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Program Report

Asset Pricing

John Y. Campbell*

Asset pricing — the study of markets for financial assets including stocks, bonds, foreign currencies, and derivatives — is a field in which there is an intense and fruitful interaction between empirical and theoretical research. The work of economists associated with the NBER Asset Pricing Program illustrates this interaction particularly well. NBER economists have been studying many different phenomena, including the high rewards that investors have received for holding stocks in general and “value stocks” in particular, the apparent predictability of stock and bond returns at long horizons, and unusual patterns in option prices. In each area, empirical puzzles have stimulated new thinking about investor behavior and the functioning of capital markets.

Financial markets are, of course, changing rapidly. NBER economists have been following these developments, and in some cases have tried to anticipate or influence them. There has been much research on international capital markets and the opportunities they present for risksharing across countries; other work has discussed new types of securities, including inflation-indexed bonds, which were issued for the first time by the U.S. Treasury in January 1997.

Cross-Sectional Patterns in Stock Returns

Historically, investors have received handsome rewards for bearing the risk of investments in equity markets. Economists have found it difficult to rationalize the size of this “equity premium.”¹

Recent research on individual U.S. stocks has uncovered facts that make this puzzle even more challenging. First, the average excess returns on value stocks — stocks whose prices are low relative to their book values, earnings,

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or dividends — are even higher than the average excess returns on stocks in general. Second, there seems to be a “momentum effect”: stocks that have outperformed the market during the last few months tend to outperform the market during subsequent months.

There is an active debate about how to interpret these phenomena. Eugene Fama and Kenneth French have proposed that value stocks deliver higher average returns because they are riskier.² Other NBER economists have challenged this view. Craig MacKinlay argues that it requires an implausibly high reward for bearing risk,³ while Rafael La Porta, Josef Lakonishok, Andrei Shleifer, and Robert Vishny suggest that investors underprice value stocks because they are too pessimistic about the earnings of these companies. They show that as much as one third of the excess return on value stocks occurs in the few days around earnings announcements, suggesting that investors are on average favorably surprised by the earnings of value stocks.⁴ Louis Chan, Narasimhan Jegadeesh, and Lakonishok document a similar tendency for the excess return on momentum stocks to occur near earnings announcements, suggesting that for these stocks also investors tend to have incorrect earnings expectations.⁵

Nicholas Barberis, Shleifer, and Vishny have built an explicit model of investors' irrational expectations that can generate excess returns on both momentum stocks and value stocks. In their model, earnings growth cannot be forecast, so the best forecast of future earnings is just the current level of earnings. Investors normally expect earnings to revert to some long-run average level, which leads them to underprice stocks that have experienced recent earnings growth (momentum stocks). A series of positive or nega-

tive earnings surprises, however, can lead investors to expect continued positive or negative earnings growth; this leads them to underprice stocks that have performed extremely badly (value stocks).⁶

Time-Variation in the Reward for Risk

Financial ratios of stock prices to book values, earnings, or dividends also are used in time-series studies of the stock market as a whole. These ratios, along with other variables including yield spreads between long- and short-term or between low- and high-quality bonds, have some ability to forecast aggregate stock and bond returns.⁷

Shmuel Kandel and Robert Staibaugh have explored the implications of this evidence for optimal portfolio choice. Using a Bayesian framework to allow for uncertainty about the degree of predictability in returns, they show that an investor with constant risk aversion and a short investment horizon should try to "time the market," adjusting the portfolio share in stocks in response to changes in the financial ratios that predict returns. In a similar spirit, Luis Viceira and I have derived the optimal market-timing portfolio strategy for an investor with constant risk aversion and a long horizon.⁸

This work takes predictable variation in returns as given. Other NBER research asks where that variation comes from, and whether it can persist in the face of market-timing responses by investors. John Cochrane and I, building on the work of George Constantinides, have argued that typical investors do not have a constant aversion to risk; instead their risk aversion tends to fall when the economy is strong, because they judge their well-being by reference to recent standards of living and feel more comfortable taking risks when

their consumption is well above recent average levels. This "habit-formation" model implies that investors do not try to profit from predictable variation in returns because it is during periods of unusually low stock returns that investors are unusually willing to take on risk.⁹ Jiang Wang has explored the possibility that different investors have different levels of risk aversion; when they trade with one another, the equilibrium reward for bearing risk can vary over time.¹⁰

Shleifer and Vishny have pointed out that even when there is no equilibrium justification for time-variation in stock returns, so that the time-variation represents mispricing of stocks, it may be difficult for rational speculators to trade aggressively enough to eliminate the mispricing. This is particularly true when an initial pricing error increases; then rational speculators who have bet on a correction of the error lose money and are forced to the sidelines. Thus stabilizing speculation tends to be weakest precisely when mispricing is most severe.¹¹

In a study of the foreign exchange market, Blake LeBaron has shown that intervention by monetary authorities is one possible source of mispricing. He finds that technical trading rules produce profits only in periods of intervention, when monetary authorities are trading to influence exchange rates and are willing to lose money in pursuit of their objectives.¹²

Option Prices, Changing Volatility, and Market Microstructure

Option markets offer economists a fascinating look at investors' expectations. By combining different options on a given underlying security, it is possible to construct a derivative security that pays off only if the

underlying price is in a particular narrow range: for example, only if the S&P 500 index is between 800 and 801 on a particular date in the future. Thus option prices can reveal the probabilities (adjusted for risk) that investors place on each possible level of the S&P 500 index.

Yacine Ait-Sahalia and Andrew Lo have developed a nonparametric econometric method for estimating risk-adjusted probabilities. They show that recent prices for S&P 500 index options imply high risk-adjusted probabilities of a large decline in the S&P 500 index.¹³ David Bates has compared two possible explanations for this finding. Investors could anticipate that a decline in stock prices would increase volatility, so that over several months a large decline in the market is more likely than an equally large increase; or they could fear a "crash," an instantaneous large drop in the market. Because the risk-adjusted probabilities of a large decline in the index are high even for very short-term options, Bates concludes that investors do indeed fear a stock market crash.¹⁴

Other researchers have studied changing volatility, a pervasive phenomenon in stock and bond markets that shifts the risk-adjusted probability distributions implied by option prices. Torben Andersen and Tim Bollerslev have argued that volatility follows a complex time-series process; there are short-lived bursts of volatility within the trading day, but there are also highly persistent movements in volatility that affect asset markets for several months.¹⁵ Robert Engle and Joshua Rosenberg, and Bernard Dumas, Jeff Fleming, and Robert Whaley, have shown how models of changing volatility can be used to explain the behavior of option prices.¹⁶

Studies of volatility within the trading day lead naturally to a new fron-

tier in financial economics, the study of transaction-level data. In recent years, data have become available on all trades and quotes for listed and some over-the-counter U.S. stocks. These data are stimulating the development of new econometric methods,¹⁷ and they make it possible to study the properties of alternative systems for trading stocks and other assets.¹⁸ A new "Market Microstructure Research Group" will meet for the first time at the 1997 NBER Summer Institute to provide a forum for empirical research in this area.

Diversification, Risk-Sharing, and New Financial Markets

A striking fact about international financial markets is that investors tend to concentrate heavily in the stocks and bonds of their own country. This "home bias" is diminishing only slowly, and it is costly because investors give up the opportunity to diversify internationally.¹⁹

One factor that may contribute to home bias is that investors are better informed about assets in their own country than about foreign assets. Consistent with this explanation, Jun-Koo Kang and René Stulz have shown that foreign investors in Japan tend to concentrate in large stocks, which presumably are better-known overseas; while Jeffrey Frankel and Sergio Schmukler have shown that Mexican stock prices declined more rapidly in the peso crisis of December 1994 than did prices of Mexican closed-end funds traded in the United States, suggesting that Mexican investors were better-informed than U.S. investors.²⁰

In a series of papers, Robert Shiller has argued that unexploited opportunities for diversification justify the establishment of new financial markets. Shiller and Stefano Athanassoulis, Shiller and Ryan Schneider,

and Shiller and Allan Weiss have proposed securities that could be used to trade international income risk, occupational income risk, and real estate price risk, respectively.²¹

While these markets do not yet exist, the U.S. Treasury has recently created a potentially important new market by issuing inflation-indexed bonds. Shiller and I have summarized the arguments that many economists have made in favor of indexing bonds and other contracts to inflation, while David Barr and I have studied the U.K. experience with inflation-indexed bonds.²² Niko Canner, N. Gregory Mankiw, and David Weil have criticized the conventional wisdom that conservative investors should hold bonds rather than stocks; they point out that nominal bonds are risky in real terms. Inflation-indexed bonds offer stable real returns and thus should appeal to conservative investors with long horizons.²³

¹ See J.Y. Campbell, "Consumption and the Stock Market: Interpreting International Evidence," NBER Working Paper No. 5610, June 1996, for a survey. W.N. Goetzmann and P. Jorion, "A Century of Global Stock Markets," NBER Working Paper No. 5901, January 1997, cautions that equity returns may be overstated by looking only at successful stock markets.

² E.F. Fama and K.R. French, "Common Risk Factors in the Returns on Stocks and Bonds," *Journal of Financial Economics* 33, 3–56.

³ A.C. MacKinlay, "Multifactor Models do not Explain Deviations from the CAPM," *Journal of Financial Economics* 38, 3–28, 1995.

⁴ R. La Porta, J. Lakonishok, A. Shleifer, and R.W. Vishny, "Good News for Value Stocks: Further Evidence on Market Efficiency," NBER Working Paper No. 5311, October 1995.

⁵ L.K.C. Chan, N. Jegadeesh, and J. Lakonishok, "Momentum Strategies," NBER Working Paper No. 5375, December 1995.

⁶ N. Barberis, A. Shleifer, and R.W. Vishny, "A Model of Investor Sentiment," NBER

Working Paper No. 5926, February 1997.

⁷ A.W. Lo and A.C. MacKinlay, "Maximizing Predictability in the Stock and Bond Markets," NBER Working Paper No. 5027, February 1995, documents predictability for the aggregate U.S. market and for selected portfolios of U.S. stocks. W.E. Ferson and C.R. Harvey, "Fundamental Determinants of National Equity Market Returns: A Perspective on Conditional Asset Pricing," NBER Working Paper No. 5860, December 1996, presents similar evidence for stock portfolios from different countries. C. Engel, "The Forward Discount Anomaly and the Risk Premium: A Survey of Recent Evidence," NBER Reprint No. 1089, November 1996, and *Journal of Empirical Finance* 3, 123–192, 1996, reviews evidence for predictability in international bond markets.

⁸ S. Kandel and R.F. Stambaugh, "On the Predictability of Stock Returns: An Asset-Allocation Perspective," NBER Working Paper No. 4997, January 1995, and J.Y. Campbell and L. Viceira, "Consumption and Portfolio Decisions when Expected Returns are Time Varying," NBER Working Paper No. 5857, December 1996.

⁹ G. Constantinides, "Habit Formation: A Resolution of the Equity Premium Puzzle," *Journal of Political Economy* 98, 519–543, 1990, and J.Y. Campbell and J.H. Cochrane, "By Force of Habit: A Consumption-Based Explanation of Aggregate Stock Market Behavior," NBER Working Paper No. 4995, January 1995. See also M. Boldrin, L.J. Christiano, and J.D.M. Fisher, "Asset Pricing Lessons for Modeling Business Cycles," NBER Working Paper No. 5262, September 1995.

¹⁰ J. Wang, "The Term Structure of Interest Rates in a Pure Exchange Economy with Heterogeneous Investors," NBER Working Paper No. 5172, July 1995.

¹¹ A. Shleifer and R.W. Vishny, "The Limits of Arbitrage," NBER Working Paper No. 5167, July 1995.

¹² B. LeBaron, "Technical Trading Rule Profitability and Foreign Exchange Intervention," NBER Working Paper No. 5505, March 1996.

¹³ Y. Ait-Sahalia and A.W. Lo, "Nonparametric Estimation of State-Price Densities Implicit in Financial Asset Prices," NBER Working Paper No. 5351, November 1995. Ait-Sahalia has taken a similar nonparametric approach to interest-rate derivatives in "Nonparametric Pricing of Interest Rate Derivative Securities," NBER Working Paper No. 5345, November 1995.

¹⁴ D.S. Bates, "Testing Option Pricing Models," NBER Working Paper No. 5129, May 1995, and "Post-'87 Crash Fears in S&P 500 Futures Options," NBER Working Paper No. 5894, January 1997.

¹⁵ T.G. Andersen and T. Bollerslev, "Heterogeneous Information Arrivals and Return Volatility Dynamics: Uncovering the Long Run in High Frequency Returns," NBER Working Paper No. 5752, September 1996, and "DM-Dollar Volatility: Intraday Activity Patterns, Macroeconomic Announcements, and Longer Run Dependencies," NBER Working Paper No. 5783, October 1996.

¹⁶ R.F. Engle and J.V. Rosenberg, "Hedging Options in a GARCH Environment: Testing the Term Structure of Stochastic Volatility Models," NBER Working Paper No. 4958, December 1994, and "GARCH Gamma," NBER Working Paper No. 5128, May 1995, and B. Dumas, J. Fleming, and R.E. Whaley, "Implied Volatility Functions: Empirical Tests," NBER Working Paper No. 5500, March 1996.

¹⁷ R.F. Engle and J.R. Russell, "Forecasting Transaction Rates: The Autoregressive Conditional Duration Model," NBER Working Paper No. 4966, December 1994, and R.F. Engle, "The Econometrics of Ultra-High Frequency Data," NBER

Working Paper No. 5816, November 1996.

¹⁸ The Industrial Organization and Regulation of the Securities Industry, A.W. Lo ed., Chicago: University of Chicago Press, 1996, contains several papers on this topic.

¹⁹ K.K. Lewis, "What Can Explain the Apparent Lack of International Consumption Risk Sharing?," NBER Working Paper No. 5203, August 1995, and "Consumption, Stock Returns, and the Gains from International Risk Sharing," NBER Working Paper No. 5410, January 1996, explore some possible explanations for the home bias puzzle and compare alternative measures of the welfare cost of home bias. G. Bekaert and M.S. Urias, "Diversification, Integration, and Emerging Market Closed-End Funds," NBER Reprint No. 2066, September 1996, and Journal of Finance 51, 835-869, July 1996, shows how closed-end funds that hold shares in emerging markets can be used for international diversification.

²⁰ J.-K. Kang and R.M. Stulz, "Why Is There a Home Bias? An Analysis of Foreign Portfolio Equity Ownership in Japan," NBER Working Paper No. 5166, July 1995, and J.A. Frankel and S.L. Schmukler, "Country Fund Discounts,

Asymmetric Information, and the Mexican Crisis of 1994: Did Local Residents Turn Pessimistic Before International Investors?," NBER Working Paper No. 5714, August 1996.

²¹ R.J. Shiller and S. Athanasoulis, "World Income Components: Measuring and Exploiting International Risk Sharing Opportunities," NBER Working Paper No. 5095, April 1995; R.J. Shiller and R. Schneider, "Labor Market Indices Designed for Use in Contracts Promoting Income Risk Management," NBER Working Paper No. 5254, September 1995; and R.J. Shiller and A.N. Weiss, "Home Equity Insurance," NBER Working Paper No. 4830, August 1994.

²² J.Y. Campbell and R.J. Shiller, "A Scorecard for Indexed Government Debt," NBER Macroeconomics Annual 11, 155-197, 1996, and D.G. Barr and J.Y. Campbell, "Inflation, Real Interest Rates, and the Bond Market: A Study of UK Nominal and Index-Linked Government Bond Prices," NBER Working Paper No. 5821, November 1996.

²³ N. Canner, N.G. Mankiw, and D.N. Weil, "An Asset Allocation Puzzle," NBER Working Paper No. 4857, September 1994.

Research Summaries

Economic Analysis of Law

Lucian A. Bebchuk*

My general interest is in using economics to analyze the effects of legal rules and institutions. In this article, I describe my current and recent work in the economics of four areas in which legal rules and institutions play a major role: corporate control and structure, bankruptcy, contracts, and litigation and settlement.

*Bebchuk is a research associate in the NBER's Program in Law and Economics and a professor at Harvard Law School. His profile appears later in this issue.

Corporate Control and Structure

While much of my earlier work in corporate control focused on takeover bids for companies with dispersed shareholders, my more recent research has focused on companies in which there is a controlling shareholder. In many public companies — both in the United States and (even more so) in other countries — a significant number of shares are concentrated in the hands of a controlling shareholder.¹

One part of my research has focused on the decisions of controllers about selling their control

blocks. In a recent article, I have shown that such decisions often might be distorted.² The efficiency costs produced by these distortions should be regarded as arising from having a controlling shareholder structure.

