers—to create the “Farmer Choice - Customer First” program. This program aims to provide unbiased information to farmers about the potential pluses and minuses of planting genetically modified seeds. Ultimately, farmers who consistently experience higher-than-average corn borer infestations—due to weather or geography—see substantial cost savings from yield increases and decreased exposure to harmful insecticides. But the advantages appear significant for only a subset of farmers, and analysts forecast flat or declining adoption rates going forward.





Biotech food safety is a

THE ENVIRONMENT AND FOOD SAFETY

Farmers aren't the only ones who are looking closely at the effects of genetically modified agricultural products. Some scientists are wondering about the safety of genetically modified foods, although the size of the potential danger remains unclear.

The most serious environmental threats involve a loss of valued species and the movement of genetically modified genes to nontarget plants, insects, and animals. Concerns about the disappearance of certain species first emerged when Cornell University entomologist John Losey published a 1999 study in *Nature* suggesting that the pollen from insect-resistant corn harms the Monarch butterfly, which like the corn borer and the cotton worm, evolves through a caterpillar stage of development. This finding galvanized both environmental and consumer advocacy groups. They worried that other insects and animals could also be at risk, which could lead to an uncertain alteration to the delicate balance of ecosystems.

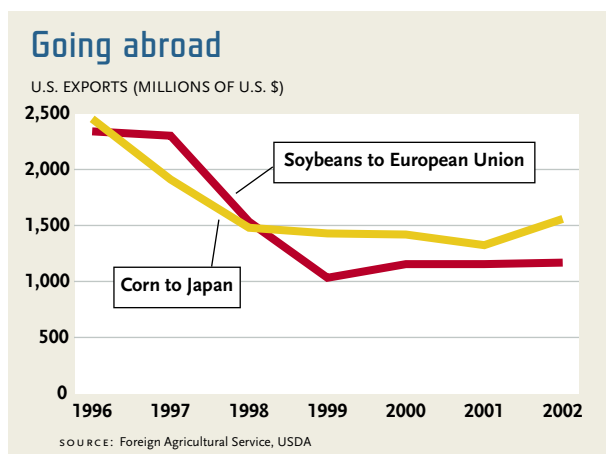
Gene flow—the transfer of genetically modified genes to nontarget organisms by natural processes, such as drifting pollen—also has raised concerns. Some worry that insects could develop a resistance to the *Bt* insecticide, or that herbicide-tolerant genes could spread to wild weeds to produce new breeds that would be increasingly difficult to eradicate. Although resistance is a natural part of evolution, and organisms instinctively become immune to chemicals that would have killed their ancestors, opponents of genetic modification raise the specter of “super” insects and weeds impervious to traditional chemicals. Gene flow also makes conventional and organic farmers uneasy, as

hot topic among scientists and consumers.

pollen from genetically modified plants could drift into their fields rendering them unable to sell their products as “nongenetically modified” or “organic.” And farmers planting genetically modified seeds worry about being sued if pollen drift from their fields is responsible for this intermingling.

Gene flow of this sort also reduces the possibility that marketers can untangle the mix of genetically modified and conventional products in the U.S. grain distribution system. And handlers compound the problem because they are not always equipped to accurately segregate the grains once they arrive at storage and transport facilities. The inadvertent mixing of genetically modified and conventional stocks has already caused trouble. In 1998, the Food and Drug Administration (FDA) approved genetically modified Starlink corn for use in animal feed, but it withheld approval for human consumption because of concerns that humans might be allergic to a new protein that it contained. Yet Starlink corn somehow found its way into taco shells (October 2000) and into bread rolls (March 2001). The ensuing controversies forced the maker of Starlink to discontinue its production at a loss of millions of dollars and to recall almost 300 food products from around the globe.

The Starlink episode raises another key issue—food safety. Gene markers, the downfall of the FlavrSavr tomato, were the



first food safety concern associated with genetically modified foods. Gene markers can code for just about any trait, but antibiotic-resistant markers are inexpensive and easy to use, making them standard in agricultural biotechnology research. Today, most experts believe that gene markers pose few risks to humans, including resistance to antibiotics.

Yet scientists don't always know how new genes will function within a plant, in other organisms up the food chain, and ultimately in the human body. Because interaction effects are not always predictable, some worry that newly formed proteins will cause unforeseen and possibly dangerous human allergic reactions. And if products are not labeled, as in the United States, it is difficult to guard against allergens. This led researchers at the National Academy of Sciences (NAS) to study whether genetically modified foods are more dangerous than foods altered by other means. They conclude that all foods containing new genetic combinations should be examined for safety, regardless of

whether the changes occurred by conventional breeding, genetic engineering, or another such method. But NAS researchers also find that the chances of unanticipated genetic changes—like new allergens—increase as the relationship between the target gene and the host grows more distant.

CONSUMERS SPEAK UP

U.S. farmers are the world's largest producers and exporters of soybeans and corn. So it is only profitable for them to plant genetically modified foods if consumers will buy them.

In the United States, consumer sentiment appears favorable. The International Food Information Council (IFIC), an organization that communicates scientific information about food safety and nutrition to consumers, has surveyed how the U.S. public feels about genetically modified foods since their introduction. The IFIC asks participants whether they think “[agricultural] biotechnology will provide benefits for you and your family within the next five years.” In 2003, a majority of those surveyed—62 percent—believed that the technology would provide benefits. However, this is down from 78 percent in 1997, so support has diminished. U.S. consumers also think that firms should inform them if they are eating genetically modified products. Researchers at California Polytechnic State

and the National University of Ireland found that 81 percent of respondents feel that mandatory labeling for genetically modified foods is “somewhat” to “very” important.

Other parts of the world seem more skeptical—like residents of the European Union, a major U.S. trading partner. The latest Eurobarometer survey on biotechnology sampled 16,000 European consumers and found that acceptance of genetically modified foods has continued to decline. Yet support also varies a great deal by country—81 percent of Greeks oppose genetically modified foods, as compared with only 30 percent of Spaniards. This consumer opposition led E.U. officials to introduce a stringent regulatory regime for genetically modified imports this year, although other motives aimed at punishing the United States may have also played a role.

Different cultural values at least partially explain the disparate consumer attitudes in the United States and Europe. Long-standing cultural mores about food, for instance, affect consumer sentiment. In Europe, native dishes and cooking styles are traditions that residents hold dear. Europeans spend more time than their U.S. cousins do on food preparation and a larger percentage of their budget on food (controlling for higher food prices), and three-hour meals are not uncommon. In contrast, U.S. consumers value quick service and convenience.

