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Program Report

Productivity

Ernst R. Berndt*

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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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 pro-

tection [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.

¹ L. Branstetter and M. Sakakibara, "Japanese Research Consortia: A Microeconomic Analysis of Industrial Policy," *Journal of Industrial Economics*, 46 (2) (June 1998).

² I. M. Cockburn and R. M. Henderson, "Absorptive Capacity, Coauthoring Behavior, and the Organization of Research in Drug Discovery," *Journal of Industrial Economics*, 46 (2) (June 1998).

³ W. B. Gray and R. J. Shadbegian, "Environmental Regulation, Investment Timing, and Technology Choice," *Journal of Industrial Economics*, 46 (2) (June 1998).

⁴ A. B. Jaffe, M. S. Fogarty, and B. A. Banks, "Evidence from Patents and Patent Citations on the Impact of NASA and Other Federal Labs on Commercial Innovation,"

Journal of Industrial Economics, 46 (2) (June 1998).

⁵ W. Lebr and F. R. Lichtenberg, "Computer Use and Productivity Growth in US Federal Government Agencies, 1987-92," *Journal of Industrial Economics*, 46 (2) (June 1998).

⁶ J. Lerner and R. P. Merges, "The Control of Technology Alliances: An Empirical Analysis of the Biotechnology Industry," *Journal of Industrial Economics*, 46 (2) (June 1998).

⁷ J. R. Barro and D. M. Cutler, "Consolidation in the Medical Care Marketplace: A Case Study from Massachusetts," in *Mergers and Productivity*, S. N. Kaplan, ed., Chicago: University of Chicago Press, 2000, pp. 9-50.

⁸ R. Rajan, P. Volpin, and L. Zingales, "The Eclipse of the U.S. Tire Industry," in *Mergers and Productivity*, S. N. Kaplan, ed., Chicago: University of Chicago Press, 2000, pp. 51-92.

⁹ C. W. Calomiris and J. Carsek, "Is the Bank Merger Rage of the 1990s Efficient? Lessons from Nine Case Studies," in *Mergers and Productivity*, S. N. Kaplan, ed., Chicago: University of Chicago Press, 2000, pp. 93-178.

¹⁰ S. N. Kaplan, M. L. Mitchell, and K. H. Wruck, "A Clinical Exploration of Value Creation and Destruction in Acquisitions: Organizational Design, Incentives, and Internal Capital Markets," in *Mergers and Productivity*, S. N. Kaplan, ed., Chicago: University of Chicago Press, 2000, pp. 179-238.

¹¹ S. R. Cole and K. Lehn, "Workforce Integration and the Dissipation of Value in Mergers: The Case of US Air's Acquisition of Piedmont Airlines," in *Mergers and Productivity*, S. N. Kaplan, ed., Chicago: University of Chicago Press, 2000, pp. 239-86.

¹² D. J. Ravenscraft and W. F. Long, "Paths to Creating Value in Pharmaceutical Mergers," in *Mergers and Productivity*, S. N. Kaplan, ed., Chicago: University of Chicago Press, 2000, pp. 287-326.

¹³ A. B. Jaffe, J. O. Lanjouw, and J. Lerner, "Introduction," *RAND Journal of Economics*, 32 (1) (Spring 2001), pp. 75-6.

¹⁴ M. Sakakibara and L. Branstetter, "Do Stronger Patents Induce More Innovation? Evidence from the 1988 Japanese Patent Law Reforms," *RAND Journal of Economics*, 32 (1) (Spring 2001), pp. 77-100.

¹⁵ B. H. Hall and R. H. Ziedonis, "The

Patent Paradox Revisited: An Empirical Study of Patenting in the U.S. Semiconductor Industry," *RAND Journal of Economics*, 32 (1) (Spring 2001), pp. 101-28.

¹⁶ J. O. Lanjouw and M. Schankerman, "Characteristics of Patent Litigation: A Window on Competition," *RAND Journal of Economics*, 32 (1) (Spring 2001), pp. 129-51.

¹⁷ H. A. Hopenhayn and M. F. Mitchell, "Innovation Variety and Patent Breadth," *RAND Journal of Economics*, 32 (1) (Spring 2001), pp. 152-66.