A central feature of the model of control transfers that I have developed is that controllers may differ from each other in two respects: their ability to manage and produce value; and their ability to capture private benefits of control. My analysis shows that, under the existing regime in the United States, inefficient transfers may take place; this will happen when the potential new controller

has less managerial ability but a sufficiently greater ability to capture private benefits than the previous controller. Also under the existing regime, some efficient transfers may not take place; this will happen if the potential new controller, although better able to manage the company, has a sufficiently lower ability to capture private benefits.

My analysis also examined control transfers under the equal opportunity rule that prevails in many other countries. Under this rule, minority shareholders are entitled to participate in the transaction on the same terms as the control seller. My analysis shows that adopting the equal opportunity rule would prevent all inefficient transfers, but also would prevent a wider range of efficient transfers. Finally, the analysis has identified conditions under which adding the equal opportunity rule would and would not be efficient overall; for example, adopting the equal opportunity rule would produce an efficiency loss overall if existing and new controllers draw their characteristics from the same distributions.

In a related paper, Jesse Fried and I study the decisions of controllers on whether to effect a freezeout.³ In a corporate freezeout, which is allowed under U.S. rules, a controller can take the shares of the minority shareholders and provide them instead with consideration exceeding the value of those shares as appraised by the court. Our model shows that decisions on whether to effect a freezeout may be distorted, thus producing another efficiency cost arising from having a controlling shareholder structure. The analysis identifies conditions under which efficient freezeouts might not take place or inefficient freezeouts might take place. We use this model to analyze how alternative legal rules perform with respect to the objectives of facilitating efficient freezeouts and

discouraging inefficient ones.

These two projects take as given the existence of control blocks. Another part of my research examines the factors that determine the initial ownership structure. In joint work, Luigi Zingales and I⁴ analyze the choice that initial owners make between retaining a complete ownership structure and creating a controlling shareholder structure by selling some shares to the public. We show that, in this choice, private and social optimality might diverge.

The source of this potential divergence is an externality. The initial choice of ownership structure will have important effects on both the initial shareholders and the potential future buyers of control. Since the IPO price will reflect the effects of the choice on the initial shareholders, the initial owner will internalize these effects fully. Since potential future buyers are not "at the table" at the time of the IPO, however, the initial owner will not take into account the effect of the ownership structure on them. Our analysis identifies three ways in which the initial choice of ownership structure can affect these future buyers.

Having identified a possible distortion, we turn to identifying conditions under which the distortion leads to excessive or suboptimal incidence of controlling shareholder structures. Our analysis has normative implications for the regulation of sale of control transactions and of public offerings of minority shares. Among its positive implications, our analysis suggests reasons for the substantial differences in the incidence of control blocks across different countries.

Bankruptcy

Much of my initial work on bankruptcy concerns the ex post distribution of value in corporate bankruptcy. In a joint article, Howard

Chang and I develop a bargaining model that explains why, under the existing corporate reorganization regime, equityholders are able to obtain value even when the creditors are not paid in full.⁵ This model can help to explain the empirical evidence about the commonality of such deviations from the absolute priority of debt over equity.

In another article, I put forward a proposal for dividing the reorganization pie in a way that would eliminate deviations from absolute priority.⁶ Unlike the existing bargaining-based method for reorganizations, the method that I propose involves no bargaining, nor does it require that the value of the reorganized company be identified. Under this method, the participants in a reorganization would receive a set of options with respect to the securities of the reorganized company. These options can be designed so that, whatever the reorganization value, the participants ultimately will all receive the value to which they are entitled according to the absolute priority standard.

My proposed "options" method of corporate reorganization has received many and varied reactions. Some have endorsed it (Aghion, Hart, and Moore, for example, have used it as the basis for the distribution of the reorganization value in their proposal on corporate reorganizations⁷), while others have expressed various criticisms and concerns. To address the issues raised, I have been working on a follow-up project that will explore how the options approach can and should deal with the various problems that commentators have raised with respect to it.

In developing the options method, my premise has been, as that of much of the literature on bankruptcy reform, that it is desirable to distribute the bankruptcy value in accordance with the absolute priority

principle. The problem that I sought to solve was just how to produce such a distribution, given that the bankruptcy value is not verifiable by courts. But an important question that might be raised is what the desirable distribution is. Of course, in choosing the bankruptcy distribution, it is important to consider the ex ante effects of alternative distributions. Some of my recent work seeks to contribute to the understanding of these ex ante effects.

In a recent article, Jesse Fried and I⁸ analyze the ex ante effects of providing secured claims with full bankruptcy priority over unsecured claims. We show that, contrary to the conventional wisdom, providing such full priority has certain undesirable ex ante effects. In particular, full priority of secured claims leads to excessive use of security interests, distorts the choice between security interests and covenants, and produces suboptimal precautions against tort liability, use of covenants, and monitoring by secured creditors. Accordingly, we have put forward alternative rules for partial priority of secured claims, and we have analyzed the efficiency costs and benefits involved in the adoption of a partial priority regime.

In two other working papers, I analyze some of the ex ante effects of providing debtholders with absolute priority over equityholders. In one, I show that deviations from such absolute priority of debt over equity might have an adverse effect on the moral hazard problem between debt and equity.⁹ In particular, such deviations might increase the excessive incentive that equityholders have to prefer risky projects over safe ones, to make dividend distributions, and to engage in claim dilution by issuing extra debt.

In the second paper, Randy Picker and I analyze certain positive ex ante effects of deviations from the

absolute priority of debt over equity.¹⁰ Such deviations might have a positive effect on those decisions by managers-owners that determine the extent to which a firm's managers have an advantage over others in operating the firm's assets. Without any such deviations, managers will entrench themselves by over-investment in assets that require their unique skills, and they also will under-invest in firm-specific human capital. Allowing ex post deviations from absolute priority decreases the severity of these two problems.

Contracts

In contract law, my interest is in understanding how the rules can affect the various aspects of the contracting parties' behavior. In an article published several years ago, Steven Shavell and I showed that contractual rules might have an effect on informational transfer between the contracting parties.¹¹ In analyzing the optimal default rule in a contractual setting, models generally had taken the information held by the contracting parties to be given. However, as our model suggested (and as was suggested by Ayres and Gertner in an article published at the same time¹²), the choice of an appropriate default rule might lead to transfers of information between the contracting parties and thus might reduce informational asymmetries between them. Our model also has analyzed when inducing such informational transfers would and would not be socially optimal.

In a recent paper Omri Ben-Shahar and I¹³ examine the effects of legal rules on pre-contractual reliance. During contractual negotiations, but before entering a contract, parties might make reliance expenditures — expenditures that would increase the surplus should a contract be made but would be wasted otherwise. In the absence of any pre-contractual

liability, parties' reliance will be socially suboptimal. The focus of our model is on analyzing whether and how rules could be designed to induce optimal reliance decisions. We also study the effects of the rules governing pre-contractual liability on parties' decisions whether to enter into contractual negotiations.

In another recent working paper Ivan P'ng and I¹⁴ analyze the effect of remedies for breach in those cases in which breach is not deliberate (a situation that has already received comprehensive treatment) but rather inadvertent. We analyze the effects of alternative remedies on parties' decisions with respect to taking precautions against inadvertent breach and with respect to investment in reliance on contractual performance.

Litigation and Settlement

About a decade ago, I participated in initiating game-theoretic analysis of litigation and settlement decisions. A large literature has grown since then, and my 1984 model of pre-trial bargaining under imperfect information has been used by many of the subsequent papers.¹⁵ I have remained very interested in this area and am currently working on two subjects within it.

One subject is the credibility of threats to sue. In negative-expected-value (NEV) suits, the expected litigation costs exceed the expected judgment. While it is widely believed that plaintiffs with NEV suits are often able to get something from the defendant, the question is what enables such potential plaintiffs to have a credible threat and to succeed in extracting value.

One possible explanation for the success of such suits, which I advanced in an early article on the subject, is rooted in the existence of imperfect information on the defen-

dant's side.¹⁶ My more recent work, however, has examined the numerous situations in which the plaintiff is known to have an NEV suit.¹⁷ In an article published last year and in a subsequent paper, I developed a model that can explain why plaintiffs might have a credible threat in such situations.

My model is based on the recognition that litigation costs are generally not incurred all at once but rather over time, with bargaining possibly taking place at various points throughout the litigation process. This divisibility of the litigation process plays a critical strategic role. Indeed, I demonstrate that greater divisibility of litigation costs can never hurt — and may help — the plaintiff's strategic position. Because of this effect of divisibility, plaintiffs have credible threats in a much wider set of cases — including numerous small-stake cases — than has been suggested by the prior economic analysis of the subject.

My analysis also attempts to identify the conditions under which a plaintiff with an NEV suit will succeed in extracting a settlement. In particular, my work shows how the credibility of such threats is shaped both by the relative sizes of the parties' litigation costs and by the ways in which the parties' litigation costs are expected to be distributed over time.

Second, I am working on an analysis of the terms of settlement. Much of the literature on settlement has focused on the factors determining its likelihood. The likelihood of settlement is of interest to economists, of course, since it determines the extent to which the deadweight costs of litigation will be incurred. In analyzing the effect of the law on behavior, however, the terms of settlement are also of great importance. And some of my current research concerns how these terms are effected by various

procedural, institutional, and contractual arrangements.

In a recent paper, I analyze the effect of fee-shifting rules on the terms of settlement.¹⁸ For each of the main fee-shifting rules, the analysis examines whether the rule will make settlement terms more favorable to the plaintiff or the defendant — and also whether the rule will move these terms closer to, or further away from, the expected judgment.

In another recent paper, Howard Chang and I model the effects of offer-of-settlement rules on the terms of settlement.¹⁹ Under such rules, if a party to a lawsuit makes a formal offer to settle and the offer is rejected, then this offer will become part of the record in the case and the allocation of litigation costs will depend on how the judgment in the case compares with this offer. Our model makes it possible to derive the expected settlement amount under any given offer-of-settlement rule. Our analysis also shows how such a rule can be designed, if this is deemed desirable, to eliminate the bargaining disadvantage that a party with higher litigation costs would have otherwise.

Finally, in a recent article Andrew Guzman and I²⁰ analyze the strategic role that fee arrangements between lawyers and clients can play in settlement negotiations. Compared with an hourly fee arrangement, contingent fee arrangements strengthen the bargaining position of the side employing them, and thus make the terms of settlement more favorable to this party.

¹ See M. Barclay and C. Holderness, "Private Benefits from Control of Public Corporations," *Journal of Financial Economics* 25, (1989), pp. 371–95.

² See L. Bebchuk, "Efficient and Inefficient Sales of Corporate Control," NBER Reprint No. 2012, October 1995, and *Quarterly Journal of Economics* 109, (1994), pp. 957–93.

³ See L. Bebchuk and J. Fried, "Efficient

and Inefficient Freezeouts of Minority Shareholders," mimeo, Harvard Law School (1997).

⁴ See L. Bebchuk and L. Zingales, "Corporate Ownership Structures: Private versus Social Optimality," NBER Working Paper No. 5584, May 1996.

⁵ See L. Bebchuk and H. Chang, "Bargaining and the Division of Value in Corporate Reorganization," *Journal of Law, Economics, and Organization* 8, (1992), pp. 253–79.

⁶ See L. Bebchuk, "A New Approach to Corporate Reorganization," *Harvard Law Review* 101, (1988), pp. 775–804.

⁷ See P. Aghion, O. Hart, and J. Moore, "The Economics of Bankruptcy Reform," *Journal of Law, Economics, and Organization* 8, (1992), pp. 523–546.

⁸ See L. Bebchuk and J. Fried, "The Uneasy Case for the Priority of Secured Claims in Bankruptcy," *The Yale Law Journal* 105, (1996), pp. 857–934.

⁹ See L. Bebchuk, "On the Effects of Deviations from Absolute Priority on Ex Ante Corporate Decisions," mimeo, Harvard Law School (1996).

¹⁰ See L. Bebchuk and R. Picker, "Bankruptcy Rules, Managerial Entrenchment, and Firm-Specific Human Capital," forthcoming in the *Journal of Law and Economics*.

¹¹ See L. Bebchuk and S. Shavell, "Information and the Scope of Liability for Breach of Contract: The Rule of *Hadley v. Baxendale*," *Journal of Law, Economics, and Organization* 7, (1991), pp. 284–12.

¹² See I. Ayres and R. Gertner, "Filling Gaps in Incomplete Contracts: An Economic Theory of Default Rules," *Yale Law Journal* 99, (1989), pp. 87–130.

¹³ See L. Bebchuk and O. Ben-Shahar, "Pre-Contractual Reliance," mimeo, Harvard Law School (1996).

¹⁴ See L. Bebchuk and I. P'ng, "Damage Measures for Inadvertent Breach of Contract," mimeo, Harvard Law School (1996).

¹⁵ See L. Bebchuk, "Litigation and Settlement under Imperfect Information," *Rand Journal of Economics* 15, (1984), pp. 404–15.

¹⁶ See L. Bebchuk, "Suing Solely to Extract a Settlement Offer," *Journal of Legal Studies* 17, (1988), pp. 437–50.

¹⁷ See L. Bebchuk, "A New Theory Concerning the Credibility and Success of Threats to Sue," *Journal of Legal Studies* 25, (1996), pp. 1–26; L. Bebchuk, "On Divisibility and Credibility: the Effects of

the Distribution of Litigation Costs over Time on the Credibility of Threats to Sue," mimeo, Harvard Law School (1996).

¹⁸ See L. Bebchuk, "The Effect of Fee-Shifting Rules on Settlement Terms," Har-

vard Law School, Discussion Paper No. 202 (1996).

¹⁹ See L. Bebchuk and H. Chang, "The Effect-of-Settlement Rules on the Terms of Settlements," mimeo, Harvard Law

School (1997).

²⁰ See L. Bebchuk and A. Guzman, "How Would You Like to Pay for That?," Harvard Negotiation Law Review 1, (1996), pp.53-63.

Sunk Investments, The Churn, and Macroeconomics

by Ricardo J. Caballero*

Behind the smooth path of macroeconomic aggregates, there is a very active microeconomic world. Massive flows of factors of production constantly are being reshuffled, while households are busy rebalancing their stocks of durables, real estate, or even their lifestyles. Market economies seem to handle this overwhelming "churn" with undeniable success, and it follows therefore that the eventual failure of economies that repress private initiative is perhaps unavoidable.

Is the dynamic nature of microeconomic actions and heterogeneity just a distraction to macroeconomists, or does it hide an important piece of information about aggregate dynamics? In this article, I argue that there are at least two reasons to conclude the latter. The first of these reasons is very direct: The mechanics of aggregate fluctuations are quite different from those of representative agent models. The second reason is more involved: An active churn requires a massive flow of transactions, and associated with these, an ongoing process of contracting and renegotiation. In this highly demanding environment, contractual problems and malfunctioning institutions soon accumulate and affect macroeconomic outcomes, and they become a

major consideration for normative issues. For expositional simplicity, I discuss each of these themes in turn, although it should not be difficult to envision their close connection.

Micro Adjustment is Intermittent and Lumpy

If one looks more closely inside the active microeconomic world, a distinctive intermittent pattern arises. At the level of individual units, there are many economically relevant actions which occur only infrequently and in lumps. For example, we do not upgrade our cars daily; rather we do it infrequently, and when we do so the improvement over our old car is substantial. Similarly, the intermittent and lumpy nature of investment and labor demand decisions at the establishment level has been documented extensively U.S. manufacturing.¹ Rather than the result of perfectly synchronized and smooth microeconomic actions, aggregate activity is driven largely by the net outcome of dramatic actions by a limited fraction of individual units. Aggregate fluctuations are influenced heavily by changes in the degree of synchronization of these sporadic but lumpy individual actions.

There are several technological and institutional reasons why microeconomic adjustment is largely intermittent and lumpy, the simplest of which is the presence of fixed costs of adjustment. Giuseppe Bertola and I start from a model in which consumers face such costs when adjust-

ing their stock of durable goods, and we then aggregate their lumpy actions, allowing for heterogeneous initial stocks of durables and idiosyncratic as well as aggregate shocks to their wealth. We show that such a model, albeit stylized, describes the quarterly behavior of purchases of U.S. durable consumer goods notably well. The estimated microeconomic adjustment costs and the degree of heterogeneity required to do so are reasonable.² Allowing for the same combination of ingredients — but with a (very small) fixed cost of adjusting consumption patterns — is also enough to account for the underreaction of aggregate nondurable consumption to wealth innovations (the excess smoothness puzzle) and its overreaction to predictable changes in income (the excess sensitivity puzzle).³

A significant fraction of plants' investment — and the bulk of the volatility of that investment — comes in sporadic large projects. Even with a sample biased toward large and stable U.S. manufacturing establishments, Doms and Dunne document that the majority of these establishments have years in which their capital grows by more than 50 percent.⁴ Moreover, on average about 25 to 40 percent (in the 17-year period from 1972 to 1988) of the investment of an establishment is concentrated in one investment project.

