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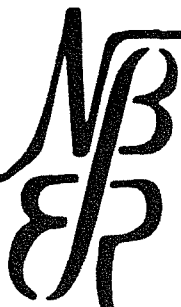
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# REPORTER

NATIONAL BUREAU OF ECONOMIC RESEARCH, INC.

MARCH 1978

## NBER Conferences

A Conference on Public Regulation, sponsored by the National Bureau of Economic Research under a grant from the National Science Foundation (Research Applied to National Needs) and organized by NBER's Gary Fromm, was held in Arlington, Virginia, December 15-17, 1977. The aim of the conference, the proceedings of which will be published, was to advance both the theory and practice of regulation through analyses of contemporary public policy issues.

The conference started with a theoretical overview of the subject area (R. Noll, Calif. Institute of Technology, and P. Joskow, MIT). Income-distributional concerns (R. Willig, Bell Laboratories, and E. Bailey, CAB), the public interest component of the regulation picture (R. Zerbe, Univ. of Washington), and open entry and cross subsidy (K. Baseman, U.S. Dept. of Justice) were discussed, and the implications of the conference proceedings summarized (S. Peltzman, Chicago).

Analyses of specific industries covered the casualty insurance industry (P. Munch, Rand, and D. Smallwood, Univ. of Calif., San Diego), surface freight transportation in Australia, Canada, Great Britain, and the United States (J. Nelson, Washington State), railroad investment behavior (R. Levin, Yale), water pollution in the pulp and paper industry (J. Jackson, Pennsylvania, and R. Leone, Harvard), water pollution control generally (P. Downing and J. Kimball, Virginia Polytechnic and State), telecommunications in Canada (M. Fuss and L. Waverman, Univ. of Toronto), the electric utility industry (G. Jarrell, Rochester), and, finally, crude oil prices (W. Montgomery, Calif. Institute of Technology).

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Microeconomic Wage and Price Adjustment and Macroeconomic Fluctuations was the topic of an NBER conference at the Bureau's Palo Alto office on January 19 and 20. It explored the relation between wage and price determination at the level of

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the individual worker and business; and the response of the overall economy to shocks.

Discussion during the conference centered on the proposition that recessions may be protracted because of long-term contracts — employment contracts as well as contracts between businesses — that cannot accommodate new economic conditions. Among proponents of this view (the core of a current attempt to create a solid foundation for Keynesian macroeconomics) who were in attendance were Martin Bailey, Donald Gordon, Costas Azariadis, and Edmund Phelps. Robert Hall, the newly appointed director of NBER's economic fluctuation program, presented evidence against this new Keynesian approach, and an alternative theory, emphasizing the role of supply changes in economic fluctuations, was advocated by a number of other participants (Robert Barro, Herschel Grossman, et al.).

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On January 27 and 28 the NBER office in Palo Alto played host to a group of prominent economists specializing in the health field. Under the banner of "The Economics of Physician and Patient

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Behavior," the conference produced valuable contributions to the body of empirical research dealing with the determinants of demand and supply in the area of medical care and insurance.

One of the outstanding topics of discussion was the role of the physician in determining the demand for medical care. Thus, the "availability effect," or the notion that physicians can directly influence the demand for their services, was the subject of five papers: "Physician-Induced Demand for Medical Care" (Jerry Green, Harvard); "The Supply of Surgeons and the Demand for Surgical Operations" (Victor R. Fuchs, NBER and Stanford); "On the Rationing of Health Services and Resource Availability" (Barry Friedman, Northwestern); "Determinants of Pediatric Care Utilization" (Michael Grossman, NBER and C.U.N.Y.); and "Moving the Target to Hit the Bullet: Generation of Utilization by Physicians in Canada" (Robert G. Evans, University of British Columbia).

The field of medical insurance was covered in "The Norms Hypothesis and the Demand for Medical Care" (Joseph P. Newhouse, Rand); "Health Insurance and Preventive Medicine" (Charles Phelps, Rand); and "Physician Participation in State Medicaid Programs" (Frank A. Sloan, Vanderbilt). Finally, the picture was rounded out by analyses of the effect of advertising on prices, in "The Effects of Advertising — Lessons from Optometry" (Roger D. Feldman, North Carolina), and of the effect of a hospital's medical staff on resource allocation and costs, in "Medical Staff Characteristics and Hospital Costs" (Mark V. Pauly, Northwestern).

## Computer Research Center Transfers to M.I.T.

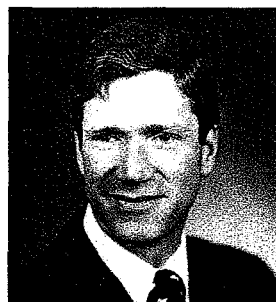
On January 31 the sponsorship of the National Bureau's Computer Research Center for Economic and Management Science passed to the Massachusetts Institute of Technology. The Computer Research Center, recently headed by Professor Edwin Kuh of M.I.T., was founded six years ago on an experimental and developmental basis with funding from the National Science Foundation. Given the success of this experiment, as shown by the ability of C.R.C. to function as an intellectually and financially viable entity, and the redirection of the Bureau's research mission, NBER's Board of Directors voted at its September meeting to approve the change in sponsorship of the C.R.C.

## American Economic Association Awards

At the December 1977 meetings of the American Economic Association two NBER personalities received the AEA's most prestigious awards. One, the Francis A. Walker medal, awarded every five years, went to Nobel Laureate Simon Kuznets, one of the illustrious names long associated with the National Bureau. The other, the John Bates Clark medal, awarded "biennially to that American economist under the age of forty who is adjudged to have made a significant contribution to economic thought and knowledge," was presented to Martin S. Feldstein, the Bureau's president, "for the high quality and extraordinary quantity and diversity of his achievements."

Interestingly enough, the very first recipients of these awards back in 1947 were also NBER luminaries: Wesley Mitchell, the Bureau's founding father, and Paul Samuelson, first winner of the Nobel Prize in economics and onetime NBER director. Over the years, various outstanding economists connected with the Bureau have been honored by the American Economic Association. Among the winners of the John Bates Clark medal still on NBER's research staff today are Milton Friedman, another Nobel Laureate, and Gary S. Becker, policy advisor of the National Bureau's Center for Economic Analysis of Human Behavior and Social Institutions.

## NBER Personalities



**David F. Bradford**

A relatively recent (1977) addition to the research roster of the National Bureau, David Bradford is the director of its taxation and business finance program (see "New NBER Research," p. 5). Like most NBER personalities, he also has a busy teaching career. On the Princeton faculty since 1966, he is currently Professor of Economics and Public Affairs in its Economics Department and the Woodrow

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Wilson School of Public and International Affairs, and teaches a course in federal tax legislation at NYU Law School.

David Bradford's academic background is as broad as the list of his scholastic honors is long. (The latter includes a National Merit Scholarship, Phi Beta Kappa, a Woodrow Wilson Fellowship, a Stanford University Workshop Fellowship, a Ford Foundation Dissertation Fellowship, a U.S. Treasury Department Exceptional Service Award, and a Fulbright Fellowship.) He is a graduate of Amherst (BA, economics, 1960) and holds advanced degrees from Harvard (MS, applied mathematics, 1962) and Stanford (Ph.D., economics, 1966). Abroad he attended Churchill College of Cambridge University (1963-1964), the Institut für Sozialwissenschaften in Basel (1969), the Institut für Höhere Studien und Wirtschaftsforschung in Vienna (1972), and, most recently, the Center for Operations Research and Econometrics in Louvain, Belgium (1977).

Government service is another aspect of his life that marks David Bradford a true NBER personality. He was Deputy Assistant Secretary for Tax Policy (Tax Analysis) of the U.S. Treasury Department during 1975-1976 and full-time consultant to the Assistant Secretary of Defense in 1964-1965 (working in Bonn, Germany, London, England, and Washington, D.C.). He still serves as consultant (on tax policy) to the U.S. Treasury Department, and was consultant to the U.S. Bureau of the Budget (on programming, planning, and budget techniques) in 1967-1968, the U.S. Department of Housing and Urban Development (on the cost of urban services) in 1966-1967, and the National Advisory Commission on Selective Service (on deferment policy) in 1966.

Not surprisingly, the list of Bradford's various publications is too long for inclusion here. Some of the most recent ones are: "The Optimal Taxation of Commodities and Income" (with H.S. Rosen), *American Economic Review* (May 1976); "Observable Preferences for Public Goods" (with G. C. Hildebrandt), *Journal of Public Economics*, (1977); and "The Incidence and Allocation Effects of a Tax on Corporate Distributions," Discussion Paper 7738, CORE, Université Catholique de Louvain, August 1977.

At home in Princeton with his wife Gundel and ten-year old Theodore and eight-year old Catherine Louise, David Bradford enjoys a busy family life, which includes activities like home restoring, travel, and skiing. The Bradfords both love opera, an enthusiasm greatly enhanced by their stay in Vienna, where they lived next door to the Staatsoper.



**Richard B. Freeman**

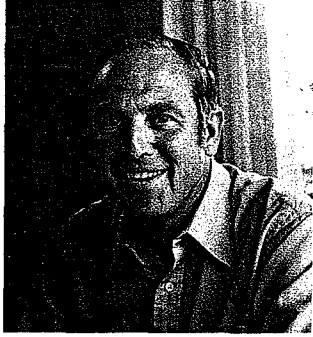
"Freeman's door is always open" was one of the typical comments heard last spring when Richard Freeman received Harvard's second annual Graduates' Award for Good Teaching, established by John Kenneth Galbraith. Friendly, involved, down-to-earth, the popular young professor is known for making himself available to his students despite his busy writing schedule. And that schedule is busy indeed — *The Overeducated American* (Academic Press, 1976), *Black Elite* (McGraw-Hill, 1977), *The U.S. Discriminatory System* (Twentieth Century Fund, 1979) are just a few titles among many in the recent output of the National Bureau's new director of labor studies (see "New NBER Research," p. 5).