¹⁸ A. B. Jaffe and J. Lerner, "Reinventing Public R and D: Patent Policy and the Commercialization of National Laboratory Technologies," *RAND Journal of Economics*, 32 (1) (Spring 2001), pp. 167-98.

¹⁹ M. Schankerman and S. Scotchmer, "Damages and Injunctions in Protecting Intellectual Property," *RAND Journal of Economics*, 32 (1) (Spring 2001), pp. 199-220.

²⁰ A. B. Jaffe, M. Trajtenberg, and M. S. Fogarty, "Knowledge Spillovers and Patent Citations: Evidence from a Survey of Inventors," *American Economic Review*, 90 (2) (May 2001), pp. 215-8.

²¹ R. B. Freeman and M. M. Kleiner, "Who Benefits Most from Employee Involvement: Firms or Workers?" *American Economic Review*, 90 (2) (May 2001), pp. 219-23.

²² S. Borenstein and J. Farrell, "Is Cost-Cutting Evidence of X-Inefficiency?" *American Economic Review*, 90 (2) (May 2001), pp. 224-7.

²³ S. Helper, "Economists and Field Research: You Can Observe a Lot Just by Watching," *American Economic Review*, 90 (2) (May 2001), pp. 228-32.

²⁴ I. M. Cockburn and R. Henderson, "Publicly Funded Science and the Productivity of the Pharmaceutical Industry," in *Innovation Policy and the Economy*, vol. 1, A. B. Jaffe, J. Lerner, and S. Stern, eds., Cambridge, MA: MIT Press, 2001, pp. 1-34.

²⁵ M. Cremer, "Creating Markets for New Vaccines — Part I: Rationale," in *Innovation Policy and the Economy*, vol. 1, A. B. Jaffe, J. Lerner, and S. Stern, eds., Cambridge, MA: MIT Press, 2001, pp. 35-72.

²⁶ M. Cremer, "Creating Markets for New Vaccines — Part II: Design Issues," in *Innovation Policy and the Economy*, vol. 1, A. B. Jaffe, J. Lerner, and S. Stern, eds., Cambridge, MA: MIT Press, 2001, pp.

73-118.

²⁷ C. Shapiro, "Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting," in *Innovation Policy and the Economy*, vol. 1, A. B. Jaffe, J. Lerner, and S. Stern, eds., Cambridge, MA: MIT Press, 2001, pp. 119-50.

²⁸ S. Greenstein, "Commercialization of the Internet: The Interaction of Public Policy and Private Choices or Why Introducing the Market Worked So Well," in *Innovation Policy and the Economy*, vol. 1, A. B. Jaffe, J. Lerner, and S. Stern, eds., Cambridge, MA: MIT Press, 2001, pp. 151-86.

²⁹ D. C. Mowery and A. A. Ziedonis, "Numbers, Quality, and Entry: How Has the Bayh-Dole Act Affected U.S. University Patenting and Licensing?," in *Innovation Policy and the Economy*, vol. 1, A. B. Jaffe, J. Lerner, and S. Stern, eds., Cambridge, MA: MIT Press, 2001, pp. 187-220.

³⁰ P. M. Romer, "Should the Government Subsidize Supply or Demand in the Market for Scientists and Engineers?," in *Innovation Policy and the Economy*, vol. 1, A. B. Jaffe, J. Lerner, and S. Stern, eds., Cambridge, MA: MIT Press, 2001, pp. 221-52.

³¹ D. S. Evans and R. L. Schmalensee, "Some Economic Aspects of Antitrust Analysis in Dynamically Competitive Industries," in *Innovation Policy and the Economy*, vol. 2, A. B. Jaffe, J. Lerner, and S. Stern, eds., Cambridge, MA: MIT Press, 2001, pp. 1-50.

³² N. Gallini and S. Scotchmer, "Intellectual Property: When Is It the Best Incentive System?," in *Innovation Policy and the Economy*, vol. 2, A. B. Jaffe, J. Lerner, and S. Stern, eds., Cambridge, MA: MIT Press, 2001, pp. 51-78.