Cultural beliefs about how society should balance technological innovation with the preservation of nature also influence the cross-national differences in consumer purchasing decisions.

Moreover, these attitudes may be slow to change. Across cultures, food choices are bound up in many parts of life—religion (the sacred cow for Hindus), cultural identity (apple pie for U.S. residents), and social cohesion (cappuccino for Italians). As a result, the foods we eat often evoke an intimate and deeply emotional response. For instance, in the United States guinea pigs are pets; in parts of South America they are gastronomic delicacies. And advertising may not be able to easily change such closely held views. In fact, U.S. and European researchers find that increased media coverage about genetically modified products—even if it is positive—heightens concern.

So what does this mean for U.S. farmers and firms in the food business? In surveys on both sides of the Atlantic, consumers say that they are willing to pay significantly more for nongenetically modified alternatives—16 to 38 percent more in the United States and up to 50 percent more in parts of Europe. These premiums are much higher than the cost reductions associated with genetically modified seeds. However, perhaps talk is cheap, as people could be overestimating their willingness to pay more for nongenetically modified products.

FOOD FOR THOUGHT

Many firms are beginning to respond to consumer interest in nongenetically modified products. Companies like Frito Lay, McDonald’s, and Gerber baby food (whose parent company, ironically, manufactures genetically modified seeds) have set

Food choices are deeply rooted in emotion and cultural identity.

Researchers at Ghent University found that Belgian consumers rejected genetically modified foods primarily because of negative attitudes toward biotechnology generally, rather than from a consideration of the pros and cons of a particular genetically modified food item. Further, Europeans appear to value environmental preservation more than those in the United States do, as demonstrated by Europe’s early support for recycling and the Kyoto Protocol. Meanwhile, U.S. consumers tend to adopt new technologies more quickly than do Europeans (apart from the cell phone), as shown by high U.S. adoption rates of home computers and personal digital assistants.

Recent experiences may be another key factor. Many U.K. consumers are dubious about their government’s ability to regulate food, in part because of their memories of its mishandling of the mad cow epidemic still resonate. In fact, a 2001 survey by researchers at the University of Illinois asked U.K. and U.S. consumers whether they believed that “the government ensures the safety of the overall food supply.” The survey found that only 25 percent of U.K. consumers trust their government to guarantee food safety, compared to 76 percent in the United States.

Differences like these will make selling genetically modified foods in Europe—and perhaps in other parts of the world—difficult. Consumers in Japan, Australia, New Zealand, South Korea, and Indonesia have also been wary of biotech foods, and as a result their governments have imposed import restrictions.

limits on the genetically modified ingredients used in their products. These voluntary restrictions came about because of the desire to sell in the European and Asian markets, as well as increasing pressure from Greenpeace and other advocacy groups. And as U.S. consumers show an appetite for natural and organic foods—organic sales were up 20 percent last year—natural food stores continue to sprout up across the country.

But segmented markets for genetically altered and conventional grains might cause other problems—including price increases for consumers. Crops must be stored and shipped separately, and verification testing is time-consuming and expensive. Further, costs will rise as pressure to reduce identification errors increases. One study estimates that a zero tolerance for genetically modified content might raise soybean costs as much as 50 percent, but a 1 percent tolerance might increase costs by only 15 percent. So while large-scale segregation may seem like an easy solution, the consequences are not clear-cut.

As with most new technologies, agricultural biotechnology is neither a panacea nor Pandora’s box. But as different ideologies and attitudes continue to clash, the debate about biotechnology in the global food supply persists. History shows that science alone will not transform opinions. In fact, deeply felt emotions may make it quite difficult to change consumer attitudes. And while nobody can foretell the future, it is clear that both economic and social concerns matter. *

Regulating genetically modified foods

The United States and the European Union, along with other countries such as Japan and Australia, have each developed procedures for testing and introducing foods produced by genetic engineering into the marketplace. Most developing countries do not have such rules, and no overarching framework of international law exists.

In the United States, the creation of genetically modified organisms did not prompt new rules or substantial changes to existing laws governing food and environmental safety. U.S. regulators look at the chemical properties of genetically modified foods with a mass spectrometer, and if they line up with the conventional variety—as all genetically modified crops have to date—regulators determine that the plants are “substantially similar.”

This means that the regulation of genetically modified foods falls under three different jurisdictions—the Environmental Protection Agency (EPA), the United States Department of Agriculture (USDA), and the Food and Drug Administration (FDA).

The EPA regulates pesticide, herbicide, and fertilizer use and sets limits on the amount of harmful chemicals allowed in agriculture production. So, if a genetically modified food incorporates a chemical into the plant, as with insect-resistant corn, then the EPA plays a role in the approval process. The USDA issues permits for field trials and reviews petitions by seed developers to commercially release genetically modified seeds. The FDA has the broadest mandate as the supervisor and coordinator of licensing and testing of genetically modified foods (excluding meat, poultry, and dairy, which the USDA monitors). Seed developers must also consult other U.S. laws, including various state seed certification rules. U.S. law currently does not require labels for



The patchwork approach to regulation allows countries to tailor the rules to reflect their own attitudes, but it also creates confusion and overlap.

they contain proteins that do not exist in conventional varieties. In 1998, the European Union temporarily banned most new genetically modified foods from crossing its borders while officials created a new regulatory regime. In the meantime, they continued to import a small number of crops approved prior to the ban, but with detailed labeling requirements. The European Union recently unveiled their new regime, which includes strict admission, labeling, and tracking requirements, as well as a 0.9 percent threshold for “accidental contamination” of both food and feed grains as they move through the supply chain. Individual E.U. countries may also have additional rules, such as crop registration procedures. In May 2004, a variety of insect-resistant corn became the first new genetically modified food allowed into the European Union in six years. But biotechnology supporters should be cautious, as the approval process was slow, difficult, and costly.

genetically modified food products.

In contrast to U.S. regulators, E.U. authorities consider genetically modified crops “novel foods,” in part because

Two sets of international agreements also apply to genetically modified foods. The first is the Cartagena Protocol on Biodiversity, ratified in 2003 by 82 countries including European nations and Japan, but not the United States. The Protocol seeks to protect countries from risks associated with imports of genetically engineered organisms. Among other things, the Protocol requires exporting countries to provide information about the way scientists modified the food item, label all genetically modified products, and adhere to the importing country’s national biosafety laws and risk assessment procedures.