After graduating from Dartmouth in 1964, Freeman worked as a research economist for the Area Redevelopment Administration, the Committee for Economic Development, and the Harvard Economic Research Project. He received his Ph.D. from Harvard in 1969 and went on to teach, first at Yale, then at the University of Chicago, and finally at Harvard, where he was recently made full professor.

His research aim is to reconcile two different approaches to the analysis of labor problems: the traditional institutional case study approach and the quantitative, econometric method. In the ambitious study of the youth labor market at the Bureau a variety of tools will be used to present what is hoped will be the most accurate and comprehensive analysis of this subject to date.

As noted before, Richard Freeman is a prolific writer. His contributions to the literature, far too numerous for listing here, range over a broad spectrum of labor economics, and include books and articles on supply and demand for various levels of skills; economic discrimination, social mobility, and income distribution; economic history; trade unionism; and economic development.

On the home front, his interests range over a broad spectrum too, from enthusiasm for basketball to home decorating. The latter he shares with his multilingual wife, the former Franziska Amacher of Zurich, Switzerland, who is both a sociologist and an architect, with a special interest in old homes.



## Victor R. Fuchs

"Folk hero of the health world," as he is popularly dubbed, vice president of the National Bureau of Economic Research and director of its West Coast operations, Professor of Economics at Stanford (economics department and medical school) — Victor Fuchs certainly fits no stereotyped picture of an ivory tower academician. "I wasn't very scholarly when I was young," he said in a recent interview, "and, after starting adult life as a businessman, went back to graduate school when I was twenty-six." This did not prevent him from winning various academic honors, including the Calvin K. Kazanjian fellowship at Columbia, where he received his MA in 1951 and his Ph.D. in 1955. Neither did it keep him from a distinguished teaching career at Columbia (1953-59), New York University (1959-60), the Mount Sinai School of Medicine (Professor of Community Medicine, 1968-74), the City University of New York Graduate Center (1968-74), and Stanford University (since 1974).

Fuchs's association with the National Bureau goes back to 1962, when he became a member of its Senior Research Staff after a two-year stint at the Ford Foundation. The research program he directs today as head of NBER's Center for Human Behavior and Social Institutions applies economic theory and empirical research to various market and nonmarket activities with important implications for human welfare. His energetic administration has brought the National Bureau a substantial amount of new support from foundations and government agencies, a source of considerable satisfaction to Victor Fuchs, who views the Bureau's role primarily in terms of "laying the groundwork for the years to come." In this case this means future work in income distribution and labor markets, population and the family, law and economics, taxation and social insurance, and health economics — his own specialty.

It was during his first decade at the National Bureau that Victor Fuchs became interested in the service industries and the economics of health and population. While working on his *The Service Economy* (1968), a classic in its field, he found the

health industry to be one of the biggest and most interesting service industries. "When I started to write papers on health economics," says Victor Fuchs, "few people agreed with my ideas. Now more people are starting to think about these problems from an economic point of view." According to the *N.Y. Times* review (March 21, 1975) of his widely read book *Who Shall Live*, "no book in recent years has demonstrated a better grasp of the social context of health and health care."

And the flow of books (eight), articles (over 70) and speeches (one or two each month) continues unabated, reflecting the author's vitality and involvement in the world around him. A member of the Institute of Medicine of the National Academy of Science, a former member of the President's Committee on Mental Retardation, and an active participant in other organizations and advisory boards, Fuchs has an impressive schedule of public appearances at home and abroad. (See "NBER Conferences" on p. 1 for the latest meeting under his leadership.)

At the same time, he manages to be an avid tennis and raquet ball player, and enjoys hiking with his family, who all share in the active Fuchs lifestyle: His wife, Beverly, develops new programs for senior citizens for the City of Palo Alto; their married daughter, Nancy, is a Ph.D. candidate also training to be a rabbi; their younger daughter, Paula, a college senior, is studying religion, too; their second-oldest, Fred, works in the film industry; and the youngest, Ken, is on his high school's basketball team.



## Geoffrey H. Moore

"Are we in an international growth recession now?" "What are the cycle turning points for the major industrial countries?" "How does the recovery in industrial production compare to previous recoveries?" "Which industries are counter-cyclical?" These are some of the questions that typically reach Geoffrey Moore's desk at the National Bureau on a business day. They come from banks, newspapers, business firms, universities, other research organizations, government agencies — domestic and foreign.

For today Geoffrey Moore's name is virtually

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synonymous with business cycle evaluation, in the tradition of his eminent predecessors in NBER business cycle research, Wesley Mitchell and Arthur Burns. By monitoring various series of business indicators, he keeps his finger on the pulse of the economy at home and abroad. Of course, when it comes to the question of identifying a peak or a trough in the business cycle at the time it occurs, Geoffrey Moore is quick to point out that this is essentially a matter of forecasting — and that the National Bureau's function is basic research rather than current forecasting. Thus, he recalls, when in March 1975 some colleagues expressed the view that the recession had hit bottom, it was not until many months later that the Bureau identified March 1975 as the turning point, after careful review of all the evidence on developments both before and after that date.

Focusing on the business cycle represented a logical evolution from Geoffrey Moore's early interest in the cyclical aspects of agriculture: his Ph.D. dissertation (Harvard, 1947) dealt with harvest cycles. Still earlier he had worked his way through college in various agriculture-connected occupations and earned his B.S. (Phi Beta Kappa, 1933) and M.S. (1937) degrees from Rutgers University in agriculture.

And it was a study of short-term fluctuations in agricultural output that originally earned NBER's director of business cycle research the fellowship which was to launch his long and distinguished career at the National Bureau in 1939. In 1942 he was made a permanent member of the Bureau research staff, in 1948 became associate director of research, and in 1965 succeeded Solomon Fabricant as director of research. In the same year he was also elected to the Board of Directors as a director at large, a position he still holds in addition to that of director of business cycle research. Thus, except for a four-year term as U.S. Commissioner of Labor Statistics (1969-1973) in Washington, the National Bureau of Economic Research has been home base for Geoffrey Moore.

Of course, like all outstanding NBER personalities, he has also been involved in numerous outside activities. Here are just a few examples: teaching stints at Rutgers, NYU, and Columbia; work on various government committees; activities as president of the American Statistical Association (1968); research at Stanford's Hoover Institution and the American Enterprise Institute. All of this has been accompanied by a steady stream of publications, the most recent of which include "Employment, Unemployment, and the Inflation-Recession Dilemma" (*Contemporary Economic Problems*

1976, American Enterprise Institute), "Recovery and Then?" with Philip A. Klein (*Across the Board*, October 1976), "An Inflation Chronology" (*NBER Reporter*, June 1977), "Cost-Price Relations" (*NBER Reporter*, September 1977), and "Inflation and Profits" (*NBER Reporter*, December 1977).

At home — in New Canaan, Connecticut, and Ely, Vermont — "Geof" Moore pursues his hobbies of gardening, tennis, and sailing. But economics and statistics are never far from his family's interests: Mrs. Moore, the former Melita Holly, was a member of the UN Statistical Office from its inception until her recent retirement, and among his four children, one, Kathleen, is a fellow-economist. Another daughter, Pamela, works in quality control in the food industry, his oldest, Stephen, is an aeronautical engineer, and his second son, Peter, is a professor of mathematics.

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## New NBER Research

Two new entries in the National Bureau's dynamic research program stand out in their relevance to current public debate: the problems of youth unemployment and of business taxation and finance. Research results in these areas should go far in providing the empirical basis essential for formulating appropriate policy decisions by government, business, and labor leaders on these questions of great public concern.

### The Youth Unemployment Project

While the extraordinary spurt in youth unemployment, particularly among black youth, is indeed a question of great public concern, surprisingly little accurate information is available on the nature of the problem. NBER's new project, under the leadership of Richard Freeman (see "NBER Personalities," p. 3), is expected to produce the most complete picture of the youth labor market attempted to date, and, at the same time, also throw additional light on the economics of the labor market in general. It will be conducted via a series of individual studies by various outstanding economists, seminars, meetings with outside experts in the youth labor market, interview surveys, and a final NBER conference. Its findings will be presented in a comprehensive nontechnical report accessible to a wide audience concerned with policies relating to the problems of youth employment and unemployment.

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With the objective of quantifying the characteristic patterns of the youth unemployment situation and evaluating the factors underlying them, the research program will use time series data, cross-section data, and cohort and longitudinal data. An attempt will be made to identify those geographic areas where unemployment rates are low to obtain clues for factors that might reduce unemployment elsewhere.

In estimating the quantitative effect of supply forces, the studies will examine labor turnover, attitudes toward low-level "secondary jobs," family backgrounds, demographic changes in the teenage population, and transitional adjustment from full-time schooling to full-time work. On the demand side, estimates will center on changes in the occupational composition of the economy, such rigidities in the wage structure as the minimum wage, the movement of jobs from the inner cities to the suburbs, and substitution of female older workers (induced by their increased labor force participation) for teenage workers. In addition, the distinctive factors influencing employment of young blacks and women as well as the phenomenon of declining unemployment rates in line with the aging process of a cohort will also be analyzed.