³³ M. Trajtenberg, "Government Support for Commercial R and D: Lessons from the Israeli Experience," in *Innovation Policy and the Economy*, vol. 2, A. B. Jaffe, J. Lerner, and S. Stern, eds., Cambridge, MA: MIT Press, 2001, pp. 79-134.

³⁴ T. F. Bresnahan, "Prospects for an Information-Technology-Led Productivity Surge," in *Innovation Policy and the Economy*, vol. 2, A. B. Jaffe, J. Lerner, and S. Stern, eds., Cambridge, MA: MIT Press, 2001, pp. 135-62.

³⁵ J. B. DeLong, "Do We Have a 'New' Macroeconomy?," in *Innovation Policy and the Economy*, vol. 2, A. B. Jaffe, J. Lerner, and S. Stern, eds., Cambridge, MA: MIT Press, 2001, pp. 163-84.

³⁶ C. S. Carson, "The Conference on Research in Income and Wealth: The Early Years," in *Fifty Years of Economic Measurement: The Jubilee of the Conference on Research in Income and Wealth*, Studies in Income and Wealth, vol. 54, E. R. Berndt and J. E. Triplett, eds., Chicago: University of Chicago Press, 1990, pp. 3-8.

³⁷ C. R. Hulten, "Total Factor Productivity: A Short Biography," in *New Developments in Productivity Analysis*, Studies in Income and Wealth, vol. 63, C. R. Hulten, E. R. Dean, and M. J. Harper, eds., Chicago: University of Chicago Press, 2001, pp. 1-47.

³⁸ W. E. Diewert, "Which (Old) Ideas on Productivity Measurement Are Ready to Use?," in *New Developments in Productivity Analysis*, Studies in Income and Wealth, vol. 63, C. R. Hulten, E. R. Dean, and M. J. Harper, eds., Chicago: University of Chicago Press, 2001, pp. 85-102.

³⁹ R. M. Solow, "After 'Technical Progress and the Aggregate Production Function'," in *New Developments in Productivity Analysis*, Studies in Income and Wealth, vol. 63, C. R. Hulten, E. R. Dean, and M. J. Harper, eds., Chicago: University of Chicago Press, 2001, pp. 173-8.

⁴⁰ J. Greenwood and B. Jovanovic, "Accounting for Growth," in *New Developments in Productivity Analysis*, Studies in Income and Wealth, vol. 63, C. R. Hulten, E. R. Dean, and M. J. Harper, eds., Chicago: University of Chicago Press, 2001, pp. 179-222.

⁴¹ Z. Griliches, "A Perspective on What We Know About the Sources of Productivity Growth," in *New Developments in Productivity Analysis*, Studies in Income and Wealth, vol. 63, C. R. Hulten, E. R. Dean, and M. J. Harper, eds., Chicago: University of Chicago Press, 2001, pp. 609-12.

⁴² E. R. Dean and M. J. Harper, "The BLS Productivity Measurement Program," in *New Developments in Productivity Analysis*, Studies in Income and Wealth, vol. 63, C. R. Hulten, E. R. Dean, and M. J. Harper, eds., Chicago: University of Chicago Press, 2001, pp. 55-84.

⁴³ M. I. Nadiri and I. R. Prucha, "Dynamic Factor Demand Models and Productivity Analysis," in *New Developments in Productivity Analysis*, Studies in Income and Wealth, vol. 63, C. R. Hulten, E. R. Dean, and M. J. Harper, eds., Chicago:

University of Chicago Press, 2001, pp. 103-64.

⁴⁴ S. Basu and J. Fernald, "Why Is Productivity Procyclical? Why Do We Care?," in *New Developments in Productivity Analysis*, Studies in Income and Wealth, vol. 63, C. R. Hulten, E. R. Dean, and M. J. Harper, eds., Chicago: University of Chicago Press, 2001, pp. 225-96.

⁴⁵ L. Foster, J. Haltiwanger, and C. J. Krizan, "Aggregate Productivity Growth: Lessons from Microeconomic Evidence," in *New Developments in Productivity Analysis*, Studies in Income and Wealth, vol. 63, C. R. Hulten, E. R. Dean, and M. J. Harper, eds., Chicago: University of Chicago Press, 2001, pp. 303-63.