The other body of international law concerning genetically modified foods resides in the World Trade Organization (WTO). To prevent discrimination based on nationality, the WTO requires a country refusing imports to base its decision on scientific evidence of food or environmental safety. It was on this basis that in the summer of 2003, the United States, Canada, and Argentina began the WTO process of challenging the legality of the European Union’s moratorium on new genetically modified organisms. Such disputes, a direct result of the patchwork approach to regulating genetically modified foods, will endure so long as nations cannot agree to a single set of standards.

Running in cycles

Ups and downs in the market for downtown office space. By Jane Katz

LAST SPRING, more than two years after the end of the recession, downtown Boston still had lots of empty offices. The vacancy rate for prime office space hovered above 10 percent, in the neighborhood of its recent peak, with suburban rates substantially higher. And asking rents for downtown Class A space at \$30 to \$40 per square foot were still declining. The story was similar in Hartford (vacancy rate 20+ percent) and in other parts of the country such as Chicago, San Francisco, and San Jose (15+ percent). Nationally, the downtown vacancy rate averaged almost 14 percent with rents falling about 4 percent year over year.

Yet only a few years earlier in 2000, the U.S. vacancy rate in downtown office markets had been about half that level. In Boston, prime space was even tighter, with vacancies running below a minuscule 2 percent and asking rents topping \$60 per square foot. But then the stock market declined, which was followed by a national recession. In the aftermath, many small companies failed and many large technology, telecom, and financial services firms cut back hiring, resulting in the soft rents and empty space that persisted into autumn 2004.

This was not the first time that the market for corner office suites and Dilbert-style cubicles had displayed a boom-and-bust pattern. But compared to the last big bust in the early 1990s, most downtown office towers held their value, and most large developers managed to avoid bankruptcy even as vacancy rates rose to comparable levels. "I'm back from the dead," the developer of Boston's 33 Arch Street told *The Boston Globe* in April. "Everyone was burying me six months ago."

Why are office markets prone to cycles? Why was the recent cycle less bloody than the one that ended in the early 1990s? And does this mean smoother sailing in the future?

PAST HISTORY

Cycles of over- and under-supply in real estate have long been more the rule than the exception. As far back as the 1930s, Homer Hoyt identified real estate cycles in his classic study of the Chicago real estate market from 1830 to 1933.

But by all accounts, the boom in the 1980s and the subsequent bust in 1989-92 was especially severe. Following relatively low levels of construction in the 1970s, the 1980s featured a period of massive building. Nationwide, metro-area office space increased by more than 1 billion square feet, or 95 percent, from 1980 to 1992, while office employment rose only about 40 percent, according to data from Torto Wheaton

THE MARKET FOR CORNER SUITES AND SMALL CUBICLES HAS LONG SHOWN A PATTERN OF BOOM AND BUST. WHAT ACCOUNTS FOR THESE CYCLES?

OFFICE (S)PACE

It can take five to ten years before a new downtown office tower is ready to be occupied. By that time, market conditions can change quite drastically. | BY MARC ROSENTHAL



Research. About half the nation's office space in existence in 1992 was built during the 12-year period after 1980.

When the bust came, vacancy rates reached 15 percent and higher in many areas of the country. Rents fell sharply (as much as 25 to 50 percent) and property values dropped, too—"in some cases, precipitously," note Lynn Browne and Karl Case in their analysis in the Boston Fed volume, *Real Estate and the Credit Crunch*. In a separate study for Brookings, Case cites the example of the 1.4 million square foot Wang Towers in Lowell, Massachusetts, which sold in 1994 for \$525,000, or a mere 38 cents a square foot.

DOWNTOWNS ARE OCCUPIED BY BIG COMPANIES, AND THE LAW FIRMS, BANKS, ADVERTISING AGENCIES, AND OTHER BUSINESSES THAT SUPPLY THEM

The consequences were more than just empty offices. Cash flows fell, sometimes below the debt service of the construction loans that developers had received from banks. In other instances, the decline in a building's market value put the developer in violation of the terms of its loan, forcing the bank to consider the loans "nonperforming" even if no interest payments were immediately due.

Meanwhile, longer-term lenders (such as insurance companies), who had been expected to assume finance of the finished buildings, dried up as the market deteriorated. Banks (sometimes under supervisory pressure) went after whatever developers' assets they could in a high-stakes game of musical chairs. In the end, hundreds of developers failed, as did many banks. The cycle was particularly pronounced in the Northeast and in New England, where the Bank of New England, one the region's largest with

\$32 billion of assets, was closed by the Federal Deposit Insurance Corporation in January 1991, imposing net losses on that agency of \$733 million. Many remaining banks responded by tightening their credit standards, contributing to the depth of the recession and subsequent slow recovery. Economists Patric Hendershott and Edward Kane estimated that economic losses from oversupply reached \$130 billion.

The extra space wasn't fully absorbed until years later, when demand finally recovered enough to make new projects look feasible. In Boston's central business district, there wasn't a single new major office project completed between the opening of Two International Place (in 1993) and the World Trade Center East (in 2000).

FORCES OF BOOM AND BUST

Most downtown office space houses top managers and other corporate staff for large industrial and financial services companies and the business services that supply them: law firms, banks, insurance companies, accounting firms, business consultants, and advertising agencies.

Thus, the main driver of the demand for office space is economic growth, and especially an increase in office employment. And the proximate cause of a bust is usually an economic shock that results in a drop in demand for office workers and the offices that house them. Recessions, however, don't always produce a real estate bust; the recession of 1980-82, which was not preceded by a major building boom, saw relatively low vacancy rates and rent declines.

In addition, each cycle has its own unique circumstances. It is widely believed, for example, that changes in the tax laws were a contributing factor during the 1980s. Case notes that in the Tax Reform Act of 1986 (in conjunction with the Economic Recovery Tax Act of 1981) "drastically altered the tax landscape for real estate" by reducing marginal tax rates, repealing the capital gains exclusion, altering passive loss rules, and lengthening the depreciable lives of assets. This time around, the bust was probably exacerbated by the attacks on September 11, 2001, which not only further slowed the economy, but also made space at the top of a high-rise office building in a major downtown city look a little less attractive.