Clearly, the causes of youth unemployment must be understood before appropriate remedies can be developed. For example, if it were shown that unemployment among the young could be substantially reduced by lowering the costs of employing them, a case could be made for youth employment wage subsidies. On the other hand, unemployment due to poor work habits would argue for expenditures on major training programs. The National Bureau's research program will provide the groundwork for the fundamental answers to such questions.

## **Business Taxation and Finance**

The National Bureau's new research program in this area is taking shape at a time when major changes in the U.S. tax system are under serious consideration, both to stimulate capital formation and eliminate anomalies in our taxation. Proposals under public debate include a reduction in the corporation income tax rates, an increase in the investment tax credit rate, the partial integration of corporation and individual income taxes via a tax credit for dividends received, taxation in full of capital gains, and changes in the schedule of individual marginal rates. At the same time, the effects exerted by some of these proposed changes on our

economic system are scarcely understood. This is where the National Bureau of Economic Research comes in — to produce the theoretical and empirical evidence necessary for drawing conclusions about these relationships and for making appropriate policy decisions.

David Bradford (see "NBER Personalities," p. 2), director of the Bureau's business taxation and finance program, effectively set the stage by organizing a miniconference in mid-December 1977 featuring what reads like a cast of stars as participants: William Andrews, Martin Bailey, Michael Boskin, Peter Diamond, Martin Feldstein, Robert Glauber, Roger Gordon, Jerry Green, Arnold Harberger, Dwight Jaffee, Burton Malkiel, Charles McLure, Merton Miller, Stewart Myers, Myron Scholes, and John Shoven. David Shakow and Larry Dildine of the U.S. Treasury and Dan Newlon of the National Science Foundation acted as U.S. government observers at the meeting. Three presentations covered the major issues: "The Incidence and Allocation Effects of a Tax on Corporate Distributions" (David Bradford, NBER and Princeton); "Dividends and Taxes" (Merton Miller and Myron Scholes, Chicago); and "Corporate Financial Policy and Taxation in a Growing Economy" (Martin Feldstein, Jerry Green, and Eytan Sheshinski, NBER and Harvard). It is hoped that similar meetings will take place from time to time, and a summer workshop is in the planning stage.

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## **Stage-of-Process Modeling and the Mitchell-Burns View of the Business Cycle**

*Joel Popkin*

In a recent paper, "Wesley Mitchell in Retrospect," Geoffrey H. Moore, the Bureau's director of business cycle research, points out that, "like the present-day model builders, Mitchell also insisted that theory fit the facts. But the realm of facts that Mitchell thought the theory should fit covered a wider historic and geographic range and more aspects of economic life than most model builders nowadays envisage."

One of the products of this broad view of busi-

ness cycle theory was the work that Mitchell, Simon Kuznets, Arthur Burns, and others did in the 1930s in putting together a voluminous collection of statistical time series pertaining to business cycle processes, which later provided the factual basis for the various studies of leading, coincident, and lagging indicators.

These studies have been published since the 1950s, about the time that another approach to the study of economic fluctuations, via macroeconomic models, was being pursued, mainly by Lawrence Klein and his associates.

But many of the findings of Mitchell, Burns, and their collaborators did not fit readily into the theoretical framework utilized by the macroeconomic model builders. A major reason for this is that much of the analysis conducted by the NBER centered on many variables that were not part of the national income and product accounts, the major variables in macro theory. Frequently the variables Mitchell and Burns focused on in advancing understanding of business cycle processes were those that pertained to intermediate sector behavior. While the macroeconomic model school had a set of testable hypotheses and the data framework to assess them,<sup>1</sup> many of the leading and the lagging indicators did not fit readily into these hypotheses and hence their behavior was not accounted for. As a result, a considerable amount of NBER business cycle research has focused on the timing relationships between the intermediate sector variables and the final demand measures that describe fluctuations in the aggregate economy.

However, for a number of reasons, including the continued widespread use of NBER-developed indicators, a need remained to develop and test hypotheses about the relationships between the intermediate sector of the economy and final demand. The earliest attempts to do this are reflected in the Brookings-SSRC model, particularly in the development by Schultze and Tryon of price equations for value added for roughly 40 manufacturing and nonmanufacturing industries.

Given the economic developments between the recessions of 1957-1958 and 1969-1970, particularly with respect to the stability of exchange rates, the absence of inflation-producing sectoral bottlenecks and the relatively nonvolatile behavior of prices of raw materials — agricultural and nonagricultural — this partial integration was useful. For much of the attention accorded to inflation focused on labor markets and wage behavior, an important element in value added.

Toward the end of the period it began to be recognized that, particularly for the analysis of inflation, it was necessary to consider on an industry basis the full spectrum of costs that determine the empirical aspects of supply curves. In a paper presented at a conference on the econometrics of price determination in October 1970, William Nordhaus called attention to the fact that a considerable amount of price analysis "proceeded without the benefit of formal theory," one consequence of which was the failure to take into account the role of materials prices and capital costs in determining industry price behavior. At the same conference its chairman, Otto Eckstein, presented a paper in which materials prices were included as variables in analyzing the behavior of output prices across the two-digit industries in manufacturing.

At about the same time work was under way at the Bureau of Labor Statistics to develop the relationships among the crude, intermediate, and finished goods components of the Wholesale Price Index and their linkages to the Consumer Price Index. Such "stage-of-process" analysis contained the seeds for the potential blending of the Mitchell-Burns focus on business cycle processes with the macroeconomic models then in use. The stage-of-process price model contained some preliminary empirical tests of hypotheses that would account for the early NBER findings by Mills and others of the phenomenon that the amplitude of price fluctuations diminishes as one moves from crude materials prices to those of finished goods. And, because it explicitly tested various lags in the transmission of price changes from one processing stage to another, it provided some tentative and partial answers to why prices of crude materials served as a leading indicator of business activity. But the model was incomplete, for it did not explain the behavior of the variables that determined wages and price-to-variable cost ratios.

In 1974 the National Science Foundation awarded a grant for the analysis of the inflation of 1965-1974 by means of building a stage-of-process model of the intermediate sector of the U.S. economy and linking it to a final demand model. The award coincided with the opening of the Bureau's Washington office and the work started in late 1974. Additional funding was received subsequently from the Council on Wage and Price Stability.<sup>2</sup>

The result has been the estimation of a model of intermediate and final demand by stage of process. The model is currently being tested; the tests and the subsequent use of the model for the analysis of

<sup>1</sup>It is interesting to note that this data framework originated with the National Bureau in the pioneering work on national income carried on by Mitchell, Macauley, King, and especially Kuznets.

<sup>2</sup>Any opinions, findings, conclusions or recommendations expressed herein are those of the author and do not necessarily reflect the views of the National Science Foundation or the Council on Wage and Price Stability.



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inflation will be completed some time this year. It contains 300 variables, of which 75 are exogenous. Of the 225 endogenous variables, 125 are determined by behavioral equations resulting from testing hypotheses about how the economy works. The remaining 100 variables are obtained either from identities — for example, shipments are derived by subtracting from new orders the change in unfilled orders, both of which are determined by behavioral equations — or are definitional — i.e., they are combinations of other variables in the model.

Of the 300 total, 175 variables measure behavior in the intermediate sector and 125 in the final demand sector, so the model now is quite small by today's standards for final demand models. Of course, one hypothesis that can be tested is whether it is more fruitful to spread limited resources more thinly over both the intermediate and final demand sectors than to concentrate in more detail on final demand.

The final demand model contains, on the output side, a thirteen-sector breakdown of personal consumption expenditures into five goods and eight services components. Fixed investment is divided into four components and government spending into five, reflecting the government level doing the purchasing — federal or state and local — and the type of purchase — construction, purchases of commodities, and the services of government employees. Net foreign and inventory investment are also categories of final output. The output and income sides of the national accounts are linked through the usual identities and equations for various income components like employee compensation and profits.

A key element in the disaggregation of the output side was to segregate components that could be related to industries in the intermediate sector that supply them. Hence the emphasis on commodities and construction, both of which require manufactured inputs from the intermediate sector of the model. Based on the final demands for the various construction and commodities components, their suppliers place orders for various inputs produced by other sectors. Consumer and producer outlays on autos trigger the placement of orders for autos with manufacturers; outlays on construction affect orders placed for construction materials; consumer outlays on nonauto durables influence orders placed with the manufacturers of such durables. And, of course, orders received by such manufacturers affect the orders they place for basic material like steel. The placement of orders is a basic link between the final demands and intermediate demands.

The orders placed for finished manufactures leads to changes in unfilled orders, production, and fin-

ished goods inventories. These variables together with material and labor costs represent market supply and demand curves, and their behavior determines the prices finished goods producers charge retailers.

Some of the same variables — namely new orders, unfilled orders, and finished goods inventories — also determine the orders finished goods producers place for basic materials. But some other variables are also needed. They relate to the materials finished goods producers have on hand and on order. It was Ruth Mack who, in her NBER studies of inventory behavior, first hypothesized that firms consider in making inventory decisions not only the goods they have on hand but also those that have been ordered but not yet received — i.e., the totality of materials they own. Preliminary econometric results confirm her hypothesis.

The placement of orders by finished goods producers triggers a process similar to that described when retailers place orders. Ultimately, the prices of basic materials are determined and these affect prices charged by finished goods producers.

