NBER Reporter

NATIONAL BUREAU OF ECONOMIC RESEARCH

Reporter OnLine at: www.nber.org/reporter

SPRING 2002

IN THIS ISSUE

Program Report

Productivity

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The NBER's research efforts traditionally have been organized along the same lines as university economics departments' Ph.D. fields: labor, public finance, macroeconomics, and so on. The Productivity Program has been a major exception to this general organizational structure, having instead as its research focus topics that frequently cross traditional areas and fields of economics.

The Productivity Program began in 1979 when NBER President Martin Feldstein asked Zvi Griliches of Harvard University to serve as the first Director of the NBER's Program on Technological Change and Productivity Measurement. Griliches served in that position until just before his death in November 1999. Over the years, the Productivity Program has interacted with other NBER programs, and in fact a substantial portion of the Productivity Program academic affiliates currently are associated with one or more other NBER programs as well. The Program also has had a number of other interactions and spin-off initiatives.

In this report, I outline developments in a number of Productivity Program activities over the last five years. In a forthcoming issue of the NBER Reporter, I will focus on research themes and developments in the NBER's core Productivity Program.

The "Pin Factory" Initiative

Empirical economic research typically involves formulating a mathematical model, accessing data from magnetic tapes or, increasingly, downloading data from websites, estimating parameters using canned or customized econometric software, and then describing the empirical results. In most cases, this research process involves no fieldwork, and hardly ever are there interviews with the economic actors being modeled, nor are there visits to the places they live and work. With generous support from the Sloan Foundation, the NBER has embarked on an effort to promote field research among economists, making factory and site visits a significant component of empirical research. Dubbed the "pin factory" initiative in reference to Adam Smith's visit to a pin facto-

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NBER Reporter

NATIONAL BUREAU OF ECONOMIC RESEARCH

Preparation of the NBER *Reporter* is under the editorial supervision of Donna Zerwitz.

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ry that helped him explain the benefits of division of labor, this NBER field research has involved about 20 visits between 1995 and 1999 to firms in Boston, Cleveland, Detroit, Kentucky, Los Angeles, and San Francisco, all organized with the assistance of NBER Research Associate Susan Helper, Case Western Reserve University. The goal of this program is to foster deeper understanding of the sources of productivity growth in the U.S. economy, via the combined application of traditional theoretical and empirical research techniques along with field research and direct observation by economists of the business world.

Based in part on these visits, Program members Adam Jaffe of Brandeis University, Jenny Lanjouw of Yale University, and Josh Lerner, Harvard Business School, organized a conference in January 1999 on "The Patent System and Innovation." In April 1999, Helper served as organizer of a conference on "Organizational Change and Performance Improvement." Feldstein and Jaffe also organized a session at the American Economic Association's 2000 Annual Meetings in Boston on "The NBER/Sloan Project on Industrial Technology and Productivity: Incorporating Learning from Plant Visits and Interviews into Economic Research." Details of these conferences and meetings can be found at: **http://www.nber.org/sloan/project_report.html**.

Results of this and related fieldwork have been published in a number of places. NBER Research Associate Severin Borenstein, Haas School of Business, and Joseph Farrell, University of California, Berkeley, edited the June 1998 special issue of the *Journal of Industrial Economics*, "Inside the Pin Factory: Empirical Studies Augmented by Manager Interviews" [1,2,3,4,5,6]. NBER Research Associate Steven N. Kaplan edited an NBER Conference Report volume titled, *Mergers and Productivity*, consisting of six papers plus comments that provide in-depth case studies of selected mergers [7,8,9,10,11,12]. Jaffe, Lanjouw, and Lerner were guest editors of a Symposium on the Patent System and Innovation, published in the Spring 2001 *Rand Journal of Economics*, comprising six articles dealing with various intellectual property issues [13,14,15,16,17,18,19]. Finally, papers presented at the "pin factory" session of the 2000 annual meetings of the American Economic Association were published in the May 2000 issue of the *American Economic Review* [20,21,22,23].

More recently, NBER Research Associate

Iain Cockburn, Boston University, has organized three additional pin factory visits in the greater Boston area, at Sycamore Networks, the EMC Corporation, and State Street Bank. Currently plans are underway to extend the pin factory concept internationally, focusing on labor market practices and the adoption of new technologies. This new initiative will be led by Faculty Research Fellow Kathryn L. Shaw, Carnegie Mellon University, and Labor Studies Program Director Richard B. Freeman, Harvard University.

Innovation Policy and The Economy

Another important project within the NBER's Productivity Program is the "Innovation Policy and the Economy" (IPE) initiative, headed by Jaffe. The IPE project has dealt with broad intellectual property issues that affect innovation and R and D, such as the impact of changing patent policy and the commercialization possibilities from government-funded research on new technologies. One feature of this IPE project is that it provides a forum for active debate of issues by sponsoring an annual policy-related conference in Washington D.C., bringing together leading academic researchers and policymakers with mutual interests in innovation policy.

Seven papers presented at the initial April 2000 meeting have been published in the first volume of a new NBER series, *Innovation Policy and the Economy*, edited by Jaffe, Lerner, and NBER Faculty Research Fellow Scott Stern of Kellogg School of Management. Topics range from public-private funding and the pharmaceutical industry [24]; designing markets for vaccines [25,26]; cross-licensing, standards, and patent pools [27]; commercialization of the internet [28]; effects of the Bayh-Dole Act on university patenting [29]; and government subsidies for scientists and engineers [30].

The second IPE Washington D.C. meeting, held in April 2001, addressed antitrust issues in the software industry [31]; the design of alternative incentive systems for intellectual property protection [32]; the Israeli experience with commercial R and D policy [33]; and the role of information technology in the "new" macroeconomy [34,35].

The third annual meeting of the IPE program is scheduled for April 16, 2002 at the National Press Club in Washington D.C. Program details are available on the Conference Department page of the NBER's website: **http://www.nber.org/~confer/**.

NBER and the Conference on Research in Income and Wealth

The history of the NBER has been associated closely with that of the Conference on Research in Income and Wealth (CRIW), particularly since the 1930s when NBER founder Simon Kuznets collaborated with academics and government statisticians in creating the framework of national income and product accounts [36].

Two productivity-related volumes recently have been published that continue the NBER-CRIW partnerships among government statisticians, government economists, academic economists, and private sector economists. The first, *New Developments in Productivity Analysis*, edited by NBER Research Associate Charles R. Hulten, University of Maryland, Edwin R. Dean, George Washington University, and Michael J. Harper, U.S. Bureau of Labor Statistics, consists of an introduction and 15 papers presented at a March 1998 NBER/CRIW conference in Silver Spring, MD. The papers discuss: histories of the concept of total factor productivity and its measurement [37,38, 39,40,41]; a description of the BLS's productivity measurement program [42]; cyclical and dynamic aspects of productivity [43,44]; aggregation issues [45,46]; industry studies [46,47,48]; international productivity growth comparisons [49,50]; and the incorporation of negative externalities and changing environmental quality into productivity calculations [50,51].

The second recently published NBER/CRIW volume, *Medical Care Output and Productivity*, involved researchers from both the Health Care and Productivity Programs at the NBER, as well as a number of government economists and statisticians. Edited by NBER Research Associate David M. Cutler, Harvard University, and me, this volume includes 15 papers originally presented at a June 1998 conference at the National Institutes of Health in Bethesda, MD. Some chapters in this volume raise conceptual issues, such as how health care differs from other service industries and the implications for measurement [52,53,54,55], what procedures currently are used by the BLS for health care price measurement in its Consumer Price Index [56] and Producer Price Index [57] programs, and a reconciliation of hospital and physician service accounts between the Bureau of Economic Analysis' National Income and Product Accounts and the Center for Medicare and Medicaid's National Health Accounts [58].

Other chapters consider price measurement of treatments for specific illnesses, conditions, and therapies, including technological and medical developments for the treatment of heart attacks are reviewed in [59], and the implications of these developments and changed treatment patterns for the (mis)measurement of heart attack treatment price indexes is found in [60]. The development of a price index for cataract surgery [61]; an hedonic price index for anti-arthritis drugs [62]; and a price index for the treatment of acute phase major depression [63] are all discussed. Three additional chapters deal with valuing reductions in child injury mortality [64], modeling the effects of pharmaceutical innovations that result in enhanced patient compliance and welfare [65], and the issues involved in assessing the allocation of publicly funded biomedical research [66].

Although the NBER's Productivity Program has long had a tradition of involving professionals from government statistical agencies in the NBER's Summer Institute, beginning in 2000 there also have been explicitly jointly organized sessions of the NBER Productivity Program and the CRIW.

In the 2000 Summer Institute, the two-day joint program was co-organized by Hulten (Chair of the CRIW) and me. In 2001, the two-day joint program was co-organized in addition by David W. Wilcox of the Federal Reserve Board.

For the 2002 Summer Institute, the joint NBER/CRIW program is expanding from two to three days, and again is being co-organized by Hulten, Wilcox, and me. The focus of the third day will involve examination and assessment of the National Academy of Science's (NAS) recently published panel report and recommendations on conceptualizing and measuring cost-of-living and price indexes [67]. This NAS report follows up on the much-publicized Boskin Commission findings [68] of a systematic upward bias in the CPI as a measure of changes in the cost-of-living. Six NBER Research Associates served on this NAS panel (myself, Angus Deaton of Princeton University, W. Erwin Diewert, University of British Columbia, Claudia D. Goldin, Harvard University, Griliches until his death in November 1999, and Richard Schmalensee, MIT). Based in part on research by NBER Research Associate Ariel Pakes of Harvard University [69], whose earlier versions of this NBER Working Paper are cited in the NAS panel report, the BLS is currently experimenting with recommendations for introducing hedonic-based pricing methods into the CPI on a real-time basis.

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Research Summaries

Monetary Policy Analysis

Bennett T. McCallum*

The past several years have seen very rapid development in the area of monetary policy analysis.[1] One welcome aspect is the convergence of approaches used by academic and central-bank economists. For example, a look at a notable NBER conference volume[2] and/or a special issue of the *Journal of Monetary Economics* (Vol. 43, July 1999) suggests that it would be difficult, if not impossible, to identify the author of almost any article or comment as belonging to one group or the other. A major stimulus to this convergence, I believe, was John Taylor's exposition of the now-familiar "Taylor Rule,"[3] which encouraged academics to focus on policy rules expressed in terms of interest-rate instruments (thereby conforming to actual central bank practices) and encouraged central bankers to think of policy in a more rule-like fashion.

Mainstream Analysis

Much of this recent work has used the following approach: the researcher specifies a quantitative macroeconomic model that is intended to be structural (invariant to policy changes) and consistent with both theory and evidence. Then, analytically or by stochastic simulations, he determines how crucial variables such as inflation and the output gap behave on average under various hypothesized policy rules. Normally, rational expectations is assumed throughout. Evaluation of the outcomes can be accomplished by reference to an explicit objective function or left to the judgement (that is, implicit objective function) of the policymaker. Optimal control techniques may or may not be involved.

There is also considerable agreement about the general, broad structure of the macroeconomic model to be used — but much disagreement over details. For the simplest closed-economy analysis a three-equation system is often used, involving just 1) an optimizing "IS" type of intertemporal spending relation; a price adjustment relation; and 2) an interest rate policy rule of the general Taylor type. The basic logic of the analysis is not affected if (1) and (2) are sets of equations representing "sectors" of the model, rather than single equations. A major development over the past 10-15 years is the tendency of researchers to use versions of (1) and (2) that are based on optimizing analysis of individual agents in a dynamic, stochastic setting. Often the price adjustment relation is based on the work of Calvo and Rotemberg, although there continues to be much dispute concerning the theoretical and empirical adequacy of this specification.[4] Development of the optimizing or "expectational" IS relationship — basically a consumption Euler equation plus some substitutions — was affected more or less simultaneously by a number of independent analysts.[5] My own paper with Edward Nelson was not the first in print, but is arguably the only one to explore the relationship of the new expectational specification with IS specifications of the traditional type.

Extensions and Differences

More generally, my recent work has conformed in large measure to the approach just outlined. Papers with Nelson appear in both the Taylor volume and the *JME* issue mentioned earlier.[6] The former represents a policy-rule exploration based on an estimated model that is highly orthodox in most respects; the latter features an extension, however, that makes the model applicable to a small open economy. We derive import demand as part of the optimizing behavior of consumer-producer households, with imports being modelled as intermediate goods used in the production of consumables, rather than as consumption goods in the manner favored in most of the "new open-economy macro" literature. In a subsequent paper, Nelson and I show that this alternative formulation is helpful in matching some features of actual exchange rate behavior.[7]

A second way in which my work represents an extension of the basic model concerns the role of capital. Much of the literature treats the stock of productive capital as fixed or exogenous.[8] A paper written with Miguel Casares endogenizes capital investment behavior and explores several issues.[9] Some significant findings are that capital stock adjustment costs must be included to avoid highly unrealistic behavior (especially in sticky-price models); that adjustment-cost specifications need to penalize rapid changes more sharply than with the familiar quadratic cost specification; and that models with constant capital can provide reasonable approximations for purposes of monetary policy and business-cycle analysis.

One feature of the literature under discussion is that most models include no money-demand function and no variable reflecting quantities of any monetary aggregate. The usual optimizing analysis justifies this omission,

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however, only if the specification of the function for transaction costs (which are reduced by holdings of real money balances) is separable in money and the spending variable. Two recent papers of mine argue that such separability is implausible; I conduct investigations of the magnitude of the implied misspecification.[10] My quantitative analysis, based on calibrations intended to be realistic, indicates that the effects of this misspecification are very small.[11] Thus the usual omission of money perhaps is acceptable, although inappropriate in principle. (The first of these papers also shows how monetary policy can be effectively expansionary via an exchange rate channel even with the usual interest rate instrument immobilized by a "liquidity trap" at its zero lower bound.)

There are a few ways in which my work differs from much of the current research, though. One is its emphasis on the difficulty of measuring the "output gap" variable that appears in price-adjustment and Taylor-rule equations, that is, the percentage difference between current output and its "potential" or "natural-rate" value. Papers written with Nelson and on my own argue that ignorance of the reference value is not a matter of simple measurement error, but rather a conceptual uncertainty that is likely to be long-lasting.[12] In such circumstances, it is dangerous to respond strongly to measures of the output gap, as some analysts have recommended. A second difference is that we occasionally use monetary-base or exchange-rate instruments, rather than the usual short-term interest rate.

A methodological paper argues strongly for the general approach to policy analysis outlined at the start of this report.[13] It emphasizes that structural models are necessary for policy analysis and that so-called "structural VARs" do not qualify — their relationships are not designed to have the necessary policy invariance. More controversially, the paper argues that vector-autocorrelation functions, not impulse response functions, should be emphasized in model diagnostics (to avoid the need for highly questionable identification assumptions). A starting point for the discussion is that policy analysis needs to focus on the systematic portion of monetary policy, not policy "shocks," since the latter account for a very small fraction of movements in interest rate instruments in actual economies.

Rational Expectations Indeterminacies

A substantial portion of my recent work has been devoted to the contention that one small but prominent strand of the recent literature is misguided. This strand features rational expectations "indeterminacies" that occur under various conditions pertaining to policy-rule design. In several papers, I have emphasized that the aberrations in question reflect multiple (real) solutions of the "bubble" or "sunspot" type, not purely nominal indeterminacies of the sort discussed in the classic monetary writings of Lange, Gurley and Shaw, Johnson, and especially Patinkin.[14] I argue that there are several reasons to believe that the multiple-solution indeterminacies represent mathematical curiosities that are of no relevance for actual policymaking. One reason featured in my most recent papers is that the solutions involving problematic results are not E-stable or (therefore) adaptively learnable, as explained in the extensive theoretical contributions of Evans and Honkapohja.[15] By contrast, the unique minimum-state-variable solution (defined in several of my papers[16]) exists, is learnable, and is perfectly well-behaved in the analytical settings under discussion. Applications of this analysis pertain to the "fiscal theory of price level determination," as well as warnings against monetary rules based on expected future inflation rates[17] and suggestions of liquidity traps generated by global indeterminacy under Taylor rules.[18] All of these warnings are, I suggest, spurious. My position on these indeterminacy issues is admittedly idiosyncratic, but could therefore be of greater value if correct.

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[1] *For useful reviews, see R. Clarida, J. Gali, and M. Gertler, "The Science of Monetary Policy: A New Keynesian Perspective,"* Journal of Economic Literature, *37 (December 1999), pp. 1661-707; and M. Goodfriend and R.G. King, "The New Neoclassical Synthesis and the Role of Monetary Policy," NBER Macroeconomics Annual 1997, Cambridge, MA: MIT Press, 1997, pp. 231-83. A more historical perspective is taken in B.T. McCallum, "Recent Developments in Monetary Policy Analysis: The Roles of Theory and Evidence," NBER Working Paper No. 7088, April 1999, and* Journal of Economic Methodology, *6 (2) (1999), pp. 171-98.*

[2] *J.B. Taylor, ed.,* Monetary Policy Rules, *Chicago: University of Chicago Press, 1999.*

[3] *J.B. Taylor, "Discretion versus Policy Rules in Practice," Carnegie-Rochester Conference Series on Public Policy, 39 (December 1993), pp. 195-214.*

[4] *This issue, and others involving model specification, is discussed briefly in B.T. McCallum, "Should Monetary Policy Respond Strongly to Output Gaps?" NBER Working Paper No. 8226, April 2001, and* American Economic Review, *91 (May 2001), pp. 258-62.*

[5] *Notable publications include M. Woodford, "Price Level Determinacy Without Control of a Monetary Aggregate," Carnegie-Rochester Conference Series on Public Policy, 43 (December 1995), pp. 1-46; W. Kerr and R. G. King, "Limits on Interest Rate Rules in the IS Model," Federal Reserve Bank of Richmond Economic Quarterly, 82 (Spring 1996), pp. 47-75; and B.T. McCallum and E. Nelson, "An Optimizing IS-LM Specification for Monetary Policy and Business Cycle Analysis," NBER Working Paper No. 5875, January 1997, and* Journal of Money, Credit, and Banking, *21 (3, 1) (August 1999, pt. 2), pp. 296-316.*

[6] *B.T. McCallum and E. Nelson, "Performance of Operational Policy Rules in an Estimated Semi-Classical Structural Model," NBER Working Paper No. 6599, June 1998, and J.B. Taylor, ed.,* Monetary Policy Rules, *Chicago: University of Chicago Press, 1999; and B.T. McCallum and E. Nelson, "Nominal Income Targeting in an Open-Economy Optimizing Model," NBER Working Paper No. 6675, August 1998, and* Journal of Monetary Economics, *43 (3) (June 1999), pp. 553-78.*

[7] *B.T. McCallum and E. Nelson, "Monetary Policy for an Open Economy: An Alternative Framework with Optimizing*

Agents and Sticky Prices," NBER Working Paper No. 8175, March 2001, and Oxford Review of Economic Policy*, 16 (Winter 2000), pp. 74-91.*

[8] This practice is not universal, of course. Notable exceptions include R.G. King and A. Wolman, *"Inflation Targeting in a St. Louis Model of the 21st Century,"* Federal Reserve Bank of St. Louis Review *78 (May/June 1996), pp. 83-107; and* T. Yun, *"Nominal Price Rigidity, Money Supply Endogeneity, and Business Cycles,"* Journal of Monetary Economics*, 37 (April 1996), pp. 345-70.*

[9] M. Casares and B.T. McCallum, "An Optimizing IS-LM Framework with Endogenous Investment," NBER Working Paper No. 7908, September 2000.

[10] B.T. McCallum, "Theoretical Analysis Regarding a Zero Lower Bound on Nominal Interest Rates," NBER Working Paper No. 7677, April 2000, and Journal of Money, Credit, and Banking*, 32 (November 2000, pt. 2), pp. 870-904; and B.T. McCallum, "Monetary Policy Analysis in Models Without Money," NBER Working Paper No. 8174, March 2001, and* Federal Reserve Bank of St. Louis Review*, 83 (July/August 2001), pp. 145-60.*

[11] This finding is consistent with the econometric analysis of P. N. Ireland, "Money's Role in the Monetary Business Cycle," NBER Working Paper No. 8115, February 2001.