My work with Eduardo M. Engel using annual U.S. manufacturing sectoral (aggregate) data shows that these data also could be explained well using a model built from microeconomic lumpiness and hetero-

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geneity.⁵ Moreover, the statistical apparatus that we develop allows us to conclude that the model so constructed vastly outperforms the standard representative agent-linear competitors. The essence of the aggregate advantage of these models is their ability to generate brisker expansions and sharper contractions on the face of large — possibly accumulated — shocks.⁶ The concept of pent-up demand acquires a very precise and useful meaning, where the aggregate elasticity of investment with respect to shocks changes over time, as accumulated shocks vary the degree of synchronization of establishments' actual and repressed investments. We not only confirm this conclusion in joint work with John C. Haltiwanger, but also are able to reconstruct all intermediate steps in the aggregation process. Using a panel of more than 7,000 U.S. manufacturing establishments for 1972 to 1988, we document the lumpy and largely irreversible nature of investment at the establishment level, the massive heterogeneity faced by establishments, and we show how the implied time varying elasticity plays a key role in shaping the response of aggregate investment to the tax reforms of the 1980s.⁷

Undoubtedly, investment imprints some of its features on employment and other complementary factors. However, decisions about job creation and destruction in U.S. manufacturing also exhibit a lumpy and intermittent pattern at higher frequencies than investment does. Using data similar to what we use for investment, we again document this microeconomic pattern, and show that the aggregated version of such a model clearly outperforms standard representative agent models in describing quarterly aggregate data (the latter had a mean-squared error about twice that of the nonlinear model). We trace the aggregate effect

of the microeconomic nonlinearities we find, and conclude not only that their impact is large, but also that it is concentrated during sharp recessions.⁸

Job Creation and Destruction

This is a natural place to make the transition to the second theme of this review. In a series of papers, Mohamad Hammour and I study the ongoing process of job creation and destruction in detail. We ask positive as well as normative questions. If job reallocation is an inescapable requisite of technical progress and economic evolution, then policies that are overly protective of existing jobs may hinder the pace of renovation and lead to technological "sclerosis." But laissez-faire policies may be equally deficient. The massive job destruction that takes place in a recession, for example, may be the sign of chronically malfunctioning markets, rather than an aspect of the healthy recycling of jobs. Indeed, we argue that if the main role of unemployment in an efficient economy is to facilitate reallocation, then job destruction and creation ought to be synchronized and correlated positively, in order to avoid wasteful accumulation of persistent unemployment.⁹

This desirable feature is seldom observed. In the United States and other OECD countries, for example, job creation and destruction flows are correlated negatively.¹⁰ More dramatically, economies undergoing deep structural adjustment generally are characterized by an existing productive structure that bears the full burden of the shock and faces extensive destruction, while the pace of creation and investment in the new structure remains excessively timid. This gives rise to a serious unemployment crisis, which not only

brings unnecessary suffering and waste but also puts at risk the political support for the much needed reforms.¹¹

Many factors contribute to the widespread decoupling of creation and destruction flows. We argue, however, that harmful decoupling is the natural general equilibrium response to the presence of contracting difficulties at the microeconomic level.¹²

Most central economic relationships develop some degree of specificity among factors of production; that is, the value of those factors is higher within the relationship than outside it. Specificity reduces the flexibility of separation decisions, which induces reluctance in the investment decision. This is the basic insight of the irreversible investment literature, and a key ingredient in all of the models behind the results described in the first part of this review. However, it acquires a potentially more troublesome dimension when combined with contracting difficulties, for quasi-rents may not be divided ex-post according to their ex-ante terms of trade. This is the "holdup problem," which has been studied extensively in the microeconomics literature.

Rent appropriation, we argue, also has important macroeconomic implications. In general equilibrium, the market system will adjust to help partly compensate the appropriated factors, providing a highly inefficient macroeconomic "solution" to the unresolved microeconomic contracting problem. The appropriated factor of production will partially withdraw its participation in joint production, depressing creation. Excessive destruction, on the other hand, results from the rigid private opportunity cost of the appropriating factor, which in equilibrium will not find enough opportunities in joint production. Despite the resulting seg-

mentation of this factor, the rents earned in joint production are enough to put socially wasteful pressure on weaker production units.

The underutilization of resources and factor market segmentation just described are not the end of the story, though. Rent appropriation may also result in technological sclerosis, recessions that are excessively sharp, and expansions that run into inefficient bottlenecks. In the long run, institutions, such as those governing capital-labor relations, are likely to evolve to alleviate the harm of excessive appropriability problems; but the sluggish nature of institutional evolution is unlikely to keep up with the myriad economic events that alter the balance of forces. Technology choice also will be affected, with the appropriated factor partially "excluding" the other from production to reduce appropriation. In ongoing work, we are developing the hypothesis that long-run excessive technological substitution is an important ingredient in accounting for protracted European unemployment.¹³

The problem of appropriability affects many relationships and markets. Labor and financial markets are particularly hard hit. Firms need to invest in workers, who cannot credibly commit to fully repay these investments. Workers may have to renounce many opportunities in the process of specializing. Financiers are unable to precontract with managers on all future aspects of their project. The interaction between the inefficiencies in these markets is deeply intertwined with the nature of the churn. Problems in financial markets scramble the productivity-ranking of the Schumpeterian churn and lead to excessive turnover attributable to privately inefficient separations. When

combined with labor market problems, they raise unemployment, exacerbate aggregate volatility, and substantially increase the social cost of recessions.¹⁴

Conclusion

To summarize, we cannot ignore the ebullient nature of the microeconomic world and the problems within it, if we are to give meaningful quantitative — and sometimes even qualitative — answers to questions as central as: What are the costs of recessions? How do financial and contractual factors hamper aggregate economic performance? What is the natural rate of unemployment? What is a "reasonable" level of job destruction and unemployment in the aftermath of structural adjustment?

Macroeconomists finally seem to be taking on this challenge; the "Non-representative agent" working group at the NBER's Summer Institute is oversubscribed and — more significantly — the group's name no longer differentiates its methods and themes from those discussed in several other EFG groups.

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² G. Bertola and R.J. Caballero, "Kinked Adjustment Costs and Aggregate Dynamics," in NBER Macroeconomics Annual 1990, Cambridge: MIT Press (1990); R.J. Caballero, "Durable Goods: An Explanation for their Slow Adjustment," *Journal of Political Economy* 101 (2), April 1993, pp. 351–84.

³ R.J. Caballero, "Near Rationality, Heterogeneity, and Aggregate Consumption," *Journal of Money, Credit and Banking* 27 (1), February 1995, pp. 29–48.

⁴ Doms and Dunne, *op.cit.*

⁵ R.J. Caballero and E.M.R.A. Engel, "Explaining Investment Dynamics in U.S. Manufacturing: A Generalized (S,s) Approach," NBER Working Paper No. 4887, October 1994.

⁶ R.J. Caballero, "A Fallacy of Composition," *American Economic Review* 82 (5), December 1992, pp. 1279–92.

⁷ R.J. Caballero, E.M.R.A. Engel, and J.C. Haltiwanger, "Plant Level Adjustment and Aggregate Investment Dynamics," *Brookings Papers on Economic Activity* 2, *Macroeconomics* 1995, 1–54.

⁸ R.J. Caballero, E.M.R.A. Engel, and J.C. Haltiwanger, "Aggregate Employment Dynamics: Building from Microeconomics" forthcoming in *American Economic Review* 1997; R.J. Caballero, and E.M.R.A. Engel, "Microeconomic Adjustment Hazards and Aggregate Dynamics," *Quarterly Journal of Economics* 433 (2), May 1993, pp. 359–83.

⁹ R.J. Caballero and M.L. Hammour, "On the Timing and Efficiency of Creative Destruction," *Quarterly Journal of Economics* 446 (3), August 1996, pp. 805–52; R.J. Caballero and M.L. Hammour, "The Cleansing Effect of Recessions," *American Economic Review* 84 (5), December 1994, pp. 1350–68.

¹⁰ S.J. Davis, J.C. Haltiwanger, and S. Schuh, *Job Creation and Destruction*, MIT Press, 1996.

¹¹ R.J. Caballero and M.L. Hammour, "On the Ills of Adjustment," *Journal of Development Economics* 51, 1996, 161–192.

¹² R.J. Caballero and M.L. Hammour, "The 'Fundamental Transformation' in Macroeconomics," *American Economic Review, Papers and Proceedings* 86 (2), May 1996; R.J. Caballero and M.L. Hammour, "The Macroeconomics of Specificity," NBER Working Paper No. 5757, September 1996.

¹³ R.J. Caballero and M.L. Hammour, "Incomplete Contracts, Factor Proportions, and Unemployment," mimeo, MIT, March 1997.

¹⁴ R.J. Caballero and M.L. Hammour, "Improper Churn: Financial Constraints and Factor-Market Flows," mimeo, MIT, December 1996.

Making Sense of the Medical System

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Problems of the medical care system are among the most vexing issues on the public agenda. While virtually everyone complains about the medical care system, there is no general agreement about the diagnosis of what is wrong or the appropriate remedy. My research examines the performance of the medical care system and the role that the public sector can and does play in influencing that system.

Public complaints about the medical system are numerous.¹ About 15 percent of the United States population is without health insurance; in a rich country like ours, many find that unacceptable. Others who are insured find that coverage fleeting; they can get insurance when they are healthy but are canceled or face large rate increases when they become sick.²

But far and away the dominant concern about the medical care system is that it costs so much money. The United States spends nearly 14 percent of national income — close to one in every seven dollars — on medical care. Nearly 20 percent of government spending is for medical care. A person with an expensive illness can easily spend over \$100,000. The cost of medical care is so important because virtually every medical care problem we face — from caring for the uninsured to decisions by insurers to insure only the healthy — is made worse when medical costs are high. For example, some people are uninsured because the cost of insurance is so high compared to the

much smaller cost of receiving free care; if medical care were less expensive, this would be less of a concern. Similarly, insurers like to select healthy people to insure because the cost difference between healthy and sick is so great; if medical care were less expensive, the gains from favorable selection would be smaller.

Concern about high medical care costs is not unique to the United States. Throughout the developed world, the cost of medical care has increased in real, per capita terms twice as rapidly as national income for three decades or more.³ As a result, medical care reform has been on the agenda of virtually every country in the OECD in recent years. Understanding the growth of medical care spending is thus a problem with world-wide implications. The first part of my research is thus focused on understanding the rising cost of medical care.

The passkey to access the medical care system is health insurance. Substantial evidence exists that people with health insurance receive more care, more frequently, from higher quality providers, in more appropriate settings, than do people without health insurance. Examining why people are without health insurance, and what role the public sector can plan in this issue, is the second part of my research.

The Rising Cost of Medical Care

Very little has traditionally been known about the sources of cost increase in medical care. Public policy has generally focused on the price of medical services; deficit reduction, for example, is frequently accomplished by reducing the prices the government will pay for medical care over time.⁴ But price increases need not be the whole story. Spend-

ing on medical care (or any good) can increase because prices are increasing (holding the quantity and quality of services constant) or because the quantity or quality of services is increasing.

In several recent papers, Mark McClellan and I have attempted to disentangle the sources of increased spending on medical care.⁵ McClellan and I look in particular at spending on heart attacks. We use a case study approach because the only way to really understand the nature of medical care provision is to consider care for a particular condition. Heart attacks are a natural case study because they are quite common (there are roughly 250,000 new heart attacks annually in the Medicare population), they are very expensive (Medicare spending on hospital care for heart attack patients is over \$3 billion per year), and their costs are growing rapidly (over 4 percent per year in real, per capita terms). We use data on everyone in the Medicare program who had a heart attack between 1984 and 1991.

We decompose the growth of costs for heart attack patients into three factors: changes in the share of people who experience a heart attack; changes in the prices paid for a given level of treatment; and changes in the quantity of services provided to patients with a heart attack. We find that virtually all of the growth of medical care costs is a result of increases in the quantity of medical services provided. The incidence of heart attacks has been falling over time, as better diet, increased exercise, and medical therapies have improved cardiovascular health. The price of a given level of services has been essentially constant. What has been most important in explaining the rise of costs is the increasing intensity of medical treatments. In

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just the eight year period we study, the share of patients receiving very intensive diagnostic services (cardiac catheterization) rose from 11 to 40 percent, and the share receiving intensive therapeutic procedures (revascularization procedures such as bypass surgery or angioplasty) rose from 6 to 30 percent. Since more intensive care is reimbursed at a higher level than less intensive care, this increase in the intensity of services leads to substantial cost growth.

This conclusion naturally raises the question of why technology has diffused so rapidly. McClellan and I⁶ posit six factors for the diffusion of medical technologies: organizational issues such as hospital size and ownership (for inpatient services); the generosity of insurance; public sector regulations on technology adoption; malpractice fears ("defensive medicine"); provider interactions such as the tendency of specialists to use more intensive procedures or of providers to compete with each other; and demographic factors such as age and income.

McClellan and I look at the importance of each of these factors in the diffusion of heart attack technologies. We find two factors to be of particular importance. The first is the generosity of insurance coverage. When insurance is more generous, technology diffuses more rapidly. The second factor is interactions among providers. When there are more providers in an area who are capable of using advanced technologies, these technologies are utilized more frequently.

These findings suggest that there are steps that public policy has taken and can take to influence the diffusion of technology. Tax policy and public regulations, for example, affect the generosity of insurance coverage. Policies towards the licensing of physicians will influence the physician distribution. In current

research, I am exploring how these and other policies have affected the dynamics of the medical care system.

Is Technology Worth It?

In addition to understanding the sources of cost growth, we want to know if spending more on medical care is "worth it." Spending more on medical care (or any good) is valuable if the services received have greater value than their cost. Spending more is wasteful if the services received are less valuable than their cost.

The value of medical care is its impact on the length and quality of life. Both of these factors are difficult to measure in aggregate, and to decompose into those portions due to medical care and those due to other factors. In research with Mark McClellan, Joe Newhouse, and Dahlia Remler, as well as research with Doug Staiger,⁷ I have tried to measure the value of medical care using data on mortality from acute medical conditions (such as a heart attack).

In Cutler, McClellan, Newhouse, and Remler, we use Social Security death records for the patients in the heart attack sample that McClellan and I analyze, and measure changes in longevity for heart attack patients. Over the 1984 to 1991 period, life expectancy following a heart attack rose by about 8 months. If the value of a lifeyear is \$25,000 (a common estimate in the literature), the discounted value of this additional lifespan is \$15,000. In contrast, the real costs of treating a heart attack rose by only \$3,000. The implication is that the additional medical care provided more in the way of benefits than it cost — in other words, that it was worth it socially.

Staiger and I explore trends in outcomes for patients following an acute hospitalization between 1974 and 1987. Our sample includes patients

with a heart attack as well as a variety of other serious diseases such as congestive heart failure. Staiger and I find that mortality rates for acutely ill patients fell over this time period, but not by as much as for the heart attack sample. The increase in longevity appears to just match the increased cost of medical care. Staiger and I also find evidence that medical care appears to be overutilized. Over the time period that we examine, mortality rates in the few months after a hospitalization fell by much more than mortality rates one year after the hospitalization. Some of what medical care was buying was a postponement of death by several months, but not as long as a year.

This research suggests two important conclusions. First, the *average* value of medical care is very high. If one asks the question: for the average patient, have health outcomes improved to such a degree that the patient is better off now than he or she was a decade or two ago, even with the higher expenditures on medical care, the answer is generally yes. If one asks whether all of the people who receive a particular procedure or type of care benefit from it enough to justify its use, the answer is no. The *marginal* value of medical care appears to be very low.

One can understand these results using simple economic theory.⁸ In the traditional medical care system, patients paid little for medical care at the time they used services and little for more generous insurance. As a result, there were incentives to develop beneficial — but expensive — new services and to provide them to all patients who would benefit at all, regardless of cost. Thus, people on average benefitted from medical care, but this technology would still be overused.

The medical system is currently transforming itself in a direction that might limit these developments.