But beyond particular events, office markets also appear to exhibit cycling that is partly independent of national macroeconomic conditions (see chart on page 28). What might account for the particular pattern in office markets?

Timing is everything. Office buildings take a long time from when a project is conceived to when the offices are ready to be occupied. Buying the land, obtaining permits, designing the building, and putting together financing all take time—and that's before ground is even broken. In densely populated downtowns, where traffic patterns and infrastructure are already in place, construction can take several years. By the time the building is built, as many as ten years down the road, demand may have dried up. International Place Two, with 750,000 square feet of office space, was first conceived in 1981, announced in 1983, approved by the city in 1985, broke ground in 1988, and didn't open until 1993, by which time the vacancy rate in downtown

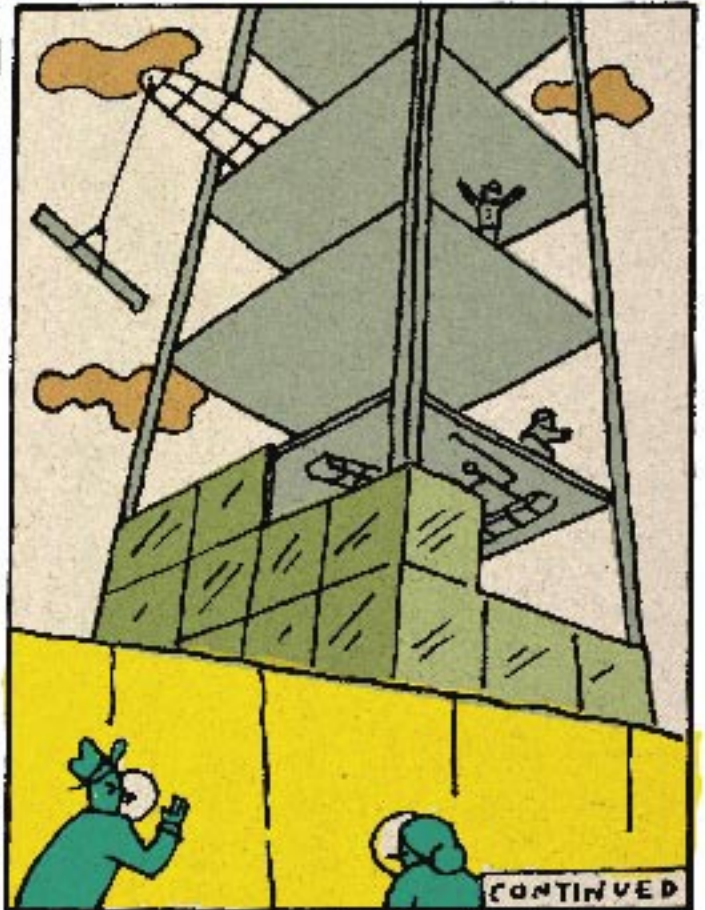
Recently opened in downtown Boston

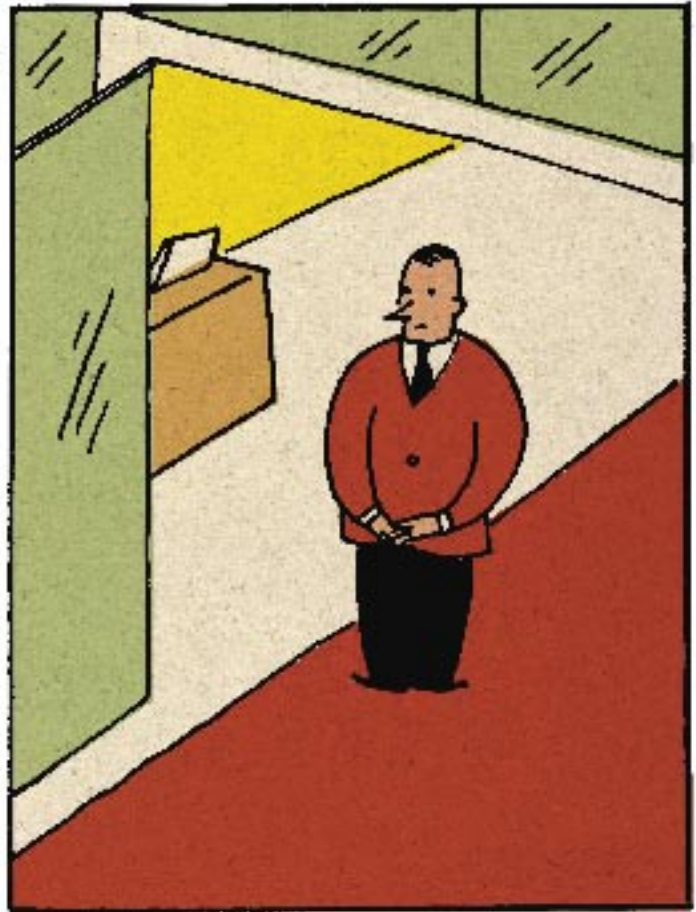
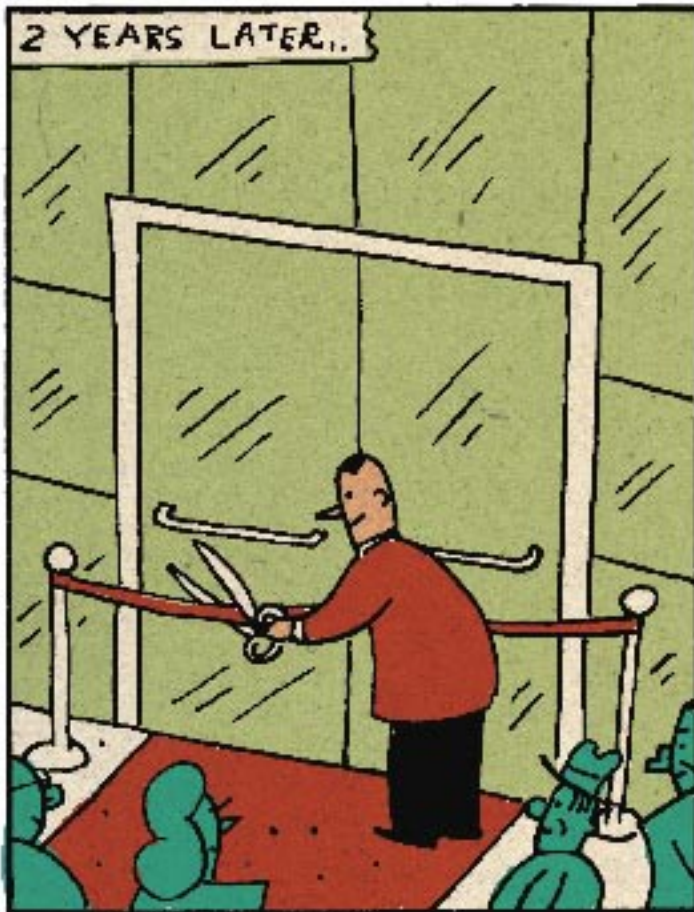
Boston has seen 11 major office buildings built or renovated since 1999. Most are a relatively modest 500,000 to 600,000 square feet, far smaller than the Prudential Tower (1965) at 52 stories high and 1.2 million square feet or the John Hancock Tower (1976) at 60 floors and 1.6 million square feet. Of the 11, two were developed by publicly traded companies, and five are now at least partially owned by publicly traded companies.