⁴⁶ D. Ellerman, T. M. Stoker, and E. R. Berndt, "Sources of Productivity Growth in the American Coal Industry, 1972-95," in *New Developments in Productivity Analysis*, Studies in Income and Wealth, vol. 63, C. R. Hulten, E. R. Dean, and M. J. Harper, eds., Chicago: University of Chicago Press, 2001, pp. 373-414.

⁴⁷ M. N. Bailey and E. Zitzewitz, "Service Sector Productivity Comparisons: Lessons for Measurement," in *New Developments in Productivity Analysis*, Studies in Income and Wealth, vol. 63, C. R. Hulten, E. R. Dean, and M. J. Harper, eds., Chicago: University of Chicago Press, 2001, pp. 419-55.

⁴⁸ V. E. Ball, R. Fare, S. Grosskopf, and R. Nohring, "Productivity of the U.S. Agricultural Sector: The Case of Undesirable Outputs," in *New Developments in Productivity Analysis*, Studies in Income and Wealth, vol. 63, C. R. Hulten, E. R. Dean, and M. J. Harper, eds., Chicago: University of Chicago Press, 2001, pp. 541-77.

⁴⁹ N. Islam, "Different Approaches to International Comparison of Total Factor Productivity," in *New Developments in Productivity Analysis*, Studies in Income and Wealth, vol. 63, C. R. Hulten, E. R. Dean, and M. J. Harper, eds., Chicago: University of Chicago Press, 2001, pp. 465-502.

⁵⁰ D. W. Jorgenson and E. Yip, "Whatever Happened to Productivity Growth?," in *New Developments in Productivity Analysis*, Studies in Income and Wealth, vol. 63, C. R. Hulten, E. R. Dean, and M. J. Harper, eds., Chicago: University of Chicago Press, 2001, pp. 509-40.

⁵¹ F. M. Gollop and G. P. Swinand, "Total

Resource Productivity: Accounting for Changing Environmental Quality," in *New Developments in Productivity Analysis*, *Studies in Income and Wealth*, vol. 63, C. R. Hulten, E. R. Dean, and M. J. Harper, eds., Chicago: University of Chicago Press, 2001, pp. 587-605.

⁵² J. E. Triplett, "What's Different About Health? Human Repair and Car Repair in National Accounts and in National Health Accounts," in *Medical Care Output and Productivity*, *Studies in Income and Wealth*, vol. 62, D. M. Cutler and E. R. Berndt, eds., Chicago: University of Chicago Press, 2001, pp. 15-94.

⁵³ D. Meltzer, "Theoretical Foundations of Medical Cost-Effectiveness Analysis: Implications for the Measurement of Benefits and Costs of Medical Interventions," in *Medical Care Output and Productivity*, *Studies in Income and Wealth*, vol. 62, D. M. Cutler and E. R. Berndt, eds., Chicago: University of Chicago Press, 2001, pp. 97-113.

⁵⁴ T. Philipson and D. Lakdawalla, "Medical Care Output and Productivity in the Nonprofit Sector," in *Medical Care Output and Productivity*, *Studies in Income and Wealth*, vol. 62, D. M. Cutler and E. R. Berndt, eds., Chicago: University of Chicago Press, 2001, pp. 119-37.

⁵⁵ E. R. Berndt, D. M. Cutler, R. G. Frank, Z. Griliches, J. P. Newhouse, and J. E. Triplett, "Price Indexes for Medical Care Goods and Services: An Overview of Measurement Issues," *Medical Care Output and Productivity*, *Studies in Income and Wealth*, vol. 62, D. M. Cutler and E. R. Berndt, eds., Chicago: University of Chicago Press, 2001, pp. 141-98.

⁵⁶ I. K. Ford and D. H. Ginsburg, "Medical Care in the Consumer Price Index," in *Medical Care Output and Productivity*, *Studies in Income and Wealth*, vol. 62, D. M. Cutler and E. R. Berndt, eds., Chicago: University of Chicago Press, 2001, pp. 203-19.