[12] B.T. McCallum and E. Nelson, "Timeless Perspective vs. Discretionary Monetary Policy in Forward-Looking Models," NBER Working Paper No. 7915, September 2000; and B.T. McCallum, "Should Monetary Policy Respond Strongly to Output Gaps?" NBER Working Paper No. 8226, April 2001. Also relevant in this regard is A. Orphanides, "The Quest for Prosperity without Inflation," ECB Working Paper Series 2000-15, March 2000.

[13] B.T. McCallum, "Analysis of the Monetary Transmission Mechanism," NBER Working Paper No. 7395, October 1999, and The Monetary Transmission Process: Recent Developments and Lessons for Europe*, Deutsche Bundesbank, eds., Palgrave Publishers, 2001.*

[14] B.T. McCallum, "Issues in the Design of Monetary Policy Rules," NBER Working Paper No. 6016, April 1997, and J.B. Taylor and M. Woodford, eds., Handbook of Macroeconomics*, North Holland: Elsevier Science, 1999; B.T. McCallum, "Indeterminacy, Bubbles, and the Fiscal Theory of Price Level Determination," NBER Working Paper No. 6456, March 1998, and* Journal of Monetary Economics*, 47 (February 2001), pp. 19-30; B.T. McCallum, "Monetary Policy Analysis in Models Without Money," NBER Working Paper No. 8174, March 2001; and B.T. McCallum, "Inflation Targeting and the Liquidity Trap," NBER Working Paper No. 8225, April 2001. For references and a summary of the earlier literature see H.G. Johnson, "Monetary Theory and Policy,"* American Economic Review*, 52 (June 1962), pp. 325-84.*

[15] Most notable of many publications is G.W. Evans and S. Honkapohja, Learning and Expectations in Macroeconomics*, Princeton: Princeton University Press, 2001. Also see J. Bullard and K. Mitra, "Learning About Monetary Policy Rules," forthcoming in the* Journal of Monetary Economics*.*

[16] B.T. McCallum, "Role of the Minimal State Variable Criterion in Rational Expectations Models," NBER Working Paper No. 7087, April 1999, and International Tax and Public Finance*, 6 (4) (November 1999), pp. 621-39.*

[17] First noted by M. Woodford, "Nonstandard Indicators for Monetary Policy: Can Their Usefulness Be Judged from Forecasting Regressions?" in Monetary Policy*, N.G. Mankiw, ed., Chicago: University of Chicago Press, 1994.*

[18] For example, J. Benhabib, S. Schmitt-Grohe, and M. Uribe, "The Perils of Taylor Rules," Journal of Economic Theory*, 96 (January 2001), pp. 40-69.*

Saving and Spending Retirement Wealth

Olivia S. Mitchell*

I am keenly interested in the mechanisms by which people accumulate and decumulate retirement wealth, as well as the factors that shape this process. The subject is of considerable international concern in light of looming Social Security shortfalls in most developed nations, and the global shift from defined benefit to defined contribution pension systems. Future retirees clearly must bear a larger responsibility for ensuring their well being in retirement, yet there is reason to believe that existing retirement institutions do not always function efficiently and equitably. Accordingly, much of my work examines the form and function of public and private institutions that support saving for retirement and wealth decumulation after retirement. I also examine the regulatory environment for public and private pension institutions.

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Building Retirement Wealth

My research on retirement wealth exploits a variety of detailed microeconomic datasets to examine accruals of pension wealth. For example, the Health and Retirement Study is an invaluable survey that links respondent answers to administrative data on life-

time earnings, Social Security benefits, and company-provided pensions.[1] Using these data, I show that the *median* U.S. household on the verge of retirement anticipates total retirement assets of around $475,000, with Social Security benefits representing one-third of this sum, private pensions close to $125,000, and housing and other financial wealth amounting to about $87,000 each (in 2001 dollars).[2] Households headed by unmarried persons are substantially worse off than their married counterparts: retirement wealth among the poorest quintile of married couples is equal to the wealth held by unmarried people in the middle of the wealth distribution. I also find that these sums are inadequate to smooth consumption in retirement if people retire at age 62, implying saving shortfalls of 15 percent of annual income. Delaying retirement helps, since the shortfall is cut in half for retirement at age 65.[3]

Detailed analyses of the interactions between pension rules and employee characteristics show that accruals of pension wealth tend to be extremely discontinuous, particularly in defined benefit plans. Moreover, the peaks and valleys in pension wealth profiles successfully predict retirement flows.[4] Pension rules also produce benefit accruals that are markedly different for women than for men, mainly because of how different lifetime earnings and labor market histories translate into old age benefits.[5] Thus, while three-quarters of older women near retirement today have worked enough to be entitled to Social Security old-age benefits based on their own accounts, it would take substantial extra employment to boost the remaining quarter over the eligibility threshold. Furthermore, one-third of older wives can expect no additional retirement benefit from contributing to Social Security late in life, since their net benefits are negative after taking into account Social Security contributions while employed.

I have also linked administrative records and worker reports of corporate pension provisions to evaluate the real-world environment in which employees make pension saving and retirement decisions. Here I show that workers are often misinformed about their company-sponsored pensions; this myopia is troubling, since workers may save or consume suboptimally, change jobs, and retire earlier than they would have if they were equipped with better pension information.[6] Related research evaluates the factors driving company pension accruals and how, in turn, these spikes in retirement wealth patterns influence corporate outcomes, including a tendency to influence worker turnover and to "buy out" older, more expensive workers.[7]

Annuities and Dissaving in Retirement

Even if people accumulate adequate retirement wealth, there remains the problem of how to draw it down sensibly over the retirement period. Key concerns at this stage are longevity risk (which may lead to outliving one's wealth), inflation risk, and investment risk. One line of my research explores the role of the life annuity, an insurance product that pays out a periodic sum for life in exchange for a premium charge. Life annuities offer retirees the opportunity to insure against the risk of outliving their assets by pooling mortality experience across the group of annuity purchasers.

Some of my analysis examines how annuities are priced. This work indicates that the expected present value of payouts associated with single-premium, immediate life annuities is approximately 80 cents per premium dollar if we use mortality rates for the general population. By contrast, the money's worth of such annuities is much higher for people who actually purchase annuities, since their mortality is lower on average than in the population as a whole. Using annuitant mortality rates, the payouts rise to 90-95 cents per dollar of premium (in expected present discounted value). My evidence also suggests that administrative load charges for annuity products in the United States are low and declining to less than 10 percent of the premium value.[8] Analysis of annuity markets in other countries finds even lower loads, particularly in countries such as Singapore where there is apparently little adverse selection.[9]

This work goes on to evaluate the welfare gains from having retirement wealth payout in annuity form. I conclude that the gains are substantial, particularly those associated with inflation-adjusted annuities. Using plausible measures of risk aversion, I conclude that a variable payout equity-linked annuity could be even more valuable than a real annuity when the additional real returns associated with common stocks more than compensate for the volatility of prospective payouts.

Determinants of Pension Performance

In addition to examining how pensions influence retirement wealth saving and dissaving, I also investigate the factors shaping pension system performance and structure. One research thread explores pension plan efficiency, funding, governance, and performance.[10] The analysis shows that the way pension plans are governed and supervised, as well as their structure, influences key pension outcomes including administrative expenses, funding patterns, and investment performance. A second research thread explores regulatory policy toward retirement saving and dissaving. In one study I show that older Americans receiving annuities pay more taxes once they live beyond their life expectancy, although one could argue that living longer would warrant a lower tax burden.[11] Another study explores the pros and cons of guaranteeing a lifetime benefit from a defined contribution pension program.[12] Several pension systems recently have introduced an option to let participants trade a defined benefit pension at retirement for a lump sum amount, with potential cost consequences for plan participants as well as taxpayers. My ongoing research focuses on the question of how to make retirement systems more resilient, including offering credible guarantees for protecting retirement wealth.[13]

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[1] *The HRS is supported by the National Institute on Aging, the Social Security Administration, and the U.S. Department of*

Labor among other sources; see: http://www.umich.edu/~hrswww/.

[2] *In reporting these statistics, we rank HRS households by total wealth rather than just financial wealth. As a result, the data indicate more financial wealth held by the median household than would be found if one ranked households by financial wealth alone.*

[3] *O.S. Mitchell and J.F. Moore, "Retirement Wealth Accumulation and Decumulation: New Developments and Outstanding Opportunities," NBER Working Paper No. 6178, September 1997, and in* Journal of Risk and Insurance, *65 (3) (1998), pp. 371-400; and J.F. Moore and O.S. Mitchell, "Projected Retirement Wealth and Saving Adequacy," NBER Working Paper No. 6240, October 1997, and in O.S. Mitchell, B. Hammond, and A. Rappaport, eds.,* Forecasting Retirement Needs and Retirement Wealth, *Philadelphia, PA: UPP Press, 2000, pp. 68-94.*

[4] *G.S. Fields and O.S. Mitchell,* Retirement, Pensions and Social Security, *Cambridge, MA: MIT Press, 1984.*

[5] *S. Pozzebon and O.S. Mitchell, "Married Women's Retirement Behavior," NBER Working Paper No. 2104, December 1986, and in* Journal of Population Economics, *2 (1989), pp. 39-53; O.S. Mitchell, "Social Security Reforms and Poverty Among Dual-Earner Couples," NBER Working Paper No. 2382, September 1987, and in* Journal of Population Economics, *2(1) (1991), pp. 39-53; P.J. Levine, O.S. Mitchell, and J.W. Phillips, "Worklife Determinants of Retirement Income Differentials Between Men and Women," NBER Working Paper No. 7243, July 1999, and in Z. Bodie, B. Hammond, and O.S. Mitchell, eds.,* Innovations in Financing Retirement, *Philadelphia, PA: UPP Press, 2002, pp. 50-76; and O.S. Mitchell and J.W.R. Phillips, "Retirement Responses to Early Social Security Benefit Reductions," NBER Working Paper No. 7963, October 2000.*

[6] *O.S. Mitchell, "Worker Knowledge of Pension Provisions," NBER Working Paper No. 2414, October 1987, and in* Journal of Labor Economics, *6 (January 1988), pp. 21-39.*

[7] *O.S. Mitchell and G.S. Fields, "Rewards for Continued Work: The Economic Incentives for Postponing Retirement," NBER Working Paper No. 1204, September 1983, and in M. David and T. Smeeding, eds.,* Horizontal Equity, Uncertainty, and Economic Well-Being, *Chicago: University of Chicago Press, 1985; O.S. Mitchell and R.A. Luzadis, "Firm-Level Policy Toward Older Workers," NBER Working Paper No. 1579, March 1985, and in* Industrial and Labor Relations Review, *12 (October 1988) pp. 100-108; R.A. Luzadis and O.S. Mitchell, "Explaining Pension Dynamics," NBER Working Paper No. 3084, August 1989, and in* Journal of Human Resources, *26 (Fall 1991), pp. 679-703; A.L.Gustman, O.S.Mitchell, and T.L.Steinmeier, "The Role of Pensions in the Labor Market," NBER Working Paper No. 4295, March 1993, and in* Industrial and Labor Relations Review, *47 (3) (April 1994), pp. 417-38; and A.L.Gustman and O.S. Mitchell, "Pensions and the U.S. Labor Market," NBER Working Paper No. 3331, April 1990, and in Z. Bodie and A. Munnell, eds.,* Pensions and The U.S. Economy, *Philadelphia: Irwin, 1992.*

[8] *Much of this work appears in J. Brown, O.S. Mitchell, J. Poterba, and M. Warshawsky,* The Role of Annuity Markets in Financing Retirement, *Cambridge, MA: MIT Press, 2001. See also J.R. Brown, O.S. Mitchell, and J.M. Poterba, "Mortality Risk, Inflation Risk, and Annuity Products," NBER Working Paper No. 7812, July 2000, and in Z. Bodie, B. Hammond, and O.S. Mitchell, eds.,* Innovations in Financing Retirement*; and J.R. Brown, O.S. Mitchell, and J. M. Poterba, "The Role of Real Annuities and Indexed Bonds in an Individual Accounts Retirement Program," NBER Working Paper No. 7005, March 1999, and in J. Campbell and M. Feldstein, eds.,* Risk Aspects of Investment-Based Social Security Reform, *Chicago: University of Chicago Press, 2001, pp. 321-60.*

[9] *S. Doyle, O.S. Mitchell, and J. Piggott, "Annuity Values in Defined Contribution Retirement Systems: The Case of Singapore and Australia," NBER Working Paper No. 8091, January 2001; and O.S. Mitchell, "Developments in Decumulation: The Role of Annuity Products in Financing Retirement," NBER Working Paper No. 8567, October 2001.*

[10] *O.S. Mitchell, "Administrative Costs of Public and Private Pension Plans," NBER Working Paper No. 5734, August 1996, and in M. Feldstein, ed.,* Privatizing Social Security, *Chicago: University of Chicago Press, 1998, pp. 403-56.*

[11] *J.R. Brown, O.S. Mitchell, J.M. Poterba, M.J. Warshawsky, "Taxing Retirement Income: Nonqualified Annuities and Distributions from Qualified Accounts," NBER Working Paper No. 7268, July 1999, and in* National Tax Journal, *52 (3) (September 1999), pp. 563-92.*

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[13] *See the recent Final Report of the President's Commission to Strengthen Social Security (www.csss.gov).*

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The Market for Child Care

H. Naci Mocan*

Recent research reveals a positive relationship between cognitive skills and labor market success.[1] Developmental psychologists argue that the cognitive, social, and emotional development of children is enhanced by exposure to high-quality child care and is harmed by low-quality care.[2] Given the relationship between the quality of child care, child outcomes, and children's future labor market achievement, it is critical to develop an understanding of the way the child care market operates and how it relates to quality. The issue is important because the average quality of center-based child care provided in the United States is thought to be mediocre, especially compared to the quality of care provided in other developed countries.[3] As a result, there is significant interest both at the federal and state levels in devising mechanisms to improve the quality of child care in this rapidly growing market.[4]

One main strand of my research focuses on the child care industry. From 1990 to 1993 I was a member of an interdisciplinary team that collected data from a stratified random sample of approximately 100 child care centers in Colorado, North Carolina, Connecticut, and California.[5] These data include very detailed information on classroom, staff, and center characteristics, as well as information about the parents of children attending the centers. Although center-based child care constitutes only 30 percent of all child care arrangements,[6] it is the sector which has the most detailed and reliable data, particularly for the analysis of provider behavior.

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Using this dataset, my research addresses issues such as: the behavior of firms in supplying quantity and quality of child care services; the behavioral differences between for-profit and nonprofit providers; the determinants of child care workers' wages; the production of quality in child care centers; the determinants of fees; and the analysis of information asymmetry between parents and providers.

Quality and Quality Production

There are two distinct but related concepts of quality in child care.[7] One is "structural quality," which describes the child care environment measured by such variables as the child-staff ratio, classroom size, the average education of the staff, and staff turnover. These structural measures of quality are thought to be inputs to the production of "process quality," which measures, among other things, the nature of the interactions between the care provider and the child and activities to which the child is exposed. Process quality is measured by instruments designed by developmental psychologists.[8] The index of process quality has a seven point scale, with a range from inadequate (1), to mediocre (4), to excellent (7). This index is used widely in early childhood literature to gauge the quality of the services produced at child care centers. I estimated quality-adjusted cost functions for child care centers and found an elasticity of cost with respect to (process) quality of 0.4.[9] By these estimates, it would cost $243 to $324 per child per year (in 1993 dollars) to increase the quality of child care services from "mediocre" to "good." David M. Blau and I obtained similar estimates of the marginal cost of quality.[10]

Our knowledge about how to increase quality, on the other hand, is limited. Using the same data, my coauthors and I estimated center-level quality production functions.[11] Although the estimates we obtained, as well as others in the literature, demonstrate the existence of a positive and statistically significant relationship between structural center characteristics (for example, staff-child ratios, group size of the children, average teacher education, and training) and center quality, the magnitude of that relationship is numerically small. We obtain the same result when estimating the quality production function at the classroom level.[12] Furthermore, production functions explain at most 50 percent of the variation in center or classroom quality, indicating that there exists a significant amount of residual center or classroom level idiosyncrasy that is related to quality.[13] This result has implications for the effectiveness of regulations.

Why Low Quality?

Two natural questions to ask are why the average quality of child care is low in the first place, and whether low quality is something to be concerned about. If parents are fully aware of the benefits of high quality child care, if they can accurately assess the level of quality provided for their children, and if they have access to a range of quality-price alternatives, then whatever quality they choose to purchase should be optimal. Therefore, the relevance of these conditions requires careful investigation.[14] It can also be argued that average quality in the market is low because parents do not care about quality the way it is defined and measured by psychologists. If parents put a greater value on other aspects of the child care services, such as the proxim-

ity to home and other conveniences, then they would look for these characteristics in a child care arrangement over those captured by the process quality index or its components.

Parent Valuation of Quality and Information Asymmetry

To investigate parents' attitudes towards quality, I analyze survey data of parents who were given the same instruments used by child development experts to measure attributes of quality in their child's specific classroom. Parents were asked to evaluate how important those attributes were for them. An overwhelming majority of parents indicated that the specific aspects of quality measured by the instruments were "very important" for them, indicating that parents feel strongly about the same dimensions of quality deemed important by child development experts.[15] This result does not imply that parents do not value other aspects of child care, but it does seem to refute the hypothesis that average quality in the market is low because parents do not care about quality the way it is defined by child development experts.[16]

Of course, talk is cheap. That is, parents may indicate that they value quality, but their willingness to pay for it may be a better indicator of how much they really appreciate quality. Blau and I estimated fee equations and found that the price elasticity of process quality ranged from 0.13 to 0.4 in the four states analyzed (North Carolina, Connecticut, Colorado, and California).[17] On the other hand, Blau reported a very small relationship between family income and quality.[18] Thus, the analysis of a price-quality relationship does not depict a very clear picture of parent willingness to pay for quality.

It is plausible to hypothesize that the child care center is informed about the level of quality of its service, but the consumers (parents) have difficulty in distinguishing between the quality levels of alternative centers. Parents' lack of information on quality may simply be attributable to their inability to spend enough time at the center to observe various dimensions of the operation. Given that it costs more to produce higher quality, providers would not have an incentive to increase the quality of their services if they could not charge higher fees. Furthermore, if parents cannot distinguish between high-quality and low-quality centers, then their willingness to pay higher fees is curtailed. Under this scenario, high quality centers exit the market, average quality falls, and eventually the market is filled primarily with "lemons" that provide mediocre quality.

I investigated this information asymmetry hypothesis using very detailed information on classroom, center, and parent characteristics. Classroom quality was assessed by trained observers, and individual aspects of the services provided for children were classified as difficult-to-observe (for example, the quality of nap time) and easy-to-observe aspects of quality (for example, cleanliness of the reception area). Parents were given the same questions and were asked to provide ratings using the same scale as trained observers. A comparison of parent and observer ratings indicated that parents are weakly, but not strongly rational. That is, parents do not use all available information when forming their quality assessments. Although parents are trying to extract signals of quality from classroom and center attributes, these attempts are, for the most part, unsuccessful because parents associate certain center characteristics with quality when they should not; and, they don't read other correct signals of quality. In addition, parents' attempts to extract signals are stronger in cases of difficult-to-observe items of quality. Parent characteristics, such as education and marital status, were found to affect the accuracy of the predictions. I also found some indication of moral hazard, evidenced by the fact that nonprofit centers with very clean reception areas tend to produce lower levels of quality for difficult-to-observe aspects.[19] These results, taken together, indicate that the market for center-based child care has aspects of a "market for lemons."

Regulations and Subsidies

Information asymmetry between sellers and buyers regarding the quality of a product is one of the main motivations for the implementation of regulations. In principle, buyers and sellers can write contracts contingent upon some child outcome that is correlated with the quality of service provided. However, the implementation of outcome-contingent contacts between providers and parents is not feasible because of the difficulty in observing and evaluating the outcome, and the time delay between the rendering of services and realization of the outcome. Under these circumstances, regulations are considered to be vehicles through which the provision of an "acceptable" level of quality to the market is ensured to protect the consumer. Another justification for regulatory action is that positive externalities are associated with the provision of high quality. It is argued that even if consumers are able to determine the level of quality, regulations may be desirable and socially optimal because they eliminate the lower-end of the quality distribution from the market. This is important for child care, since it may have aspects of a public or merit good.