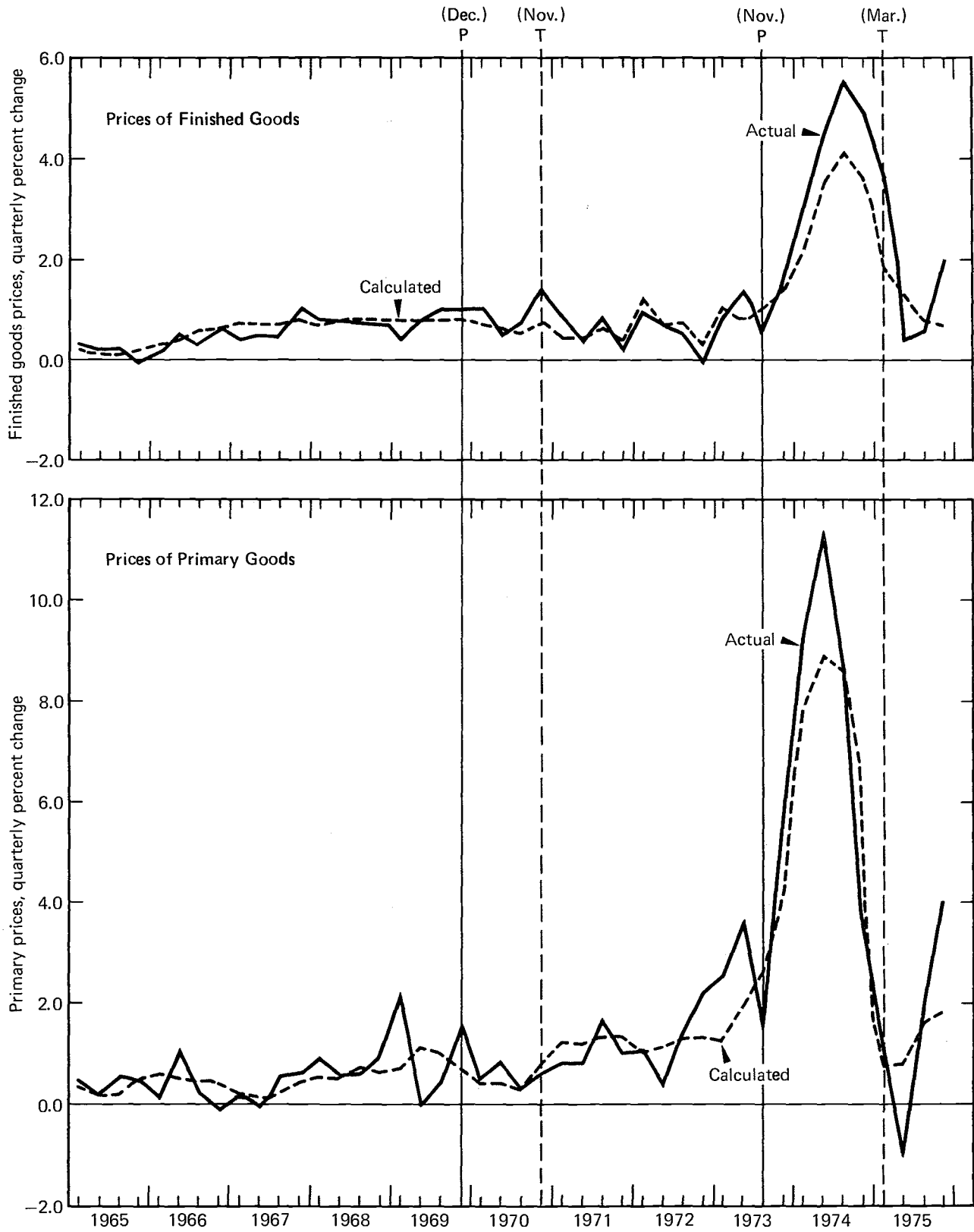
In all there are 14 manufacturing sectors represented in the model. In principle they account for all manufacturing output. Six of the sectors are finished goods producers — autos, other consumer durables, food, other consumer nondurables except fuels, machinery and equipment other than ordnance and transportation equipment, and a producers goods sector consisting of ordnance, shipbuilding, aircraft, and railroad equipment. The other nine sectors are basic materials producers — textiles, lumber, paper, chemicals, stone, clay and glass, steel, nonferrous metals, and petroleum. That the petroleum industry sells both to intermediate and final demand sectors can be handled in the model.

Perhaps at this point the way in which such a model links the business cycle indicators developed and analyzed by Mitchell, Burns, and others is obvious. Of the twelve leading indicators currently used by the federal government in its composite leading index, four are represented exactly or approximately in the model. They are new orders for consumer goods and materials, contracts and orders for plant and equipment, net change in inventories on hand and on order, and the change in sensitive prices. Two others can and will be built in without major extension of the model — new building permits and the average hours of production workers in manufacturing. All four of the coincident indicators are in the model — nonagricultural payroll employment, personal income less transfers, industrial production, and manufacturing and trade sales. Labor cost per unit of output in manu-

facturing and inventories are the two of the six lagging indicators incorporated in the model. Among

the indicators, the model is deficient in its coverage of those relating to financial markets.

Chart 1



An example of how the model functions as a framework for testing the NBER findings with respect to leading and lagging indicators is provided by using the model to predict prices of primary materials and nonfood finished manufactures. The primary price index is similar to though broader than the index of sensitive prices, which is a leading indicator.

Chart 1 contains actual percentage change in both indexes for 1965-1975, the sample period on which the model's structure is based. The model was simulated, beginning with 1965, with final outputs and crude petroleum prices exogenous, so that its ability to predict prices could be focused on explicitly. It had the task of translating the final outputs into orders for finished manufactures and all of the other intermediate sector variables described earlier. In the simulation, predicted rather than actual values of these endogenous variables were used to determine whether the model cumulates biased prediction errors.

The percent changes predicted by the model for the two price indexes are also plotted in Chart 1. The reader can verify that both actual and model-predicted percentage changes in the prices of primary manufactures peaked before those of finished goods around the time of the business cycle peaks in 1969 and 1973. The same tendency of primary price changes to lead at troughs is manifest in 1970, but less clear in 1975. However, it must be kept in mind that both the dating of cycles and measurement of indicators are based on monthly data while the model, at this time, is based on quarterly data.

So much for the empirical results; what does the model have to say about *why* sensitive price changes lead? In many primary sectors, but not in many finished goods sectors, a disequilibrium variable, the ratio of new orders to production, is a significant variable with a positive effect on price change.<sup>3</sup> When new orders exceed output one or both of two things must be happening — unfilled orders are being built up and finished stocks on hand are being drawn down. Before the trough of a recession is reached production is cut back to levels below that of incoming orders in order to work off inventories. When that process ends, around the trough of a recession, the ratio of new orders to output rises, and with it, the rate of change of primary prices. As the expansion begins, increases in new orders for primary goods are larger than the upward adjustment in production. This causes primary price increases to accelerate while unfilled orders rise and finished inventories of primary materials fall. As the expansion matures, primary

production is continually adjusted upward until it is consistent with the rate of incoming orders and is adequate to reduce backlogs and replenish inventories. Thus, the ratio of new orders to production falls and the rate of primary price increase slows.

It would appear, then, that the tendency of primary price changes to lead changes in business activity is no coincidence. And it seems reasonable that the same process which explains the leading role of sensitive prices explains some of the other leading indicators as well. Thus, an integrated model of intermediate and final demand by stage of process seems to provide a link between the traditional macro models and the NBER business cycle process analysis which has led to the development of the indicators. Such a model also provides a consistent framework for analyzing jointly the comprehensive bodies of data produced monthly on the intermediate sector of the economy — new and unfilled orders, production, inventories by stage of fabrication, wages and prices, and the quarterly data of the national income and product accounts. And finally, since the intermediate sector of the model is defined in terms of a 36-sector aggregation of the 1967 U.S. input-output table, a link between I-O and dynamic econometric models is established.

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## Is an International Recession Brewing?

*Geoffrey H. Moore*

A major study by the NBER has been under way since 1973 to develop a system of leading, coincident, and lagging indicators on an international scale, that is, on a comparable basis for a number of industrialized countries. In this effort we have so far ignored differences in the economic organization and policies of the several countries and have concentrated instead upon duplicating the economic content of the indicator system that has become widely used in the United States. We do not regard this as the ultimate goal, but merely a practicable interim target, helpful in tracking an international recovery or recession, in revealing factors that are holding back recovery or leading to recession, and in anticipating changes in foreign trade flows. We are now in a position to begin using some of the practical results of this research program.

<sup>3</sup>When new orders exceed production in an industry, the implication is that price is below equilibrium and must rise in a competitive market. An NBER Working Paper on the structure of the price equations will be available shortly.

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Back in 1937, when the National Bureau's work on business cycle indicators began, the prime objective was to use them to signal a cyclical revival, i.e., the end of a recession, specifically the end of the severe recession in the United States that began in the spring of that year. In 1950 the objective was broadened to include signals of a cyclical downturn, and subsequent studies of indicators have been focused on both the beginning and the end of recessions. An international system should, therefore, be expected to signal both peaks and troughs in each of the countries covered as well as in the several countries taken together. In short, an important function is to detect a worldwide recession or recovery promptly.

This is important in part because international recessions — those in which many countries participate more or less simultaneously — are apt to be more serious than "local" ones. We need recall only 1973-75 and 1957-58, both of which were international in scope, to recognize this. Going farther back in time, the depressions of 1929-31, 1920-21, and 1907-08 were also international and were among the most severe on record. If we are to avoid such disasters, or at least take timely steps to counter them, we need to know when they are about to begin or end.