"Managed care" is becoming the norm for the privately insured population. In this system, providers are not paid more to perform additional medical services; in some cases, they are even paid less if they provide more care. Patients are generally not free to go to the provider of their choice; typically, specialty care must be approved by a primary care gatekeeper in advance. And providers are monitored by insurers directly to limit the quantity of services they provide. These types of changes may have far-reaching consequences for the medical care system, and are a subject I am currently exploring.⁹

Public and Private Insurance

There are two dominant sources of health insurance in the United States. Most of the population (close to two-thirds) has private health insurance. Generally, this is provided through an employer at substantial cost to the individual and his/her employer. A typical family policy, for example, might cost over \$5,000 per year. The second source of health insurance is the public sector. Medicare for the elderly and disabled, and Medicaid for the poor, elderly in nursing homes, and disabled, provide care to nearly 20 percent of the population. These programs are free or heavily subsidized, provided the person meets the eligibility criteria for the program.

The links between public and private insurance are multifaceted. On the one hand, public health insurance can provide access to care for those who would otherwise be without it; for many people, health insurance is simply too expensive to afford without government help. On the other hand, some people qualify for public insurance but have more substantial incomes. This is particularly true in recent years, when Medicaid has been expanded to cover a

greater array of people. In the mid-1980s, Medicaid was a program for poor single mothers and their children. Eligibility was tied to AFDC receipt, and encompassed only the very poor. By the early 1990s, Medicaid had been expanded to cover several other groups: single and married women with higher incomes who were pregnant; and children with higher incomes regardless of their family situation. These Medicaid expansions were the largest increase in public sector insurance since Medicare and Medicaid were established in 1965.

For people in these higher income groups, providing public insurance raises the potential problem of "crowding out": people might just substitute from private health insurance to public health insurance, without much overall increase in the amount of health insurance provided. This concern is particularly important in the Medicaid context; Jonathan Gruber and I¹⁰ estimate that of the people newly covered by the expansions in the late 1980s and early 1990s program, two-thirds already had private health insurance. Analysis of crowding out has a long history in public economics — from Social Security to Aid to Families with Dependent Children — but crowding out has generally not been considered in the health insurance context.

Jonathan Gruber and I¹¹ have estimated the degree of crowding out empirically. Using cross-state and cross-age estimates, we look at how private insurance coverage responded to the Medicaid expansions of recent years. Gruber and I find substantial estimate of crowding out; for every 2 people who enrolled in Medicaid because of these coverage expansions, one person lost private insurance coverage.

Substitution of public for private insurance has good and bad points. On the negative side, it means that

society has to spend more than it wants to provide insurance to the previously uninsured. On the positive side, crowding out transfers income to a group (poor working families) that it has been traditionally hard to reach. Our research suggests that it is fundamentally important to consider the crowding out question as we design public policies for health insurance.

Summary

My research on the medical sector leads me to two primary conclusions. First, we get a lot for our money. When we look at the outcomes of medical care for the average person the medical system provides a lot of value. But at the same time, the medical system has a lot of waste. Care gets provided that is not always worth its cost. People enroll in public insurance when we would rather have them be insured privately. These are pressing issues for the public sector, and how the public sector deals with them will have important implications for our satisfaction with the medical system in years to come.

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² D.M. Cutler, "Market Failure in Small Group Health Insurance," NBER Working Paper No. 4879, October 1994, discusses the evidence on this question.

³ D.M. Cutler, "Does The United States Spend Too Much on Medical Care?" in *Health Care in the United States and Japan*, A. Garber, ed., forthcoming.

⁴ D.M. Cutler, "Restructuring Medicare for the Future," in *Setting National Priorities*, R. Reischauer, ed., Washington, D.C.: The Brookings Institution, 1996, pp. 197–234.

⁵ D.M. Cutler and M. McClellan, "What is Technological Change?" in *The Economics Of Aging*, D. Wise, ed., forthcoming;

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⁶ D.M. Cutler and M. McClellan, "The Determinants of Technological Change in Heart Attack Treatments."

⁷ D.M. Cutler, M. McClellan, J.P. Newhouse, and D. Remler, "Are Medical Prices Declining?" NBER Working Paper No. 5750, September 1996; D.M. Cutler and D. Staiger, "Measuring the Benefits of Medical Progress," mimeo, September 1996.

⁸ See Cutler and Staiger, *op. cit.*

⁹ For discussion of these issues, see D.M. Cutler, "Restructuring Medicare for the Future," *op. cit.*; D.M. Cutler and S. Reber, "Paying for Health Insurance: The Trade-off Between Competition and Adverse Selection," NBER Working Paper No. 5796, October 1996; and D.M. Cutler, M. McClellan, and J. P. Newhouse, "Prices and Productivity in Managed Care Insurance," mimeo, March 1997.

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¹¹ D.M. Cutler and J. Gruber, "The Effect of Medicaid Expansions on Public Insurance, Private Insurance, and Redistribution," D.M. Cutler and J. Gruber, "Does Public Insurance Crowd Out Private Insurance?," *Quarterly Journal of Economics*, May 1996, pp. 391-430; D.M. Cutler and J. Gruber, "Medicaid and Private Insurance: Evidence and Implications," *Health Affairs*, January/February 1997, 16 (1), pp. 194-200.

Education, the Wage Structure, and Technological Change: Learning about the Present through the Past

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Lawrence F. Katz**

Human Capital Issues of Our Day

Rising income inequality and the possible causal roles of education and technological change are among the most prominent issues of our day. Earnings inequality has been rising since at least the late-1970s, as manifested in both the increased returns to education and the widening of the income distribution within groups. Many assert that high schools are failing to adequately train youths not bound for college and have serious shortcomings even for those who do continue their education. Employers today, it has been argued, pay little attention to secondary-school credentials, and youths not bound for college have scant incentive to excel

in school. In comparison with other countries and with what schools once accomplished, U.S. secondary education appears to be in decline. The decline, moreover, exists not because we are spending too little, but because, it is claimed, less is being bought for more.¹

At the same time, the technologies of our day, particularly computer-based ones, are demanding more of workers. To many, the combination of the "dumbing down" of secondary schools and a technology that is ability-biased in its rewards have increased the returns to higher education, innate ability, and social background.² Public secondary schools, it is often asserted, respond poorly to incentives, and thus the situation will not improve until basic institutions are changed.

Other periods also have witnessed large advances in technology and increasing demands on the educational system. Did the wage structure widen with each wave of technological progress? And if technological change in the past increased the premium to skill, as it appears to be doing today, did U.S. educational institutions meet the challenges of technological booms? Immigration is a contentious issue today, in part

because of rising inequality. But immigration around the turn of this century was considerably greater and placed enormous strains on the nation's public-school resources. What was the public-sector's response during the period of mass European migration (1900 to 1914)? Rising inequality is a more serious issue today because productivity slowed beginning in 1973, and concern is often expressed that lagging U.S. productivity mirrors the increasing failures of its education system. How did educational advances of the past affect economic growth? Our joint and separate research over the past several years has addressed these questions and the related subjects of economic inequality, education, and technological change.

The Rise of the American High School and Its Economic Consequences

Most of the increase (about 70 percent) in the educational attainment of Americans between 1900 and 1970 occurred at the secondary-school level and much of the advance was accomplished between 1910 and 1940, when the high-school gradua-

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tion rate rose from less than 10 percent to 50 percent. Because of the importance of the high-school expansion to educational change in the twentieth century, we began our project with an exploration of the rise of the American high school and the reasons for its extraordinary and unprecedented increase.³ Our project is the first quantitative study tracking the expansion of secondary schooling in the United States and has produced a major panel data set of states (1910 to 1970s) and cities (1920s and 1930s).

Secondary (or preparatory) schools had existed in the United States, and much of Europe, well before their expansion in the early twentieth century, but they were institutions that primarily trained youths for college. In 1910, for example, half of public high-school graduates in the United States continued their education, a percentage that was higher than it would be until the 1970s. College enrollments after 1910 did not fall or even slow down in their rate of increase. Rather, youths began to enter high schools to obtain an education that would lead directly to employment, not college. The economy had begun producing white-collar jobs that demanded formal education in excess of that provided by the common schools but considerably less than that furnished by college. The public educational system responded by altering its curriculum. In 1900 more than half of all public high-school students enrolled in Latin classes and virtually none took commercial courses. By 1935 only about 15 percent studied Latin, whereas 10 percent enrolled in bookkeeping, 17 percent in typing, and 9 percent in shorthand. By the 1920s the blue-collar sector also was producing jobs that demanded far more education than that provided by grammar school. The educational system

responded here as well, by offering shop, chemistry, mechanical drawing, and other courses that endowed students with the cognitive skills demanded by employers.

The modern secondary school was virtually invented in America where it diffused more completely and rapidly than in Europe. Youths in most European countries would have to wait another 20 or 30 years for their "high school movement" to begin. Educational differences that had narrowed between parts of Europe and America in the late-nineteenth century emerged again in the early part of the twentieth century and grew substantially. By the 1950s youths in the United States were three decades ahead of their British counterparts in terms of high school enrollment and graduation rates.

High school attendance and graduation rates, although much higher in America than in Europe, diffused differentially across the United States. Our state-level data show that certain states underwent spectacular increases in secondary schooling from 1910 to the mid-1930s. Although the increase in secondary schools began in New England, its states were rapidly eclipsed by those in the Pacific and West North Central regions. Southern states, as well as those of the industrial North, lagged. California, Iowa, Kansas, and Nebraska were among the leaders in secondary education in the 1920s, whereas the northern laggards were states like New Jersey, New York, and Pennsylvania. The rates achieved in the leading states were so high by the mid-1930s that they were not again exceeded until the 1960s. The industrial North closed much of the gap during the Great Depression, when jobs for youths were scarce, and the South rapidly converged on the rest of the nation in the 1950s and 1960s.

Using our state- and city-level data we have begun to explore the reasons for the expansion of secondary schooling. Although there are too few countries to analyze the causes of differences between the United States and Europe, there are enough states and cities in the United States to analyze differences within that nation. In a recent paper, we use the cross-section and time-series variation for the United States to better understand the wide differences in schooling across nations.⁴ We find that the factors that encouraged early expansion of secondary schools were high levels of income and wealth, a more even distribution of wealth, less manufacturing given income levels, and more state support to college education. States with a larger fraction of older inhabitants had higher, not lower, graduation rates, unlike findings using more recent data. We also find that state laws regarding compulsory education and child labor appear to have lagged, rather than led, educational advance. States, however, do appear to have hastened the spread of secondary schooling by legislating school-district fiscal responsibility.

Why the United States has recently begun to fall behind some countries in the quality of its education may be rooted, ironically, in the virtues that, early in the twentieth century, led to the expansion of high schools that were open to all, publicly funded and provided, and largely forgiving in their standards for advancement.

The Changing Returns to Education and the Evolving Wage Structure

Much of the motivation for our exploration of educational change was to understand its relationship to changes in the wage structure. But

easily-accessible data concerning economic inequality are far more reliable after the early 1960s than before, and prior to 1940 there is no representative nation-wide sample of individual wages or earnings. The period before 1940 has remained a statistical dark-age in terms of the entire distribution of earnings or wages and the returns to education. We have begun the task of reconstructing the pre-1940 history of economic inequality and the returns to education with research on the earnings of ordinary white-collar workers from 1890 to 1940.⁵ We are also currently engaged in a large-scale collection of the Iowa state census of 1915, the only U.S. state census before 1940 which contains information on education, earnings, immigrant status, and religion, among other variables.

The return to secondary-school education was high in 1940, the first year that census data allow its estimation. But was it even higher before? The enormous increase in secondary schooling during the "high school movement" would suggest that it was. To estimate changes in the returns to education during the expansion of secondary schooling, we construct the first wage series by sex for ordinary white-collar workers (clerks, bookkeepers, secretaries, typists, stenographers) during the 1890 to 1940 period. We find that the premium to high-school educated workers plummeted sometime between 1890 and the late 1920s, declining 30 to 40 percentage points most likely in the World War I period. Our best estimate of the rate of return to a year of high school for males was 22 percent before the decline and 12 percent after. We attribute much of the decline to the increased supply of high-school graduates during the initial period of the "high school movement" and far less to immigration restriction. But even

though the premium to education declined substantially, it remained relatively high until 1939 when it began to undergo another decline. The supply of educated workers expanded rapidly, but the demand for their skills, as we discuss below, also expanded. Thus even though the return to high school fell during the initial increase in secondary-school graduates, it remained relatively high until the 1940s.

The change in the return to schooling in the twentieth century is one part of the larger subject of changes in wage and income inequality. We have only just begun the more difficult task of mapping the full history of overall wage and income inequality in the United States across the past century. An extensive list of researchers has already done much of the pioneering work, but there are still large holes in the series particularly in the crucial period before the 1940s. Although we are now certain that there was a sharp decline in inequality in the 1940s, we have only scant evidence on what occurred before.⁶ Simon Kuznets, using the income tax returns for the top portion of the income distribution, showed that the very top continued to gain at the expense of all others in the 1920s although the process began to reverse in the 1930s.⁷ We are currently piecing together the various scraps of evidence, including those from our data project in-progress on Iowa, and are adding the data from our recent research to assess the past century's evolving wage structure.

The U.S. Educational Stock and Its Role in Economic Growth

The 1940 census was the first at the federal level to inquire about the education of Americans, but the responses of older age groups have

been questioned for some time. To evaluate the suspect "stock" data on schooling levels from the 1940 census, we have constructed a new series built up from "flow" data on education contemporaneous with the period when the individuals were teenagers. Our findings are often vastly different from those derived from the 1940 census.⁸ We have already subjected our series to numerous tests and checks that confirm the long-held suspicion that the 1940 and 1950 censuses vastly overstate the schooling of cohorts educated before 1920 and thus that twentieth-century educational advance was even greater than the census data suggest.

The increase in the U.S. educational stock was a major contributor to American economic growth across much of the twentieth century according to numerous estimates. The forces of educational advance that drove growth in the past are now themselves slowing down and the implication, for some, is that productivity in consequence has waned. Our goal is to provide new evidence on the educational stock for a period of one of its greatest increases, that from 1910 to 1950. Our preliminary work indicates that the increase in years of schooling was even more rapid than prior measures indicate. Thus, education's role in economic growth may have been larger than previously thought.

Technological Change and Technology-Skill Complementarity

U.S. educational wage differentials have expanded over the past forty years despite continued and large increases in the relative numbers of more educated workers. The phenomenon strongly suggests that rapid increases in the demand for skilled

workers have on average outpaced the depressing effect of the increase in their supply. One popular explanation for secular shifts in relative labor demand favoring more skilled workers is that technological change has a strong "skill-biased" component. Another possibility is that physical capital is more complementary with human capital (skilled labor) than with raw (unskilled) labor. Since the physical capital stock has tended to grow at a faster rate than the labor force, capital-skill complementarity implies growth in the relative demand for educated labor. Much empirical research covering the post-World War II period supports the capital-skill and technology-skill complementarity hypotheses.

Current research raises the question of whether new technologies and physical capital were always more complementary with skilled than with unskilled labor. There are reasons to believe that capital-skill complementarity may be a twentieth-century phenomenon. Studies of nineteenth-century manufacturing suggest that physical capital was complementary with raw materials and that both substituted for skilled labor. Further, many have argued that industrialization (at least through the early twentieth century) served to "deskill" a host of artisanal trades and reduce the relative earnings of craftsmen such as weavers, shoemakers, and puddlers. In recent research we demonstrate that capital and skill, and technology and skill, were strong complements by the 1910s and 1920s and that the complementarities were associated with particular technologies, such as continuous and batch processes as well as the adoption of electric motors.⁹

Even though it is often claimed that we are living in a period of unprecedented and extraordinary technological change, the advances that appeared or diffused in the two

decades around 1915 may have been more consequential. Manufacturing horsepower in the form of purchased electricity rose from 9 percent in 1909 to 53 percent in 1929; similar changes swept residential use. New goods proliferated, such as the automobile, airplane, commercial radio, aluminum, synthetic dyes, and rayon; household electric appliances such as the refrigerator and washing machine; office machinery such as calculators, dictating machines, and copying equipment. We demonstrate that many of these new processes and goods increased the relative demand for educated workers.

Using the 1940 census data, we show that the fraction of young (18 to 34 year old) male, blue-collar workers (operatives, craft, laborers) with high-school educations was far greater in the new high-tech industries of the day (for example, certain chemicals, scientific equipment, petroleum refining, radio, aircraft, telephone, and electrical and other machinery) than in the older standards of American industry. It was not just the burgeoning white-collar sector that increased the demand for high-school graduates. Managers in the manufacturing, transportation, and public utilities sectors valued those blue-collar workers who had cognitive skills enabling them to compute formulas, read blueprints, comprehend complex manuals, and understand the basics of chemistry and electricity, for example.

Many parallels exist between the impact of technological change today and in the past. We have already found that shifts in labor demand favoring skilled workers, between 1910 and 1930, are similar in magnitude to those more recently. But the wage structure changes accompanying these technologically-induced demand shifts have been different. The wage structure today has expanded far more than it did during

the previous era of great technological advance that we have explored. One possible reason for the different response in the wage structure is that the supply of educated workers rose far more in the past, an increase that resulted from the "high school movement."