Regulations are imposed at the state level and are targeted at structural center characteristics such as group sizes, child-staff ratios, and sanitation conditions. Child care regulations institute minimum standards but do not impose "optimal" standards as defined by the National Association for the Education of Young Children. However, even stringent regulations are not expected to significantly affect quality because compliance is not guaranteed. For example, by analyzing the frequency distributions of a large number of regulatory characteristics of child care centers, Blau and I show that a substantial portion of day care centers fail to comply, even though they face binding regulations.[20] Furthermore, even under full compliance, an increase in

the stringency of regulations is not expected to significantly translate into an improvement in quality because of the weak association between regulatory structural inputs (for example, child-staff ratios) and quality. For example, my co-authors and I found that to increase the quality of a center from average to good, the child-staff ratio must go down from 5.4 children to 1 staff to 1.6 children to 1 staff, which is an extremely expensive proposition.[21] Consequently, tightening regulations related to observable structural characteristics is not, by itself, a promising means of improving quality. Furthermore, even if mandates were effective, they are not without costs. Research shows that stronger regulations reduce the number of child care centers and family day care providers in the market, and reduce the demand for market-based child care.[22] Thus, stringent regulations may have detrimental effects on the availability of care, without increasing average quality significantly.

Subsidies, on the other hand, may be more effective in promoting quality. Blau and I estimated quality supply functions for child care firms.[23] The results showed that the supply of quality is moderately elastic with respect to price and child care workers' wages. These results suggest that wage subsidies for child care firms and price subsidies for consumers may be more promising tools in increasing quality.

Nonprofit Sector

The emergence of nonprofit institutions is thought to help cure some of the market failure attributable to asymmetric information between firms and consumers. Since a prominent feature of the child care industry is the presence of the nonprofit sector, my research also analyzes behavioral differences between for-profit and nonprofit firms in child care. The results obtained from cost functions and quality production and supply functions reveal that for-profit and nonprofit firms have similar cost structures and that there is no efficiency difference between them. Both nonprofit and for-profit firms behave like profit-maximizers. Quality supply is more elastic with respect to price in for-profit centers, likely because many nonprofit centers face constraints on improving quality because of reliance on donations.

Erdal Tekin and I exploit an employer-employee matched dataset and estimate wage and compensation equations for part-time and full-time child care workers, while adjusting for workers' selection into the nonprofit sector and full-time work. The results show that part-time jobs are "good jobs" in child care and that there are substantial nonprofit wage and compensation premiums, supporting the property rights hypothesis.[24]

Conclusion

The average quality of center-based child care is low in the United States as measured by child development experts. The evidence suggests that parents value quality, yet, there is also evidence of information asymmetry in the market between parents and providers regarding the quality of the services. That is, parents have difficulty in assessing the quality of child care they are purchasing. If parents cannot distinguish between high-quality and low-quality services, then demand for quality is curtailed. Nonprofit centers provide no remedy to this problem as their production and supply behavior are very similar to those of for-profits, and average quality produced by nonprofits is similar to average quality produced by for-profits.

Although regulations may be desirable for eliminating the very bottom of the quality distribution, they are not a viable solution to improving average quality in the market because of low compliance and a weak association between regulated firm characteristics and quality. Policies targeted at consumers are more promising. Making information on quality available to consumers in the form of consumer guides and providing price subsidies are feasible policy options for improving quality.

A full-blown cost-benefit analysis of improved quality requires information on the magnitude of the causal impact of quality on child outcomes. Although current research in the child development literature reports a positive association between quality of child care and child outcomes, the results have limited causal interpretation because of design and statistical analysis problems. Therefore, a useful direction of research would be to estimate child outcome production functions. Experiments in which children are randomly assigned to different levels of quality may be expensive and unfeasible, but there is potentially useful information in recent longitudinal datasets that link children and their families to child care quality and subsequent child outcomes.

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[1] *For example, R. J. Murnane, J. B. Willett, and F. Levy, "The Growing Importance of Cognitive Skills in Wage Determination,"* Review of Economics and Statistics, *77 (May 1995), pp. 251-66.*

[2] Who Cares for America's Children? Child Care Policy for the 1990s, *C. D. Hayes, J. L. Palmer, and M. L. Zaslow, eds. Washington: National Academy Press, 1990.*

[3] *N. H. Mocan, "Cost Functions, Efficiency, and Quality in Child Care Centers,"* Journal of Human Resources, *32 (Fall 1997), pp. 861-91; B. Bergmann,* Saving Our Children from Poverty: What the United States Can Learn from France, *New York: Russell Sage Foundation, 1996.*

[4] *In 1995, there were 19.3 million preschool-age children who were receiving some form of child care. Of these children, 11.2 million had a parent who was either employed or in school, and 9.3 million of these children received child care from somebody other than a relative. There were 1.2 million child care workers in 2000. See K. Smith,* Who's Minding the Kids? Child Care Arrangements: Fall 1995, *(Current Population Reports P70-70) Washington, DC: U.S. Census Bureau, 2000;* Occupational Outlook Handbook 2002-2003 Edition, *Washington, DC: Bureau of Labor Statistics, 2001.*

[5] *The team included economists, psychologists, and child development experts from the University of Colorado at Denver, Yale University, University of North Carolina at Chapel Hill, and UCLA. These states and particular regions within states were chosen*

for their regional, demographic, and child care program diversity as well as the variation in their regulatory environment.

[6] *Others are family day care homes and child care provided at home by relatives and non-relatives.*

[7] *J.M. Love, P.Z. Schochet, and A.L. Meckstroth, "Are They in Any Real Danger? What Research Does — And Doesn't — Tell Us About Child Care Quality and Children's Well-Being," manuscript, Princeton NJ: Mathematica Policy Research, Inc.; see also* Who Cares for America's Children? Child Care Policy for the 1990s.

[8] *These are the Early Childhood Environmental Rating Scale (ECERS) and its infant-toddler version, the Infant-Toddler Environmental Rating Scale (ITERS). For details about these instruments, and about the quality index and its components, see N. H. Mocan, "Can Consumers Detect Lemons? Information Asymmetry in the Market for Child Care," NBER Working Paper No. 8291, May 2001; N. H. Mocan, "The Child Care Industry: Cost Functions, Efficiency, and Quality," NBER Working Paper No. 5293, October 1995, and* Journal of Human Resources, *32 (Fall 1997), pp. 861-91.*

[9] *N. H. Mocan, "Quality-Adjusted Cost Functions for Child Care Centers, NBER Working Paper No. 5040, June 1995, and* American Economic Review, *85 (May 1995), pp. 409-13; see also N. H. Mocan, "The Child Care Industry: Cost Functions, Efficiency, and Quality."*

[10] *D. M. Blau and N. H. Mocan, "The Supply of Quality in Child Care Centers," NBER Working Paper No. 7225, July 1999; revised version forthcoming in the* Review of Economics and Statistics.

[11] *N. H. Mocan, M. Burchinal, J. R. Morris, and S. Helburn, "Models of Quality in Center Child Care," in* Cost, Quality, and Child Outcomes, *S. Helburn, ed., Denver: Center for Research on Economic and Social Policy, University of Colorado at Denver, 1995.*

[12] *D. M. Blau, "The Production of Quality in Child Care Centers,"* Journal of Human Resources, *32 (Spring 1997), pp. 354-87.*

[13] *This problem is similar to the one observed in education production functions. See Hanushek's research summary in Spring 2001 NBER Reporter.*

[14] *Even under this scenario there would be room for incentives that aim to increase the demand for quality. If child care has aspects of a "public good" or "merit good" where high quality child care not only benefits its private consumers, but also the society as a whole, through positive externalities, then attempts to improve quality through incentives to consumers or regulations imposed on the providers may be justified. For example, if high quality care increases the cognitive skills of children and their labor market opportunities as young adults, then this suggests that high quality child care today would benefit society tomorrow by helping create more educated and more productive individuals, who have higher earnings potentials, and who have a smaller probability of welfare dependency and criminal activity.*

[15] *See also N. H. Mocan, "Can Consumers Detect Lemons? Information Asymmetry in the Market for Child Care."*

[16] *D. M. Blau and A. Hagy, "The Demand for Quality in Child Care,"* Journal of Political Economy, *106 (1998), pp. 104-46, did not find evidence that parents are willing to pay more for regulated attributes of care such as staff-child ratio, but D. M. Blau and N. H. Mocan, "The Supply of Quality in Child Care Centers," NBER Working Paper No. 7225, July 1999, revised version forthcoming in the* Review of Economics and Statistics, *reports a positive relationship between fees and process quality.*

[17] *See D. M. Blau and N. H. Mocan, "The Supply of Quality in Child Care Centers."*

[18] *D. M. Blau,* The Child Care Problem: An Economic Analysis, *New York: Russell Sage Foundation, 2001.*

[19] *See also N. H. Mocan, "Can Consumers Detect Lemons? Information Asymmetry in the Market for Child Care."*

[20] *D. M. Blau and N H. Mocan, "The Effects of Regulations on the Child Care Market," unpublished, University of Colorado at Denver, 2001.*

[21] *See also N. H. Mocan, M. Burchinal, J. R. Morris, and S. Helburn, "Models of Quality in Center Child Care."*

[22] *S. L. Hofferth, and D. D. Chaplin 1998, "State Regulations and Child Care Choice,"* Population Research and Policy Review, *17 (1998), pp. 111-40; S. Rose-Ackerman, "Altruistic Nonprofit Firms in Competitive Markets: The Case of Day Care Centers in the United States,* Journal of Consumer Policy, *9, (1986), pp. 291-310; V. J. Hotz and M. R. Kilburn, "Regulating Child Care: The Effects of State Regulations on Child Care Demand and Its Costs," unpublished, RAND, 1994.*

[23] *See also D. M. Blau and N. H. Mocan, "The Supply of Quality in Child Care Centers."*

[24] *N. H. Mocan and E. Tekin, "Nonprofit Sector and Part-Time Work: An Analysis of Employer-Employee Matched Data of Child Care Workers," NBER Working Paper No. 7977, October 2000. Forthcoming in* The Review of Economics and Statistics.

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FDI Flows: A Critical Look

Assaf Razin*

The resilience of foreign direct investment (FDI) during financial crises may have led many developing countries to regard this type of international capital flow as the private capital inflow of choice. But evidence on the size of the specific benefits of FDI inflows to emerging markets is still very sketchy. In Loungani and Razin[1] we note that while there is some evidence that FDI benefits host countries, they should assess its potential impact carefully and realistically[2]. My recent research focuses on the economic effects of international factor movements and financial mobility[3]. In this report I will focus on FDI flows.

Like its theoretical counterpart, the empirical work has tended to focus either on underlying factors that explain the location of FDI flows across countries, or on explaining the cyclical behavior of FDI flows, using obvious macroeconomic variables, and assessing the contribution of FDI flows to investment in capacity and growth. Given the wide range of potential motives for FDI, it was difficult to provide a single model covering all possible circumstances.

Earlier, Kindleberger[4] suggested that, in order to think about FDI, we must ask not why capital might flow into a country, but rather why some particular asset would be worth more under foreign control than under domestic control. This in turn could reflect either higher expected earnings under foreign control, or a lower foreign cost of capital, and hence a higher valuation of given earnings.

Evidence on capital inflows to developing countries shows that, although equity portfolio flows have risen rapidly in recent years, they still compose a much smaller fraction of the total inflows than do portfolio debt instruments (such as bonds, certificates of deposit, and commercial paper). Furthermore, the latter flows are smaller than FDI flows, which make up more than half of private flows.

I develop a stylized model of FDI[5] in the presence of asymmetric information between the "insiders" and the "outsiders" of the firm. Because of potential agency problems between owners and managers, the former set rigid investment rules before realization of productivity shocks. The management then implements these rules by seeking funds to finance the investment after the firm-specific productivity parameter is known. At the end of the planning stage, when the firm-specific productivity parameter is still not known, the foreign direct investors step in. Anticipating their better micro-management skills, they are willing to use a skimming technology to elicit higher productivity firms. Consequently, they outbid all other investors for these top productivity firms, and make larger investments than their domestic counterparts.

Although domestic investors also have access to the skimming technology used by the foreign director investors, they nevertheless cannot pay for the cost of this technology and compete with foreign direct investors for the top productivity firms, because they cannot design a state-dependent investment rule for these firms.

The open economy does gain from the inward FDI flows. In the absence of the skimming technology used by FDI, the original domestic owners would not be able to distinguish between the firms with productivity levels below a cutoff level and the top productivity firms Thus, they would pre-determine the same investment level for the various groups of firms; in the presence of FDI, they can pre-determine one investment level for the top productivity firms that are acquired by the FDI investors. Naturally, this one additional degree of freedom provided by FDI must be beneficial to the open economy; hence the "gains from trade" argument for FDI.[6]

I also address the possibility of a "pecking order" among the three major types of capital flows: debt, equity, and FDI in this theory. Based on a different asymmetric information assumption — that is between foreign and domestic savers — and segmented international capital markets (following the work of Roger Gordon and Lans Bovenberg[7]), I argue that the information asymmetry favors domestic savers. Why is there any equity trade at all, given the "lemons" situation that arises from the information asymmetries between domestic and foreign investors? The answer hinges on the international setting. The domestic risk-free interest rate exceeds the world risk-free interest rate. This interest-rate wedge generates higher valuations of the equity assets from the point of view of foreign investors, as compared with the domestic potential investors; this counteracts the "lemons" effect and ensures that the domestic equity market will not collapse. This result relies on some segmentation in the international bond market in the background to prevent such equity trade from collapsing. In this context however, there are insufficient portfolio-equity inflows; that is, there is a home bias in equity holdings. Following up on this idea, my colleagues and I[8] explore the "pecking order" for international capital inflows in the context of a model in which domestic savers and FDI investors are endowed with better information than the portfolio foreign investors. The ranking of capital inflows is somewhat similar to the "pecking order" of corporate capital structure. Recall that in corporate

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finance the hypothesis maintains that the firms prefer internal finance (retained earnings, the analogue of FDI in the case of international flows) to external finance. If the latter is required, then firms will issue the safest security (debt, the analogue of debt portfolio inflows), and they will issue new equity (the analogue of equity portfolio flows) only as a last resort.

Foreign investors who are not liquidity constrained at the same time their host country investors are subject to liquidity constraints could gain crucial inside information about the productivity of the firms under their control. FDI entails direct control of the acquired domestic firm, which the typical domestic savers with portfolio ownership positions in the firm do not have. Foreign operators of a multinational subsidiary therefore possess an inside-information advantage over potential domestic investors. The foreign investors can bid the investment project away from their domestic counterparts because of the foreigners' advantage: having access to funds available in the capital market because they can post better collateral. As a result of this asymmetry, owners of multinational subsidiaries with above-average valuations are unwilling to sell off equity at prices offered by uninformed potential domestic buyers. The resulting adverse selection can lead to over-investment by foreign direct investors. The apparently desirable property of FDI flow resilience during crises in fact may reflect a distortion in the secondary market for equity assets[9].

Recently, a striking feature of FDI flows has been pointed out: the share of FDI in total inflows is higher in riskier countries, as measured either by countries' credit ratings for sovereign (government) debt or other indicators of country risk[10]. There is also some evidence that the FDI share is higher in countries where the credit risk is higher. This finding is consistent with the theory in my paper with Sadka, because the micro-management superiority of FDI investors over their domestic counterparts is more pronounced when the corporate governance in the host country is weak and financial institutions are not well developed. Credit ratings depend not only on firms' characteristics but also on some aggregate macroeconomic variables or political factors. In the context of a stylized model I demonstrate that a "good" equilibrium involves a "high" level of aggregate investment, with a moderate country-specific risk premium, which is hardly observable. However, there may be another, "bad" equilibrium with a very high country-specific risk premium, which reflects that capital flows dry up. The country may switch abruptly from the high-investment equilibrium to the low-investment equilibrium — that is, an endogenously determined reversal of capital flows[11].

Though it is true that the machines in the FDI parable are "bolted down" and, hence, difficult to move out of the host country on short notice, financial transactions sometimes can accomplish a reversal of FDI flows quite easily. For instance, the foreign subsidiary can borrow against its collateral domestically and then lend the money back to the parent company. Likewise, because a significant portion of FDI is intercompany debt, the parent company can recall this debt on short notice[12].

Both economic theory and recent empirical evidence suggest a beneficial impact of FDI on developing countries. But recent work also points to some sources of potential risks and excesses: FDI can be easily reversed through financial transactions in some circumstances; there is an FDI bias in the composition of capital inflows, because of adverse selection and "fire sales." A large statistical effect of FDI on the level of domestic investment is likely to be the result of an endogeneity bias, and of heavy reliance by multinationals on borrowings from domestic lenders. The high share of FDI in a country's total capital inflows may reflect its capital-market institutions' weakness rather than their strength. Though the empirical relevance of some of these sources remains to be demonstrated, they do appear to make a case for taking a nuanced view of the likely effects of FDI.

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[1] *L. Prakash and A. Razin, "How Beneficial Is Foreign Direct Investment?"* Finance and Development*, 38 (2) (June 2001), pp. 6-10.*

[2] *The name "foreign direct investment" usually brings to mind real investment and international flows of capital. But, as noted by Froot, FDI actually requires neither capital flows nor investment in capacity. Conceptually, FDI is an extension of corporate control over international boundaries: "When Japanese-owned Bridgestone takes control over the U.S. firm Firestone, capital need not flow into the U.S. The equity purchase can be largely financed by U.S. domestic lenders. Any borrowing by Bridgestone from foreign-based third parties also does not qualify as FDI (although it would count as an inflow of portfolio capital into the U.S.). And, of course, in such acquisition there is no investment expenditure; merely an international transfer in the title of corporate assets." See K. A. Froot, "Japanese Foreign Direct Investment," NBER Working Paper No. 3737, June 1991, and in* U.S.-Japan Economic Forum*, Vol. 1, M. Feldstein and Y. Kosai, eds., National Bureau of Economic Research and Japan Center for Economic Research, 1991.*

[3] *A. Razin and E. Sadka,* Labor, Capital and Finance: International Flows*, Cambridge: Cambridge University Press, 2001.*

[4] *C.P. Kindelberger,* American Business Abroad: Six Lectures on Direct Investment*, New Haven: Yale University Press, 1969.*

[5] *A. Razin and E. Sadka, "FDI Flows and Domestic Investment: The Dominant Role of FDI," Tel Aviv University, mimeo, 2001.*

[6] *Under asymmetric information between foreign and domestic savers, the theory resorts to segmented world capital markets to explain the special role of FDI. See also, A. Razin, E. Sadka, and C.Yuen, "An Information-Based Model of Foreign Direct Investment: The Gains from Trade Revisited," NBER Working Paper No. 6884, January 1999, and in P. Isard, A. Razin, and A. Rose, eds.,* International Finance and Financial Crises: Essays in Honor of Robert P. Flood, Jr.*, Kluwer Academic Publishers and the International Monetary Fund. See also A. Razin, E. Sadka, and C. Yuen, "Excessive FDI under Asymmetric Information," NBER Working Paper No.*

7400, October 1999, and in R. Glick, M. Spiegel, and R. Moreno, eds., Financial Crises in Emerging Markets*, Cambridge: Cambridge University Press, 2001; and A. Razin, E. Sadka, and C. Yuen, "An Information-Based Model of Foreign Direct Investment: The Gains from Trade Revisited,"* International Tax and Public Finance*, 6 (4) (1999). For an integration of various aspects of FDI, see A. Razin and E. Sadka,* Labor, Capital and Finance: International Flows*, Cambridge: Cambridge University Press, 2001.*

[7] *R. H. Gordon and A. L. Bovenberg, "Why is Capital so Immobile Internationally? Possible Explanations and Implications for Capital Income Taxation,"* American Economic Review*, 86 (1996), pp. 1057-75.*

[8] *A. Razin, E. Sadka, and C.Yuen, "A Pecking Order of Capital Inflows and International Tax Principles,"* Journal of International Economics*, 44 (1998); and "Implications of the Home Bias: A Pecking Order of Capital Inflows and Corrective Taxation," published as Chapter 4 in A. Razin and E. Sadka, eds.,* The Economics of Globalization: Policy Perpectives from Public Economics*, Cambridge: Cambridge University Press, 1999, pp. 85-122.*