A second, closely related function of an indicator system is to measure the scope, severity, and unusual features of international recessions or recoveries while they are in progress. For example, one of the unusual, and widely noted, features of the current recovery in the United States is the sluggishness of capital investment compared with previous recoveries. This has prompted much analysis of why it has occurred and how it can be remedied. But sluggishness in capital investment has also characterized the current recoveries in many other countries, a fact that seems to rule out purely localized explanations and may limit the effectiveness of localized remedies. Another unusual and perhaps related feature is the persistence of both high unemployment and high inflation in many countries. An international indicator system should be capable of tracking these phenomena and providing a solid, comparable, up-to-date statistical basis for their appraisal.

A third function is to help appraise prospects for foreign trade. Insofar as the indicators are sensitive measures of the general state of demand — as, indeed, data on new orders, inventory change, hiring rates, and profitability are — one can expect that they would relate to the state of demand for imported products too. Of course, a wide variety of

other factors are also relevant, but demand is surely fundamental. Leading indicators for our trading partners should tell us something about how much they are likely to buy from us, and leading indicators for *their* trading partners should tell us something about how much they are likely to sell to them.

Finally, a potential function of a system of international indicators is to provide early warning signals of acceleration or deceleration in the rate of inflation. Inflation is in part a demand phenomenon, and as has just been said, many of the indicators are demand-oriented. Inflation is also an international phenomenon, and an international indicator system should be designed to throw light upon it.

What are the principal features of the NBER international indicator system as it presently exists? First, as noted above, it is patterned after the U.S. system, now published regularly by the Department of Commerce, with groups of leading, coincident, and lagging indicators covering a wide variety of economic processes that have been found to be important in business cycles. The coincident indicators are comprehensive measures of economic performance — real GNP, industrial production, employment, unemployment, income, and trade. They are the measures to which everyone looks to see whether the nation is prosperous or depressed. The leading indicators are, for the most part, measures of anticipations or new commitments. They have a "look ahead" quality and are highly sensitive to changes in the economic climate as perceived in the market place. The lagging indicators are far more sluggish in their reactions but serve a useful purpose in smoothing out and confirming changes in trend that are first reflected in the leading and coincident indicators. Moreover, their very sluggishness is an asset in cyclical analysis, because when they do begin to move, or move rapidly, they can reflect excesses or imbalances in the economy. Hence the lagging indicators can, and often do, provide the earliest warnings of all, as when rapid increases in costs of production threaten profit margins and hence inhibit new commitments to invest. Table 1 gives a conspectus of the U.S. indicators, arranged according to the type of economic process they represent and the cyclical timing they exhibit.<sup>1</sup>

Our attempt to duplicate the U.S. system abroad does not mean that we thought every country was alike or that other equally good or better indicators could not be found. Rather, it was a system we were intimately familiar with, in terms both of its empirical properties and the economic logic on which it

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NOTE: The research summarized here is the product of a collaborative effort among many individuals and institutions, private and public. A full report, *Monitoring Business Cycles at Home and Abroad*, by Geoffrey H. Moore and Philip A. Klein, with the assistance of Walter Ebanks, is being readied for publication later this year.

<sup>1</sup>For a list of NBER publications that explain the relationships among particulars see p. 16 of the current issue of the *NBER Reporter*.

**Table 1**  
**Cross-Classification of U.S. Indicators (1966 List Modified) by Economic Process and Cyclical Timing**

Economic Process	Cyclical Timing		
	Leading	Roughly Coincident	Lagging
Employment and unemployment	Average workweek, mfg. New unemp. insurance claims, inverted	Nonfarm employment Unemployment, inverted	Long-duration unemployment, inverted
Production, income, consumption, trade	New orders, consumer goods and materials*	Gross national product* Industrial production Personal income* Manufacturing and trade sales*	
Fixed capital investment	Formation of business enterprises Contracts and orders, plant and equipment* Building permits, housing		Investment expenditures, plant and equipment*
Inventories and inventory investment	Change in business inventories*		Business inventories*
Prices, costs, and profits	Industrial materials prices Stock prices Profits* Ratio, price to unit labor cost		Change in output per manhour, mfg., inverted
Money and credit	Change, consumer instalment credit*		Commercial and industrial loans outstanding* Bank interest rates on business loans

NOTE: The list and classification is substantially the same as that prepared in 1966 and published in *Indicators of Business Expansions and Contractions*, Geoffrey H. Moore and Julius Shiskin, National Bureau of Economic Research, 1967. The chief modification is that those series marked with an asterisk are converted to constant prices. The timing classification for each series is the same as shown in *Business Conditions Digest* for all turns (see Table 1, col. 1, in any recent issue), except as follows. Unemployment is unclassified (U) at all turns in BCD because it leads at peaks and lags at troughs, but we classify it roughly coincident as in the 1966 price list. Four series that we use in constant prices are shown in BCD only in current prices (change in consumer instalment debt, investment expenditures for plant and equipment, commercial and industrial loans outstanding, and change in output per manhour, inverted, which is the constant price equivalent of labor cost per unit of output). We classify the constant price series the same as the current price series.

\*In constant prices.

was based. This logic seemed applicable to many countries where free enterprise prevails. Orders placed for machinery that is "made to order" are likely to lead machinery production, and likely also to lead the production of the goods the machinery helps to produce. In any market-oriented economy, changes in the relations between prices and costs influence incentives to expand future output and to make capital investments. In countries where there are markets for common stock, one can expect stock prices to be especially sensitive to changes in profit prospects and in interest rates, and hence to anticipate the effects that these changes produce.

We began the study with these familiar ideas in mind, and also with the objective of compiling sets of indicators as nearly comparable as possible across countries. Unless some attention is paid to

comparability in the data, comparisons of cyclical movements among different countries are likely to become hopelessly confused. To cite one example, an index of leading indicators published by the British Central Statistical Office includes a series on interest rates treated invertedly — that is, a rise in rates is counted as a depressing factor, and vice versa. This is not an unreasonable position to take, but we have treated interest rates on a positive basis and include them among the lagging indicators, although at times, as noted above, we interpret a rapid rise in such indicators as an adverse development. A straightforward comparison of the U.S. and U.K. leading indexes as published in each country would run afoul of this difference in procedure.

Nevertheless, we recognize that the system should not be held in a straitjacket, and that

**Table 2**  
**Cyclical Timing of Economic Indicators, Five Countries**

	Mean Lead (-) or Lag (+), in Months, at Growth Cycle Turns				
	United States 1948-73	Canada 1950-70	United Kingdom 1951-72	West Germany 1952-73	Japan 1954-72
Leading group	-3	-3	-8	-4	-4
Coincident group	+1	0	0	0	0
Lagging group	+7	+4	+8	+9	+5

SOURCE: *Monitoring Business Cycles at Home and Abroad*, Tables IV-1 to IV-5 (National Bureau of Economic Research, manuscript). The indicators included in each group correspond, where data are available, with those for the United States in Table 1. A comparable analysis for France and Italy has not yet been completed.

adaptations to the way business is done in each country should be made as more experience with the system accumulates and additional research is conducted. Perhaps in the end two systems will evolve, one in which international comparability is maintained and the other in which each country's own data and cyclical response mechanisms are used to best advantage.

The acid test of our plan to assemble comparable sets of indicators for each country according to the U.S. system lies in whether the data then behave in the way U.S. experience has led one to expect. To perform this test we fitted long-run trends to each indicator, including those for the United States, identified cyclical turning points in the deviations from trend, set up a chronology of "growth cycle turns" for each country to represent the peaks and troughs in aggregate economic activity (after allowance for trend), and measured the leads of each indicator with respect to these growth cycle turns. That is easier said than done, but computer programs, carefully monitored to rule out dubious results, helped enormously and enhanced the objectivity of the process. A summary of the results is given in Table 2.

As will be seen, the leading indicators — selected and classified on the basis of U.S. data — lead in each of the other countries, and the lagging indicators lag. The coincident indicators, of course, show virtually no lead or lag, because they are used to determine the growth cycle chronologies themselves. But what is significant, because the grouping of the indicators was based on U.S. experience, not that in the country itself, is that the sequence of turns among the leading, coincident, and lagging groups in each country corresponds roughly to those in the United States. The detailed results show that this sequence has been repeated at virtually every turn in each country. Moreover, this consistency includes the tendency for the turns in the lag-

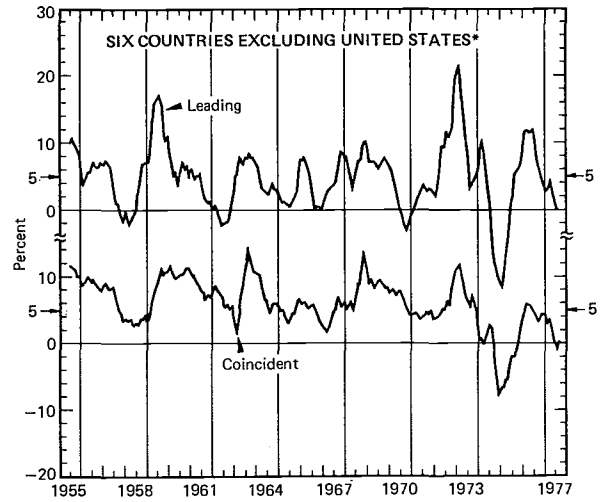
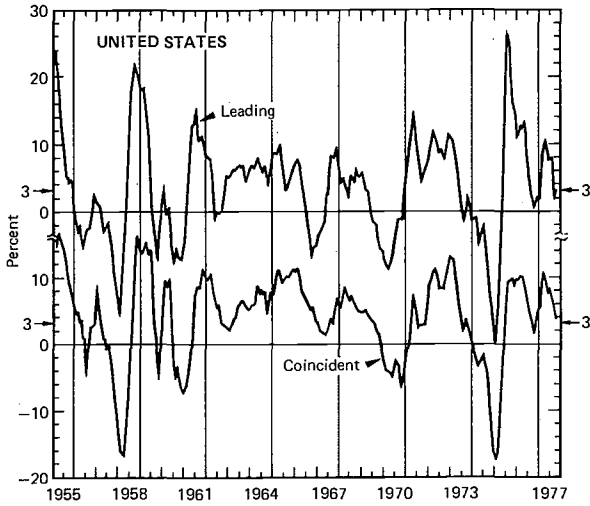
ging group to precede the opposite turns in the leading group, the logic of which we noted above. It is also true, of course, that there are wide variations in the lengths of lead or lag, from one cycle to another or one indicator to another. The system is not simple or mechanical. But the historical record is available to help guide current interpretations and we think it supports the hypothesis upon which our initial work was based, namely, that the U.S. system is broadly applicable overseas.