⁵⁷ D. Fixler and M. Ginsburg, "Health Care Output and Prices in the Producer Price Index," in *Medical Care Output and Productivity*, *Studies in Income and Wealth*, vol. 62, D. M. Cutler and E. R. Berndt, eds., Chicago: University of Chicago Press, 2001, pp. 221-67.

⁵⁸ A. Sensenig and E. Wilcox, "National Health Accounts/National Income and Product Accounts Reconciliation: Hospital Care and Physician Services," in *Medical Care Output and Productivity*, *Studies in Income and Wealth*, vol. 62, D. M. Cutler and E. R. Berndt, eds., Chicago: University of Chicago Press, 2001, pp. 271-300.

⁵⁹ P. Heidenreich and M. McClellan, "Trends in Heart Attack Treatment and Outcomes, 1975-1995: Literature Review and Synthesis," in *Medical Care Output and Productivity*, *Studies in Income and Wealth*, vol. 62, D. M. Cutler and E. R. Berndt, eds., Chicago: University of Chicago Press, 2001, pp. 363-409.

⁶⁰ D. M. Cutler, M. McClellan, J. P. Newhouse, and D. Remler, "Pricing Heart Attack Treatments," in *Medical Care Output and Productivity*, *Studies in Income and Wealth*, vol. 62, D. M. Cutler and E. R. Berndt, eds., Chicago: University of Chicago Press, 2001, pp. 305-47.

⁶¹ I. Shapiro, M. D. Shapiro, and D. W. Wilcox, "Measuring the Value of Cataract Surgery," in *Medical Care Output and Productivity*, *Studies in Income and Wealth*, vol. 62, D. M. Cutler and E. R. Berndt, eds., Chicago: University of Chicago Press, 2001, pp. 411-37.

⁶² I. M. Cockburn and A. H. Anis, "Hedonic Analysis of Arthritis Drugs," in *Medical Care Output and Productivity*, *Studies in Income and Wealth*, vol. 62, D. M. Cutler and E. R. Berndt, eds., Chicago: University of Chicago Press, 2001, pp. 439-58.

⁶³ E. R. Berndt, S. H. Busch, and R. G. Frank, "Treatment Price Indexes for Acute

Phase Major Depression," in *Medical Care Output and Productivity*, *Studies in Income and Wealth*, vol. 62, D. M. Cutler and E. R. Berndt, eds., Chicago: University of Chicago Press, 2001, pp. 463-505.

⁶⁴ S. Glied, "The Value of Reductions in Child Injury Mortality in the United States," in *Medical Care Output and Productivity*, *Studies in Income and Wealth*, vol. 62, D. M. Cutler and E. R. Berndt, eds., Chicago: University of Chicago Press, 2001, pp. 511-34.

⁶⁵ P. Ellickson, S. Stern, and M. Trajtenberg, "Patient Welfare and Patient Compliance: An Empirical Framework for Measuring the Benefits from Pharmaceutical Innovation," in *Medical Care Output and Productivity*, *Studies in Income and Wealth*, vol. 62, D. M. Cutler and E. R. Berndt, eds., Chicago: University of Chicago Press, 2001, pp. 539-60.

⁶⁶ F. R. Lichtenberg, "The Allocation of Publicly Funded Biomedical Research," in *Medical Care Output and Productivity*, *Studies in Income and Wealth*, vol. 62, D. M. Cutler and E. R. Berndt, eds., Chicago: University of Chicago Press, 2001, pp. 565-89.

⁶⁷ National Research Council, "At What Price? Conceptualizing and Measuring Cost-of-Living and Price Indexes," Panel on Conceptual, Measurement and Other Statistical Issues in Developing Cost-of-Living Indexes, C. L. Schultze and C. Mackie, eds., Committee on National Statistics, Division of Behavioral and Social Sciences and Education, Washington DC: National Academy Press, 2002.

⁶⁸ Final Report of the Advisory Commission to Study the Consumer Price Index, Washington DC: U.S. Government Printing Office, 1996.

⁶⁹ A. Pakes, "A Reconsideration of Hedonic Price Indices with an Application to PCs," NBER Working Paper No. 8715, January 2002.

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