[9] *Krugman considered two potential reasons for a surge in FDI inflows after a financial crisis, while at the same time, other forms of capital inflows (loans or portfolio flows) dry up: 1) Assume that foreign firms are more efficient than their domestic counterparts. The macroeconomic moral-hazard view suggests that if domestic firms can borrow with implicit guarantees, they will be willing to pay higher prices than foreign owners despite their lower expected returns. As a result, foreign firms will be crowded out of the domestic market. In the aftermath of the financial crisis, however, when the regime of government guarantees collapses, the result will be a transfer of ownership to the more efficient foreign firms. In a pure moral-hazard version of the financial crisis, therefore, the drop in asset values as a result of the financial crisis, and the consequent transfer of ownership is an efficient move from the world's point of view. 2) The financial-panic point of view of the crisis (based on a model similar to Diamond-Dybvig type of bank runs) is, however, quite different. Suppose that foreign firms, unlike domestic investors during a panic, are not liquidity-constrained, but they are less efficient at running domestic investment projects than domestic firms. Evidently, in the absence of a crisis, the foreign firms will not get involved. But once there is a crisis, any firm that is not liquidity-constrained can earn more than the liquidation value by keeping half-finished projects in existence. It will therefore be in a position to buy the project from the crisis-stricken financial intermediary: a transfer of ownership to a foreign firm that is less efficient than the domestic firm, which is an efficient move from the world's point of view. See P. Krugman, "Firesale FDI," MIT Working Paper, 1998; also available on the web at: http://web.mit.edu/krugman/www.FIRESALE.htm.*

[10] *R. Hausmann and E. Fernandez-Arias, "Foreign Direct Investment: Good Cholesterol?" Inter-American Development Bank Working Paper No. 417, Washington, DC, 2000; and R. Albuquerque, "The Composition of International Capital Flows: Risk Sharing through Foreign Direct Investment," Bradley Policy Research Center Working Paper No. 00-08, Rochester, New York: University of Rochester, 2000.*

[11] *A. Razin and E. Sadka, "Country Risk and Capital Flow Reversals," NBER Working Paper No. 8171, March 2001, and in* Economic Letters*, 72 (1) (June 2001), pp. 73-7; and* Labor, Capital and Finance: International Flows*, Cambridge: Cambridge University Press, 2001.*

[12] *S. Claessens, M. Dooley, and A. Werner demonstrate that a common characterization of FDI as "cold" capital flows and foreign portfolio investments as "hot" capital flows, is inconsistent with the data. See S. Claessens, M. Dooley, and A. Warner, "Portfolio Capital Flows: Hot or Cold?"* World Bank Economic Review*, 9 (1) (1995), pp. 153-74. See also G. M. Milesi-Ferretti and A. Razin, "Current Account Reversals and Currency Crises: Empirical Regularities," NBER Working Paper No. 6620, June 1998, and in P. Krugman, ed.,* Currency Crises*, Chicago: University of Chicago Press, 2000.*

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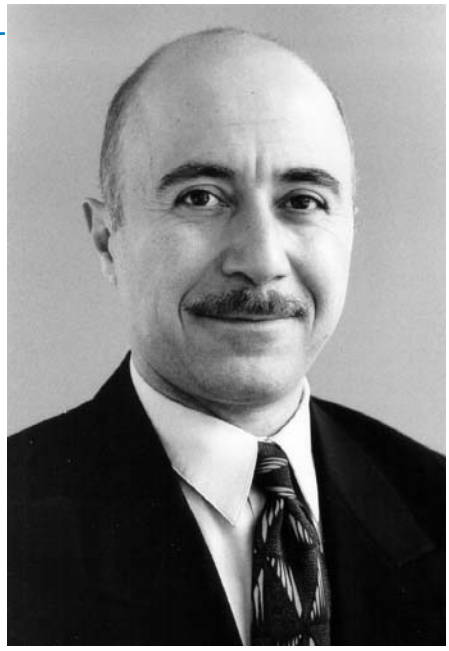
NBER Profile: *Naci Mocan*



H. Naci Mocan has been an NBER Research Associate since 1995 in the Health Economics Program and the Program on Children. Now a Professor of Economics and Chairman of the Economics Department at the University of Colorado at Denver, Mocan directed the Center for Research on Economic and Social Policy at the University of Colorado at Denver from 1995 to 2001. He was also an NBER Faculty Research Fellow from 1989 to 1995.

Mocan received his B.A. in Economics from Bogazici University in Istanbul, Turkey in 1984 and his Ph.D. in Economics from the Graduate School and University Center of the City University of New York in 1989. His research concentrates on policy-relevant applied microeconomic analysis with emphases on issues in the child care market and the economics of crime. His work has been published in a variety of academic journals, including the *American Economic Review*, *Review of Economics and Statistics*, *Journal of Health Economics*, and *Journal of Human Resources*.

A native of Istanbul, Turkey, Mocan lives in Denver, Colorado with his wife Madeline, his 9-year old daughter Leyla, and their cat Catkin. When he is not working or coaching Leyla's soccer team — the mighty Red Hornets — he attempts to ski in the winter and fish in the summer.

NBER Profile: *Olivia S. Mitchell*

Olivia S. Mitchell is a Research Associate in the NBER's Programs in Aging and Labor Studies. She is also the International Foundation of Employee Benefit Plans Professor of Insurance and Risk Management, and Executive Director of the Pension Research Council, at the Wharton School, University of Pennsylvania.

Mitchell received her M.A. and Ph.D. degrees in economics from the University of Wisconsin-Madison, and her B.A. in economics from Harvard University. She recently served on President Bush's Commission to Strengthen Social Security (www.csss.gov) and she is a co-principal investigator for the Health and Retirement Studies at the University of Michigan. Mitchell also has been a member of the Board of Directors of Alexander and Alexander Services, Inc. and has co-chaired the Technical Panel on Trends in Retirement Income and Saving for the Social Security Advisory Council. Her collaborative study on Social Security reform won the Paul Samuelson Award for "Outstanding Writing on Lifelong Financial Security" from TIAA-CREF.

Mitchell speaks fluent Spanish and Portuguese, having worked extensively in Latin America, Europe, and Australasia. She lives in Philadelphia with her computer programmer husband and two daughters who, with her, enjoy scuba diving and hiking in warm climes.

Not-For-Profit Organizations

An NBER Conference on Not-for-Profit Organizations, organized by Edward Glaeser of NBER and Harvard University, took place on January 18-19. The following papers were discussed:

Raymond Fisman, Columbia University, and **R. Glenn Hubbard**, Chairman, President's Council of Economic Advisers (on leave from NBER and Columbia University), "Endowments, Governance, and the Nonprofit Form"
Discussant: Jerry Green, NBER and Harvard University

Jonathan K. Nelson, Syracuse University, and **Richard Zeckhauser**, NBER and Harvard University, "A Renaissance Instrument to Support Nonprofits: The Sale of Private Chapels in Florentine Churches"
Discussant: Bruce Weinberg, Ohio State University

Burton A. Weisbrod and **Burcay Erus**, Northwestern University, "Compensation Structures Across Institutional Forms: Responses to Exogenous Revenue Constraints in the Hospital Industry, 1992-7"
Discussant: Sendhil Mullainathan, NBER and MIT

Henry Hansmann, Yale University; **Daniel Kessler**, NBER and Stanford University; and **Mark McClellan**, Member, President's Council of Economic Advisers (on leave from NBER and Stanford University), "Ownership Status and Capacity Choice: The Case of Hospitals"
Discussant: David Cutler, NBER and Harvard University

Sharon Oster, Yale University, and **William N. Goetzmann**, NBER and Yale University, "Valuing Art: Art Museums as Economic Institutions"
Discussant: Antoinette Schoar, NBER and MIT

Jason R. Barro, NBER and Harvard University, and **Michael Chu**, Harvard University, "HMO Penetration, Ownership Status, and the Rise of Hospital Advertising"
Discussant: Fiona Scott Morton, NBER and Yale University

Guy David and **Anup Malani**, University of Chicago, and **Tomas Philipson**, NBER and University of Chicago, "Theories of Nonprofit Firm Behavior: A Synthesis and Empirical Evaluation"
Discussant: Thomas Hubbard, NBER and University of Chicago

Fisman and **Hubbard** consider the governance implications for nonprofits, defined as organizations with no residual claimants. In for-profit enterprises, shareholders are the residual bearers of risk. Because a nonprofit, by definition, has no residual claimants, something else must act to absorb financial shocks. Nonprofit managers often describe the endowment, or fund balance, as serving this function. However, an endowment can provide managers with unchecked discretionary funds. The authors present a model of nonprofit governance in which the manager may divert funds from the endowment, and as a result, donors face a trade-off between expenditure smoothing and donation dissipation. The model yields a number of predictions, which are examined with data on U.S. nonprofits. The principal findings are: first, that organizations' endowments are highly correlated with revenue volatility, consistent with a precautionary savings model of the endowment. Second, taking advantage of differences in nonprofit oversight across U.S. states, organizations in poor governance states, relative to strong governance states: 1) have managerial compensation that is more highly correlated with inflows of donations; 2) derive a smaller percentage of their revenues from donations; and 3) allocate a smaller percentage of donations in the endowment for future expenditures. Fisman and Hubbard conclude that this sheds light on governance problems in the nonprofit form, and suggests an important role for oversight in overcoming these difficulties.

The Catholic Church in Renaissance Florence behaved much in the spirit of many contemporary American nonprofits. It supported itself overwhelmingly from the contributions of wealthy donors, and provided a range of services for the citizenry. **Nelson** and **Zeckhauser** analyze the sale of private chapels within churches to individuals and families, with a focus on three prominent churches. These chapels were private property, and could be inherited or resold. They served primarily as the setting for masses on behalf of owners, and often as burial sites, but they were rarely occupied by their owners. The sales of these chapels and masses were a significant source of church funds, and facilitated a church construction boom over the period 1280-1530. The authors conclude that Renaissance Florentine churches and today's nonprofits are similarly situated in multiple ways: they must overcome the free-rider problem in raising funds; they secure support by selling private benefits not readily available elsewhere, often status; they have a tangle of

residual claimants; they focus on posterity; and, these factors in concert may lead their mission to drift.

A fundamental challenge to every society is how to establish incentives for individuals and organizations to behave in ways that achieve social goals. This encompasses the design of institutions and associated labor rewards structures. **Weisbrod** and **Erus** investigate whether hospitals of various institutional forms respond differently to an exogenous change in demand — as would be the case if their objective functions differed but were stable over time. The authors recognize the difficulty of directly measuring some important dimensions of organization "performance" in mixed industries, where multiple forms of institutions coexist. Thus, their approach involves inferring performance in unobserved forms by examining financial reward structures, which are observed more easily. They focus on the 1990s in an attempt to capture the effects of growing emphasis on health care cost containment during that period. They hypothesize that responses to the exogenous fiscal stringency differed across institutional forms, reflecting differential objective functions, but only for top management, not for middle management or technical workers. For CEOs, while compensation (both base salary and "total" compensation - base salary plus bonus) increased industry-wide, religious nonprofits sustained the pattern of differential rewards, but secular nonprofits became substantially more like for-profits in their compensation structures. In lower level jobs, however, neither type of nonprofit hospital offered compensation that differed from for-profits, in total or in composition, at the beginning of the period or at the end.

Hansmann, **Kessler**, and **McClellan** explore the effect of hospital ownership on the rapidity of exit from a market in the face of declining demand. They find that the bed capacity provided by hospitals of all ownership types is similarly responsive to increases in demand for hospital services, but that hospitals of different ownership types respond differently to decreases in demand. For-profit hospitals are the most responsive, followed in turn by public and religiously affiliated nonprofit hospitals, while secular nonprofits are distinctly the least responsive of the four types. High market concentration affects the responsiveness of all four types to decreases in demand, increasing the responsiveness of religious nonprofit, public, and particularly for-profit hospitals, while decreasing the responsiveness of secular nonprofit hospitals. These results are consistent with for-profit hospitals' managers, and to a lesser degree also with managers of public and religiously affiliated nonprofit hospitals, seeking to minimize costs of service, and hence to eliminate unused or underused capacity. Managers of unaffiliated nonprofit institutions, in contrast, may not perceive such an incentive so long as net cash flow does not become negative. Market concentrations enhances this divergence between the incentives facing secular nonprofits and those facing the other ownership types, allowing hospitals motivated by cost efficiency to internalize more of the cost consequences of capacity reduction, while allowing secular nonprofits more market power to charge prices that will cover their costs.

Art museums are economic institutions that facilitate art education and connoisseurship. **Oster** and **Goetzmann** examine the empirical evidence on how museum governance, revenue structure, and the collection affect these related goals. They find strong differences in performance among public, not-for-profit, and university museums, consistent with expectations about institutional economic incentives. The authors find that attendance is correlated with an instrument for museum collection value, consistent with the idea that the collection is an asset, in an economic sense. They find that museums in affluent locations rely more upon private donations, consistent with the hypothesis that museums serve a social function. Analysis of time-series data on attendance shows that art prices and museum attendance are uncorrelated, suggesting that the demand for the aesthetic experience by different sectors of the market is disjoint. Also, there is no evidence that inter-city attendance is correlated, suggesting that variations in the appetite for the visual arts are local.

Barro and **Chu** examine the recent increase in hospital advertising expenditures. They first show that the rise in hospital advertising has not been universal. Large, not-for-profit, teaching hospitals have, by far, experienced the largest increase in spending. Adjusting for size, for-profit hospitals have actually decreased their marketing expenses over this period. This increase in advertising spending is best explained by managed care penetration. There is a small and marginally significant relationship between increases in for-profit presence in hospital markets and an increase in advertising spending by the not-for-profit hospitals in those markets.

The literature on not-for-profit (NFP) firms includes many theories for why such firms exist and how they differ empirically from for-profit (FP) firms. **David**, **Malani**, and **Philipson** examine the degree to which the existing empirical studies allow one to distinguish between alternative theories of NFP firms. The authors synthesize many popular theories of NFP firms into a common theoretical framework, built upon the neoclassical model of the firm. They demonstrate that each theory can be reduced to restrictions on the objective function of the owner/patrons of firms, and they explain how these restrictions dictate the owner/patrons' choice of organizational form for their firms. The framework generates a common set of predictions for each theory regarding the behavior of NFP firms at the firm-level and at the industry-level under conditions of perfect competition with mixed production. These predictions permit the comparison of theories across a range of common measures, such as size and response to demand shocks. Turning to the existing empirical literature, the authors find that few studies can directly distinguish between theories based on their differing predictions. The analysis suggests that the production of empirical evidence that can distinguish between the predictions of the different theories in common framework is a fertile ground for future research.

Strategic Alliances

An NBER Conference on Strategic Alliances, organized by Josh Lerner, NBER and Harvard University, and Raghuram G. Rajan, NBER and University of Chicago, took place on March 1 and 2. The program was:

Mihir A. Desai, NBER and Harvard University; **C. Fritz Foley**, Harvard University; and **James R. Hines**, NBER and University of Michigan, "International Joint Ventures and the Boundaries of the Firm"
Discussant: Ray Fisman, NBER and Columbia University

George Baker, NBER and Harvard University; **Robert Gibbons**, NBER and MIT; and **Kevin J. Murphy**, University of Southern California, "Formal and Relational Contracts in Ongoing Strategic Alliances"
Discussant: Oliver Hart, NBER and Harvard University

Michael Ryall, University of Rochester, and **Rachelle C. Sampson**, New York University, "The Effects of Repeated Interaction on the Organization and Performance of R and D Alliances"
Discussant: Per Stromberg, University of Chicago

Ben Gomes-Casseres, Brandeis University; **John Hagedoon**, University of Maastricht; and **Adam Jaffe**, NBER and Brandeis University; "Knowledge Flows in Technology Alliances"
Discussant: Gordon Phillips, University of Maryland

Joe Peek, University of Kentucky, and **Eric S. Rosengren**, Federal Reserve Bank of Boston, "Corporate Affiliations and the (Mis)Allocation of Credit"
Discussant: Jeremy Stein, NBER and Harvard University

David T. Robinson, Columbia University, and **Toby Stuart**, University of Chicago, "Conflicting Motives for Equity Participants in High-Tech Strategic Alliances"
Discussant: Bengt Holmstrom, NBER and MIT

Panel 1: Key Issues Facing Practitioners in Structuring and Managing Alliances
Douglas Birdsall, Senior Vice President-Alliances, Northwest Airlines; Gregory Gardiner, Managing Director of Yale University's Office of Cooperative Research; and Kevin Oye, Sycamore Networks.

Panel 2: Legal Perspectives on Strategic Alliances
Bernard Black, Stanford University; Michael Levine, Harvard University; and Ronald Mann, University of Michigan

Desai, **Foley**, and **Hines** link the declining propensity of multinational firms to share ownership of their foreign operations to the increasing returns to coordination associated with managing globalized operations. The evidence indicates that firms are more likely to establish joint ventures in settings in which it is attractive to purchase inputs from, and sell to, local markets. This suggests a potential role for joint venture partners in facilitating learning about local markets. Joint ventures are less common in situations which require a firm to forego what would otherwise be attractive opportunities to use wholly-owned affiliates to coordinate integrated production activities across different locations, to transfer technology, and to engage in worldwide tax planning. The authors use the liberalization of ownership restrictions by host countries in the 1980s and 1990s and the joint venture tax penalties imposed by the U.S. Tax Reform Act of 1986 to show that firms respond to regulatory and tax changes by expanding the volume of their intrafirm trade, as well as the extent of their 100 percent affiliate ownership. The estimates here indicate that 4 percent greater sole ownership of an affiliate is associated with 2 percent higher intrafirm trade volumes. Taken together, the evidence suggests that growing returns to managing global operations through wholly-owned affiliates, together with regulatory and tax changes, gave rise to the sharply declining propensity of American firms to organize their foreign operations as joint ventures over the last two decades.

Strategic alliances range from short-term cooperative projects, through long-term partnerships and joint ventures, to transactions that permanently restructure firm boundaries and asset ownership. Still, the economics literature lacks a framework for analyzing this plethora of governance structures. **Baker**, **Gibbons**, and **Murphy** draw on detailed discussions with practitioners to present a rich model of feasible governance structures. Their model focuses on three issues emphasized by practitioners: spillover effects (as opposed to specific investment or hold-up); contracting problems ex post (as opposed to only ex ante); and relational contracts (as opposed to spot transactions). Using this model, the authors first identify the managerial challenges presented by each governance structure and then analyze which governance structure is efficient in which environments.

Ryall and **Sampson** examine technology alliance contracts in detail, to explore if and how formal contract terms vary with the availability of informal governance. The authors use a case study approach to explore the contract mechanisms that reveal a possible interaction between formal and informal governance. By examining actual contracts, they can see first hand the variety of processes that contract-

ing parties have invented and whether these processes are complementary or substitutable for one another. While they conjecture here as to the source of discovered contract variation, this exploration is intended primarily to facilitate later empirical analyses to test whether contract regularities are consistent with theoretical predictions.

Gomes-Casseres, **Hagedoon**, and **Jaffe** explore the relationship between inter-firm linkages (alliances) and technology flows, measured as patent citations. Specifically, they argue that two firms will be more likely to cite each other's patents when they have had one or more alliances with each other than if they are not linked organizationally. The authors test this hypothesis and related arguments regarding alliances in the information technology industry using data from the MERIT/CATI database and patent data from the U.S. Patent Office. Patents are seen as reflecting an underlying technological capability. Patent citations are interpreted as a (noisy) proxy for flows of technological knowledge from the cited firm to the citing firm; alliances are defined as organizational structures for governing incomplete contracts that, in the authors' sample, often involve technology transfer or joint R and D. The preliminary results indicate that the formation of alliances is associated with increased knowledge flow; that firm pairs with multiple alliances show the largest effects; and that the alliance formation interacts in interesting ways with other factors affecting knowledge flow, such as technological proximity.

The strong corporate affiliations in Japan have been cited as one of the major impediments to making the fundamental changes necessary to escape the economic malaise that has afflicted the Japanese economy over the past decade. While Japanese corporate affiliations during good economic times were heralded as an effective way to increase credit availability and reduce agency costs, these same affiliations may impede needed economic restructuring insofar as they insulate firms from the market discipline that otherwise would be imposed by creditors. **Peek** and **Rosengren** show that corporate affiliations have contributed to significant misallocations of credit, since troubled borrowers with strong corporate affiliations with their lenders are more likely to obtain additional credit than their healthier brethren. In contrast, lenders that are not affiliated with the firm are much less likely to extend additional credit as firms become more troubled.