We have proceeded to compute composite indexes of the leading, coincident, and lagging indicators for each country and for groups of countries, using a method employed for some years by the U.S. Department of Commerce. Our indexes are constructed so that their trend rate of growth during 1966-76 was equal to that of real GNP for the country concerned during the same period. The procedure corrects for the rather haphazard long-run trends that are likely to result from combinations of indicators that, despite our efforts to obtain comparability, are not precisely the same. In addition to the indexes with GNP trend we also have the same indexes with the long-run trend eliminated. These depict the growth cycles discussed above. The trend rates of growth themselves are of interest for those who wish to examine and perhaps project each country's long-run rate of growth. Finally, we have computed short-run rates of growth, based on changes over successive six-month intervals (June to December, July to January, etc.). These rates also depict the growth cycles, but they do not depend upon any trend-fitting procedure, and hence avoid the uncertainty that is inevitably attached to bringing such trends up to date.

If the potential uses of an international indicator system are to be realized, the indicators must be kept up to date, processed appropriately, and made generally accessible. To this end an experimental program was begun during 1977 in which the

**Chart 1**

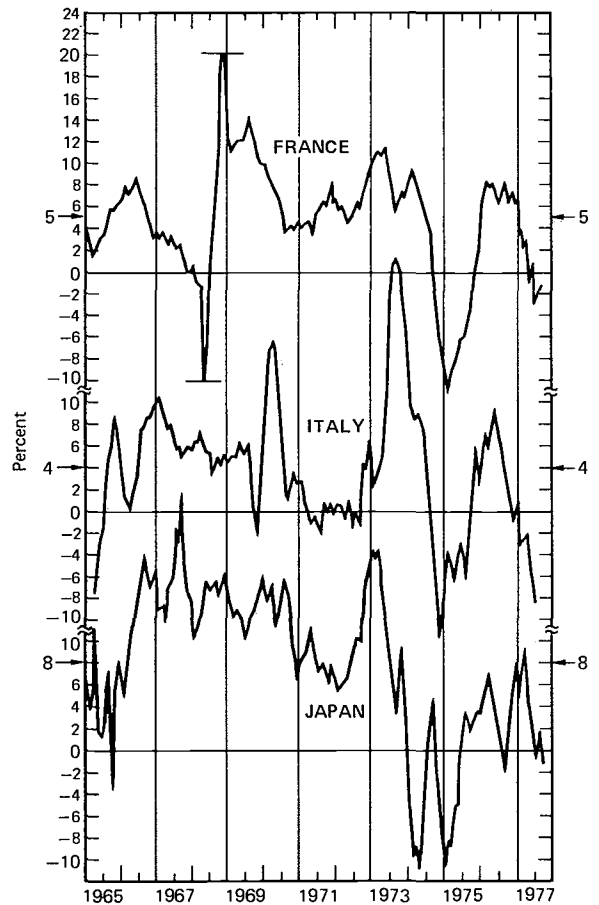
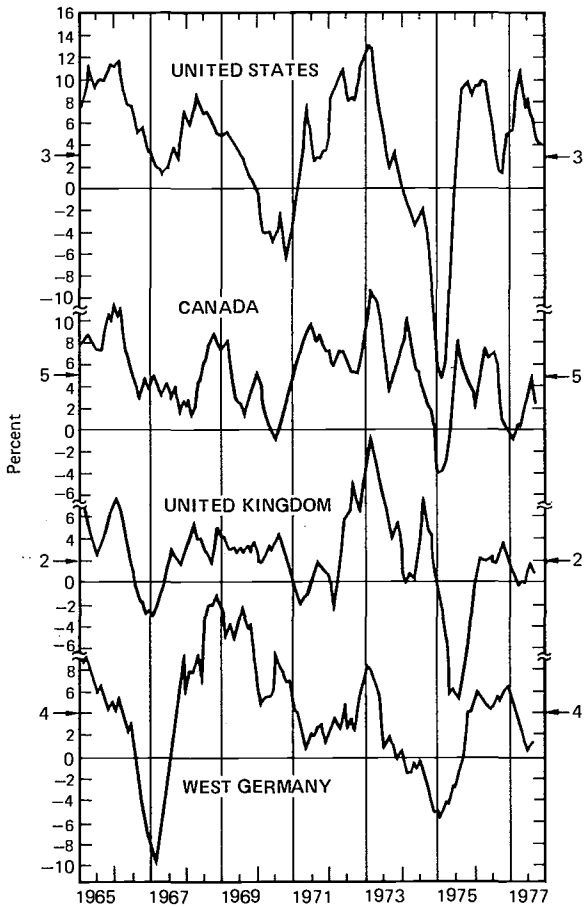
Rate of Change in Leading and Coincident Indexes, 1955-77 (percentage change over preceding six months at annual rate)



\*Canada, United Kingdom, West Germany, France, Italy, Japan; weighed by GNP in 1970.  
 Note: Arrows indicate rate of change, 1966-76, in the index and in real GNP.  
 Source: National Bureau of Economic Research, Inc., December 1977

**Chart 2**

Rate of change in Coincident Indexes, Seven Countries, 1965-77 (percentage change over preceding six months at annual rate)



Note: Arrows indicate rate of change, 1966-76, in the index and in real GNP.

Source: National Bureau of Economic Research, Inc., December 1977

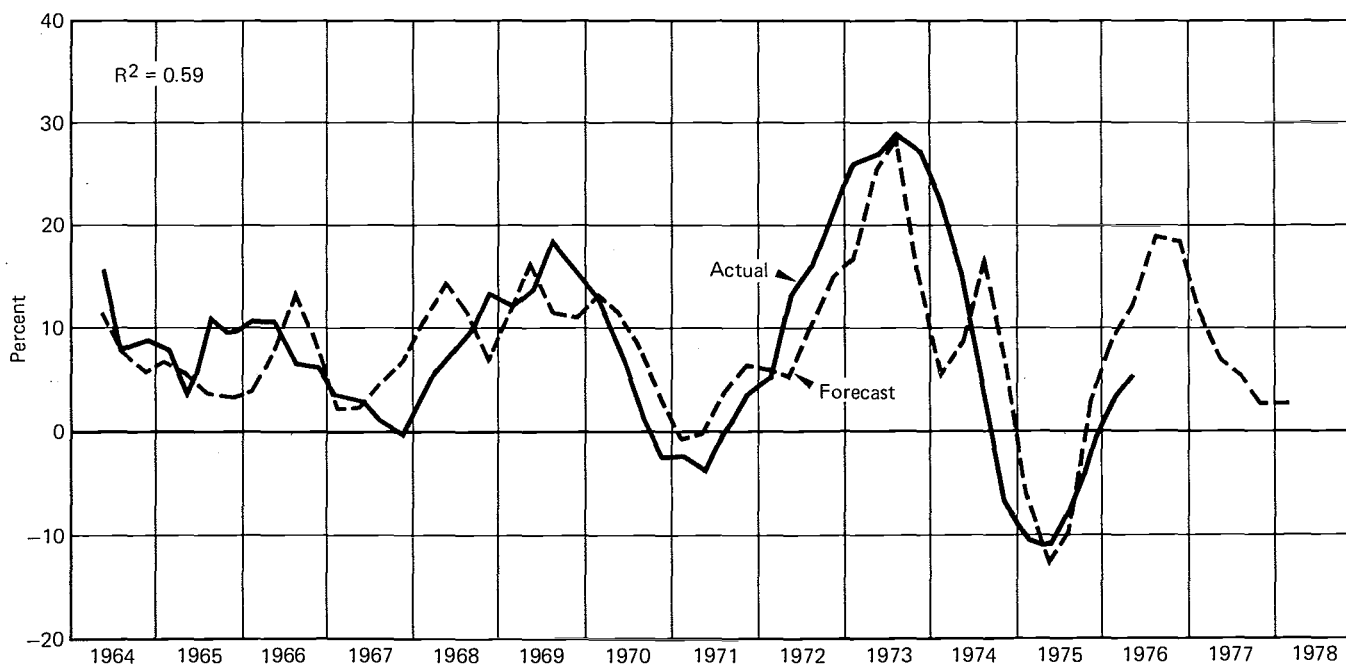
OECD, the statistical offices of the seven industrial countries, and the National Bureau have been participating. The program is designed initially to collect the indicator data, transmit them promptly to the National Bureau for processing (i.e., for the construction of composite indexes, calculation of rates of change, and derivation of trend-adjusted data), and exchange the processed results among the participating agencies. Some of the resulting products are shown in Charts 1 and 2, compiled last November and December.