Building	Floors	Square feet (1,000's)	Year opened/renovated
10 Post Office Square	14	450	Renovated in 1999; built in 1929
World Trade Center East	16	504	2000
10 St. James Avenue	20	585	2001
111 Huntington Avenue*	36	867	2001
Independence Wharf*	14	330	Renovated in 2001; built in 1926
World Trade Center West	17	532	2002
131 Dartmouth Street*	11	369	2002
One Lincoln Street*	36	1,020	2003
601 Congress Street*	16	400	2004
33 Arch Street	33	608	2004
100 Cambridge Street	22	565	Renovated in 2004; built in 1965

NOTES: Includes buildings zoned primarily as office space, with at least 10 floors and 100,000 square feet of usable space. * Indicates building was developed or is now at least partially owned by a publicly traded company.

SOURCE: Spaulding & Slye Office Report, Summer 2004





Boston was 14 percent.

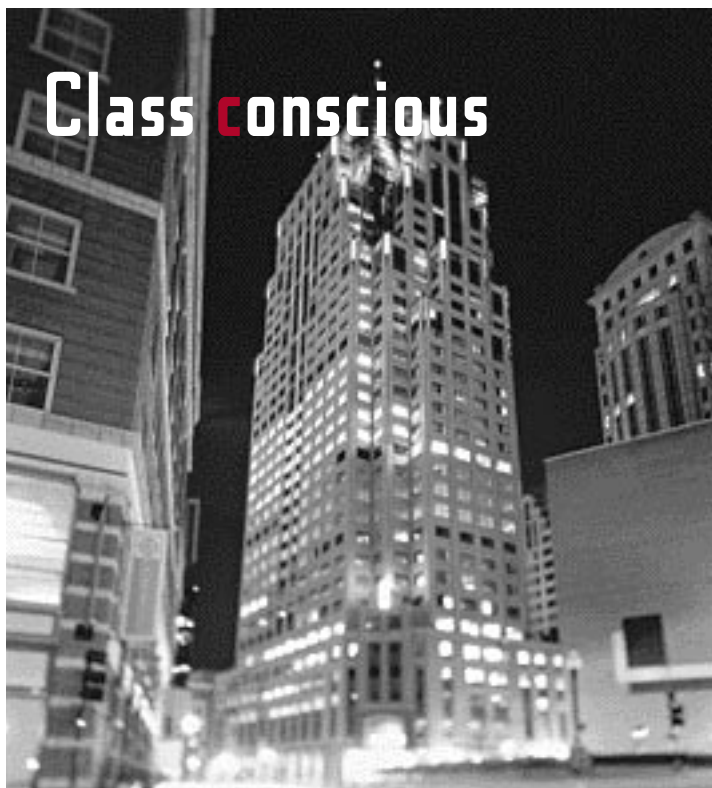
Even though developers know there will be lags, accurately predicting demand that far in advance is extremely tricky. And the difficulties can be compounded when accurate information is hard to obtain and interpret. To begin with, in downtown markets such as Boston, each building has unique attributes and location, and contracts are complicated, confounding the task of making accurate forecasts. In a slack market, concessions such as free rent and improvements are common, and can mask rent declines. And sometimes building owners hold space vacant as inventory for future demand or hesitate to adjust rents down when occupancy levels fall, as they wait for higher rental rates before leasing space.

An additional factor in periodic overbuilding: In major cities, new supply office space typically comes in big chunks. This suggests an incentive for the developers to try and get there first and snap up prospective tenants and financing. This can lead to overbuilding, as a number of firms jump in early thinking they can push out or discourage others from entering the market as well.

Financing and capital flows. There are a number of factors in the ownership and flow of financing that have also been implicated in historic patterns of boom and bust. Commercial development in the United States has historically been dominated by highly leveraged entrepreneurs. Often, they were men with outsized ambitions and reputations who were attempting to build vast personal fortunes and were willing to take on huge risks. They typically borrowed heavily from banks to finance their buildings, and their various projects were often linked—with one project providing backing for another; prior to the early 1990s, individual properties could carry mortgages representing as much as 90 percent or more of the building's construction cost or market value. As for the banks, the properties themselves and personal wealth and reputation of the developer seemed sufficient security for the loan, while rental income from tenants was presumed to be enough to cover the interest payments. Such "enthusiastic financial markets both nationally and locally" were part of the fuel in the 1980s building boom.

These forces for expansion could also be exacerbated by the incentives created by fees paid only upon doing the deal. Land assembly profits, consulting fees, project management fees, and bonuses at lending institutions can all be reasons why certain parties might push a deal once it's started—even though the deal might not make economic sense by completion.

So long as the economy was strong, building values were rising, and capital was flowing into the sector, everything worked out fine. But when values fell, as they did in the late 1980s and early 1990s, the net worth of many projects—which could actually be small relative to the size of their assets (and liabilities)—fell to zero quite quickly. And the revenue streams produced by tenants in many of the buildings shrank below the level necessary to cover interest payments. In the boom and bust of the late 1980s and early 1990s, this led to a cascading series of bankruptcies among developers and failures among banks who lent to them.



The United States currently has approximately 11 billion square feet of office space. About half is located in the central business districts of major metro areas, and half of that sits in only four downtowns: New York (29 percent); Chicago (10 percent); Washington, D.C. (7 percent); and Boston (5 percent).

