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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.

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