These materials show that the widespread recovery from the 1973-75 recession has been seriously interrupted. In the early stages of this recovery the rates of growth in both the leading and coincident indexes exceeded their long-run average (1966-76) in nearly all countries. Since the autumn of 1976, however, this has no longer been true of the leading indexes, and since the spring of 1977 it has not been true of the coincident indexes. Indeed, the short-run rates of growth have fallen far below the long-run rate in most countries, and for the six countries outside the United States taken together the most recent rates have declined to zero. The situation resembles the widespread slowdowns that preceded the earlier growth recessions of 1958, 1967, 1970, and 1974.

The effect of such a development upon the United States is likely to show up particularly in our exports. It is customary to assume that exports depend upon the level of economic activity in the country to which the exports go. Ordinarily this is measured by gross national product or industrial production, which are among the coincident indicators. Since the leading indicators, as we have seen, anticipate the movement of the coincident by several months, the leading indexes for our trading partners may also anticipate the movements in our exports to them. We have made a number of tests of this hypothesis, using the leading indexes to forecast the rate of change in the volume of trade in both directions, to and from particular countries or groups of countries, and for trade as a whole as well as for various commodity groupings. This research is still in progress, but the initial results show that from one-half to two-thirds of the variation in trade flows can usually be accounted for in this manner. Chart 3 displays one such result, where the rate of growth in U.S. exports of manufactured goods to Western Europe, Canada, and Japan, after allowance for changes in prices, is forecast by the leading index for the six countries outside the United States. Despite the fact that our exports are affected by many other factors not explicitly taken account of in this simple model, the forecasts have tracked the

Chart 3

Forecast and Actual Percent Changes in U.S. Exports of Manufactured Goods to Western Europe, Canada, and Japan (quantity)



Note: Changes are between annual totals, one year apart. Forecasts are based on leading index for six countries, GNP weights (Canada, United Kingdom, West Germany, France, Italy, Japan), change over the last six months before the forecast year.



major swings fairly well. In 1976 and 1977, however, the index projected larger increases than occurred. That is, the recovery in demand after the 1974-75 recession, as measured by the leading index for the six major countries, did not produce a commensurate increase in U.S. exports. This shortfall, together with the slowdown in the leading index during 1977, is not a favorable augury.

The same method can be employed to forecast the exports of any country — developed or developing — that trades with the industrial countries for which we have leading indexes. We have already obtained similar results for the exports of the United Kingdom, West Germany, Japan, and for a major group of developing countries. Naturally, this method taken by itself has serious limitations, since it ignores other factors that influence the quantities of goods exported, such as changes in exchange rates, tariffs and other barriers or incentives to trade, supply conditions, and pricing policies, except insofar as these factors affect the leading indicators. Yet even a small contribution to our economic intelligence in appraising trade prospects can be worthwhile, in view of the importance of trade flows and trade balances in the economic relations among nations.

The indicator system that is yielding these results is in its infancy so far as development is concerned. If it is worth maintaining it should be preserved and improved by a continuing research and development program. Additional countries should be covered, and additional indicators should be included, along the lines noted above. Methods of trend-adjusting current data need testing and evaluation, as do the methods of using the indicators in trade forecasting models. The application or adaptation of the indicator system to produce early warning signals of inflation should be explored. Greater attention should be given to prompt availability of the results. In this connection the National Bureau plans to make the basic statistical data on these indicators available on a monthly subscription basis in the near future so that those who are interested can use them in their own appraisals and forecasts.<sup>2</sup>

Far more resources than are presently being devoted to this enterprise are needed to pursue this research agenda. But the stakes are high. Detecting a world-wide recession promptly and measuring its scope and severity, appraising trade prospects, and getting early warning of new inflationary trends are matters of such vast consequence to the peoples of the world that an effort of this sort should not require much debate.

## Why Do the Leading Indicators Lead? An NBER Reading List

Geoffrey H. Moore

The index of leading indicators released each month by the U.S. Department of Commerce is, according to the usual press notices, "believed to anticipate future changes in the economy." What is the basis for this belief? Since the NBER originated the idea of leading indicators — back in 1937 in a study by Wesley Mitchell, one of the founders of the Bureau, and by Arthur Burns, former chairman of the Federal Reserve — and since over the years the Bureau has issued a large number of reports that explain and document their behavior, a classified list of NBER references may be helpful to those who wish to gain a better understanding of why the leading indicators lead.

The following list contains general references that cover a large number of different indicators and explain their interconnections as well as specialized references that explain the behavior of particular indicators. The latter are organized according to the list of 26 indicators issued by the Bureau in 1966, which was used by the Department of Commerce from 1967 to 1975, but most of the entries serve equally well to document the 1975 list presently used by the Department of Commerce. The references are limited to reports either published by the National Bureau or prepared by members of its staff for publication elsewhere. Their titles are given in Section 3.

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Burns, 1961, 1969 (Chapter 1); Clark, J. M., 1934; Mitchell and Burns, 1961; Moore, 1961 (Chapters 3, 7), 1974; Moore and Klein, 1977; Moore and Shiskin, 1967; Shiskin, 1961; Zarnowitz, 1972; Zarnowitz and Boschan, May 1975, November 1975.

### 2. Specific References, by Type of Indicator\*

#### LEADING INDICATORS

1. Average Workweek, Manufacturing Industries  
Bry, 1959, 1961
2. Initial Claims, Unemployment Insurance  
Moore, 1961 (Chapter 16), 1973; O'Dea, 1975
3. New Business Formation  
Evans, 1948; Zarnowitz, 1961
- 4,5. Durable Goods, New Orders; Plant and Equipment, Contracts and Orders  
Zarnowitz, 1961, 1973

<sup>2</sup>For further information, write International Indicator Project, National Bureau of Economic Research, 261 Madison Avenue, New York, N.Y. 10016. (Telephone 212-682-3190).

\*The list of indicators is the 1966 list, published in Moore and Shiskin, 1967.

6. Building Permits, Housing  
Burns, 1938; Clark, 1934; Grebler, 1960
7. Inventory Change, Manufacturing and Trade  
Abramovitz, 1950; Mack, 1967; Stanback, 1962
8. Industrial Materials Prices  
Mack, 1967; Moore, 1972, Zarnowitz, 1962
9. Common Stock Prices  
Hickman, 1953; Macaulay, 1938; Moore, 1975;  
Morgenstern, 1959
- 10, 11. Corporate Profits; Ratio, Price to Unit Labor  
Cost  
Hultgren, 1965; Moore, 1962, 1975; Zarnowitz  
and Lerner, 1961
12. Consumer Instalment Credit, Change in  
Haberler, 1942; Kisselgoff, 1952; Klein, 1971

#### ROUGHLY COINCIDENT INDICATORS

- 13, 14. Nonagricultural Employment; Unemployment  
Rate  
Bry, 1959, 1961; Burns, 1969 (Chapter 7); Moore,  
1961 (Chapter 16), 1973; O'Dea, 1975
- 15, 16. Gross National Product, in current dollars; in  
constant dollars  
Kuznets, 1941, 1946
17. Industrial Production  
Mitchell and Burns, 1936; Zarnowitz, 1973
18. Personal Income  
Creamer, 1956
- 19, 20. Manufacturing and Trade Sales; Retail Sales  
Burns, 1952; Clark, 1934; Friedman, 1957; Mack,  
1956

#### LAGGING INDICATORS

21. Unemployment Rate, 15 weeks and over  
Moore, 1973; Moore and Shiskin, 1967, 1967;  
O'Dea, 1975
22. Plant and Equipment Expenditures  
Hastay, 1954; Zarnowitz, 1961, 1973
23. Manufacturing and Trade Inventories  
Abramovitz, 1950; Mack, 1967; Stanback, 1962
24. Unit Labor Cost, Manufacturing  
Fabricant, 1959; Hultgren, 1965; Moore, 1961  
(Chapter 16), 1962, 1975
25. Commercial and Industrial Loans Outstanding  
Moore, 1969; Moore and Shiskin, 1967
26. Bank Rates on Short-Term Business Loans  
Cagan, 1966, 1969; Conard, 1966

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## Current NBER Working Papers

The following list includes all working papers issued since November 1977. For earlier issues, see NBER Reporter, December 1977, p. 13.