SPACE ON TOP FLOORS tends to be the most desirable and the most expensive. Vacancy rates are often below those on lower floors; in April 2004, the vacancy rate for space above the 20th floor in Boston was 6.7 percent compared to 12.8 percent on lower floors.

SUBURBAN office buildings also tend to have lower rents and higher vacancy rates than downtown.

SUBLEASED SPACE is space rented from a tenant, and is generally less desirable and therefore cheaper than space leased directly from an owner. The sublease length is limited to the number of years left on the original lease, and the tenant may be less willing than an owner to make improvements. Still, subleased space is a close enough substitute that the release

of a significant amount will affect rents on the direct lease market.

Office space is typically divided into three classes. Designations are subjective and made by local brokers based on geography, amenities, aesthetics, and maintenance—and different data sources may use different methods of classification.

CLASS A is premium space in good locations with unique tenant layouts and high-quality materials and workmanship. The buildings are generally new or recently renovated with modern mechanical systems and above-average maintenance and management. Class A space generally includes all major downtown office towers and accounts for about two-thirds of all downtown office space (square feet) and about one-third of all downtown office buildings.

CLASS B is utilitarian space without special attractions, and with average layouts and maintenance.

CLASS C is utilitarian space with below-average layouts and maintenance.

CHANGES IN THE 1990S

Although vacancy rates were almost as high as in the last bust, this most recent cycle has seen relatively few bankruptcies. In January 2004, the *Wall Street Journal* even called real estate “an island of creditworthiness.” Real estate companies hadn’t had a corporate debt default in 10 years, and commercial mortgage delinquencies were 0.4 percent—compared to 7.5 percent in 1992.

IN THE PAST, COMMERCIAL DEVELOPMENT WAS DOMINATED BY HIGHLY LEVERAGED ENTREPRENEURS WILLING TO TAKE ON BIG RISKS TO GET RICH

Part of the explanation was a more modest expansion in total space as compared to the earlier period. Nationwide metro-area office space grew only 17 percent from 1992 to 2003,

while office employment grew 30 percent. In metro Boston, commercial office space grew by 18 percent, slightly less than the increase in office employment, which was about 25 percent over the period. Moreover, while more than 10 new towers went up in downtown Boston, on average they were relatively modest in size compared to the 1980s when One International Place, 125 High Street, One Financial Center, and Exchange Place all opened, each with approximately one million square feet of office space.

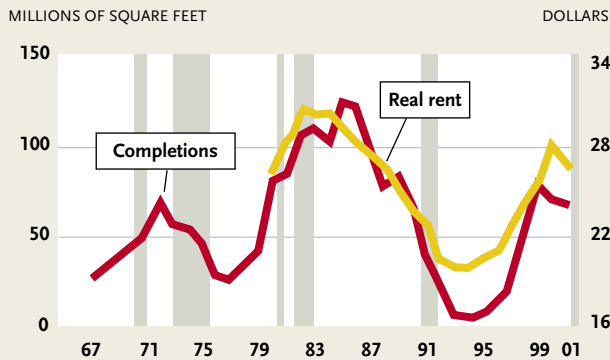
Many observers attributed at least some of the moderation to changes in ownership structure and an increased role of public

capital markets in providing finance. On the equity side, real estate investment trusts (REITs) became more prominent during the 1990s. REITs were originally developed in the 1960s to overcome the difficulties faced by small investors in commercial real properties, which tend to be large, expensive, and concentrate too much of a small investor’s portfolio in one place. The trusts were made free of income tax at the enterprise level and were required to distribute 90 percent of their net taxable income to shareholders annually—the idea was to create a passive instrument for managing previously acquired wealth.

By the end of the 1990s, many REITs had grown into large, vertically integrated firms doing everything from acquiring land to developing and owning buildings to even managing large properties for other companies.

Starting in the 1990s, many also went public. Prudential Real Estate Investors estimates that about 8 percent of the nation’s office space (in square feet) is owned by public companies. Public ownership is generally higher in bigger buildings and in large urban areas; SNL Financial estimates that more than one-third of Boston’s downtown office space is currently held by REITs. Beacon Properties, a Boston real estate company owned by the Leventhal family, went public in 1997 and then merged with Equity Office Properties, the nation’s largest REIT, which also went public in 1997. Originally founded by Sam Zell in

THE OFFICE CYCLE

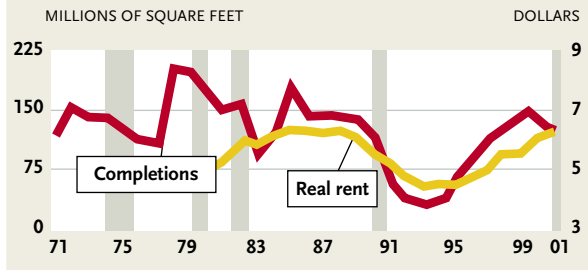


Commercial patterns

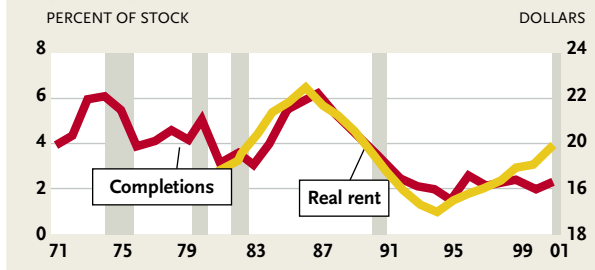
Over the last 30 years, the office market has experienced two major supply booms while the United States has seen five cycles of recession and recovery. Thus, the tendency to overbuild may be more than a reflection of the business cycle. Note that in all four commercial property markets, rent changes seem to follow supply flows.