Robinson and **Stuart** conduct a detailed, micro-level analysis of 126 strategic alliance contracts, all of which were written to sponsor early-stage, genomics-based biotechnology research at small R and D companies. Among pre-IPO companies, many alliances resemble venture capital contracts: they involve convertible preferred equity and typically contain anti-dilution provisions, warrants, and board seats. Contracts contain explicit provisions linking equity participation to subsequent IPO activity, and contain clauses designed to insulate both parties from multi-tasking problems. Finally, equity participation is correlated positively with the ambiguity of the contracting environment.

The conference also featured two panel discussions. The first highlighted practitioners' perspectives on alliance arrangements. The second highlighted the views of legal academics on such arrangements. Both sessions considered the complexity of alliance agreements, the extent to which contractual incompleteness sometimes was necessary, and the process by which these agreements were renegotiated.

A summary of these papers and discussions will be published in a future issue of the *Journal of Financial Economics*.

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Structural Impediments to Growth in Japan

More than 50 economists from several countries, representing universities, governments, and business, gathered in Tokyo on March 18 and 19 for an NBER Conference on "Structural Impediments to Growth in Japan." Magnus Blomstrom, NBER and Stockholm School of Economics; Jennifer Corbett, Oxford University; Fumio Hayashi, NBER and University of Tokyo; and Anil K Kashyap, NBER and University of Chicago, organized the meeting. The following papers were presented and discussed:

Albert Ando, NBER and University of Pennsylvania; **Dimitrios Christelis**, University of Pennsylvania; and **Tsutomu Miyagawa**, Gakushuin University, "Household Savings and Corporate Behavior in the Japanese Economy"
Discussant: Charles Y. Horioka, NBER and Osaka University

Yishay Yafeh, Hebrew University, "Japan's Corporate Groups: Some International and Historical Perspectives"
Discussant: Sumner La Croix, University of Hawaii

David Flath, Kyoto University, "The Japanese Distribution Sector in Economic Perspective: The Large Store Law and Retail Density"
Discussant: Gary Saxonhouse, University of Michigan

Hiroshi Ono, Stockholm School of Economics, and **Marcus E. Rebick**, Oxford University, "Impediments to the Productive Employment of Labor in Japan"
Discussant: Fumio Ohtake, Osaka University

Robert Dekle, University of Southern California, "Population Aging in Japan: Its Impact on Future Saving, Investment, and Budget Deficits"
Discussant: Douglas Joines, University of Southern California

Mitsuhiro Fukao, Keio University, "Barriers to Financial Restructuring: Japanese Banking and Life-Insurance Industries"
Discussant: Colin McKenzie, Osaka University

Kenn Ariga, Kyoto University, and **Kenji Matsui**, Yokohama National University, "Mismeasurement of CPI"
Discussant: Robert E. Lipsey, NBER and Queens College

Lee Branstetter, NBER and Columbia University, and **Yoshiaki Nakamura**, Research Institute of Economy, Trade, and Industry, "Has Japan's Innovative Capacity Declined?"
Discussant: Fredrik Sjoholm, Stockholm School of Economics

Masaru Inaba, University of Tokyo, and **Keiichiro Kobayashi**, Research Institute of Economy, Trade, and Industry, "Japan's Debt Trap and the Complexity Externality"
Discussant: Akiyoshi Horiuchi, University of Tokyo

Takero Doi, Keio University, and **Takeo Hoshi**, University of California, San Diego, "FILP: How Much Has Been Lost? How Much More Will Be Lost?"
Discussant: Yasushi Iwamoto, Kyoto University

Ando, **Christelis**, and **Miyagawa** note that the saving-income ratio for the household sector in Japan for the decade of the 1990s, as reported in the Japanese National Accounts, is approximately 12.8 percent on average. Even after a number of plausible adjustments, the ratio remains around 10 percent. Given that the growth rate of income for this decade is only a little over 1 percent per year (in terms of GDP in constant prices) and that the Japanese population is aging rapidly, that saving ratio appears to be surprisingly high. One possible cause of this high saving rate is the very low ratio of net worth (excluding the value of land) to income. The household sector's net worth is small because the market value of corporate equities in Japan is extraordinarily low relative to the reproduction cost valuation of capital-plus-financial-assets-less-financial-liabilities. This is not a recent development; throughout the period after World War II, the market value of Japanese corporations was one third to one fifth of the reproduction cost of their investment-plus-net-financial-assets. Thus, the evidence suggests that non-financial corporations in Japan have over-invested substantially, and the choice of their investment appears to have been grossly inefficient. If the investment decisions of these non-financial corporations had been efficient and the market value of their equities reflected the value of their investment, then the household sector would have had additional assets of some 500 trillion yen, generating perhaps 20 trillion yen of additional consumption in 1999. This also would have raised the value of assets of financial institutions enough to put them in reasonably sound financial condition. Thus, a case can be made that the current economic malaise in Japan is caused primarily by the grossly inefficient investment behavior of non-financial corporations in Japan.

Yafeh reviews the literature on corporate groups in Japan and elsewhere, and summarizes the existing evidence on the economic roles that corporate groups have played in the Japanese economy. He then presents a comparison of Japanese corporate groups and business groups in other (developed and developing) countries. His main

conclusion is that Japanese groups, while similar to groups in other countries in many respects, are different in their risk and return characteristics. Finally, Yafeh describes the evolution of Japan's corporate groups over the past 25 years, and asks whether such groups constitute an impediment to structural change in Japan. He finds that, with some exceptions, there is limited evidence on the economic importance of corporate groups in the postwar Japanese economy. There is also little to suggest that groups have had a major impact on growth rates of particular industries in Japan, and no evidence that Japanese groups (unlike groups in other countries) enjoy any particular political clout. Therefore it is unlikely that corporate groups will constitute an impediment to structural change.

Flath discusses the distribution sector of Japan, examining the conventional view that its peculiar features are attributable to distorting government regulations. He finds that regulation has mattered, but that fundamentals — like Japan's geographic centricity, lack of private cars, and smallness of dwellings — have had a larger effect. A myriad of small stores is the crucial characteristic of the Japanese distribution sector, from which other peculiarities — such as the complex wholesale marketing channels with multiple steps and ubiquity of vertical restraints — also follow. Flath estimates that, in the period 1985 to 1997, the variation in the number of stores per person across prefectures and over time exhibited little sensitivity to variation in the numbers of large stores per person. Japan's proliferation of small stores is fundamentally caused, not by regulation, but by its relative lack of private cars and its small dwellings. Regulatory limits on large stores are themselves the result of the ubiquity of small stores, not the other way around. However, this is now changing. Increased private car ownership and suburbanization in Japan favor large specialty super stores and convenience stores and undercut the small, family-owned, non-self service stores. This process is not only reducing the overall number of stores in Japan, it is also enlarging the distorting effects of regulatory limits on large stores, and to that extent it is eroding the political viability of such policies.

Ono and **Rebick** examine a number of personnel practices, laws, and regulations that lower the supply of labor in the Japanese economy. Broadly speaking, there are two kinds of impediments: those that restrict the movement of labor between firms and those that discourage women from participating to a greater extent. Using other OECD countries and especially the United States as a benchmark, the authors estimate that removal of these barriers would increase the productive labor supply in Japan by some 13 to 18 percent and thus could raise the potential growth rate of the Japanese economy by roughly 1 percent per annum over a 10-year period.

Dekle revisits the impact of demographic change on Japanese saving and investment, and on government budget deficits. There is widespread belief that rapid aging will lead to major shifts in the Japanese saving and investment balance, and severely worsen Japan's fiscal situation. Using the latest government demographic projections, Dekle shows that the aging of the population now underway will steadily lower Japan's total saving rate from 30 percent of GDP today to 19 percent of GDP in 2040. Given the more rapid decline in total saving, Japan's current account will steadily narrow from its current level, and turn to deficit around 2025. He also shows that the aging of the population will worsen government finances, as healthcare and social security spending soar. Unless government fiscal balances improve from the current negative 7 percent of GDP to almost (positive) 5 percent of GDP over the next decade or so, the current government debt is not sustainable. Finally, Dekle forecasts future government spending from projected demographics. Based on the forecasted government spending, he believes that large tax increases will become necessary for the current government debt to be sustainable. In fact, he shows that taxes as a percentage of GDP will need to be raised from the current 28 percent to almost 50 percent by 2050.

Fukao shows that Japan will not be able to have a viable banking sector without stopping deflation. The banking industry has never shown a profit since fiscal year 1993 if one excludes capital gains on stock and real estate portfolios from its bottom line. The interest margins are too low to cover the increased loan losses in a weak economy. Banks cannot raise interest margins because of the following factors: competition with government sponsored financial institutions that receive subsidies; intense political pressure to make new loans to small- and medium-sized companies backed up by the Financial Services Agency; and weakened borrowers under deflation. Fukao expects that the Japanese government will have to nationalize most of the banking sector within two to three years. Capital injection will not solve this problem, because banks cannot maintain enough lending margin to cover loan losses under deflation and competition with government agencies. Further, weakened banks ask life-insurance companies to provide equity capital and subordinated loans. In return, mutual life-insurance companies ask banks to subscribe to their surplus notes (similar to non-voting redeemable preferred shares) and subordinated debts. The life-insurance problem is easier to solve, though. By using a legal reorganization procedure, failed life-insurance companies can cut promised interest rates on their insurance policies. On the other hand, it is not possible for the government to deeply cut deposits of failed large banks when a large part of the banking sector is either insolvent or very nearly so. Thus, the government has to bear the full brunt of defaulting loans when its debt-GDP ratio is rising by 10 percentage points a year. Probably, the Japanese government will not be able to sustain investment grade credit ratings for more than five years.

Ariga and **Matsui** investigate several key problems in Japanese economic statistics. They use CPI mismeasurement and bias as an example to explore the roots of the problem and to offer guidelines for improvement. They emphasize three major shortcomings

shared by many official statistics in Japan: long delays in adjustments; lack of proper coordination; and insufficient information disclosure. In the analysis of CPI bias, the authors limit their focus to potential biases attributable to aggregation, survey methodology, and sample selection procedures. They estimate that, in recent years, the commodity CPI inflation rate is biased upward by at least .5 percent per year, even if they assume away the potential bias associated with the quality adjustment, delay in incorporating changes in consumption basket, and other important unresolved problems.

Branstetter and **Nakamura** examine Japan's recent R and D performance using several complementary modes of analysis. First, they interviewed several corporate R and D managers at leading Japanese firms, both in the central R and D operation in Japan and managers based at Japanese R and D facilities abroad. Second, they collected evidence from aggregate economic statistics concerning changes in Japanese R and D. Third, they gathered comprehensive data on R and D inputs and outputs for a panel of nearly 200 Japanese firms. Microeconometric analysis of this dataset allows them to examine where any downturn in R and D activity is concentrated, what Japanese firms are themselves doing to rectify the downturn in performance, and what effects these steps have had to date. The authors find that after a decade of convergence in terms of R and D inputs and outputs in the 1980s, Japanese and U.S. technology trends have diverged sharply in the 1990s. Measured in a common currency, real R and D outlays in Japan have grown much more slowly than in the United States. The gap in patent output that was closing rapidly in the 1980s began expanding again in the 1990s. Turning to firm-level data, the authors find evidence of a slowdown in the growth of R and D productivity in Japan in the 1990s. This slowdown does not affect all firms equally, though. By and large, the research productivity of the electronics industry, broadly defined, has continued to grow in line with the trends of the 1980s and early 1990s. On the other hand, firms outside the electronics industry have performed less well. Conversations with Japanese R and D managers revealed several steps that Japanese firms are taking to restructure their R and D operations and improve research productivity. Two such steps — the establishment of research facilities abroad and the forging of technology alliances with U.S. firms — have led to increased flows of technological information to Japanese firms, the authors find. These increased flows of knowledge also raise overall inventive productivity.

Kobayashi and **Inaba** argue that the Japanese economy has shifted to a stagnant equilibrium because of an external diseconomy, which they call the complexity externality. The complexity externality is a coordination failure by which inefficiency of one firm affects other firms' productivity through the network of division of labor. They present a simple model that illustrates how the accumulation of bad debt triggers the spreading of complexity externality and shifts the economy from a good equilibrium to a bad equilibrium. They also examine the existence of complexity externality using the Input-Output Tables of Japan. Their empirical evidence suggests that the Japanese economy shifted to a bad equilibrium when the asset-price bubble burst and procrastination prevailed during the beginning of the 1990s.

Doi and **Hoshi** examine the financial health of the Fiscal Investment and Loan Program (FILP) as of the end of March 2001. They study the financial conditions of the FILP recipients, including public corporations and local governments. They find many public corporations and local governments are de facto insolvent. Their estimates suggest as much as 68 percent of the FILP loans are bad. The expected losses are likely to be 45 trillion yen (9 percent of GDP) or higher. The authors also study the effects of the FILP reform of April 2001, which tries to introduce market discipline into the allocation of FILP funds. They do not detect significant changes in the financial flow, yet. The financial market seems to differentiate the newly introduced FILP agency bonds, which are supposed to lack government guarantee, from government guaranteed bonds. It is too early to tell, however, whether the financial market will become an effective monitor of FILP agencies.

These papers will be published by the University of Chicago Press in a volume titled *Structural Impediments to Growth in Japan*. Many of them are also available at "Books in Progress" on the NBER's website.

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Seventeenth Annual Conference on Macroeconomics

The NBER's Seventeenth Annual Conference on Macroeconomics, organized by Mark Gertler, NBER and New York University, and Kenneth S. Rogoff, NBER and Princeton University, was held in Cambridge on April 5 and 6. The following papers were discussed:

Nancy L. Stokey, University of Chicago, "'Rules versus Discretion' after Twenty-Five Years"
Discussants: Peter Ireland, Boston College, and Lars E. O. Svensson, NBER and Princeton University

Aart Kraay, The World Bank, and **Jaume Ventura**, NBER and MIT, "Foreign Assets as a Buffer Stock"
Discussants: Fabrizio Perri, New York University, and Eric Van Wincoop, University of Virginia

J. Bradford DeLong, NBER and University of California, Berkeley, "Productivity Growth in the 2000s"
Discussants: Susanto Basu, NBER and University of Michigan, and Boyan Jovanovic, NBER and University of Chicago

James H. Stock, NBER and Harvard University, and **Mark W. Watson**, NBER and Princeton University, "Has the Business Cycle Changed and Why?"
Discussants: Jordi Gali, NBER and Universitat Pompeu Fabra, and Robert E. Hall, NBER and Stanford University

Charles Engel, NBER and University of Wisconsin, "Expenditure Switching and Exchange Rate Policy"
Discussants: Karen Lewis, NBER and University of Pennsylvania, and Pierre-Olivier Gourinchas, NBER and Princeton University

Alberto Alesina and **Robert J. Barro**, NBER and Harvard University, and **Silvana Tenreyro**, Harvard University, "Optimal Currency Areas"
Discussants: Rudiger Dornbusch, NBER and MIT, and Andrew K. Rose, NBER and University of California, Berkeley.

Stokey notes that although discretionary policy has some advantages, maintaining a reputation can be costly. Hence, in choosing among instruments for conducting monetary policy, the ease of observability is an important factor. The advantage of a policy rule depends on the type of discretionary government it replaces. A rule is more attractive in an economy where the discretionary government is sometimes myopic than in one where it is always the Ramsey type.

Faced with income fluctuations, countries smooth their consumption by raising savings when income is high (and vice versa). How much of these savings do countries invest at home and abroad? In other words, what are the effects of fluctuations in savings on domestic investment and the current account? In the long run, **Kraay** and **Ventura** find, countries invest the marginal unit of savings in domestic and foreign assets in the same proportions as in their initial portfolio, so that the latter is remarkably stable. In the short run, countries invest the marginal unit of savings mostly in foreign assets, and only gradually do they rebalance their portfolio back to its original composition. This means that countries try to smooth not only consumption but also domestic investment. To achieve this, they use foreign assets as a buffer stock.

The causes of the productivity growth slowdown of the 1970s remain mysterious. By contrast, nearly all agree that the cause of the productivity growth speed-up of the 1990s lies in the information technology sector. The extraordinary pace of invention and innovation in the information technology sector has generated real price declines of between 10 and 20 percent per year for decades. Increased total factor productivity in the information technology capital goods-producing sector, coupled with extraordinary real capital deepening as the quantity of real investment in information technology capital bought by a dollar of nominal savings grows, together have driven the productivity growth acceleration of the later 1990s. Will this new higher level of productivity growth persist? According to **DeLong**, the answer is likely to be "yes." The most standard of simple applicable growth models — that of Oliner and Sichel — predicts that the social return to information technology investment would have to suddenly and discontinuously drop to zero in order for the upward jump in productivity growth to reverse itself in the near future. More complicated models that focus in more detail on the determinants of investment spending, or on the sources of increased total factor productivity, appear to strengthen, not weaken, forecasts of productivity growth over the next decade.

From 1960-83, the standard deviation of annual growth rates of real GDP in the United States was 2.71 percent. From 1984-2001, the corresponding standard deviation was 1.59 percent. **Stock** and **Watson** investigate this large drop in the cyclical volatility of the real economy. Their evidence suggests that the drop in volatility has been widespread: it is evident in most measures of sectoral output and employment, and in measures of wage and price inflation. Split-sample estimates of breaks in volatility suggest a break in the early 1980s, but considerable sampling uncertainty around the break date. Stock and Watson investigate several explanations for the reduced volatility, including changes in sectoral composition, inventory management methods, monetary policy, and smaller structural shocks.

Changes in nominal exchange rates can lead to "expenditure switching" when they influence relative interna-

tional prices. A traditional argument that favors a policy of flexible nominal exchange rates rests on the notion that when prices are sticky in producers' currencies, movements in nominal exchange rates can change relative prices between home and foreign goods. But if prices are fixed ex ante in consumers' currencies, then nominal exchange rate flexibility cannot achieve any relative price adjustment. In fact in that case, nominal exchange rate fluctuations have the undesirable feature of leading to deviations from the law of one price. Thus the case for floating exchange rates is weakened if prices are sticky in this way. The empirical literature appears to support the notion that prices are sticky in consumers' currencies. **Engel** also provides support for this conclusion. He then reviews some new approaches in the theoretical literature that imply an important expenditure-switching role even when consumer prices are sticky in consumers' currencies. Still, further empirical research is needed to resolve the quantitive importance of the expenditure-switching role of nominal exchange rates.

As the number of independent countries increases and their economies become more integrated, we would expect to observe more multi-country currency unions. **Alesina**, **Barro**, and **Tenreyro** explore the pros and cons for different countries to adopt as an anchor the dollar, the euro, or the yen. Although there appear to be reasonably well-defined euro and dollar areas, there does not seem to be a yen area. The authors also address the question of how trade and co-movements of outputs and prices would change after a currency union is formed. This response is important because the decision of a country to join a union would depend on how the union affects trade and co-movements.

These papers will be published by the MIT Press as *NBER Macroeconomics Annual, Volume 17*. They will also be available at "Books in Progress" on the NBER website, www.nber.org.

Bureau News

Petrin is 2002/3 Griliches Fellow

Amil Petrin, an NBER Faculty Research Fellow in the Productivity Program and a member of the economics faculty at the University of Chicago's Graduate School of Business, has been selected to receive the Zvi Griliches Fellowship at the NBER for the academic year 2002/3. This fellowship, which is awarded every two years, was created and funded by friends and colleagues of Professor Griliches to honor his memory and his tradition of mentoring young empirical economists.

Petrin plans to spend the coming year at the NBER's Cambridge office studying the demand and supply side effects of Direct Broadcast Satellite's (DBS) entry into the cable television market. Additionally, he will be developing methods that exploit consumer utilization rates of products to improve demand and welfare estimates for them.

Petrin received his B.A. from the University of Pennsylvania in 1989 and his Ph.D. from the University of Michigan in 1998. He has been teaching at the University of Chicago since 1998.

Three NBER National Fellows Named

The NBER recently announced the selection of National Fellows for 2002/3. These National Fellows will spend one academic year at the Bureau's office in Cambridge, and will devote their time to research and writing in the area of their program affiliation. The National Fellows are selected from among the NBER Faculty Research Fellows

The 2002/3 NBER National Fellows are: Kenneth Chay, University of California, Berkeley, working in Labor Studies; Menzie D. Chinn, University of California, Santa Cruz, working in International Finance and Macroeconomics; and Melissa A. Thomasson, Miami University of Ohio, working in Development of the American Economy.

Chay's research will focus on the economic effects of environmental regulation and the health impact of air pollution; changes in black-white relative health over time and the effects of civil rights programs; and estimation methods for nonlinear models, as applied to the effects of smoking and state dependence in program participation. Chinn plans to investigate the modeling of exchange rates in a tripolar world. Thomasson will study the economic history of health care and health insurance in the United States.