¹ On school expenditures see, for example, E.A. Hanushek, "Rationalizing School Spending: Efficiency, Equity, and Their Connection to Rising Costs," in *Individual and Social Responsibility*, V. Fuchs, ed. Chicago: University of Chicago Press, 1996; C.M. Hoxby, "Are Efficiency and Equity in School Finance Substitutes or Complements?," *Journal of Economic Perspectives* 10 (Fall 1996), pp. 51-72; on employers see J.H. Bishop, "Nerd Harassment, Incentives, School Priorities and Learning," unpublished paper, Cornell University, 1996.

² On computers and recent wage structure changes see, for example, D. Autor, L.F. Katz, and A.B. Krueger, "Computing Inequality: Have Computers Changed the Labor Market?" forthcoming as an NBER Working Paper.

³ See C. Goldin, "How America Graduated from High School: 1910 to 1960," NBER Working Paper No. 4762, June 1994; "Appendix to: How America Graduated from High School: The Construction of State-Level Education Data," NBER Historical Working Paper No. 57, June 1994; "Egalitarianism and the Returns to Education during the Great Transformation of American Education," 1996, revised version of a paper presented at the Symposium on the Economic Analysis of Social Behavior, Chicago, IL; "America's Graduation from High School: The Evolution and Spread of Secondary Schooling in the United States," unpublished paper, Harvard University, 1996; and C. Goldin and L.F. Katz, "Why America Led in Education: Lessons from Secondary School Expansion, 1910 to 1940," forthcoming as an NBER Working Paper.

⁴ C. Goldin and L.F. Katz, "Why America Led in Education: Lessons from Secondary School Expansion, 1910 to 1940," op. cit.

⁵ C. Goldin and L.F. Katz, "The Decline of Noncompeting Groups: Changes in the Premium to Education, 1890 to 1940," NBER Working Paper No. 5202, August 1995.

⁶ C. Goldin and R.A. Margo, "The Great Compression: The Wage Structure in the United States at Mid Century," *Quarterly Journal of Economics* 107 (February 1992), pp. 1-34.

⁷ S. Kuznets, *Shares of Upper Income Groups in Income and Savings*, New

York: National Bureau of Economic Research, 1953.

⁸ C. Goldin and L.F. Katz, "The U.S. Educational Stock and Economic Growth: New Estimates and Their Implications," *working paper in progress*.

⁹ C. Goldin and L.F. Katz, "Technology, Skill, and the Wage Structure: Insights from the Past," *American Economic Review, Papers & Proceedings* 86 (May 1996), pp. 252-57; "The Origins of Technology-Skill Complementarity," NBER Working Paper No. 5657, July 1996.



NBER Profile: *Lucian A. Bebchuk*

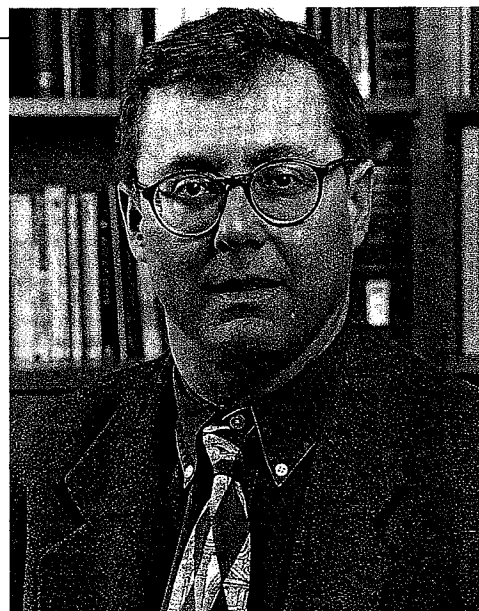
Lucian A. Bebchuk is a Professor of Law, Economics, and Finance at Harvard Law School, and a research associate of the National Bureau of Economic Research.

Bebchuk grew up in Israel, where he obtained a B.A. in mathematics and economics from the University of Haifa and an LL.B. from the University of Tel-Aviv. For his graduate work he went to Harvard, where he received an M.A. and a Ph.D. in economics from the Harvard Economics Department, and an LL.M. (Masters in Law) and an S.J.D. (a doctorate in law) from the Harvard Law School. During his graduate studies at Harvard, he was a Junior Fellow of the Harvard Society of Fellows between 1983 and 1985.

Bebchuk joined the Harvard Law School faculty in 1986 as an assistant professor, and he was promoted to full professor in 1988. He has visited the University of Chicago and also has been a frequent visitor to Tel-Aviv University. He is a member of the Board of Directors of the American Law and Economics Association and of the John M. Olin Center for Law, Economics, and Business at Harvard Law School.

Bebchuk's interests lie in the use of economics and finance to analyze the effects of legal rules and institutions. He has worked on a broad range of subjects and has published extensively in economic, financial, and legal journals. In the area of corporate structure and governance, he has worked on corporate takeovers, the contractual structure of firms, sale of control blocks, insider trading, corporate fiduciary duties, and state competition in corporate law. In bankruptcy, his research has examined corporate reorganizations, secured debt, and the ex ante effects of bankruptcy. In the area of litigation and settlement, his research has brought game theory to bear on decisions whether to sue and whether to settle. Finally, in the area of contracts, his research has focused on the effects of contractual rules on informational transfers as well as performance and reliance decisions.

Bebchuk and Alma Cohen, a doctoral student at Harvard, live in Cambridge, MA. To counter the potentially adverse effects of excessive work, they try to do some of their work in cafes.



NBER Profile: *Ricardo J. Caballero*



Ricardo J. Caballero is an NBER research associate in economic fluctuations and growth and a professor of economics at MIT. Caballero, a Chilean native, received his B.S. and M.A. in economics from the Pontificia Universidad Catolica de Chile and his Ph.D. from MIT. From 1988 to 1992, he was an assistant and then an associate professor of economics at Columbia University. He spent 1991–2 at the NBER as an Olin Fellow, after which he stayed in Cambridge as the Castle-Krob Associate Professor of Economics at MIT. He was promoted to full professor in 1995.

Caballero's teaching and research fields are macroeconomics and international economics. His writings have been published in numerous profes-

sional journals and scholarly volumes: his current research looks at macroeconomic aspects of labor and capital markets. He also has written about aggregate consumption, exchange rates, externalities, growth, price rigidity, capital flows, and dynamic aggregation. He is an associate co-editor of the *Journal of Monetary Economics* and serves on the editorial board of *Cuadernos de Economia* and *Revista de Analisis Economico*.

Caballero also has been a visiting scholar and consultant at the International Monetary Fund, the Inter-American Development Bank, the Federal Reserve Board, and the World Bank. He and his wife, Maggie, live in Brookline (MA) with their two daughters, Camila (6) and Isabella (4).

NBER Profile: *Lawrence F. Katz*

Lawrence F. Katz is a professor of economics at Harvard University and a research associate in the NBER's Programs in Labor Studies and Economic Fluctuations and Growth. He received his A.B. from the University of California, Berkeley and his Ph.D. in economics from MIT. Before coming to Harvard in 1986, Katz was on the faculty at the University of California, Berkeley. He also served as the Chief Economist of the U.S. Department of Labor from January 1993 to August 1994. Katz has been editor of the *Quarterly Journal of Economics* since 1990. He is also a fellow of the Econometric Society and a "Global Leader of Tomorrow" of the World Economic Forum.

Katz's primary research interests focus on issues in labor economics and the economics of social problems and income distribution. His work has covered a wide range of topics including: unemployment; the measurement and determinants of economic inequality;

the evolution of the U.S. wage structure; theories of wage determination; education and the labor market; the problems of disadvantaged youth; regional labor markets; the economics of immigration; the impact of international trade on the labor market; welfare reform; and the evaluation of the effects of social programs and labor market policies. Much of his current work is joint with Claudia Goldin and explores the historical origins of the recent widening of the U.S. wage structure and the rise of U.S. educational attainment over the past century. He also continues to study the roles of technological change, international trade, immigration, and labor market institutions in explaining recent increases in U.S. wage inequality and differences among advanced nations in changes in inequality and unemployment. He recently edited the NBER volume *Differences and Changes in Wage Structures* (with Richard Freeman, published by the University of Chicago



Press in 1995).

Katz shares a house in Cambridge, common research interests, and hobbies with Claudia Goldin. They recently travelled to South-Central Nebraska to witness one of the last great migrations: the return of half a million sandhill cranes to the Platte River.

NBER Profile: *Claudia Goldin*

Claudia Goldin is professor of economics at Harvard University and director of the NBER's Program on the Development of the American Economy. Before coming to Harvard she was on the faculty of the University of Pennsylvania, Princeton University, and the University of Wisconsin. She has won many teaching awards and enjoys teaching undergraduate and graduate students at Harvard University.

In 1991 Goldin served as vice president of the American Economic Association, and she was vice president of the Economic History Association in 1989. From 1984 to 1988 she was editor of the *Journal of Economic History*, and she is currently on the editorial boards of the *Quarterly Journal of Economics*, *Explorations in Economic History*, and the *Review of Economics and Statistics*. She is a fellow of the Econometric Society and of the American Academy of Arts and Sciences.

Goldin received her B.A. from Cornell University and her Ph.D. from

the University of Chicago. Her research is in the general area of American economic history and has covered a wide range of topics, such as slavery, emancipation, the post-bellum South, the family, women in the economy, the economic impact of war, immigration, New Deal policies, inequality, and education. Most of her research interprets the "present through the lens of the past" and explores the origins of current issues of concern, such as the reasons for immigration restriction, the causes of increased female labor force participation, the impact of technological change on the wage structure, and the role of education in ameliorating inequality. She is the author and editor of several books, among them *Understanding the Gender Gap: An Economic History of American Women* (Oxford 1990) and *The Regulated Economy: A Historical Approach to Political Economy* (with G. Libecap; University of Chicago Press 1994). She is currently exploring the rise of public education in America, particularly the "high school movement" of the



1910 to 1940 period and its impact on inequality of earnings.

Goldin is an avid bird watcher, mountaineer, and all-round naturalist, and shares these passions with her companion of many years, Lawrence F. Katz, with whom she co-authors much of her research.

NBER Profile: *David M. Cutler*



David M. Cutler is a faculty research fellow in the NBER's Programs in Aging, Health Care, Public Economics, and Productivity. He is also associate professor of economics at Harvard University. He received his B.A. in economics from Harvard in 1987 and his Ph.D. in economics from MIT in 1991.

In addition to his positions at Harvard and the NBER, Cutler served in 1993 as Senior Staff Economist at the Council of Economic Advisers and Director of the National Economic Council. Cutler was primarily involved in drafting the Clinton Administration's healthcare reform proposal. He also has served on several government advisory panels, including groups at

the National Institutes of Health and the Social Security Administration.

Cutler's research focuses on the economics of health care. Currently, he is examining the sources of cost growth in medical care, the productivity of the medical system, and the relationship between public provision of medical care and private insurance coverage. Cutler is also an associate editor of the *Journal of Health Economics*.

Cutler lives in Cambridge, where he enjoys ultimate frisbee, walks along the Charles River, and reading history.

Conferences

Ninth Annual IASE Held in Argentina

The ninth Annual NBER Inter-American Seminar on Economics, sponsored jointly with the Universidad de San Andres this year, took place in Buenos Aires on November 17–19. The organizers were Sebastian Edwards, NBER and University of California, Los Angeles, and Mariano Tommasi, Universidad de San Andres. After an opening session that included remarks from Roque Fernandez, the Economic Minister of Argentina, the following papers were discussed:

Mauricio Cardenas, Foundation for Higher Education and Development, "Colombian Savings: A Long View"

Discussant: Jorge Streb, CEMA

Jonathan Skinner, NBER and Dartmouth College; **Karen Dynan**, Federal Reserve Board; and **Stephen Zeldes**, NBER and Columbia University, "Do the Rich Save More?"

Discussant: Guillermo Mondino, Fundacion Mediterranea

Andrew Samwick, NBER and Dartmouth College, "Discount Rate Heterogeneity and Social Security Reform"

Discussant: George McCandless, Universidad de San Andres

Aaron Tornell, NBER and Harvard University, and **Philip Lane**, Columbia University, "Adjustment of Savings and the Current Account to Windfalls"

Discussant: Juan Pablo Nicolini, Universidad di Tella

Alan Taylor, NBER and Northwestern University, "Argentina and the World Capital Market: Saving, Investment, and International Capital Mobility in the Twentieth Century"

Discussant: Roberto Cortes Conde, Universidad de San Andres

Joshua Aizenman, NBER and Dartmouth College; and **Andrew Powell**, Banco Central de la Republica Argentina, "The Political Economy of Public Savings and the Role of Capital Mobility"

Discussant: Pablo Sanguinetti, Universidad di Tella

Marcio G.P. Garcia and **Alexandre Barcinski**, Pontifica Universidad Catolica do Rio, "Capital Flows to Brazil in the Nineties: Macroeconomic Aspects and the Effectiveness of Capital Controls"

Discussant: Carlos Zarazaga, Federal Reserve Bank of Dallas

Fernando Navajas and **Ricardo Lopez Murphy**, FIEL, "Domestic Savings, Public Savings, and Expenditure on Durables"

Discussant: Osvaldo Schenone, Universidad de San Andres

Carmen Reinhardt, University of Maryland, and **Ernesto Talvi**, Inter-American Development Bank, "Capital Flows and Saving in Latin America and Asia: a Reinterpretation"

Discussant: Frederico Sturzenegger, Universidad de San Andres

Felipe Morande, ILADES, "Savings in Chile: What Went Right?"

Discussant: Claudio Sapelli, Universidad Catolica de Chile

Cardenas analyzes the long-term determinants of savings in Colombia. He uses time-series data to investigate the collapse of private savings in that country after the launching of the market-oriented reforms of 1990. In particular, he analyzes the possible interaction between savings and real exchange rate behavior, labor legislation reform, and trade liberalization reform. Cardenas suggests that the sharp decline (in excess of 5 percent of GDP) in private savings after 1990 was merely a temporary reaction to structural changes. He also finds that public savings consti-

tute a fundamental determinant of aggregate savings, and argues that a major fiscal adjustment would have a positive effect on savings in the long run.

Using a number of new datasets, **Skinner** and his co-authors confirm that high income households save a larger fraction of their permanent income than lower income households do. Also, based on saving rates for households headed by individuals aged 70 to 80, they find some evidence of a modest positive correlation between money income and saving, although the patterns are not

as consistent as those for younger households. In sum, these preliminary results on the saving behavior of older households cast doubt on the traditional life cycle model modified to allow differences in time preference rates, differences in Social Security replacement rates, and so on.

As many countries consider the privatization of existing pay-as-you-go Social Security systems, the option to make participation in the new system voluntary may appeal to policymakers who need to obtain the political support of their workers. A

critical issue in determining the popularity of such a reform and its economic consequences is households' preferences for consumption. **Samwick** finds that an appropriate menu of reform plans can induce the voluntary buyout of 84 percent of existing payroll taxes at a cost to national saving of less than 0.25 percent.

Tornell and **Lane** point out that the structure of the fiscal process is critical in what happens to the current account. In countries in which there is strong control over the national budgetary process, pressures to increase spending in the wake of extra resources can be resisted successfully, and an improvement in the current account takes place. Conversely, if there is divided control over the fiscal process, then the voracity effect described in this paper is allowed to operate and a perverse outcome occurs.

Taylor considers integration in the world capital market between the economies of the core and periphery in the twentieth century. He focuses in particular on Argentina. He argues that understanding the changing relations in international capital markets offers important insights into the growth and development process, especially for the countries of the periphery. Moreover, studying the historical extent of market integration yields information about current relationships between capital-scarce economies, like Argentina, and the global capital market as a whole. The repercussions of economic reform and demographic change also are likely to have implications for future saving, investment, and international capital flows.

Aizenman and **Powell** explain public saving and public investment in economies where fiscal budgeting decisions are the outcome of a political process which involves many groups competing for scarce funds. They show that there is a strong bias

towards noncooperation among these groups (in other words, a collective action problem). If there is no strong center to impose the cooperative solution, then this problem manifests itself in a very low savings rate. In the extreme, current spending may be determined simply by current tax income and by access to capital. This explains why in the face of a boom, which may be known to be temporary, governments may not save but rather may borrow more to finance even higher levels of expenditure.