NOTE: Dollars are indexed to 2000 for office and industrial markets; 1999 for retail and hotel markets. Shaded areas are recession periods defined by the National Bureau of Economic Research.
SOURCE: *Real Estate Cycles and Outlook*, 2002, Torto Wheaton Research

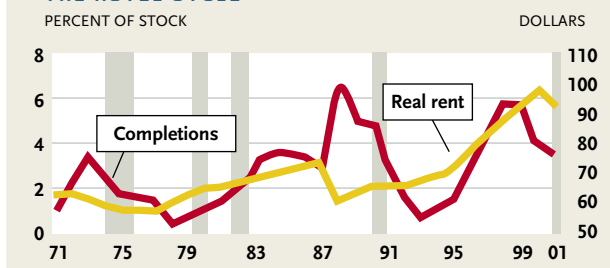
THE INDUSTRIAL CYCLE

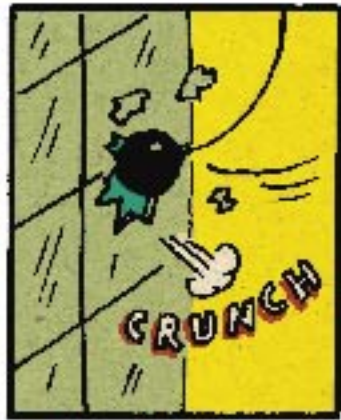
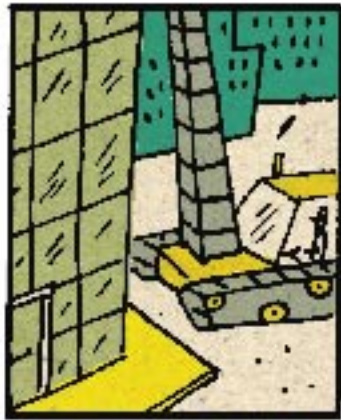


THE RETAIL CYCLE



THE HOTEL CYCLE





1976, Equity Office Properties has quadrupled the space in its portfolio since 1997 (currently about 12.4 million square feet of office space) and has a capitalization of \$25 billion. Its portfolio includes many downtown Boston properties, including 100 Summer Street, 225 Franklin Street, and 60 State Street. Another large REIT, Boston Properties, went public in 1997; its portfolio includes the Prudential Tower, 101 Huntington Avenue, and 111 Huntington Avenue. Both Equity Office Partners and Boston Properties are traded on the New York Stock Exchange.

With public companies come public scrutiny by boards and shareholders, including pension funds and other sophisticated institutional investors, all of which impose market discipline. Notes Chief Investment Strategist Doug Poutasse of AEW Capital Management, “Every day there is a stock price.” There is also a raft of professional analysts following the stocks and the industry, none of whom existed in the early 1990s.

In contrast to many of the high-profile developers in the 1980s, a typical REIT has about half debt and half equity and thus is only about 40 to 50 percent leveraged. If property values fall, this means a larger equity cushion helping to prevent bankruptcy. And even if the REITs go under, the losers are private investors, not the banks or the public agencies that insure them.

On the lending side, there has been an increase in the market for securities backed by commercial mortgages. Similar to the market for home mortgages, commercial mortgages can now be sliced and diced according to risk, property type, and geographic area, and the resulting pieces are repackaged and sold in public bond markets. Some of these bonds are designed to have extremely low risk, while others are quite risky.

The riskiest, says Poutasse, are bought by about five relatively small companies that are experienced at assessing and taking such risks. And even if they fail, they are not large enough to cause a collapse of the entire market.

Bank lending for construction loans also seems to have become more conservative. William Wheaton, professor and Research Director of the MIT Center for Real Estate observes that in the 1990s development construction lending became syndicated, with several banks taking part. This may have introduced more discipline and oversight into the process of making construction loans.

All these factors may have contributed not only to the relatively modest expansion in new downtown towers, but also to fewer buildings being financed without at least some tenants lined up in advance. For example, 111 Huntington broke ground with a major law firm as an anchor tenant. World Trade Center East had several tenants, including Fidelity, when it began construction. The “back-from-the-dead” developer of 33 Arch Street, who had built on spec—that is, without tenants—was more unusual in the 1990s than in the 1980s. So even with high vacancy rates, in many cases tenants were holding a large chunk of the space—vacant or subleased—and landlords were still receiving rent. Also, developers had more latitude to cut deals with tenants in trouble without first having to get the bank’s approval.

Finally, in contrast to the severe liquidity crisis that developed

in the early 1990s, this time around the stock market decline sent capital flooding into the real estate market, notes Poutasse, as people looked to invest in buildings. According to Prudential Real Estate Investors, “Public companies’ equity capital-raising rose for the third consecutive year (in 2003). REITs raised a total of \$13.3 billion in new equity capital, the most since 1998.” This is yet another reason why the value of many buildings has held up to the decline in market rents and relatively soft rental market.

SMOOTHER SAILING OR BETTER LUCK THIS TIME?

Almost all observers note these changes and think they were important factors in the relatively bloodless downturn during this cycle. In his Brookings paper, Karl Case concludes, “Although commercial real estate markets remain inherently volatile, many of the destabilizing factors of the 1980s are gone. New construction has been fairly modest. Given the experience of the early 1990s, financial institutions, pension funds, and insurance companies have become significantly more cautious in their real estate lending practices. The basic tax treatment of real estate has not changed dramatically since 1986.”

David Geltner, professor and Director of the MIT Center for Real Estate, agrees that public markets make a positive difference, since capital flows respond fairly quickly to any positive or negative news. He points to a suggestive anecdote. In early 1998, the REIT market had been booming and real estate development really started to take off. Then, the Russian debt crisis followed by the Long Term Capital Management implosion put some clouds on the horizon. All of a sudden, the REIT market dried up, as did the market for commercial mortgage-backed securities. This curtailed some projects that would otherwise have eventually been completed.

Nonetheless, Geltner points out that it is hard to say for sure why things were better this time around. Much of the evidence is anecdotal—there is little data on construction loans and lending and monitoring practices. Moreover, despite the rise in public ownership, much office property is still held in private companies. And while public markets tend to be relatively efficient, experience with the stock market suggests that public capital markets are no guarantee against periods of irrational exuberance. It is even harder to know what will happen next time around. Some of the restraint of the 1990s might have simply come from memories of having been burned in the 1980s—memories that will inevitably fade.

Doug Poutasse is not overly optimistic. “I do not believe bank lenders have learned the underlying lesson. They just know that real estate is riskier than they thought it was, so they are lending less.” Real estate was undervalued in the 1990s, he argues, when investors were busy investing in tech stocks. Today, he believes the situation has reversed, with capital flooding into real estate. “Office towers are easy to invest in and easy to underwrite compared to malls, since there are only about 10 to 20 leases versus 300 in a mall. Also, people underestimate how much capital it takes for maintenance and tenant improvements. They look at the price appreciation and don’t realize how much it costs to maintain the building.” He views history and sees chronic overinvestment in office towers. “People fall in love with them.” *

**PUBLIC CAPITAL
MARKETS MAKE SOME
DIFFERENCE, SINCE
CAPITAL FLOWS TEND TO
RESPOND FAIRLY QUICKLY
TO NEW INFORMATION**

letter from **portsmouth, new hampshire**

Retrenchment or renewal: Which way does the wind blow for New England's fishermen? By Terry Farish



THE WIND is what determines Peter Kendall's days. It can turn a flat calm into dangerous seas. Peter fishes year-round on the good days, getting up at 3 a.m.; it doesn't matter what the season.