Industrial Organization

Members and guests of the NBER's Program on Industrial Organization met at the Bureau's California office on January 25 and 26. The meeting was organized by Frank Wolak, NBER and Stanford University, and Catherine Wolfram, NBER and University of California, Berkeley. The following papers were discussed:

Francine Lafontaine, NBER and University of Michigan, and **Scott E. Masten**, University of Michigan, "Contracting in the Absence of Specific Investments and Moral Hazard: Understanding Carrier-Driver Relations in U.S. Trucking"
Discussant: Nancy L. Rose, NBER and MIT

Justine S. Hastings, Dartmouth College, "Vertical Relationships and Competition in Retail Gasoline Markets"
Discussant: Andrea Shepard, NBER and Stanford University

Jun Ishii, University of California, Irvine, and **Jingming Yan**, Cornerstone Research, "The 'Make or Buy' Decision in U.S. Electricity Generation Investments"
Discussant: James Bushnell, University of California Energy Institute

Austan Goolsbee and **Amil Petrin**, NBER and University of Chicago, "The Consumer Gains from Direct Broadcast Satellites and the Competition with Cable TV" (NBER Working Paper No. 8317)
Discussant: C. Lanier Benkard, NBER and Stanford University

Charles King III, **Alvin J. Silk**, and **Niels Ketelhohn**, Harvard University, "Knowledge Spillovers and Growth in the Disagglomeration of the U.S. Advertising Agency Industry"
Discussant: Scott Stern, NBER and Northwestern University

Megan Busse, Yale University, and **Matthew Shum**, Johns Hopkins University, "Empirical Modeling of Endogenous Quality Choice: The Case of Cable Television"
Discussant: Thomas Hubbard, NBER and University of Chicago

Raphael Thomadsen, Columbia University, "Price Competition in Industries With Geographic Differentiation: Measuring the Effect of Location on Price in the Fast Food Industry"
Discussant: Aviv Nevo, NBER and University of California, Berkeley

Lafontaine and **Masten** consider various functions of contracting other than the protection of relationship-specific investments and the provision of marginal incentives. They apply the theory to explain variations in the form of compensation of over-the-road truck drivers in the United States. Specifically, they argue that contracts in this industry serve to economize on the costs of price determination for different types of transactions. The actual terms of those contracts vary systematically with the nature of hauls in a way that is consistent with the theory. By contrast, the authors find that vehicle ownership, which defines a driver's status as an owner operator or company driver, depends on characteristics of the driver, but not of the haul and trailer.

Hastings asks how much, if any, of the differences in retail gasoline prices between markets is attributable to differences in the composition of vertical contract types at gasoline stations in each market. ARCO's purchase of the independent retail gasoline chain, Thrifty, provides a unique opportunity to examine the effects of changes in different vertical contract types on local retail prices. This purchase caused sharp changes in the market share of fully vertically integrated stations and independent stations, differentially affecting local markets in the Los Angeles and San Diego metropolitan areas. Using unique and detailed station-level data, Hastings asks how these changes affected local retail gasoline prices. Her results indicate that a decrease in the market share of independent stations has a significant positive effect on local retail price. However, a change in the market share of refiner-owned-and-operated branded stations does not have a significant effect on local market price. These results have important implications for policymakers who are considering the regulation of vertical contracts as a means to increase competition in gasoline markets. Hastings's research design and the detailed data also allow for inference on the underlying nature of retail gasoline competition.

Ishii and **Yan** present a model of the "make or buy" decision by independent power producers (IPPs) in restructured U.S. wholesale electricity markets. Their model is based on observing whether an IPP buys a divested utility power plant ("buy"), builds a new power plant ("make"), or chooses not to invest at all. They apply the model to plant-level data that track the investment decisions of major IPPs from 1996 to 2000; this leads to estimates of the investment cost and expected profit functions that characterize how IPPs evaluate different power plant investment opportunities. The authors aim to evaluate the effectiveness of divestiture programs (which sold utility power plants to IPPs) in encouraging greater IPP participation in restructured wholesale markets. Their estimates suggest that the main factor influencing an IPP's willingness to pay for a divested power plant is the investment cost the IPP must incur to build a new power plant in the market. Moreover, their estimated model shows that IPPs that are affiliated with electric utilities buy most of the divested plants precisely because they face a relative disadvantage in

building large power plants vis-a-vis their unaffiliated counterparts. The simulation results that examine IPP investment behavior in the absence of divestiture are consistent with these findings. The simulations show that a minimal amount of new power plant investment was "crowded out" by the presence of divestiture. Moreover, the simulations indicate that divestiture encouraged entry and participation by a greater number of IPPs, most particularly those affiliated with investor-owned electric utilities.

Goolsbee and **Petrin** examine the introduction of Direct Broadcast Satellites as an alternative to cable television and the welfare gains that such satellites generated for consumers. The extent to which satellites compete with cable has become an important issue in the debate over reregulation of cable prices. The authors estimate a consumer-level demand for satellite, basic cable, premium cable, and local antenna using extensive microdata on the television choices of more than 15,000 people as well as price and characteristics data on cable companies throughout the nation. Their results indicate that, after properly controlling for unobservable product attributes and the endogeneity of prices, the direct welfare gain to satellite buyers averages between $100 and $200 per year, or approximately $1-$2 billion annually, in the aggregate.

King, **Silk**, and **Ketelhohn** investigate knowledge spillovers and externalities in the disagglomeration and growth of the advertising agency industry. A simple model of high demand, low wages, and externalities associated with clusters of related industries can explain the dispersion of advertising agency employment across states. Other factors affect the industry growth rate within states. Consistent with Porter (1990), growth will increase with buyer cluster size. In accord with Jacobs (1969) and Porter (1990), but contrary to Marshall-Arrow-Romer, it is competition, but not specialization, that enhances growth. Diversity has no effect on growth. Despite improvements in telecommunications and transportation that reduce effective distances, location still matters.

Busse and **Rysman** examine the effect of competition on second-degree price discrimination in display advertising in Yellow Page directories. Their main finding is that competition increases the curvature of the price schedule; that is, purchasers of the largest ads see their prices fall the most in response to competition. The authors also present evidence of menu costs in adjusting pricing schedules and address this issue in their estimation. The magnitudes that they find may be relevant for welfare calculations in the face of price discrimination.

Crawford and **Shum** present a framework for analyzing price and quality choice by a multiproduct monopolist. They demonstrate that well-known techniques from the optimal screening literature used in the theoretical analysis of nonlinear pricing "map" naturally to the empirical analysis of differentiated product markets. They then apply a generalized one-dimensional screening model developed recently by Rochet and Stole (2001) to analyze price and quality choice for basic cable television services. Consistent with the theory, their preliminary results suggest significant degradation in product quality relative to first-best levels. Furthermore, their results provide strong support for Rochet and Stole's (2001) nonlinear pricing model with random participation over Mussa and Rosen's (1978) classical model of monopoly quality choice.

Thomadsen analyzes the relationship between prices in the fast food industry and the market structures and taste variations induced by the geography of the market. He uses price and location data, but not quantity data, to estimate a discrete choice model of demand and supply for fast food that accounts for the exact geographic configuration of firms. He then runs counterfactual experiments to demonstrate how the location of a firm will affect its price. He finds that consumers will travel about one third of a mile to save $1. He also finds that both geographic differentiation from competitors and the distribution of consumers around the outlet have significant effects on the equilibrium prices for fast food outlets. For example, he shows that for one of the outlets in his market, moving the outlet to a location one half mile away would change the price for a meal (with an average mark-up of $2.67) by 15 cents. Also, joint ownership can increase prices significantly above those that would be charged under separate ownership, especially for the industry leader. This price increase can occur even when the co-owned outlets are located far enough apart that the firms would both charge monopoly prices had they been owned by different parties. Since the changes in prices that occur from joint versus separate ownership are the same as the differences that occur from a merger (of two franchisees belonging to the same chain), these results are suggestive of general anti-trust policy in markets with geographic differentiation.

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Insurance Project

The NBER's Insurance Project held a workshop in Cambridge on February 1. Project Director Kenneth A. Froot, NBER and Harvard University, and Howard Kunreuther, NBER and University of Pennsylvania, organized this program:

Christian Gollier, Université de Toulouse, "Insurability"
Discussant: Kenneth A. Froot

Dwight M. Jaffee, University of California, Berkeley, and **Thomas Russell**, Santa Clara University, "Extreme Events and the Market for Terrorist Insurance"
Discussant: W. Kip Viscusi, NBER and Harvard University

J. David Cummins and **Neil A. Doherty**, University of Pennsylvania, "Federal Terrorism Reinsurance: An Analysis of Issues and Program Design Alternatives"
Discussant: Christopher Lewis, University of Connecticut

D. Gordon Woo, Risk Management Solutions, "Quantifying Insurance Terrorism Risk"
Discussant: John Major, Guy Carpenter and Company, Inc.

Howard C. Kunreuther and **Geoffrey Heal**, Columbia University, "Interdependent Security: The Case of Identical Agents"
Discussant: Richard Zeckhauser, NBER and Harvard University

Martin F. Grace and **Robert W. Klein**, Georgia State University, and **Paul R. Kleindorfer**, University of Pennsylvania, "The Demand for Homeowners Insurance with Bundled Catastrophe Coverages"
Discussant: Paul Freeman, University of Denver

The events of September 11 have again raised the question of the limits of insurability by the market and of the importance of insurance for the efficient functioning of our economies. In his paper, **Gollier** examines the sources of the uninsurability problem in general and the so-called "new risks" in particular.

Jaffee and **Russell** examine several reasons why markets that insure against low frequency/high cost events often suffer disruption following the occurrence of such events. They then discuss the implications for public policy.

Although estimates vary, it seems clear that the World Trade Center (WTC) attack will cause insured losses at least twice as high as the largest previous insured loss event, Hurricane Andrew, which led to about $20 billion in insured losses. The magnitude of the WTC event and the risk of potential future losses from terrorism have led to proposals for federal government involvement in providing terrorism reinsurance. **Cummins** and **Doherty** analyze the case for a federal role and the program design options that might be used to implement a federal program. They analyze the design options (including no federal role) in terms of their efficiency in risk sharing and providing of information, as well as their potential for creating moral hazard and bureaucratic inefficiency, and for being captured by interest groups. The authors conclude that federal reinsurance would be most appropriate for large terrorist events and that the most efficient design would be securitization through the auction of federal excess-of-loss reinsurance call option spreads covering terrorist attacks.

Woo considers terrorism hazard in the wake of the international governmental resolution and the destruction of the al-Qaeda training camps in Afghanistan. The frequency and severity of attacks depend crucially on organizational structure. To minimize detection by counter-terrorist forces, terrorists may take advantage of alternative forms of network architecture adopted by drug syndicates, pirates, and other criminals, within which sporadic pulsing swarm attacks might be launched effectively. The constraints of this network architecture, with sustained pressure from counter-terrorist forces, will influence the relative likelihood of different scenarios favored by al-Qaeda. A terrorism cost function, involving planning time, technical difficulty, and consumption of resources, may be defined to quantify the relative scenario likelihood, and thereby to allow a loss severity curve to be derived. As part of the task of normalizing this curve to "strike frequency," Woo outlines a logical event-tree for computing the probability that a planned attack is successful. Any probabilistic framework for quantifying terrorism risk, however logically designed, will ultimately have to involve a measure of expert judgment. Extensive expert consultation exercises already have been commissioned by the Pentagon, and should prove as insightful to the insurance industry as to government agencies.

Kunreuther and **Heal** investigate the economic incentives for investment in security precautions. They argue that in situations where the security levels of members of a group are interdependent, incentives may be perverse: the dependence of one agent's security on the behavior of others may completely negate the payoffs he receives from investing in security. The authors refer to these cross-effects between one agent's incentives and the behavior of the others as "contamination." They illustrate their general argument by referring to two specific scenarios, fire protection and airline security, both of which relate to the question of whether it is cost-effective to invest in a protective measure where there is the possibility of contamination from others who have not adopted this measure.

Grace, **Klein**, and **Kleindorfer** estimate the demand for homeowners insurance in Florida and New York using two-stage least squares regression with the Insurance Services Office's indicated loss costs as their proxy for the quantity of real insurance services demanded. They are able

to decompose the demand into catastrophe related and non-catastrophe related, and to estimate the demand for catastrophe coverage separately from the demand for non-catastrophe coverage. Major findings include a relatively consistent pattern of results between New York and Florida: in both states, catastrophic demand is more price elastic than non-catastrophic demand. The authors also find that consumers value coverage options and that they take into account state guaranty fund provisions when purchasing insurance.

Economic Fluctuations and Growth

The NBER's Program on Economic Fluctuations and Growth met at the Federal Reserve Bank of San Francisco on February 2. Timothy Kehoe, University of Minnesota, and Michael Kremer, NBER and Harvard University, organized this program:

Laurent Calvet, Harvard University, **Martin Gonzalez-Eiras**, Universidad de San Andres, and **Paolo Sodini**, Stockholm School of Economics, "Financial Innovation, Market Participation, and Asset Prices"
Discussant: David Levine, University of California, Los Angeles

Mark Bils, NBER and University of Rochester, and **Peter J. Klenow**, Federal Reserve Bank of Minneapolis, "Some Evidence on the Importance of Sticky Prices"
Discussant: Jeffrey Campbell, NBER and University of Chicago

James A. Schmitz, Jr., Federal Reserve Bank of Minneapolis, "What Determines Labor Productivity? Lessons from the Dramatic Recovery of the U.S. and Canadian Iron-Ore Industries"
Discussant: Valerie Ramey, NBER and University of California, San Diego

Christopher A. Sims, NBER and Princeton University, "Implications of Rational Inattention"
Discussant: Christopher Carroll, NBER and Johns Hopkins University

Donald R. Davis and **David E. Weinstein**, NBER and Columbia University, "Bones, Bombs, and Break Points: The Geography of Economic Activity" (NBER Working Paper No. 8517)
Discussant: Jonathan Eaton, NBER and Boston University

Kei-Mu Yi, Federal Reserve Bank of New York, "Can Vertical Specialization Explain the Growth of World Trade?"
Discussant: Samuel Kortum, NBER and University of Minnesota

Calvet, **Gonzalez-Eiras**, and **Sodini** propose that the introduction of non-redundant assets can modify trader participation in financial markets, which can lead to a lower market premium and a higher interest rate. They demonstrate this in a tractable exchange economy with endogenous participation. Investors receive heterogeneous random incomes determined by a finite number of macroeconomic factors. They can borrow and lend freely, but must pay a fixed entry cost to invest in risky assets. Security prices and the participation structure are determined jointly in equilibrium. The model reconciles a number of features that have characterized financial markets in the past three decades: substantial financial innovation; a sharp increase in investor participation; improved risk management practices; an increase in interest rates; and a reduction in the risk premium.

Bils and **Klenow** examine the frequency of price changes for 350 categories of goods and services covering more than 70 percent of consumer spending, based on unpublished data from the Bureau of Labor Statistics for 1995 to 1997. Compared with previous studies, this one finds much more frequent price changes, with half of prices lasting less than 4.7 months. The frequency of price changes differs dramatically across goods. The authors exploit this variability to ask whether monthly time series for prices and consumption of goods with frequent price changes (flexible-price goods) differ markedly from time series for goods displaying infrequent prices changes (sticky-price goods). They find that flexible-price goods display considerably more volatile inflation rates, but no more persistent inflation rates. Innovations in aggregate inflation are associated with a dramatic increase in the prices of flexible relative to sticky goods, and a persistent decline in the relative consumption of more flexibly priced goods. Popular measures of monetary shocks (for example, innovations in the federal funds rate) also appear to have persistent effects, rather than the transitory effects one would expect from differences in price flexibility across goods. On the other hand, responses to aggregate shocks to total factor productivity are largely consistent with predictions of an explicit sticky-price model.

Labor productivity differences across industries and countries are attributed largely to differences in three factors: production technology (that is, the design of equipment and structures); physical capital; and human capital. Perhaps this list should be expanded. **Schmitz** shows that the U.S. and Canadian iron-ore industries doubled their labor productivity in the middle 1980s in large part through changes in work rules that increased effort per hour worked and reduced redundant effort. These changes were spurred by the crisis facing these industries resulting from a collapsing local steel market and from increased competition by foreign iron-ore producers for this shrinking local steel market.

Sims shows that a constraint that actions can depend on observations only through a communication channel with finite Shannon capacity can play a role very similar to that of a signal extraction problem, or an adjustment cost in standard control problems. The resulting theory looks enough like familiar dynamic rational expectations theories to suggest that it might be useful and practical, while the implications for policy are different enough to be interesting.

Davis and **Weinstein** consider the distribution of economic activity within a country in light of three leading theories: increasing returns, random growth, and locational fundamentals. To do so, they examine the distribution of regional population in Japan from the Stone Age to the modern era. They also consider the Allied bombing of Japanese cities in WWII as a shock to relative city sizes. Their results support a hybrid theory in which locational fundamentals establish the spatial pattern of relative regional densities, but increasing returns may help to determine the degree of spatial differentiation. One implication of these results is that even large temporary shocks to urban areas have no long-run impact on city size.

The striking growth in the trade share of output is one of the most important developments in the world economy since World War II. Two features of this growth present challenges to the standard trade models. First, the growth is generally thought to have been generated by falling tariff barriers worldwide. But tariff barriers have decreased by only about 11 percentage points since the early 1960s; the standard models cannot explain the growth of trade without assuming counterfactually large elasticities of substitution between goods. Second, tariff declines were much larger prior to the mid-1980s than after, and yet trade growth was smaller in the earlier period than in the later period. The standard models have difficulty generating this non-linear feature. **Yi** develops a two-country dynamic Ricardian trade model that offers a resolution of these two puzzles. The key idea embedded in his model is vertical specialization, which occurs when countries specialize only in particular stages of a good's production sequence. The model generates a non-linear trade response to tariff reductions and can explain over half of the growth of trade. Finally, the model has important implications for the gains from trade.

Asset Pricing

The NBER's Program on Asset Pricing met at the University of Chicago on March 1. Organizers John H. Cochrane and Jesus Santos, both of NBER and University of Chicago, chose these papers for discussion:

Andrew Ang, NBER and Columbia University, **Joseph Chen**, University of Southern California, and **Yuhang Xing**, Columbia University, "Downside Risk and the Momentum Effect"
Discussant: Tobias J. Moskowitz, NBER and University of Chicago

David S. Bates, NBER and University of Iowa, "The Market for Crash Risk" (NBER Working Paper No. 8557)
Discussant: Francis Longstaff, NBER and University of California, Los Angeles

Jun Liu, University of California, Los Angeles, and **Jun Pan**, MIT, "Dynamic Derivative Strategies"
Discussant: Michael W. Brandt, NBER and University of Pennsylvania

Michael J. Brennan and **Ashley W. Wang**, University of California, Los Angeles, and **Yihong Xia**, University of Pennsylvania, "A Simple Model of Intertemporal Capital Asset Pricing and Its Implications for the Fama-French Three-Factor Model"
Discussant: George M. Constantinides, NBER and University of Chicago

Harry Mamaysky, Yale University, "On the Joint Pricing of Stocks and Bonds: Theory and Evidence"
Discussant: Monika Piazzesi, NBER and University of California, Los Angeles

Randolph B. Cohen, Harvard University, **Christopher Polk**, Northwestern University, and **Tuomo Vuolteenaho**, NBER and Harvard University, "Does Risk or Mispricing Explain the Cross-Section of Stock Prices?"
Discussant: Kent D. Daniel, NBER and Northwestern University

Stocks with greater downside risk, which is measured by higher correlations conditional on downside moves of the market, have higher returns. After controlling for the market beta, the size effect, and the book-to-market effect, the average rate of return on stocks with the greatest downside risk exceeds the average rate of return on stocks with the least downside risk by 6.55 percent per year. Downside risk is important for explaining the cross-section of expected returns. In particular, **Ang**, **Chen**, and **Xing** find that some of the profitability of investing in momentum strategies can be explained as compensation for bearing high exposure to downside risk.