Since the last quarter of 1991, a very restrictive monetary policy in Brazil has resulted in probably the world's highest yield to fixed income investments. As a result, there were massive capital inflows to Brazil. The magnitude of those flows exacerbated two macroeconomic problems: an increase in the quasi-fiscal deficit caused by the interest payments on the debt used to sterilize the inflows and, after the Real Plan, the overvaluation of the currency. **Garcia** and **Barcinski** describe and analyze the restrictions to capital inflows, as well as the main "financial engineering" strategies used to circumvent these restrictions. Given the advanced stage of Brazil's domestic financial markets — including a powerful derivatives market — the restrictions have not been effective in preventing the inflows of foreign capital. Given the little progress achieved so far in the fiscal side of the reforms, it is also doubtful that these restrictions have been effective in a broader sense, that of allowing the government to buy time to implement the essential structural reforms. By reducing the urgency of the politically costly structural reforms aimed at increasing domestic savings, capital inflows may have detrimental incentive effects on the governments' resolve to push forward the stabilization plan.

Murphy and **Navajas** show that when aspects related to public sav-

ings and consumer durables are measured explicitly, there is a considerable reduction in the recent cycle of savings in Argentina. Both public savings and investment are responsible for sharp changes in domestic savings between decades, while a great deal of the cycle in private savings is explained by decisions about consumer durables. An examination of the saving-investment correlation shows a drop over time in both the short-run correlation and the speed of correction of any difference between both aggregates. However, a gap between savings and investment in Argentina is not a long-term phenomenon. Finally, an intertemporal optimization response by economic agents to new economic conditions, as well as elements of exaggerated optimism and pessimism, might explain the sharp cycle in the consumer durables spending that is behind the corresponding cycle in private savings.

Reinhart and **Talvi** show that, when trend and cyclical components of domestic saving and capital flows are taken into account properly, Asia and Latin America do not differ in the short-run response of domestic saving to capital inflows. The main differences pertain to the long-run behavior of saving rates, which are driven by trends in demographics, per capita GDP, and other factors. The authors conjecture that if the greater vulnerability of Latin America to volatile capital flows is explained somehow by saving rates, then it must be related to saving levels, rather than to the way domestic saving rates respond to changes in international capital flows.

Morande uses time-series analysis to investigate the causes behind the climb of Chile's savings from 6 to 26 percent of GDP. He finds that Chile's savings responded to structural, demographic, and policy variables. In particular, his analysis strongly

suggests that Chile's social security reform — which replaced an insolvent pay-as-you-go system with a privately managed, capitalization regime — had an important positive effect on private savings. He also finds that although government and foreign savings crowd-out private savings, they do so in less than a one-to-one fashion.

After the presentation and discussion of these papers, Luis Servén of the World Bank presided over a wrap-up of the conference and a dis-

cussion of future related research. The final session was a panel discussion, chaired by Mariano Tommasi, with the following panel members: Sebastian Edward, Domingo Cavallo, Fundacion Mediterranea; Carlos Rodriguez, Ministerio de Economia; Martin Feldstein, NBER and Harvard University; and Miguel Angel Broda. The panel discussed issues related to economic reform and asked whether Latin America was about to become the next "miracle" region in the world economy. The panel also

addressed issues related to institutional development, fiscal adjustment, investment, and productivity growth. They concluded that although Latin America had made tremendous progress, the region still showed some signs of fragility, especially with respect to the relative weakness of local banks. As in previous years, it is expected that the conference proceedings will be published in a special edition of the *Journal of Development Economics*.

Purchasing Power Parity Revisited

On December 20 and 21, the NBER, the Tokyo Center for Economic Research (TCER), and the Centre for Economic Policy Research (CEPR) in London jointly sponsored a conference in Tokyo on "Purchasing Power Parity (PPP) Revisited: the Exchange Rate and Price Movements, Theory and Evidence." The organizers were Takatoshi Ito, IMF (on leave from the NBER), Masahiro Kawai, University of Tokyo, and Kiminori Matsuyama, NBER and Northwestern University. The program was:

Charles M. Engel, NBER and University of Washington; **Michael Hendrickson**, University of Washington; and **John Rogers**, Federal Reserve System, "Intranational, Intracontinental, and Intraplanetary PPP." Discussants: Kenichi Ohno, Saitama University, and Shigenori Shiratsuka, Bank of Japan.

Torben Andersen, University of Aarhus and CEPR, "Exchange Rate Volatility, Nominal Rigidities, and Persistent Deviations from PPP." Discussants: Charles M. Engel, and Colin McKenzie, Osaka University.

Masahiro Kawai and **Hidetaka Ohara**, University of Tokyo, "Nonstationarity of Real Exchange Rates in the G7 Countries: Cointegrating Relations with Real Variables." Discussants: Colin McKenzie, and Shinji Takagi, Osaka University.

Yoko Sazanami, **Takunari Kimura**, and **Hiroki Kawai**, Keio University and TCER, "Sectoral Price Movements under the Yen Appreciation." Discussants: Torben Andersen, and Kazuo Ueda, University of Tokyo.

Axel A. Weber, Bonn University and CEPR, "Sources of Purchasing Power Disparities: Germany versus the United States and Japan." Discussants: Shinji Takagi, and Alan M. Taylor, NBER and Northwestern University.

Alan M. Taylor, NBER and Northwestern University.

Alan M. Taylor, and **Maurice Obstfeld**, NBER and University of California, Berkeley, "Nonlinear Aspects of Goods-Market Arbitrage and Adjustment: Heckscher's Commodity Points Revisited." Discussants: Mitsuhiro Fukao, Bank of Japan, and Axel Weber.

Shin-ichi Fukuda, University of Tokyo and TCER, and **Takashi Kano**, Hitotsubashi University, "International Price Linkage within a Region: the Case of East Asia." Discussants: Kenichi Ohno, and Eiji Ogawa, Hitotsubashi University. **Takatoshi Ito**, "The Long-Run PPP of the Yen." Discussants: Shin-ichi Fukuda, and Sachiko Kuroda, Bank of Japan.

Discussants: Shin-ichi Fukuda, and Sachiko Kuroda, Bank of Japan.

Engel, Hendrickson, and Rogers propose a new method of using panel data to test for purchasing power parity. Their method allows relative prices to adjust at different speeds among locations; it takes into account the interdependence of shocks and real exchange rates; and,

the outcome of their test does not depend on the "base country." They apply the test to real exchange rates for consumer prices from September 1978 to September 1994 among eight cities: New York, Los Angeles, Toronto, Vancouver, Zurich, Geneva, Frankfurt and Cologne. They are

unable to reject the null of unit roots in real exchange rates.

Andersen shows how changes in nominal exchange rates can have real effects and induce persistence in the adjustment of real exchange rates. The key to nominal rigidities is an imperfection in the capital market,

implying that agents cannot hedge perfectly against consumption risk. As a consequence, nominal changes have real effects, both by affecting the ex post real purchasing power of savings and by affecting the ex ante incentives in labor supply. Andersen considers the consequences of exogenous changes in the nominal exchange rate in a two-sector small open economy with competitive product and labor markets.

If real shocks, instead of nominal shocks, are dominant in an economy, then real shocks and the real exchange rate are expected to move together. With this framework in mind, **Kawai** and **Ohara** show that the real exchange rate is cointegrated with other real economic variables among the G7 countries. The productivity variable does not appear to be important in the cointegrating equation, but the terms-of-trade ratio is.

Using Japanese price data, **Sazanami**, **Kimura**, and **Kawai** investigate how far the price movements of tradable goods deviate from the law of one price under currency appreciation. They also investigate the relationship between the globalization of firms' activities and export pass-through. They find that internal-external price differentials have expanded surprisingly for most of the products since 1985. Commodities whose price gaps expanded quite a bit often are associated with governmental regulations and restrictive private business practices that may not necessarily be designed to discriminate against imports but in fact limit their market penetration. Second, the

authors find that globalization of the activities of Japanese firms affects their pricing behavior. Specifically, the export pass-through rate seems to have an inverted-U-shape relationship with the degree of globalization.

Recent research in international macroeconomics has rediscovered the problem of purchasing power parity. **Weber** uses an extended version of a structural vector autoregressive model to identify the importance of various types of real shocks (labor supply, productivity, and aggregate demand) and nominal shocks (money demand and money supply). Based on the evidence, he doubts that those shocks which drive real exchange rates are truly aggregate demand disturbances.

Obstfeld and **Taylor** propose that analysis of purchasing power parity and the law of one price should explicitly take into account the possibility of "commodity points" — thresholds delineating a region of no central tendency among relative prices, possibly because of a lack of perfect arbitrage in the presence of transaction costs and uncertainty. They devise a method to identify commodity points. Their model performs well using post-1980 data, and yields estimates that appear quite reasonable: adjustment outside the thresholds might imply half-lives of price deviations measured in months rather than years, and the thresholds correspond to popular rough estimates on the order of magnitude of actual transport costs. The estimated commodity points appear to be positively related to objective measures

of market segmentation, notably nominal exchange rate volatility.

Fukuda and **Kano** investigate how "prices" in East Asian economies are correlated with those in Japan and the United States. The analysis is particularly noteworthy because East Asian economies are geographically close to Japan but their currencies have been tied more to the U.S. dollar. The authors analyze two different types of "prices": the overall price levels in terms of the same currency and the relative prices between different commodities. They demonstrate that the overall price levels in East Asian economies are related closely to those in the United States. However, the relative prices in East Asian economies, especially those in Taiwan and Korea, are correlated closely to those in Japan. The results are in marked contrast with the price correlations in other regions.

Ito examines the long-run behavior of the yen/dollar real exchange rate. He combines several series to compose a Japanese consumer price index, U.S. consumer price index, and the yen/dollar exchange rate from 1880 to 1995, in order to examine hypotheses related to purchasing power parity (PPP). He tentatively concludes that there is a long-run tendency for reversion to the PPP. However, he finds no evidence of high growth with real exchange rate appreciation in the prewar yen/dollar exchange rate.

These papers and their discussions will be published in a special edition of the *Journal of the Japanese and International Economies*.

Mergers and Productivity

Steven N. Kaplan of the NBER and the University of Chicago's Graduate School of Business organized a Bureau study on the effects of mergers on productivity as part of the NBER's Project on "Productivity and Technological Change." The results of this project were presented at a conference on "Mergers and Productivity" which took place on January 16-18. The program was:

Stacey Kole, University of Rochester, and **Kenneth Lehn**, University of Pittsburgh,

"Workforce Integration and the Dissipation of Value in Mergers: the Case of USAir's Acquisition of Piedmont Aviation"

Discussants: Severin Borenstein, NBER and the University of California, Berkeley, and Mark Knez, University of Chicago

Charles Calomiris, NBER and Columbia University, and **Jason Karceski**, Columbia University, "Is

the Bank Merger Wave of the '90s Efficient? Lessons from Nine Case Studies"

Discussants: Christopher James, University of Florida, and Anil K. Kashyap, NBER and University of Chicago

Jason Barro, Harvard University, and **David M. Cutler**, NBER and Harvard University, "Consolidation in the Medical Care Marketplace: A Case Study from Massachusetts"

Discussants: Paul Healy, MIT, and Frank R. Lichtenberg, NBER and Columbia University

Bronwyn H. Hall, NBER and University of California, Berkeley, "Mergers and R and D Revisited"

Discussants: Adam B. Jaffe, NBER and Brandeis University, and Steven N. Kaplan

William Long, Business Performance Research Associates, and **David Ravenscraft**, University of North Carolina, "Paths to Creating

Value in Pharmaceutical Mergers"

Discussants: George Baker, Harvard University, and Robert Gertner, NBER and University of Chicago

Steven N. Kaplan, **Mark Mitchell**, University of Chicago, and **Karen Wruck**, Harvard University,

"A Clinical Exploration of Value Creation and Destruction in Acquisitions: Organization Design, Incentives, and Internal Capital Markets"

Discussants: G. William Schwert, NBER and University of Rochester, and Rene M. Stulz, NBER and Ohio State University

Raghuram Rajan and **Luigi Zingales**, NBER and University of Chicago, and **Paolo Volpin**, Harvard University, "The Eclipse of the U.S. Tire Industry"

Discussants: Michael C. Jensen, NBER and Harvard University, and Robert H. Porter, NBER and Northwestern University

Kole and **Lehn** observe that in 1987, USAir's acquisition of Piedmont Aviation was praised as a perfect match. The combination of two strong airlines with contiguous route structures surely would improve the utilization of aircraft, maintenance facilities, and crews. The more extensive route structure would appeal to both Piedmont and USAir frequent travelers. However, USAir stumbled in the implementation process, and its present cost structure bears the legacy of those missteps.

The U.S. banking system is undergoing dramatic consolidation. America's historical predilection for requiring local bank chartering, and limiting the powers of commercial banks, has given way to a new era of deregulation in which nationwide banks with broad powers have taken

over the industry, building themselves up largely via acquisitions. Is the current merger wave in American banking helping to promote efficiency by increasing the size and scope of banks, or is the bank merger wave driven by darker aspirations — the search for monopoly rents or the job security and personal perquisites of bank managers? **Calomiris** and **Karceski** argue that detailed case studies of some of the most recent merger transactions help to resolve some of these apparent inconsistencies, and are particularly useful in an industry like banking where rapid changes make even the recent past a poor guide to the future.

Barro and **Cutler** examine consolidation in the Massachusetts hospital market. They find that consolidation is driven primarily by a large decline

in the demand for hospital beds, resulting from increased enrollment in managed care, and technological changes. The drive to consolidate appears through three primary forces: consolidation for closure; consolidation for economies of scale; and consolidation for network creation.

Using a newly constructed dataset containing approximately 6,000 United States publicly traded manufacturing firms that existed at some time between 1976 and 1995, **Hall** reexamines a series of findings about the relationship between restructuring activity and R and D investment during the 1980s, extending them to 1995. Her dataset is essentially a universe of such firms. She finds that: 1) between 1980 and 1995, employment in these firms fell from approximately 18 million to 13 million employees,

with most of the decline taking place by 1990. 2) This shrinkage was achieved by internal shrinkage in the sectors associated with the rust belt (such as primary metals and automobiles) and by exit (often via leveraged restructuring or going private) in the low- to medium technology sectors. The high technology sectors (pharmaceuticals, computing equipment, and the like) did not experience employment reductions. 3) Prior to 1987, firms that exited by going private had a substantially lower R and D-to-sales ratio than other firms, but after that date, there is only a small difference in R and D intensities between those who go private and the others. 4) Contrary to earlier findings that R and D was unchanged by mergers between two publicly traded firms during the 1980s, there is a slight hint that R and D may have declined after merger in the 1990s, although the result is not significant.

Since 1994, merger activity has been at an all time high. A critical component of this wave is the combination of large firms in industries like banking, health care, chemicals, defense, and utilities. **Long** and **Ravenscraft** attempt to gain insights into the causes and motivations of these large horizontal combinations through a detailed study of pharmaceutical mergers and, in particular, Glaxo's 1995 hostile takeover of Wellcome. Two characteristics — cross-border transactions and large horizontal deals — explain most of the value creation in pharmaceuticals, they find. Glaxo and Wellcome were driven to merging, because of the industry pressures and the fact that they were particularly hard hit because of the patent expiration of both of their major products. Their

merger allowed them to create value through \$1 billion in cost savings involving all functional areas: administrative, commercial, manufacturing, and R and D. A detailed look at these cost cuttings suggests that economies of scale and scope play a role, but the primary factor was excess capacity created by the reduced growth opportunities in the industry and the firm.

Kaplan, Mitchell, and Wruck present clinically-based studies of two acquisitions that received very different stock market reactions at announcement, one positive and one negative. Despite the differing market reactions, they find that, ultimately, neither acquisition created value overall. In exploring the reasons for these outcomes, they rely primarily on interviews with managers and on internally generated performance data. They compare the results of these analyses to those from analyses of post-acquisition operating and stock price performance traditionally applied to large samples, and draw three primary conclusions: 1) The findings highlight the difficulty of implementing a successful acquisition strategy and of running an effective internal capital market. Post-acquisition difficulties resulted because managers of the acquiring company did not study or understand the target company sufficiently at the time of the acquisition; the acquirer imposed an inappropriate organizational design on the target as part of the post-acquisition integration process; and inappropriate management incentives existed at both the top management and division level. 2) Measures of operating performance used in large sample studies often are correlated weakly with actual post-acquisition operating

performance. 3) The initial stock-market reactions to the acquisitions appear to have been reasonable.