At 36, Peter is one of the youngest fishermen on the New Hampshire Seacoast fishermen's fleet—but not that young. There aren't many new people wanting to get into fishing these days. The industry is precarious.

When Peter gets up, he checks the weather station and the National Weather Service's marine forecast. He calls "the government"—the National Marine Fisheries Service—to get his sailing number, which will track his

A FISH STORY

"We're getting good at trying to avoid fish," says Peter Kendall, a fisherman based in Portsmouth.





days and hours at sea. On the way to the pier, he checks the sway of the flag in front of Sanders Restaurant on Route 1. He steams out of Rye past Boone Island in the Gulf of Maine and sets out his net.

Pete, as his wife Beth calls him, is a first-generation fisherman. He graduated from Portsmouth High and went on to study resource economics at the University of New Hampshire. While he was still in high school he began as a lumper at the Portsmouth Fishermen's Co-op—the guy who does the unloading, culling, weighing, and icing when the fishing boats land with their catch. He kept the job through summers in college and later became the Co-op's manager, working 80-hour weeks to find out what markets were

paying for a given catch. But he always wanted to fish, and he could make more money fishing with fewer hours.

The day he asked Beth to marry him, he also bought an old wooden boat, a 50-foot trawler, along with a fishing permit. He bought the boat and the permit for \$35,000, and he told Beth he was going to name it for her—the *Elizabeth Ann*.

ON A SHORE DAY with a cool wind, Peter is standing out on the wharf at the Co-op, looking down on the *Elizabeth Ann* who lies low with the tide. Peter looks at her and says, part with irony and part with pride in the skill it takes, "We're getting good at trying to avoid fish." He can catch 5,000 pounds of cod in 20

minutes, so he's learned how long a tow he needs to restrict his catch to the limit of 800 pounds. "We're also getting good at keeping fish alive," he says, referring to the ones caught over the limit. "Cod don't die from trawling now." He can toss them back to the sea alive.

Peter and other fishermen have developed these tactics after concern about over-fishing led regulators to severely restrict the catch of many species and limit the number of days fishermen can spend at sea. From North Carolina to Maine, only 1,400 groundfishing permits are issued—the permit required to catch cod, flounder, monkfish, pollock, hake. The fishermen holding these permits are allowed approximately 70 days at sea in a

Catch limits and rules on days at sea have cut into fishermen's earnings. Some have lost as much as half their income in just one year.

year; the latest proposals would decrease this to 53. As a result, many Seacoast fishermen diversify and also fish for shrimp, scallops, tuna, and lobster—each with distinct catch restrictions—to make up for the days when they can't go groundfishing.

About 26 dragnets, gillnetters, and lobster boats—small boats ranging from 40 to 55 feet—fish out of the Portsmouth Co-op. About as many boats are at the Co-op as there were before the tough regulations started in the mid

1990s, but their income has become more tenuous. Some Portsmouth crewmen have seen their income decline by half over the past year. But this hasn't stopped these fishermen from checking the wind in the trees and taking advantage of every day they can have at sea. For his part, Peter plans to run two boats, each of which will have her own allotment of days at sea so that Peter can fish more. And he continues to diversify with shrimping.

The Co-op that Peter used to manage is also suffering. Its revenue comes from unloading fees, roughly 10 cents per pound, that fishermen pay into the Co-op. But the regulations limiting fishermen's days at sea, the regional closures (the region off Portsmouth is closed from April through June), and the limits on species have all cut into the Co-op's business. In 1998, 6 to 7 million pounds were unloaded. In 2004, it will be 3 to 3.5 million pounds—dropped by half in six years.

Peter and others will watch and plan carefully for the Co-op's future as the impact of the new regulations becomes clear. Peter's been the one at the Co-op who has broken through some of the distrust between fishermen and scientists as they sort out the rules to protect fish stock. He tells the other fishermen, "You can't just tell the researchers there's plenty of

cod. You have to document it." And he works with researchers on his boat to collect data, something not a lot of fishermen want to do. Peter is committed to building new relationships and making it by the new rules.

BETH, TOO, HAS LEARNED to pay attention to the sway of the trees. Often Pete's cell phone is out of range when he's offshore, but some mornings it works and he calls Beth to tell her what it's like at sea. Flat calm, he'll tell her. Fifteen miles visibility. He wishes she could see the sunrise. The sky is oranges and purples and blues. The sun looks like a burning ball in the sky.

But not every day is like that. One time when the phone did work, Beth almost wished it hadn't. Pete called, trying to spare her from hearing about him from the media. "He said he was taking on water," she remembers. She started to cry sitting at her dining room table. It was blowing 40 knots. The seas were 8 foot. "He said, 'Honey, I don't know if I'm going to make it.'"

A seam in the wooden hull had split, and the *Elizabeth Ann* had water in her fo'c's'le (forward bow), the engine room, the fish hold. A boat can go down in minutes. But that day, other fishing boats stayed by until a Coast Guard vessel arrived and gave him a tow home. This week he's closing on a new fiberglass *Elizabeth Ann*.

Pete doesn't want his son to fish. Out on the pier, overlooking the battered *Elizabeth Ann*, he shakes his head. "He wants to come out with me. I want to take him out. He's real interested. But I don't want this life for my son."

Sometimes, if it gets to be supertime and Pete's not home yet and the trees out back show a strong gust of wind, Beth pops the kids in the car. They drive toward the pier, Beth's eyes on the flag out front of Sanders Restaurant. She pulls out the binoculars and they wait, taking turns watching for the first sight of Pete steaming in. *

TERRY FARISH IS THE AUTHOR OF *HOUSE IN EARNEST* AND *IF THE TIGER*. SHE LIVES ON THE SEACOAST AND IS WRITING A BOOK ABOUT GROWING UP IN A FISHERMAN'S FAMILY.

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The World Trade Center West is one of eleven office towers built or renovated in downtown Boston since 1999. What accounts for the boom-and-bust cycle in office space? See page 22.



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