Bates examines the equilibrium in which negative stock market jumps (crashes) can occur, and investors have heterogeneous attitudes towards crash risk. The less crash-averse insure the more crash-averse through the options markets that dynamically complete the economy. Bates compares the resulting equilibrium with various option pricing anomalies reported in the literature: the tendency of stock index options to overpredict volatility and jump risk; the Jackwerth (2000) implicit pricing kernel puzzle; and the stochastic evolution of option

prices. The specification of crash aversion is compatible with the static option pricing puzzles, while heterogeneity partially explains the dynamic puzzles. Heterogeneity also substantially magnifies the stock market impact of adverse news about fundamentals.

Liu and **Pan** study the optimal investment strategy of an investor who can access not only the bond and the stock markets, but also the derivatives market. They consider the investment situation in which, in addition to the usual diffusive price shocks, the stock market experiences sudden price jumps and stochastic volatility. They show that derivatives are important in providing access to the risk-and-return tradeoffs associated with the volatility and jump risks. In addition, investing in derivatives affects investors' stock position because of the interaction between the two markets. Finally, calibrating their model to the S&P 500 index and options markets, the authors find sizeable portfolio improvement for taking advantage of derivatives.

Characterizing the instantaneous investment opportunity set by the real interest rate and the maximum Sharpe ratio, **Brennan**, **Wang**, and **Xia** posit a simple model of time-varying investment opportunities in which these two variables follow correlated Ornstein-Uhlenbeck processes. They then develop the implications for stock and bond valuation. Their model suggests that the prices of certain portfolios that are related to the Fama-French (FF) HML and SMB hedge portfolios will carry information about investment opportunities. This provides a potential justification for the risk premiums that have been found to be associated with these hedge portfolios. The authors find in an analysis of stock returns that the FF portfolios in fact are associated with variation in the investment opportunity set. By analyzing bond yields, the authors find further evidence of time variation in the investment opportunity set. Finally, the authors use both pricing kernel and tracking portfolio ap-proaches to provide estimates of the magnitude of the HML and SMB risk premiums implied by their simple model.

Assuming only the absence of arbitrage, **Mamaysky** derives a dynamic model capable of jointly pricing a cross section of bonds and stocks. The key implications of the model are that bond factors must be mean-reverting, that stocks must have a dependence on these bond factors, and that stocks may have additional random-walk and mean-reverting components. In estimating the model using U.S. bond and stock data from the last 50 years, Mamaysky finds that a five-factor model, with two joint bond-stock factors and three common stock factors, can adequately account for the historical behavior of the term-structure of government debt and for the behavior of a wide cross section of equity portfolios. He then studies the behavior of bond and stock markets in the United States through the lens of this model.

Most previous research evaluates market efficiency and asset pricing models using average abnormal trading profits on dynamic trading strategies. **Cohen**, **Polk**, and **Vuolteenaho** measure the ability of the capital asset pricing model (CAPM) and the efficient-market hypothesis to explain the level of stock prices. First, they find that cash-flow betas explain the prices of value and growth stocks well, with a plausible premium. Second, they use a present-value model to decompose the cross-sectional variance of firms' price-to-book ratios into two components attributable to risk-adjusted fundamental value and mispricing. When they allow the discount rates to vary as predicted by the CAPM, the variance share of mispricing is negligible.

Development of the American Economy

Members of the NBER's Program on the Development of the American Economy met in Cambridge on March 2. Program Director Claudia Goldin, NBER and Harvard University, organized the meeting at which these papers were discussed:

Richard Sylla, NBER and New York University; **Jack W. Wilson**, North Carolina State University; and **Robert E. Wright**, University of Virginia, "Trans-Atlantic Capital Market Integration, 1790-1845"

John J. Wallis, NBER and University of Maryland, "The Property Tax as a Coordinating Device: Financing Indiana's Mammoth Internal Improvement System, 1835 to 1842" (NBER Historical Working Paper No. 136)

Lee J. Alston, NBER and University of Illinois, and **Andrés Gallo**, University of Illinois, "The Erosion of Legitimate Government: Argentina, 1930-1947"

Joseph P. Ferrie, NBER and Northwestern University, "The Rich and the Dead: Mortality in the United States, 1850-60"

Marc D. Weidenmier, NBER and Claremont-McKenna College, and **Kerry Odell**, Scripps College, "Real Shock, Monetary Aftershocks: The San Francisco Earthquake and the Panic of 1907"

Donald R. Davis and **David Weinstein**, NBER and Columbia University, "Bombs, Bones, and Break Points: The Geography of Economic Activity" (NBER Working Paper No. 8517. For a description of this paper, see page 33.)

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During the 1790s, European investors began to purchase substantial quantities of U.S. government debt securities and the equity securities issued by American corporations. A number of these securities were listed and traded in markets on both sides of the Atlantic. Based on market price quotations compiled for the same American securities in London and New York markets, **Sylla**, **Wilson**, and **Wright** ask if these early trans-Atlantic securities markets were integrated, and, if so, when they became integrated. They find little evidence of market integration before 1816, and substantial evidence of it thereafter. Studying information-flow times, the authors suggest that the advent and expansion of regularly scheduled packet shipping services increased and regularized information flowing from one market to the other, promoting integration. Evidence on lagged market responses to the arrival of information suggests that London prices were more affected by New York prices than vice versa. These findings suggest that the Federalist financial revolution of the 1790s was instrumental in making the United States a successful emerging market, and that financial globalization began by at least the second decade of the nineteenth century, quite a bit earlier than most people suspected, despite the slowness of trans-Atlantic communications.

The state of Indiana set out to build a mammoth system of canals, railroads, and turnpikes in 1836, after a decade of intense debate in which sectional rivalries prevented any state action. **Wallis** investigates the role played by the adoption of an ad valorem property tax in ameliorating the sectional rivalries and coordinating the costs of financing the transportation system with the taxes levied to finance it. He also traces the rise and fall of land values in the state between 1835 and 1842, estimating the effect of internal improvement projects on land values.

Alston and **Gallo** note that the government of Argentina received high marks for the policies implemented to fight the Great Depression. Unfortunately though, to stay in office, the Conservative governments in the 1930s engaged in electoral fraud, which the Supreme Court passively condoned. By sanctioning illegitimate government, the Supreme Court sowed the seeds of destruction of its judicial independence. The electoral fraud came to an end with a military coup in 1943, followed by a landslide Presidential victory by the populist Colonel Peron. The Peronists impeached four of the five Supreme Court justices on the grounds of sanctioning illegitimate government in the 1930s, and obstructing legislation favoring urban and rural workers during the military rule of 1943-6. Naturally, the Peronists replaced the impeached justices with appointees who favored their redistributive policies. After the impeachment process and a new constitution, Argentina was never able to return to its earlier institutional path of economic development. Successive military and democratic governments appointed their own Supreme Court justices in order to accomplish their political goals. But, without the court as a backstop, institutional volatility ensued. Unfortunately, in the long run, the result has been economic and political instability.

Despite the significant research on aggregate trends in mortality and physical stature in the middle of the nineteenth century, little evidence has been presented on the individual-level characteristics associated with premature mortality. **Ferrie** describes a new project that links individuals from the mortality schedules to the population schedules of the 1850 and 1860 federal population censuses. This makes it possible to assess the link between individual and household characteristics and the probability of dying. The results reveal a strong and negative relationship between household wealth and mortality in 1850 and 1860 and a somewhat weaker negative relationship between occupational status and mortality in 1850. The findings suggest that even when the U.S. population was largely rural and agricultural, changes in the distribution of income and wealth would have had a large impact on mortality rates and life expectancies. Urbanization merely exacerbated already existing disparities in mortality by socioeconomic status.

Economists have long studied the relationship between the real and monetary sectors. **Odell** and **Weidenmier** trace out the effects of an exogenous real shock, the 1906 San Francisco earthquake. The quake's impact manifested itself in international gold flows, as British insurance companies paid their San Francisco claims out of home funds in the fall of 1906. The capital outflow threatened the fixed sterling-dollar exchange rate, leading the Bank of England to raise interest rates and discriminate against American finance bills. The resulting contraction pushed the United States into recession, setting the stage for the 1907 Panic and the founding of the Fed.

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International Trade and Investment

Members and guests of the NBER's Program on International Trade and Investment met in Cambridge on March 15 and 16. M. Scott Taylor, NBER and University of Wisconsin, organized the meeting. The following papers were discussed:

Antoni Estevadeordal, Inter-American Development Bank; **Brian Frantz**, U.S. Agency for International Development; and **Alan M. Taylor**, NBER and University of California, Davis, "The Rise and Fall of World Trade: 1870-1939"

Yong Seok Choi, Brown University, and **Pravin Krishna**, NBER and Brown University, "The Factor Content of Bilateral Trade: An Empirical Test"

Peter K. Schott, NBER and Yale University, "Moving Up and Moving Out: U.S. Product Level Exports and Competition from Low Wage Countries"

Daniel Chiquiar, University of California, San Diego, and **Gordon H. Hanson**, NBER and University of California, San Diego, "International Migration, Self-Selection, and the Distribution of Wages: Evidence from Mexico and the United States"

Jose M. Campa, NBER and New York University, and **Linda Goldberg**, Federal Reserve Bank of New York, "Exchange Rate Pass-Through into Import Prices: A Macro or Micro Phenomenon"

Stephen R. Yeaple, University of Pennsylvania, "A Simple Model of Firm Heterogeneity, International Trade, and Wages"

Joshua Aizenman, NBER and University of California, Santa Cruz, and **Nancy Marion**, Dartmouth University, "The Merits of Horizontal versus Vertical FDI in the Presence of Uncertainty"

Richard E. Baldwin, NBER and Graduate Institute of International Studies, Geneva, and **Frederic Robert-Nicoud**, London School of Economics, "Entry and Asymmetric Lobbying: Why Governments Pick Losers" (NBER Working Paper No. 8756)

The ratio of world trade to output was a mere 2 percent in 1800, but then rose to 10 percent in 1870, to 17 percent in 1900, and to 21 percent in 1913. It then fell back to 14 percent in 1929 and to only 9 percent in 1938. The period 1870-1913 thus marks the birth of the first great era of trade globalization, and the period 1914-39 its death. What caused the trade boom and bust? The textbook interpretations offer a variety of narratives, but few precise answers. **Estevadeordal**, **Frantz**, and **Taylor** examine the gold standard, tariffs, and transport costs as determinants of trade. In the nineteenth century the gold standard was much more important than tariff policy, and just as important as transport costs, as a trade-creating force. In the 1920s, the slowdown in trade was driven by a rise in transport costs, although trade barriers other than tariffs might have been important. In the 1930s, the final collapse of the gold standard, persistently high transport costs, and the expansion of other barriers drove trade volumes even lower.

The Factor Proportions model of international trade is one of the most influential theories in international economics. **Choi** and **Krishna** use OECD production and trade data to test the restrictions (derived by Helpman,1984) on the factor content of trade flows which hold even under non-equalization of factor prices and in the absence of any assumptions regarding consumer preferences. In a further contrast with most of the existing literature, which has focused on the factor content of a country's multilateral trade, their tests concern bilateral trade flows, thereby enabling the examination of trade flows between only a subset of countries for which quality data (relatively speaking) is available. Their results provide greater support for the theory than have many previous exercises: they are unable to reject the restrictions implied by the theory for the vast majority of country-pairs.

Product cycle theory has developed countries inventing goods and developing countries copying them. Once copying takes place, developed countries abandon the market — either outright or through vertical differentiation — because of developing country cost advantages. Matching U.S. imports and exports at the product level, **Schott** finds evidence of both reactions — moving up and moving out — during the 1990s. Three trends stand out. First, U.S. intra-product trade is lower with respect to low-wage trading partners than it is with respect to high-wage trading partners. Second, U.S. export unit values are significantly higher than low-wage country import unit values in products where the U.S. and low-wage countries overlap. Finally, U.S. exports in some industries decline over time as competition from low-wage countries rises. Consistent responses also are noted among U.S. manufacturing industries: increased competition from low-wage countries is associated with declining output and skill and capital deepening.

Chiquiar and **Hanson** use the 1990 Mexico and U.S. population censuses to examine who migrates from Mexico to the United States and how these individuals' performance compares to that of those who remain in Mexico. This approach allows the authors to test, using data from a migrant-sending country, Borjas's neg-

ative-selection hypothesis: that in poor countries individuals with the greatest incentive to migrate abroad are those with below-average skill levels. The authors find that: 1) Mexican immigrants, while much less educated than U.S. natives, on average are more educated than residents of Mexico; 2) projected U.S.-Mexico wage differentials, while large for all individuals, decline with age and, weakly, with the level of schooling; and 3) if Mexican immigrants in the United States were paid according to wage determination patterns in Mexico, they would tend to fall within the upper half of Mexico's wage distribution. These results do not support the negative-selection hypothesis (at least for observable characteristics) and suggest that migration may raise wage dispersion in Mexico. Migration costs associated with illegal immigration may account for the observed patterns of migrant selection in Mexico.

Exchange rate regime optimality, as well as monetary policy effectiveness, depend on the tightness of the link between exchange rate movements and import prices. Recent debates hinge on the issue of the prevalence of producer-currency-pricing (PCP) versus local currency price (LCP) stability of imports, and on whether exchange rate pass-through rates are endogenous to a country's inflation performance. **Campa** and **Goldberg** provide cross-country and time-series evidence on both of these issues for the imports of 25 OECD countries. Across the OECD and especially within manufacturing industries, there is compelling evidence of partial pass through, rejecting both PCP and LCP as a short-run phenomenon. Over the long run, PCP is more prevalent for many types of import goods. Higher inflation and exchange rate volatility are associated with higher pass-through of exchange rates into import prices. However, for OECD countries the most important determinants of changes in pass-through are microeconomic and related to the industry composition of a country's import bundle.

Yeaple develops a simple model to explore the connection between international trade, productivity, and the wage premium. The model recreates several important stylized facts concerning the within-industry distribution of productivity, the propensity of the most productive firms to export, and the tendency of exporters to pay higher wages. He then shows that when trade barriers between countries are reduced, productivity, both within and across industries, rises. In addition, freer trade increases the premium paid to the most highly skilled workers and reduces the premiums paid to more moderately skilled workers. Hence, trade, even between identical countries, can cause a disappearance of "good manufacturing jobs, paying good wages."

Aizenman and **Marion** examine the impact of uncertainty on the profitability of vertical and horizontal foreign direct investment (FDI). Vertical FDI takes place when the multinational fragments the production process internationally, locating each stage of production in the country where it can be done at the least cost. Horizontal FDI occurs when the multinational undertakes the same production activities in multiple countries. The authors consider a model where the risk-neutral multinational must commit its investment prior to the realization of shocks. They show that greater uncertainty reduces the expected income from vertical FDI but increases the expected income from horizontal FDI. In addition, predatory actions by the host country are more costly to the multinational that has structured its production vertically rather than horizontally. Consequently, increased uncertainty should encourage horizontal FDI but discourage vertical FDI. If vertical FDI is more likely to flow into emerging markets and horizontal FDI into mature markets, then the empirical finding that most FDI is horizontal rather than vertical might be attributable, in part, to the greater uncertainty associated with emerging markets. The authors' cross-country regression results that provide some support for the predictions of the model. Volatility appears to have a differential impact on FDI inflows into mature and emerging markets. For mature markets that supposedly attract mainly horizontal FDI, greater volatility significantly increases FDI inflows. For emerging markets that receive relatively more vertical FDI inflows, increased volatility does not increase FDI inflows.

Governments frequently intervene to support domestic industries, but a surprising amount of this support goes to ailing sectors. **Baldwin** and **Robert-Nicoud** explain this with a lobbying model that allows for entry and sunk costs. Specifically, policy is influenced by pressure groups that incur lobbying expenses to create rents. In expanding industry, entry tends to erode such rents, but in declining industries, sunk costs rule out entry as long as the rents are not too high. This asymmetric appropriablity of rents means losers lobby harder. Thus it is not that government policy picks losers, it is that losers pick government policy.

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Productivity

Members and guests of the NBER's Program on Productivity and Technological Change met in Cambridge on March 15. Timothy F. Bresnahan, NBER and Stanford University, organized this program:

Ashish Arora, Carnegie Mellon University; **Marco Ceccagnoli**, INSEAD; and **Wesley M. Cohen**, NBER and Carnegie Mellon University, "R and D and the Patent Premium"
Discussant: Timothy F. Bresnahan

Jason Owen-Smith and **Walter W. Powell**, Stanford University, "Knowledge Networks in the Boston Biotechnology Community"
Discussant: Jeffrey L. Furman, Boston University School of Management

Jean O. Lanjouw, NBER and Yale University, and **Mark Schankerman**, London School of Economics, "An Empirical Analysis of the Enforcement of Patent Rights in the United States"
Discussant: Adam B. Jaffe, NBER and Brandeis University

Paroma Sanyal, Brandeis University, "Birth of a Patent: The Role of Parents, Nursemaids, and Constraints"
Discussant: Shane Greenstein, NBER and Northwestern University

Iain M. Cockburn, NBER and Boston University; **Samuel S. Kortum**, NBER and University of Minnesota; and **Scott Stern**, NBER and Northwestern University, "Are All Patent Examiners Equal? The Impact of Examiners on Patent Characteristics and Litigation Outcomes"
Discussant: Josh Lerner, NBER and Harvard University

Arora, **Ceccagnoli**, and **Cohen** empirically evaluate the relationship between R and D incentives and the patent premium, defined as the additional payoffs attributable to patenting an invention relative to the payoff to the unpatented invention. They develop a model linking a firm's R and D with its decision to patent for product innovations. The model assumes that R and D investments depend upon the expected value of an invention: this itself is a function of expected premium if the innovation is patented, assuming that the firm will choose to patent optimally (that is, only if the expected payoff from patenting an invention is greater than the expected cost). They estimate the model with a unique dataset based on the 1994 Carnegie Mellon Survey on Industrial R and D in the United States. The analysis shows that an increase in the patent premium increases R and D but the magnitude varies substantially across industries, being highest in drugs and biotech and relatively lower in industries such as food and electronics. The authors also use the estimates to simulate the impact of increasing the patent premium on patenting; they find their model to be consistent with observed changes in patenting behavior in specific industry sectors, such as semiconductors.

Owen-Smith and **Powell** examine the consequences of geographic location and network position on patenting by biotechnology firms in the Boston metropolitan area. Using ten years of data on firm-level collaborative alliances and patenting, the authors construct measures of network position both within and outside the Boston region to test the effects of geographically bounded social networks on innovation. They find that the cohesiveness of the Boston biotechnology community greatly increases with the diversity of organizational participants, the addition of geographically distant partners, and the maturity of the industry. They also demonstrate that, within the Boston region, any connection to the main network component positively affects firm patenting. In contrast, when innovation networks include geographically distant partners, a more central position in the network yields positive returns to innovation. Likewise, a diverse portfolio of partners aids firm patenting in physically dispersed networks but hinders it in a regionally bounded innovation network.

Lanjouw and **Schankerman** study the determinants of patent suits and their outcomes over the period 1978-99 by linking detailed information from the U.S. patent office, the federal court system, and industry sources. The probability of being involved in a suit is very heterogeneous, being much higher for valuable patents and for patents owned by individuals and smaller firms. Thus, the patent system generates incentives, net of expected enforcement costs, that differ across inventors. Patentees with a large portfolio of patents to trade, or having other characteristics that encourage "cooperative" interaction with disputants, avoid court actions more successfully. At the same time, key post-suit outcomes do not depend on observed characteristics. This is good news: advantages in settlement are exercised quickly, before extensive legal proceedings consume both court and firm resources. It is bad news, though, in that the more frequent involvement of smaller patentees in court actions is not offset by a more rapid resolution of their suits. However, the authors' estimates of the heterogeneity in litigation risk can facilitate development of private patent litigation insurance to mitigate this adverse effect of high enforcement costs.

Sanyal presents an integrated theoretical and empirical approach that models the effects of different sources of R and D funding and patent office attributes on the patenting process.

The empirical estimation is based on four major industries — electronics, chemical and biology, transportation, and aeronautics — for the period 1976-95. He finds first that the source of R and D funding, as well as the performer (academic, federal, and industry), has a differential effect on patenting. Second, federal R and D has positive spillovers for company R and D. Third, patenting is influenced heavily in the short run by patent office attributes. These results contribute to a better understanding of the shortcomings in the formulation of science indicators. In addition, they suggest that the comparative advantage of federal R and D funds lies in improving patent office efficiency, playing nursemaid to company research programs, and providing financial resources to university research programs, all of which serve to increase the innovative capacity of society.