Rajan, Volpin, and Zingales undertake an in-depth analysis of the tire industry during 1970–90. They attempt to uncover the causes and consequences of the acquisition activity in the industry in the 1980s, which resulted in all but one large U.S. tire manufacturer being sold to foreign companies. They do not find that ownership was acquired by more efficient producers. Nor were the takeovers undertaken in response to the failure of internal control systems to induce downsizing. The most likely explanation is that the acquisitions were driven by an increase in cross-border production and trade by automobile manufacturers. This increased the need for cross-border production by the tire manufacturers, as well as increasing the scale of product development and marketing required. U.S. manufacturers were preoccupied in the 1970s with the switch to radial tires, which the rest of the developed world had accomplished a decade earlier. In order to focus on the competitive domestic market and make the extraordinary investment required to switch to radials, they largely abandoned their international operations. This left them ill-equipped to realize the economies of cross-border production in the 1980s. As a result, all the major U.S. tire manufacturers with the exception of Goodyear were acquired by foreign firms in the 1980s.

The papers and discussions from this conference will be published in an NBER volume by the University of Chicago Press. Its availability will be announced in a future issue of the *NBER Reporter*.

The Effects of Consumption Tax Reform

On January 27, the NBER held its first videoconference, linking researchers on the east and west coasts for a day-long meeting. The subject of this videoconference was "Asset Price and Transition Effects of Consumption Tax Reform." James M. Poterba, director of the NBER's Program in Public Economics and a professor at MIT, organized this program.

David F. Bradford, NBER and Princeton University, "Tax Rate

Flexibility in Consumption Tax Systems."

Discussant: **Michael J. Boskin**, NBER and Stanford University.

William Gentry and **R. Glenn Hubbard**, NBER and Columbia University, "Fundamental Tax Reform and Corporate Finance."

Discussant: **Robert E. Hall**, NBER and Stanford University.

Andrew Lyon, University of Maryland, and **Chris Edwards**, **Peter Merrill**, and **Mel Schwarz**,

Price Waterhouse, "Business Transition Issues in Fundamental Tax Reform."

Discussant: **James R. Hines, Jr.**, NBER and Harvard University.

Martin S. Feldstein, NBER and Harvard University, "The Effect of a Consumption Tax on the Rate of Interest."

Discussant: **Alan J. Auerbach**, NBER and University of California, Berkeley.

Bradford considers the design of rules that render consumption taxes immune to the incentive and incidence effects of changes in the rate of tax. He suggests that the issue arises mainly in the case of business cash-flow taxes, and shows that two relatively simple approaches are available to deal with it: grandfathering the tax rate applicable to a given period's investment or substituting depreciation allowances for the usual expensing of investment, coupled with a credit for the equivalent of interest on the undepreciated investment stock. One cost of this approach is its requirement of identifying true depreciation. Bradford takes up the risk-free case only; he is currently studying the considerations introduced by risk.

Gentry and **Hubbard** evaluate consequences of tax reform on corporate finance to distinguish between the effects of income tax reform and consumption tax reform. They focus on one fundamental income tax reform proposal — the Treasury Department's Comprehensive Business Income Tax (CBIT) — and one consumption tax reform proposal, the Flat Tax. They conclude that:

1) Relative to CBIT, the Flat Tax exempts only the risk-free return to capital. 2) The effect of fundamental tax reform on interest rates depends on whether dividend taxes are capitalized in share values and on the elasticity of the supply of funds to the domestic business sector with respect to the net return. 3) The effects of tax reform on organization and financing decisions stem from income tax reform, although the Flat Tax permits simpler rules for mergers and acquisitions than CBIT. 4) With regard to financial innovation for tax planning, to the extent that such innovations arise to muddle the distinction between debt and equity for tax purposes, they are no longer necessary under either CBIT or the Flat Tax.

Lyon and his co-authors examine transition issues that would arise for businesses as a result of replacing the income tax with a consumption tax. They quantify asset price effects for a variety of different types of property, under alternative assumptions about the way in which relative prices might adjust during the transition period. They also assess the size of the transition "problem" by estimating the impact of transition to a con-

sumption-based tax on the financial statement for 12 different industries. The authors also evaluate the extent to which wealth effects are mitigated by two options for allowing the deduction of unrecovered basis in assets acquired prior to tax reform.

Feldstein analyzes the ways in which substituting a consumption tax for the existing personal and corporate income taxes would affect equilibrium pretax interest rates. His analysis indicates that whether the pretax rate of interest rises or falls depends on the strength of the personal saving response, the nature of the capital market equilibrium between debt and equity yields, and the response of the owner-occupied housing sector. Further, his analysis suggests that the shift from an income tax to a consumption tax is more likely to raise rates than to lower them.

Also participating in this teleconference were: B. Douglas Bernheim, NBER and Stanford University; Daniel R. Feenberg and Andrew Mitrusi, NBER; Michael Graetz, Yale University; Laurence J. Kotlikoff, NBER and Boston University; and Gilbert E. Metcalf, NBER and Tufts University.

The Costs and Benefits of Achieving Price Stability

Bureau President Martin Feldstein, also of Harvard University, organized an NBER project on the costs and benefits of reducing inflation from the current low rates in the United States and Western Europe to complete price stability. The project was an extension of an earlier study by Feldstein which was done as part of the NBER Project on Inflation organized by Christina and David Romer and published as *Reducing Inflation: Motivation and Strategy*.

In the earlier study, Feldstein showed that the interaction of tax rules and inflation causes a permanent loss of real income (that is, a deadweight loss) equal to 1 percent of GDP when the inflation rate is 2 percent rather than zero. The present value of having the zero inflation rate therefore exceeds substantially the estimated short-run cost of achieving the reduction. The purpose of the present project was to extend the earlier analysis in a variety of ways, to apply it to other industrial countries, and to examine other potential costs and benefits associated with low rates of inflation.

Participants in the project met with other economists for an NBER conference held at the Federal Reserve Bank of New York on February 20–21. Feldstein's paper for this conference, which was discussed by Stanley Fischer of the IMF (on leave from the NBER), repeated the earlier analysis with a few modifications and discussed some issues about the specification of the problem that had been raised since the earlier research was presented.

Then **R. Glenn Hubbard**, NBER and Columbia University, and **Kevin A. Hassett** and **Darrel Cohen**, Federal Reserve System, extend the analysis to deal with distortions in corporate finance. In "Inflation and the User Cost of Capital: Does Infla-

tion Still Matter?", discussed by Alan J. Auerbach of NBER and University of California, Berkeley, they demonstrate that the net effect of changes in the tax code and the level of inflation and investment since the 1970s has not relegated inflation to the sidelines. They conclude instead that: 1) inflation, even at its relatively low current rates, continues to increase the user cost of capital significantly; 2) the marginal gain to a percentage point reduction in inflation is larger for lower levels of inflation; 3) the beneficial effects of lowering inflation even further than has been achieved to date would likely be significant; and 4) inflation has only a small impact on intratemporal distortions in the choice of investment technology. They also analyze the effect of inflation on the user cost of capital in open economies.

Mihir Desai, Harvard University, and **James R. Hines, Jr.**, NBER and Harvard University, then extend Feldstein's analysis to the international economy. In "The Tax-Inflation Interaction in Open Economies," discussed by Jeffrey A. Frankel, Council of Economic Advisers (on leave from NBER), they estimate the efficiency costs of interactions between inflation and taxation in open economies. In a world of perfectly mobile portfolio capital flows, domestic inflation stimulates international capital movement, affecting domestic and foreign interest rates, tax receipts, saving behavior, and investment decisions. The efficiency costs associated with these inflation-induced international capital reallocations are typically much larger than those generated by the effects of inflation in closed economies. Domestic inflation has more moderate effects on interest rates, but potentially even more severe consequences for efficiency, in settings characterized by imperfect

international capital mobility, they conclude.

The Feldstein analysis — basically, what happens if we reduce inflation from current levels to roughly zero — was repeated by various authors for the economies of Spain, Germany, and Great Britain. These papers were discussed by Rudiger Dornbusch of the NBER and MIT and Andrew Abel of the NBER and University of Pennsylvania.

The Spanish case study, "A Cost-Benefit Analysis of Going from Low Inflation to Price Stability in Spain," was prepared by **Juan J. Dolado**, Universidad Carlos III, **Jose M. Gonzalez-Paramo**, Universidad Complutense, and **Jose Vinals**, Banco de Espana. They find the effect on Spanish GDP to be similar to what Feldstein found for the United States.

The German study, "Price Stability versus Low Inflation in Germany: An Analysis of Costs and Benefits," was undertaken by Deutsche Bundesbank economists **Karl-Heinz Todter** and **Gerhard Ziebarth**. They estimate that "the change of regime from an equilibrium inflation rate of 2 percent to a rate of zero brings permanent welfare gains, which have an equivalent value of 1.4 percent of GDP from year to year."

The U.K. analysis, "Some Costs and Benefits of Price Stability in the United Kingdom," was done by Bank of England economists **Hasan Bakshi**, **Andrew Haldane**, and **Neal Hatch**. They conclude that "aggregate welfare gains in the U.K. are much smaller than those of Feldstein for the U.S. — perhaps around one quarter of the size."

Two other papers deal with the more general effects of reducing a low inflation rate. "Inflation's Grease and Sand Effects in the Labor Market" by **Erica L. Groshen**, Federal

Reserve Bank of New York, and **Mark E. Schweitzer**, Federal Reserve Bank of Cleveland, discussed at the conference by Laurence M. Ball of NBER and Princeton University, explains that inflation has been accused of causing distortionary price and wage fluctuations (sand) as well as lauded for facilitating adjustments (grease) to shocks when wages are rigid downwards. The authors investigate whether these two effects can be distinguished from each other in a labor market by the following identifying assumption: Inflation-induced deviations among employers' mean wage-changes represent unintended intramarket distortions, while inflation-induced interoccupational wage-change dispersion reflects intended alignments with intermarket forces. The authors also look for evidence that recent years have seen an increase in the pace of occupational wage adjustment that is higher than historical patterns would predict, suggesting a rise in wage flexibility. Using a unique 40-year panel of wage changes made by large Midwestern employers, they find a wide variety of evidence to support the identifying assumption. They also find some indication that large firms may be gaining wage flexibility in the

past four years. These results lend strong support to findings that both grease and sand exist, but that they counteract each other in a welfare sense. Thus in the range between zero and 5 percent, the net impact of inflation is positive but statistically indistinguishable from zero, and it turns negative at rates over 5 percent. When positive, net benefits never exceed a tenth of gross benefits, though.

In "Does Inflation Harm Economic Growth? Evidence for the OECD," which was discussed by Federal Reserve Bank of New York Director of Research Frederic S. Mishkin (who is on leave from NBER), Bank of Spain economists **Javier Andres** and **Ignacio Hernando** conclude that even low or moderate inflation rates (as have occurred within the OECD) have a negative temporary impact upon long-term growth rates. This effect is significant and generates a permanent reduction in the level of per capita income. Inflation not only reduces the level of investment but also the efficiency with which productive factors are used. The estimated benefit of a permanent reduction in the inflation rate by a percentage point is an increase in the steady-state level of per capita in-

come which ranges from 0.5 percent to 2 percent. Although the size varies somewhat across specifications (as well as across different levels of inflation), the correlation among inflation and future income is never positive.

In addition to the authors and discussants already mentioned, some closing comments to the conference were made by Federal Reserve Governor Laurence Meyer, Benjamin Friedman of the NBER and Harvard University, and Martin Feldstein. Federal Reserve Bank of New York President **William McDonough** was the group's dinner speaker. Also participating in the discussions were: Phillip Cagan and Edmund Phelps, Columbia University; Stephen G. Cecchetti, NBER and Ohio State University; Douglas Elmendorf, Federal Reserve System; Matthew D. Shapiro, NBER and University of Michigan; and Anna J. Schwartz, NBER.

The papers and discussions presented at the conference, and a summary of the general discussion prepared by Erzo Luttmer of Harvard University, will be published by the University of Chicago Press in an NBER conference volume. Its availability will be announced in an upcoming issue of the *NBER Reporter*.



Bureau News

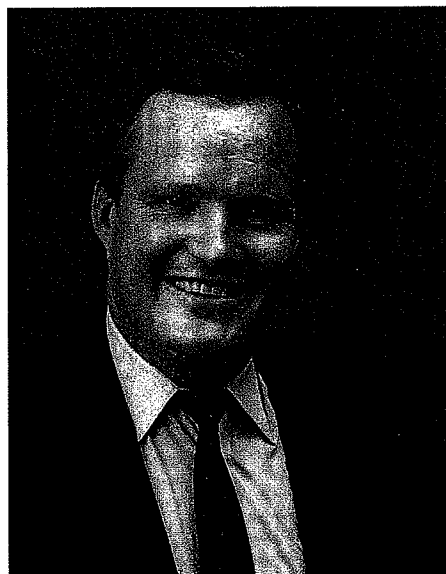
Murphy to Receive Clark Medal

The 1997 John Bates Clark Award of the American Economic Association will be given to NBER Research Associate Kevin M. Murphy of the University of Chicago. Murphy was honored for his work on wages, wage inequality, and the relationship between wages and labor force participation.

Murphy has been a member of the NBER's Program in Labor Studies since 1985. He holds a bachelor's degree from the University of California, Los Angeles, and a Ph.D. from the University of Chicago.

The Clark Medal is awarded every

other year to the economist under the age of 40 who is judged to have made the most significant contribution to economics. Past recipients of the John Bates Clark Award who have been associated with the NBER are: Milton Friedman, 1951; Zvi Griliches, 1965; Gary S. Becker, 1967; Daniel McFadden, 1975; Martin Feldstein, 1977; Joseph E. Stiglitz, 1979; A. Michael Spence, 1981; James J. Heckman, 1983; Jerry A. Hausman, 1985; Sanford J. Grossman, 1987; Paul R. Krugman, 1991; Lawrence H. Summers, 1993; and David Card, 1995.



Gruber and Scholz to Treasury

NBER Faculty Research Fellows Jonathan Gruber and J. Karl Scholz will both assume policy positions at the U.S. Department of the Treasury. Gruber, who teaches at MIT and is a member of the NBER's Programs on

the Well-Being of Children, Public Economics, and Health Care, will become Deputy Assistant Secretary for Economics on May 1. Scholz, who teaches at the University of Wisconsin and is a member of the Bureau's

Program on Public Economics, became Deputy Assistant Secretary for Tax Policy on January 21. Both will be on leave from the NBER during their stays in Washington.

NBER Announces Nonprofit Fellowships

The NBER has awarded dissertation fellowships on "The Economics of the Nonprofit Sector" to Patrick Bayer of Stanford University, Mark Duggan of Harvard University, and Jeffrey Kling of MIT. As part of a new program designed to encourage research on nonprofit institutions by NBER research associates and faculty research fellows, and to support dissertation research on the same subject by graduate students in economics who work closely with them, small grants were also awarded to NBER researchers Martin Gaynor of

Carnegie Mellon University, James J. Heckman of the University of Chicago, Michael Kremer of MIT, and Naci H. Mocan of University of Colorado, Denver. The Bureau expects to make additional awards next year.

Bayer plans to study "Competition Between Public and Private Schools." Duggan will look at "Decisionmaking in Nonprofit Hospitals," considering both administrative and care-related decisions. Kling will examine "the role of nonprofit organizations in helping families move out of public housing" and into apartments found

on the private market — this type of program becomes necessary as HUD makes the transition to voucher-based housing assistance.

Gaynor will study the "Effects of Consolidation and Concentration on Nonprofit Hospitals." Heckman will evaluate the role of "Not-for-Profit Organizations in Manpower Training." Kremer will examine the role of "Nonprofit Organizations in Developing Countries," and Mocan will produce "A Comparison of Nonprofit and For-Profit Child Care Centers."

Research Meeting of EFG Program

Nearly 60 members and guests of the NBER's Program on Economic Fluctuations and Growth met at Stanford University on January 31. Organizers Ricardo J. Caballero, NBER and MIT, and John H. Cochrane, NBER and University of Chicago, put together this agenda:

Michael Woodford, NBER and Princeton University, "Control of the Public Debt: A Requirement for Price Stability?" (NBER Working Paper No. 5684)

Discussant: Christopher A. Sims, NBER and Yale University

Lawrence Christiano and **Martin S. Eichenbaum**, NBER

and Northwestern University, and **Charles Evans**, Federal Reserve Bank of Chicago, "Sticky Price and Limited Participation Models of Money: A Comparison" (NBER Working Paper No. 5804)

Discussant: David H. Romer, NBER and University of California, Berkeley

James Hamilton, University of California, San Diego, "Measuring the Liquidity Effect"

Discussant: Bennett T. McCallum, NBER and Carnegie-Mellon University

Olivier J. Blanchard and **Michael Kremer**, NBER and MIT

"Disorganization" (NBER Additional Paper)

Discussant: Pierre-Olivier Gourinchas, Stanford University

James Kahn and **Jong-Soo Lim**, University of Rochester, "Skilled Labor—Augmenting Technical Progress in U.S. Manufacturing" Discussant: Kevin M. Murphy, NBER and University of Chicago

Robert E. Hall, NBER and Stanford University, and **Charles Jones**, Stanford University, "The Productivity of Nations" (NBER Working Paper No. 5812)

Discussant: Edward C. Prescott, NBER and University of Minnesota

Woodford considers the role of limits on the permissible growth of public debt, like those stipulated in the Maastricht Treaty, in making price stability possible. He shows that variations in the present value of current and future primary government budgets necessarily result in price level instability. In the presence of sluggish price adjustment, the fiscal shocks disturb both real output and real interest rates. On the other hand, shocks of this kind can be eliminated by a Maastricht-type limit on the value of the public debt. Furthermore, an appropriate monetary policy rule can ensure price stability even in the face of other kinds of real shocks. Thus, the debt limit serves as a precondition for the common central bank in a monetary union to be charged with responsibility for maintaining a stable value for the common currency.