Cockburn, **Kortum**, and **Stern** conduct an empirical investigation, both qualitative and quantitative, of the role of patent examiners' characteristics in the allocation of intellectual property rights. Building on insights gained from interviewing administrators and patent examiners at the U.S. Patent and Trademark Office (USPTO), the authors collect and analyze a novel dataset of patent examiners and patent outcomes. This dataset is based on 182 patents for which the Court of Appeals for the Federal Circuit (CAFC) ruled on validity between 1997 and 2000. For each patent, the authors identify a USPTO primary examiner, and they collect historical statistics from their entire patent examination history. They find that patent examiners and the patent examination process are not homogeneous. There is substantial variation in observable characteristics of patent examiners, such as their tenure at the USPTO, the number of patents they have examined, and the degree to which the patents they examine are cited later by other patents. Further, there is no evidence that examiner experience or workload at the time a patent is issued affects the probability that the CAFC finds a patent invalid. Third, examiners whose patents tend to be cited more frequently have a higher probability of a CAFC ruling of invalidity. The results suggest that all patent examiners are not equal, and that one of the roles of the CAFC is to review the exercise of discretion in the patent examination process.

International Finance and Macroeconomics

The NBER's Program on International Finance and Macroeconomics met in Cambridge on March 22. Research Associates Richard K. Lyons and Andrew K. Rose, both of the University of California, Berkeley, organized this program:

Michele Cavallo, **Fabrizio Perri**, and **Kate Schneider-Kisselev**, New York University, and **Nouriel Roubini**, NBER and New York University, "Rate Overshooting and the Costs of Floating"
Discussants: Kristin Forbes, U.S. Department of the Treasury

Philippe Martin, Federal Reserve Bank of New York, and **Helene Rey**, NBER and Princeton University, "Financial Globalization and Emerging Markets: With or Without Crash?"
Discussants: Aaron Tornell, NBER and University of California, Los Angeles, and Enrique Mendoza, NBER and University of Maryland

Michael B. Devereux, University of British Columbia, and **Charles M. Engel**, NBER and University of Wisconsin, "Exchange Rate Pass-Through, Exchange Rate Volatility, and Exchange Rate Disconnect"
Discussants: Pierre-Olivier Gourinchas, NBER and Princeton University, and Alan Stockman, NBER and University of Rochester

Kenneth A. Froot, NBER and Harvard University, and **Tarun Ramadorai**, Harvard University, "Currency Returns, Institutional Investor Flows, and Exchange-Rate Fundamentals"
Discussants: Francis X. Diebold, NBER and University of Pennsylvania, and Bernard Dumas, NBER and INSEAD

David C. Parsley, Vanderbilt University, and **Shang-Jin Wei**, International Monetary Fund, "Currency Arrangements and Goods Market Integration: A Price-Based Approach"
Discussants: Linda S. Goldberg, Federal Reserve Bank of New York, and John Rogers, Federal Reserve Board

Currency crises usually are associated with large real depreciations. In some countries, real depreciations are perceived to be very costly ("fear of floating"); in this paper, **Cavallo**, **Kisselev**, **Perri**, and **Roubini** try to understand the reasons behind this fear. They first look at episodes of currency crises in the 1990s and establish that countries entering a crisis with high levels of foreign debt tend to experience large real exchange rate overshooting (devaluation in excess of the long-run equilibrium level) and large output contractions. The authors then develop a model of currency crises that helps them understand this. The key element of the model is the

presence of a margin constraint on the domestic country. Real devaluations, by reducing the value of domestic assets relative to international liabilities, make countries with high foreign debt more likely to hit the constraint. When countries hit the constraint, they are forced to sell domestic assets; this causes a further devaluation of the currency (overshooting) and a reduction in their stock prices (overreaction). This "fire sale" can have a significant negative effect on wealth. The model highlights a key tradeoff in considering fixed versus flexible regimes: a fixed exchange regime can, by avoiding exchange rate overshooting, mitigate the negative wealth effect but at the cost of additional distortions and output drops in the short run. There are plausible values for the parameters under which fixed exchange rates dominate flexible rates, though.

Martin and **Rey** analyze the impact of financial globalization on asset prices, investment, and the possibility of crashes driven by self-fulfilling expectations in emerging markets. In a two-country model with one emerging market (intermediate income level) and one industrialized country (high income level), transaction costs of international financial flows magnify the income effect of productivity differences through their impact on asset prices and investment incentives. Symmetric liberalization of capital outflows and inflows increases asset prices, investment, and income in the emerging market. However, for intermediate levels of international financial transaction costs, a financial crash driven by self-fulfilling expectations is possible. The crash is accompanied by capital flight and a drop in income and investment below the level of financial autarky. The authors show that emerging markets are more prone to such a financial crash simply because they have a lower income level and not because of the existence of market failures, such as moral hazard or credit constraints.

Devereux and **Engel** explore the hypothesis that high volatility of real and nominal exchange rates may be attributable to the fact that local currency pricing eliminates the pass-through from changes in exchange rates to consumer prices. Exchange rates may be highly volatile because, in a sense, they have little effect on macroeconomic variables. The authors show the ingredients necessary to construct such an explanation for exchange rate volatility. In addition to the presence of local currency pricing, they need: 1) incomplete international financial markets; 2) a structure of international pricing and product distribution such that wealth effects of exchange rates changes are minimized, and 3) stochastic deviations from uncovered interest rate parity. Together, these elements can produce exchange rate volatility that is much higher than shocks to economic fundamentals, and is "disconnected" from the rest of the economy, in the sense that the volatility of all other macroeconomic aggregates are of the same order as the volatility of fundamentals.

Froot and **Ramadorai** explore the interaction between exchange rates, institutional investor currency flows, and exchange-rate fundamentals. They find that these flows carry information for future excess currency returns, but that this information is not strongly linked to future fundamentals. Flows seem important in understanding transitory elements of excess returns, which include short-run underreaction and long-run overreaction. If anything, flows have a zero or negative correlation with permanent components of excess returns. Measured fundamentals — both current and future — seem important in understanding permanent elements of excess returns. The authors conclude that investor flows are important for understanding deviations in exchange rates from fundamentals, but not for understanding the long-run currency values.

Parsley and **Wei** study the effect of instrumental and institutional stabilization of the exchange rate on the integration of goods markets. One important novelty of their paper is the use of a 3-dimensional panel of prices of 95 very disaggregated goods (for example, light bulbs) in 83 cities around the world from 1990 to 2000. The authors find that goods market integration is increasing over time and is related inversely to distance, exchange rate variability, and tariff barriers. In addition, the impact of an institutional stabilization of the exchange rate provides a stimulus to goods market integration that goes far beyond an instrumental stabilization. Among the institutional arrangements, long-term currency unions demonstrate greater integration than more recent currency boards.

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Program on Children

The NBER's Program on Children, directed by Research Associate Jonathan Gruber of MIT, met in Cambridge on April 4. They discussed these papers:

Lance Lochner, NBER and University of Rochester, "A Theoretical and Empirical Study of Individual Perceptions of the Criminal Justice System"

Robert Kaestner, NBER and University of Illinois, and **Lisa Dubay and Genevieve Kenney**, Urban Institute, "Medicaid Managed Care and Infant Health: A National Evaluation"

Phillip Levine, NBER and Wellesley College, "The Impact of Social Policy and Economic Activity Throughout the Fertility Decision Tree"

Eric A. Hanushek, NBER and Stanford University; **John F. Kain**, University of Texas; and **Steven Rivkin**, Amherst College, "New Evidence about *Brown vs. Board of Education*: The Complex Effects of School Racial Composition on Achievement" (NBER Working Paper No. 8741)

Brian Jacob, Harvard University, "Making the Grade: The Impact of Test-Based Accountability in Schools"

Lochner examines perceptions of the criminal justice system held by young males. He uses data from the National Longitudinal Survey of Youth 1997 Cohort and the National Youth Survey and asks how perceptions respond to individual information about the probability of arrest and thus affect criminal behavior. He finds that young males who engage in crime but are not arrested revise their perceived probability of arrest downward, while those who are arrested revise their probability upwards. The perceived probability of arrest then is linked to subsequent criminal behavior — youth with a lower perceived probability of arrest are significantly more likely to engage in crime in subsequent periods. Information about the arrests of others, local neighborhood conditions, and official arrest rates have little impact on the perceptions of any given individual about his own arrest rate. Further, young males typically report a higher probability of arrest than is actually observed in official arrest rates. But there do not appear to be substantial differences in perceptions across race and ethnicity for most of the crimes studied. These findings suggest that heterogeneity in perceptions may be an important cause of differences in criminal participation across individuals. Furthermore, those perceptions can be influenced by the justice system. Policies enacted to change the actual probability of arrest will have heterogeneous effects on individuals with different crime and arrest histories, but increases in true arrest rates will lower crime. Since it may take time for information about changes in actual arrest rates to disseminate, changes in enforcement policy are likely to have lagged effects on crime rates.

Kaestner, **Dubay**, and **Kenney** examine the effects of Medicaid managed care (MMC) on prenatal care utilization and infant health. They obtain separate estimates of the effect of primary-care-case-management (PCCM) managed care programs and HMO managed care plans on utilization of prenatal care, birth weight, and cesarean section. Their results suggest that MMC is associated with: a small, clinically unimportant decrease in the number of prenatal care visits and a significant increase in the incidence of low-birth weight and pre-term birth. MMC has no statistically significant relationship to the APNCU index of the adequacy of prenatal care or the incidence of cesarean section. The authors conclude that Medicaid managed care has virtually no association with, or causal effect on, use of prenatal care, birth outcomes, or cesarean section.

Levine considers the impact of changes in abortion and welfare policies, along with economic conditions between 1985 and 1996, at each stage of the fertility decision tree, including sexual activity, contraception, pregnancy, abortion, and birth. The abortion policies he considers are parental involvement laws and mandatory waiting periods; the welfare policies include generosity of benefits as well as state-level welfare waivers as a whole, and the "family cap." He uses state-level data for this period to examine abortion, birth, and pregnancy outcomes, and microdata from the 1988 and 1995 National Surveys of Family Growth to examine sexual activity and contraception. Levine finds that parental involvement laws increase contraception use among minors, leading to fewer pregnancies and therefore fewer abortions. Teen births do not rise in response. Pregnancies and births are procyclical, which is attributable to greater use of contraception when the economy falters rather than to a change in sexual activity among unmarried women. The evidence does not support much of an effect of welfare reform policies on fertility-related behavior.

Uncovering the effects of school racial composition on achievement is difficult, because racial mixing in the schools is not an accident but rather represents a complex mixture of government and family choices. While the goals of school integration legally inspired by *Brown vs. Board of Education* are very broad, **Hanushek**, **Kain**, and **Rivkin** focus more narrowly on how school racial composition affects scholastic achievement. Their evaluation, made possible by rich panel data on the achievement of Texas students,

disentangles racial composition effects from other aspects of school quality and from differences in student abilities and family background. Their results show that a higher percentage of black schoolmates has a strong adverse effect on the achievement of blacks and, moreover, that the effects are highly concentrated in the upper half of the ability distribution. In contrast, racial composition has a noticeably smaller effect on the achievement of lower ability blacks, whites, and Hispanics. This strongly suggests that the results are not a simple reflection of unmeasured school quality.

The recent federal education bill requires states to test students in grades three to eight each year, and to judge school performance on the basis of these test scores. **Jacob** uses detailed administrative data on the Chicago public school system to examine the impact of a test-based accountability policy on student and teacher behavior. He finds that math and reading scores increased sharply following the introduction of a high-stakes accountability policy in Chicago, in comparison to both prior achievement trends in the district and to changes experienced by other large, urban districts in the Midwest. However, he also finds that teachers and administrators responded strategically to the incentives along a variety of dimensions. Specifically, the accountability policy led to a substantial increase in the proportion of students placed in special education and to an increase in the proportion of students retained (even in grades not directly affected by the policy). The policy also appears to have led schools to substitute away from low-stakes subjects such as science and social studies. Finally, Jacob shows that the accountability policy did not lead to comparable achievement gains on a state-administered, low-stakes exam. This suggests that the gains on the high-stakes exam may have been driven largely by student effort and/or test-specific preparation and thus may not reflect a more general increase in student knowledge.

Environmental Economics

The NBER's Working Group on Environmental Economics met in Cambridge on April 6. Don Fullerton, NBER and University of Texas, organized this program:

Robert Mendelsohn, Yale University, and **Brent Sohngen**, Ohio State University, "Optimal Forest Carbon Sequestration"
Discussant: Robert Stavins, Harvard University

Jeffrey A. Frankel, NBER and Harvard University, and **Andrew K. Rose**, NBER and University of California, Berkeley, "Is Trade Good or Bad for the Environment? Sorting out the Causality"
Discussant: M. Scott Taylor, NBER and University of Wisconsin

Sarah West, Macalester College, and **Roberton C. Williams III**, NBER and University of Texas, "Empirical Estimates for Environmental Policymaking in a Second-Best Setting"
Discussant: Frank A. Wolak, NBER and Stanford University

Hilary Sigman, NBER and Rutgers University, "Federalism and Transboundary Spillovers: Water Quality in U.S. Rivers"
Discussant: Holger Sieg, NBER and Carnegie Mellon University

Kerry Smith, North Carolina State University, and **Christine Poulos**, University of Missouri, "Transparency and Takings: Applying an RD Design to Measure Compensation"
Discussant: Michael Greenstone, NBER and University of Chicago

Geoffrey Heal, NBER and Columbia University, and **Bengt Kristrom**, Swedish University of Agricultural Sciences, "National Income in Dynamic Economies"
Discussant: Geir B. Asheim, Stanford University

Mendelsohn and **Sohngen** examine the optimal timing and incentives between carbon sequestration in forests and the control of greenhouse gases. As carbon accumulates in the atmosphere, the carbon rental price should rise, increasing the incentive to sequester carbon over time. Although carbon sequestration is costly, a carbon rental incentive would encourage landowners to sequester substantial amounts of carbon in forests primarily by increasing forest land and lengthening rotations. Given optimal incentives, forest sequestration would account for about one-third of total carbon abatement. Tropical forests should store over two-thirds of this added carbon.

The debate over globalization and the environment can be given some much-needed focus by asking: What is the effect of trade on a country's environment for a given level of GDP? There is an apparent positive correlation between openness to trade and some measures of environmental quality. But this could be the result of endogeneity of trade, rather than causality. **Frankel** and **Rose** use exogenous determinants of trade — geographical variables from the gravity model — as instruments to isolate the effect of openness. They find that trade indeed may have a beneficial effect on some measures of environ-

mental quality. This is particularly true for SO2 and organic water pollution, and to some extent for NO2. Across seven wider-ranging measures, the beneficial effect is only significant about half the time, but there is no evidence that trade has the detrimental effect on the environment that the race-to-the-bottom theory would lead one to expect. The primary effect appears to come via income itself: some of the results in this paper support the environmental Kuznets curve, which says that growth harms the environment at low levels of income and helps at high levels, and they support the proposition that openness to trade accelerates the growth process.

West and **Williams** estimate parameters necessary to calculate the optimal second-best gasoline tax, most notably the cross-price elasticity between gasoline and leisure. Despite earlier work showing that the cost of environmental regulation in the presence of a pre-existing labor tax strongly depends on this elasticity, no prior study has estimated the cross-price elasticity between a polluting good and leisure. Using household data, the authors find that gasoline is a relative complement to leisure, implying that the optimal second-best gasoline tax exceeds marginal damages and is thus substantially higher than indicated by prior studies. This result suggests that the cross-price elasticity with leisure should be estimated for other major polluting goods, and such estimates should be incorporated into future calculations of the second-best optimal taxes on polluting goods.

The possibility that states allow greater pollution when pollution crosses state borders is sometimes used as an argument for centralized environmental policies. **Sigman** investigates the empirical extent of such free riding in river pollution in the United States. Using data from monitoring stations in the National Stream Quality Assessment Network, she evaluates the effects of interstate spillovers on water quality. The empirical results suggest that states do free ride and that giving them authority to issue and enforce water pollution permits facilitates this behavior. The estimates imply that the environmental cost of free riding at downstream stations is over $300 million annually.

Poulos and **Smith** report on the impact of a new interstate highway on property values in a neighborhood bisected by the road. Their analysis suggests that the roadway reduced real property values by 16 to 20 percent. To develop these estimates, they used a regression discontinuity (RD) design with a repeat sales property analysis. The research considers the effect of the temporal and spatial dimensions of the natural experiment, permitting the measurement of with/without property values.

Which index number best measures welfare change in a dynamic economy? A significant number of economists now disagree with the traditional answer, national income. **Heal** and **Kristrom** develop the theoretical case for a new welfare index with two attractive properties: it meets all criticisms of standard measures, those from the environmental and the growth communities, and has an intellectual rationale that is solidly founded in welfare economics. Called National Wealth (NW), this measure has all the properties possessed by an ideal welfare or income measure in a static context: an increase in national wealth is a necessary and sufficient condition for a potential Pareto improvement, a property not shared by any other measure proposed in the literature. National wealth is the value of a consumption plan at supporting prices, a generalization of the static measure, although in the dynamic context it appears unfamiliar. Changes in NW can be inferred from observable contemporaneous data although the full measure depends on future variables that are not currently observable.

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Bureau Books

NBER Macroeconomics Annual 2001

NBER Macroeconomics Annual 2001, edited by Ben S. Bernanke and Kenneth Rogoff, is available from the MIT Press. The goals of this annual conference are to present, extend, and apply frontier work in macroeconomics and to stimulate research on policy issues. The topics covered in the 2001 conference volume are: the exogeneity of growth; long-term capital movements; what caused the great stagflation; the cost channel of monetary transmission; the equity premium puzzle; and post-World War II inflation dynamics.

Both editors are NBER Research Associates in the Programs on Economic Fluctuations and Growth and Monetary Economics. Bernanke is also the Howard Harrison and Gabrielle Snyder Beck Professor of Economics and Public Affairs at Princeton University. Rogoff is Professor of Economics at Harvard University.

The volume is priced at $62.00 for the clothbound and $32.00 for the paperback edition. It may be ordered directly from the MIT Press, c/o Triliteral, 100 Maple Ridge Drive, Cumberland, RI 02864; or by phone, 401-658-4226 or 1-800-405-1619; or by email at mitpress-orders@mit.edu. The MIT Press also has a website: **http://www-mitpress.mit.edu**.

Frontiers in Health Policy Research, Volume 5

Frontiers in Health Policy Research, Volume 5, edited by Alan M. Garber, is now available from the MIT Press. This series presents economic research on health care and health policy issues. Garber, the volume's editor, directs the NBER's Program of Research on Health Care and is a professor of economics at Stanford University.

This volume contains five papers presented at an annual conference held in Washington, D.C. Topics covered include: the effects of competition on hospital costs; the necessity of HCFA payments for supporting HMO participation in Medicare Managed Care; the impact of Medicare on health care utilization; the subsidization of health insurance and the uninsured; and the public oversight role in hospital ownership conversions.

The clothbound volume costs $58.00; the paperback is $25.00.

The following volumes may be ordered directly from the University of Chicago Press, Order Department, 11030 South Langley Avenue, Chicago, IL 60628-2215; 1-800-621-2736. Academic discounts of 10 percent for individual volumes and 20 percent for standing orders for *all* NBER books published by the University of Chicago Press are available to university faculty; orders must be sent on university stationery.

Two New NBER Books on Social Security Available

The University of Chicago Press has just published two new NBER books on Social Security: *The Distributional Aspects of Social Security and Social Security Reform*, edited by Martin S. Feldstein and Jeffrey B. Liebman, and *Social Security Pension Reform in Europe*, edited by Feldstein and Horst Siebert. The first is priced at $57.00; the second is $70.00.

The Feldstein/Leibman volume discusses the varied distributional consequences of the existing Social Security program and proposals for Social Security reform. The studies examine the effects on the distribution of income and of wealth using a variety of different data sources.

The Feldstein/Siebert volume discusses the challenges facing social security reform in the aging societies of Europe. The various essays highlight the problems that European pension reform faces and how they differ from those of the United States. The volume presents specific analyses of the existing systems and proposed changes in ten countries.

Feldstein, who is the President and CEO of the NBER, and Liebman are both NBER Research Associates. Feldstein is also a professor of economics at Harvard University. Liebman is an associate professor in the Kennedy School of Government. Siebert is President of the Kiel Institute of World Economics and professor of economics at Kiel University.

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