Christiano, Eichenbaum, and Evans provide new evidence that models of the monetary transmission mechanism should be consistent with at least the following facts: after a contractionary monetary policy shock, the aggregate price level

responds very little; aggregate output falls; interest rates initially rise; real wages decline by a modest amount; and profits fall. The limited participation model can account for all of these facts, but only if one is willing to assume a high labor supply elasticity (2 percent) and a high markup (40 percent). The shortcomings of both it and the sticky price model reflect the absence of labor market frictions, such as wage contracts or factor hoarding, which dampen movements in the marginal cost of production after a monetary policy shock.

Hamilton develops a measure of the immediate effect on the federal funds rate of an open market operation. He creates a proxy for the errors the Federal Reserve makes in forecasting the extent to which Treasury operations will add or drain reserves available to private banks. These errors induce fluctuations in bank reserves that have measurable consequences for the federal funds rate. He estimates that a reduction in nonborrowed reserves of \$30 million, if sustained for an entire 14-day reserve maintenance period, will cause the federal funds rate to rise by 10 basis points.

Blanchard and Kremer note that under central planning, many firms relied on a single supplier for many of their inputs. Transition has led to decentralized bargaining between suppliers and buyers. Under incomplete contracts or asymmetric information, bargaining may inefficiently break down. If chains of production are complex, so that many different parties must bargain, these inefficiencies may be dramatic. The mechanisms that mitigate these problems in the West can only play a limited role in transition. For example, the scope for long-term relations to reduce opportunistic behavior is limited when many existing firms are expected to disappear or change most of their suppliers in the future. The result has been disorganization, and a sharp decrease in output. Output seems to have fallen furthest for the goods with the most complex chains of production, and disorganization has played a more important role in the former Soviet Union than in Central Europe.

Kahn and Lim examine the role of skilled labor in the growth of total factor productivity. They use panel

data from manufacturing industries within the United States to assess the extent to which productivity growth in yearly cross-sections of U.S. manufacturing industries is tied to industry shares of skilled labor inputs. They find an explosion in skilled-labor augmenting technological progress during the period from approximately 1973 to 1981, coinciding with a period of suddenly in-

creasing wage inequality and rapid growth in the relative wages of educated and experienced workers. They also provide evidence from aggregate manufacturing data that confirm this shift pre- and post-1973.

Output per worker varies enormously across countries. **Hall** and **Jones** show that differences in governmental, cultural, and natural infrastructure are important sources of this

variation. A high-productivity country has institutions that favor production over diversion; is open to international trade; has at least some private ownership; speaks an international language; and is located in a temperate latitude far from the equator. A favorable infrastructure helps a country both by stimulating the accumulation of human and physical capital and by raising its total factor productivity.

Industrial Technology and Productivity

Members of the NBER's Project on Industrial Technology and Productivity, led by Adam B. Jaffe of NBER and Brandeis University, met in Cambridge on February 14 to discuss some of the individual studies that are part of the overall project. The following papers were presented:

Daniel Raff, NBER and University of Pennsylvania: "What Happened at Highland Park?"

Discussant: Claudia Goldin, NBER and Harvard University

Frank R. Lichtenberg, NBER and Columbia University, and

William Lehr, Columbia University: "Computer Use and Productivity Growth in Federal Government Agencies, 1987 to 1992" (NBER Working Paper No. 5616)

Discussant: Daniel R. Feenberg, NBER

Shane Greenstein, NBER and University of Illinois, and **Timothy F. Bresnahan**, NBER and Stanford University: "Technical Progress and Co-Invention in Computing and in the Uses of Computers"

Discussant: G. Steven Olley, NBER and New York University

Susan Helper, Case Western Reserve University:

"Complementarity and Cost Reduction: Evidence from the Auto Supply Industry"

Discussant: Maryellen R. Kelley, Carnegie Mellon University

J. Vernon Henderson, NBER and Brown University, and **Randy Becker**, Brown University: "Effects of Air Quality Regulations on Decisions of Firms in Polluting Industries"

Discussant: Wayne Gray, NBER and Clark University

Raff studies total factor productivity growth at the Ford Motor Company from 1909 through 1914, the period generally taken to cover its transition from turn-of-the-century factory methods to true mass production. Annual growth rates were extremely large as compared to the rates for aggregates which economists usually see. Based on their timing, incremental improvements in technology and organization — owing to the implementation of interchangeable parts assembly and the rationalization of materials flow through the production process — that preceded the coming of the line appear to be strikingly important contributions to growth.

Lehr and **Lichtenberg** examine trends in computer usage and their effect on productivity growth for a sample of federal government agencies from 1987 to 1992. They link data from the Bureau of Labor Statistics on the growth in real output per employee with data from a marketing research firm, Computer Intelligence, on the growth in per capita computer assets for a sample of 44 federal agencies. They derive an estimated output elasticity for computers of 0.06, allowing them to conclude that computers contributed significantly to output growth. Moreover, the returns to computer investment appear to exceed those to other types of capital. There is also

a positive correlation between increased computer usage and compensation growth which is consistent with skill-biased technical change. Finally, telephone interviews with personnel from a subset of the agencies in their sample helped to verify the quality of the data and to confirm these overall findings, as well as suggesting several ways in which computers have enhanced productivity in the public sector.

Bresnahan and **Greenstein** examine the diffusion of client/server computing to users of large scale computing systems, a group that places extremely high value on technology. They examine detailed, user-based information about the

adoption of client/server and the replacement of host-based systems between 1989 and 1994. They argue that these adoption patterns can be understood in terms of the costs faced by buyers when adjusting to the new client/server platform. These costs are high and tied closely to the idiosyncracies and complexity of the buyer's computing organization. The potential adopters with the most valuable computing use also tend to be those with the highest adjustment costs. Thus, the earliest adopters of computing systems have the least valuable applications. The costs of adjusting to client/server also depend on whether market processes make this co-invention activity cheap or expensive.

Over the last 20 years, the success of Japanese manufacturing firms has brought renewed attention to the importance of cost reduction on existing products as a source of productivity growth. **Helper** uses survey data and field interviews from the auto supply industry to explore the determinants of average-cost reduction for a sample of 171 plants in the United States and Canada between

1988 and 1992. Her main result is that the determinants of cost reduction differ markedly between firms that had an employee suggestion program in 1988 and firms that did not. The two groups of firms achieved equal amounts of cost reduction, but did so in very different ways. Firms with a suggestion program saw their costs fall more if they also had "voice" relationships with customers and workers. Firms without a suggestion program gained no cost-reduction benefit from these programs; instead their cost reduction success was largely a function of increases in volume.

Henderson and Becker examine the effect of air quality regulation (related to ground level ozone) on the decisions of firms in four industries which are heavy polluters: industrial organic chemicals, plastics, metal containers, and wood furniture. Air quality regulation is much tougher in counties which are in non-attainment of national air quality standards. It also varies implicitly by plant size, with plants in the large-scale sector coming under regulation earlier and remaining under closer

scrutiny. Using Census data for 1963-92, and dividing the time into pre-regulation (before the mid-1970s), early regulation, and the mature era, the authors find that in all industries there is a big shift in plant births from non-attainment to attainment counties under regulation. The shift occurs earlier in the large-scale sectors. For three industries, the authors find an attempted expansion of the less regulated small-scale sector, which is successful for two of them. In terms of survival rates, there is evidence of grandfathering: survival rates of pre-regulation plants rise with the advent of regulation. Also, investment patterns change. New plants in the mature regulatory era in non-attainment areas have much larger initial (up-front) investments, because of the environmental negotiation process. These larger up-front investments also appear to increase later survival rates of these plants. While many of these findings seem reasonable, they are unintended consequences of regulation, and are leading to restructuring of key polluting industries.

Program Meeting on Industrial Organization

About 40 members and guests of the NBER's Program on Industrial Organization met at the Bureau's California office on February 28 and March 1. Steven T. Berry, NBER and Yale University, and Judith A. Chevalier, NBER and the University of Chicago, organized this program.

Daniel A. Akerberg, Boston University, "Advertising, Learning, and Consumer Choice in Experience Good Markets: An Empirical Examination." Discussant: Sara F. Ellison, MIT.
Martin Pesendorfer, Yale University, "Retail Sales: A Study of

Pricing Behavior in Supermarkets." Discussant: Peter Rossi, University of Chicago.

Philip A. Haile, University of Wisconsin, "Auctions with Resale Markets: An Application to U.S. Forest Service Timber Sales."

Discussant: Kenneth Hendricks, University of British Columbia.

Joel Podolny, Stanford University, and **Andrea Shepard**, NBER and Stanford University, "When Are Technological Spillovers Local? Patent Citation Patterns in the Semiconductor Industry."

Discussant: Steven T. Berry

Steven T. Berry and **Ariel Pakes**, NBER and Yale University, and **James Levinsohn**, NBER and University of Michigan, "Estimating Differentiated Product Models from Combining Micro and Macro Data: Autos Once Again."

Discussant: Peter C. Reiss, NBER and Stanford University.

Patrick S. Moreton and **Pablo T. Spiller**, University of California, Berkeley, "Bidding Strategies in Interrelated Multi-Object Auctions: Evidence from the FCC Broadband PCS Spectrum Auctions."

Discussant: Robert Gertner, NBER and University of Chicago.

Ackerberg analyzes different effects of advertising in a nondurable, experience good market. He presents a dynamic learning model of consumer behavior in which advertising has both "informative" effects and "prestige" or "image" effects. He estimates this model with consumer-level panel data that tracks grocery purchases and advertising exposure over time. In his data, the primary effect of advertising is to inform consumers.

Pesendorfer examines temporary price reductions, or sales, on ketchup products in supermarkets in Springfield, Missouri, between 1986 and 1988. He finds that demand at low price levels depends on past price choices, which suggests that there are intertemporal effects in demand. Further, the timing of sales is best explained by competition between retailers.

Haile presents a model of auctions with resale which he then applies to sales of timber harvesting contracts held by the U.S. Forest Service. After a contract is sold, there is often a considerable delay before harvesting must begin, and each firm's uncertainty about the value it places on the contract may be resolved in the interim. Because contracts can be transferred in some circumstances and always can be subcontracted, bidding may reflect the presence of a resale market in which the ex post gains to trade can be exploited. The results are consistent with the predictions of the model: First, control-

ling for the selection of the auction mechanism, first-price sealed bid auctions yield revenues which are at least as high as those from English auctions. This ranking is strict in one of the two regions studied. Second, individual bids in English auctions increase with the number of bidders. Neither of these results is consistent with the models of auctions without resale that underlie previous empirical studies of timber auctions, and the latter result is inconsistent with any known noncooperative model of auctions without resale.

Recent empirical research has provided some evidence of local technological spillovers across firm boundaries, but has provided little guidance as to how characteristics of research projects, labs, firms, or geographic areas may affect the likelihood that spillovers are local.

Podolny and **Shepard** use data on semiconductor patents with application dates between 1976 and 1990 and the citations among those patents as indicators of spillover effects. They find that common geographic location has a substantial and enduring effect on the probability of a spillover from one R and D project to another. Further, these effects are more important when the citing and cited patents are in technologically dissimilar areas. Interestingly, these effects are not larger in areas with greater technological activity; indeed the advantage of proximity appears to be negatively correlated with the

level of activity in the neighborhood of the at-risk patent.

Berry, Levinsohn, and Pakes extend their earlier research on estimating the demand for automobiles with the results from a new consumer-level dataset on new automobile purchases. Their technique allows consumer preferences to depend on both measured and unmeasured characteristics of available automobile models and on the household making the purchase decision. They find important interactions between these sets of characteristics, suggesting that household attributes such as age, family size, income, and rural location substantially influence preferences for different automotive features. The authors hope to build upon this work to analyze model design decisions by automobile manufacturers.

Moreton and **Spiller** explore the bidding strategies used by participants in the FCC's recent auction for Block C Broadband PCS spectrum licenses. They focus on two aspects that affect a bidder's expectations for winning a nearby license: the degree of competition for that license, and the attractiveness of that license to its strongest rival. They find that bidders are sensitive to the degree of competition in adjacent licenses and withdraw from markets at lower prices when confronted with rivals in adjacent markets that possess substantial cellular telephone license holdings.



Productivity Meeting

The NBER's Program on Productivity held its spring meeting at the Bureau's offices on March 7. Program Director Zvi Griliches, also of Harvard University, and Samuel S. Kortum, NBER and Boston University, organized this agenda.

Lee G. Branstetter, NBER and Dartmouth College, and **Mariko Sakakibara**, University of California at Los Angeles, Japanese Research Consortia: A Microeconomic Analysis of Industrial Policy.

Branstetter and **Sakakibara** undertake the first large-sample econometric study of Japanese government-sponsored research consortia, using firm-level data on research inputs and outputs to measure the impact of participation on the ex post research productivity of the firm. They find that frequent participation in these consortia has a positive impact on research expenditure and research productivity. Part of this impact arises from the increased knowledge spillovers that take place within these consortia. These results are useful in shedding light on the question of what role Japanese "industrial policy" played in Japanese technological innovation during the 1980s.

Jovanovic combines the vintage capital model with the assignment model, and studies the distribution of wages and rental incomes. Some of his findings are: 1) The machine-vintage premium is higher if skills are more dispersed. 2) The skill premium can be higher if technological progress is more rapid. 3) Obsolescence is faster than in the efficiency-units model, at least for older machines. 4) Low-skilled people, areas, or countries are "priced out" of the market for machines embodying advanced technology. 5) Faster technological

progress speeds up the diffusion of technology.

Discussant: Rebecca Henderson, NBER and MIT.

Boyan Jovanovic, NBER and New York University, "Obsolescence of Capital."

Discussant: Charles R. Hulten, NBER and University of Maryland.

Jonathan Putnam, Charles River Associates, "The Value of International Patent Rights."

Discussant: Jonathan Eaton, NBER and Boston University.

Samuel S. Kortum, and **Josh**

Lerner, NBER and Harvard University, "Technological Revolution or Stronger Protection? What is Behind the Recent Surge in Patenting?"

Discussant: Mehmet Yorukoglu, University of Chicago.

Edward N. Wolff, NBER and New York University, "Spillovers, Linkages, and Technical Change."

Discussant: Wolfgang Keller, University of Wisconsin.

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Putnam studies an inventor's decision to file for patent protection in each of an arbitrary set of countries, as a means of estimating the global value of patent rights, and the distribution from which patented inventions are drawn. Using oversampled, invention-level data from the 1974 international patent cohort, he estimates a model for the 18 leading patenting countries. His results are consistent with those of patent renewal models, except in the right tail of the distribution, where the international model imputes significantly more value (up to \$50 million worldwide) to the most valuable inventions. The international component of annual capitalized patent returns alone represents over \$14 billion in 1974 dollars, or about 21 percent of annual private business R and D in the countries under investigation. The average internationally protected patented invention generates about \$245,000 in patent rights, with over half the total value captured by the top 5 percent of inventions. With the exception of Japan, the largest developed countries appear to grant more value in patent rights at home than they hold abroad.

Applications for U.S. patents by U.S. inventors have taken a spectacular jump over the last decade. No comparable increase has occurred since early this century. **Kortum** and **Lerner** ask whether the jump in patenting reflects a new set of technological opportunities or a jump in the propensity to patent inventions. Conventional wisdom is that patents have fared better in the courts since the establishment of the Court of Appeals of the Federal Circuit by Congress in 1982. These authors evaluate the evidence for the hypothesis that this institutional change has increased inventors' propensity to patent.

Using U.S. input-output data for 1958 to 1987, **Wolff** finds that industry growth in total factor productivity (TFP) is related significantly to the TFP performance of supplying sectors, with an elasticity of almost 60 percent. R and D intensity is also a significant determinant of industry TFP growth, with an estimated return of about 10–13 percent, and the return to embodied R and D is around 43 percent. Direct productivity spillovers, from the technological progress made by supplying sectors, appear more important than spillovers from the R and D per-