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- #210 (W), William M. Landes, "An Economic Study of U.S. Aircraft Hijacking, 1960-1976" (November 1977)
- #211 (W), Victor R. Fuchs, "The Service Industries and U.S. Economic Growth since World War II" (November 1977)
- #212 (C), Martin S. Feldstein and Anthony Pellechio, "Social Security Wealth: The Impact of Alternative Inflation Adjustments" (November 1977)
- #213 (N), Linda N. Edwards and Michael Grossman, "The Relationship between Children's Health and Intellectual Development" (November 1977)
- #214 (W), J. S. Flemming, "Aspects of Optimal Unemployment Insurance: Search, Leisure, and Capital Market Imperfections" (November 1977)
- #215 (W), Jerry R. Green, "Mitigating Demographic Risk through Social Insurance" (November 1977)
- #216 (W), John B. Shoven, "An Evaluation of the Role of Factor Markets and Intensities in the Social Security Crisis: A Progress Report" (November 1977)
- #217 (W), William M. Landes and Richard A. Posner, "Altruism in Law and Economics" (November 1977)
- #218 (C), Zvi Bodie and Benjamin M. Friedman, "Heterogeneous-Expectations Model of the Value of Bonds Bearing Call Options" (December 1977)
- #219 (N), Dov Chernichovsky and Douglas Coate, "The Choice of Diet for Young Children and Its Relation to Children's Growth" (December 1977)
- #220 (W), B. Peter Pashigian, "Occupational Licensing and the Interstate Mobility of Professionals" (December 1977)
- #221 (W), Michael J. Boskin and Lawrence J. Lau, "Taxation and Aggregate Factor Supply: Preliminary Estimates" (December 1977)
- #222 (W), J. Huston McCulloch, "The Cumulative Unanticipated Change in Interest Rates: Evidence on the Misintermediation Hypothesis" (December 1977)
- #223 (C), Martin S. Feldstein, "The Private and Social Costs of Unemployment" (January 1978)
- #224 (C), James L. Medoff, "The Earnings Function: A Glimpse Inside the Black Box" (January 1978)
- #225 (C), Richard B. Freeman, "Job Satisfaction as an Economic Variable" (January 1978)
- #226 (W), Robert E. Hall, "Fluctuation in Equilibrium Unemployment" (January 1978)
- #227 (W), William M. Landes and Richard A. Posner, "Salvors, Founders, Good Samaritans and Other Rescuers: An Economic Study of Law and Altruism" (January 1978)
- #228 (W), Michael D. Hurd, "Estimating the Family Labor Supply Functions Derived from the Stone-Geary Utility Function" (January 1978)
- #229 (N), Victor Zarnowitz, "On the Accuracy and Properties of Recent Macroeconomic Forecasts" (January 1978)
- #230 (W), Edward P. Lazear and Robert T. Michael, "Family Size and the Distribution of Per Capita Income" (January 1978)
- #231 (C), Benjamin M. Friedman, "Who Puts the Infla-

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- tion Premium into Nominal Interest Rates?" (February 1978)
- #232 (C), Martin S. Feldstein and Lawrence Summers, "Inflation, Tax Rules, and the Long-Term Interest Rate" (February 1978)
- #233 (W), George J. Borjas, "Job Mobility and Earnings over the Life Cycle" (February 1978)
- #234 (C), Martin Feldstein and Joel Slemrod, "Inflation and the Excess Taxation of Capital Gains on Corporate Stock" (February 1978)
- #235 (C), Benjamin M. Friedman, "Price Inflation, Portfolio Choice, and Nominal Interest Rates" (January 1978, Rev.)

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### Working Paper 210: An Economic Study of U.S. Aircraft Hijacking, 1960-1976

William M. Landes

This study attempts to explain the general pattern of aircraft hijacking in the U.S. between 1961 and 1976, the reasons for the dramatic reduction in hijackings after 1972, and the costs and benefits of the regulation instituted in 1973 that required mandatory preboarding searches of all passengers and carry-on luggage.

The main findings of the paper can be summarized as follows: (1) Increases in the probability of apprehension, the conditional probability of incarceration, and the sentence are associated with significant reductions in aircraft hijackings in the 1961 to 1976 time period. These findings are based on two methods of estimating the rate of hijackings, a quarterly time series and the time or flight intervals between successive hijackings, and alternative estimates of the deterrence variables. (2) Regression estimates from the sample period ending in 1972 were used to forecast the number of additional hijackings that would have taken place between 1973 and 1976 if (a) mandatory screening had not been instituted and (b) the probability of apprehension (once the hijacking was attempted) had remained constant and equal to its 1972 value. Under these assumptions, there would have been between 41 and 67 additional hijackings compared to the 11 that actually occurred in the 1973 to 1976 period. (3) Although the mandatory screening program is highly effective in terms of the number of hijackings prevented, its costs appear enormous. The estimated net increase in security costs due to the screening program

(which does not include the time and inconvenience costs to persons searched) is \$194.24 million over the 1973 to 1976 period. This, in turn, translates into a \$3.24 to \$9.25 million expenditure to deter a single hijacking. Put differently, if the dollar equivalent of the loss to an individual hijacked passenger were in the range of \$76,718 to \$219,221, then the costs of screening would just offset the expected hijacking losses.

### Working Paper 211: The Service Industries and U.S. Economic Growth since World War II

Victor R. Fuchs

During the past 15 years employment and current dollar gross product continued to shift to the service sector at about the same rate as in the early post-World War II period, while the service sector's share of gross product in constant dollars remained relatively constant. Productivity (as measured in the National Income Accounts) continued to grow less rapidly than in industry or agriculture. The rate of growth of output per worker for the total economy was almost one percent per annum less than in 1948-65, but the shift to the service sector contributed less than 0.1 percent per annum to the decrease in productivity growth. Real GDP grew almost as rapidly as in 1948-65, while employment growth accelerated due to a sharp increase in the population of working age.

The expansion of service employment contributed substantially to the growth of female employment throughout the post-World War II period, but the increase in female labor force participation was not a significant factor in either the acceleration of employment or the slowdown of productivity growth in 1961-76. The growth of the service sector also contributed to the growth of government employment. Apart from changes in industry mix, the expansion of government employment has been quite modest. Population projections to the end of this century indicate the likelihood of a marked decrease in the rate of growth of employment (and output per capita) 1990-2000 because of slow growth of working age population and the end of the transition to high female labor force participation.

### Working Paper 212: Social Security Wealth: The Impact of Alternative Inflation Adjustments

Martin Feldstein and Anthony Pellechio

In this paper we use an important new body of data to estimate the "social security wealth" of a representative sample of 38,000 households. Our analysis emphasizes five salient results:

(1) Social security wealth is very large. At the end of fiscal year 1978, the social security wealth of the population over age 25 will exceed \$3.4 trillion.

(2) Social security wealth is distributed very equally. Households with incomes over \$25,000 account for only 10 percent of social security wealth but more than 50 percent of ordinary fungible wealth. The distribution of total wealth, including social security wealth, is therefore very much less concentrated than the distribution of ordinary wealth.

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(3) Net social security wealth, i.e., net of future social security taxes, will be \$2.0 trillion by the end of fiscal year 1978. This represents the transfer to persons now over 25 that will be made by those who are younger or not yet born. This implicit claim on future transfers provides strong political support for social security.

(4) The net social security wealth of individuals aged 25 to 34 is negative: the present value of the taxes that they will pay exceeds the present value of the benefits for which they will be eligible. The fraction of the population with negative net social security wealth will grow with time, reducing the political support for high social security taxes.

(5) A comparison of the net social security wealth under price indexing and wage indexing shows that wage indexing promises current workers a greater net transfer from future generations. This may explain its political support.

### **Working Paper 213: The Relationship between Children's Health and Intellectual Development**

*Linda N. Edwards and Michael Grossman*

The main purpose of this paper is to attempt to answer the important question of whether poor health retards the cognitive development of children. In a multivariate context we examine the relationships between the health and cognitive development of children from six to eleven years of age in Cycle II of the U.S. Health Examination Survey. To our knowledge, we present the first set of such estimates for a representative sample of noninstitutionalized white children in the United States. We compare them with existing findings for underdeveloped countries, Great Britain, and low income families in the United States. We find that with family background and home environmental variables held constant, many health measures have significant effects on IQ and school achievement. In addition, either taken as a single set or in two separate subsets (the health variables measured in infancy and those measured currently), the health variables make a statistically significant contribution to the explanation of variations in school achievement, even when IQ is held constant. With regard to the effects of specific variables, birth weight, breast-feeding, nutritional status as reflected by height and by the number of decayed permanent and primary teeth, and poor hearing stand out as important correlates of IQ and achievement.

### **Working Paper 214: Aspects of Optimal Unemployment Insurance: Search, Leisure, and Capital Market Imperfections**

*J. S. Flemming*

Unemployment insurance is analyzed in the optimal taxation framework. Benefits discourage search and thus raise unemployment. A perfect capital market model is developed and solved explicitly for a constant absolute risk aversion utility function. For realistic parameter values low replacement rates (less than 25 percent) are optimal. If there is no lending or borrowing the optimal rates rise to about 75 percent. Alternative models also admit leisure as a good and the input to search; this

reduces optimal replacement when the capital market is perfect. When it is nonexistent the optimal benefits depend on the value of leisure — rising as it falls. Alternatives to constant benefits conditional on continued unemployment are discussed.

### **Working Paper 215: Mitigating Demographic Risk through Social Insurance**

*Jerry R. Green*

A two-period lifetime overlapping-generations growth model is used to evaluate the possibility that social insurance can effectively offset economic risks associated with uncertainty about the rate of population growth. Crude measures of the seriousness of this type of risk in the current United States situation are presented. Sufficient conditions on the structure of the economy for such intergenerational risk pooling to be mutually beneficial to all members of society are derived. Although it is logically possible to satisfy them, we argue that they are unlikely to be realized empirically in an economy similar to that of the United States. Because of this failure, some more complex types of policy options are also discussed.

### **Working Paper 216: An Evaluation of the Role of Factor Markets and Intensities in the Social Security Crisis: A Progress Report**

*John B. Shoven*

This paper begins to evaluate some of the complicated sets of economic adjustments which are going to occur as the uneven population age structure of the United States matures. It argues that in the 2012-2035 "crunch" years for the social security system, workers will not only be scarce relative to retirees, but they will also be scarce relative to capital. This fact will tend to raise the wage-rentals ratio and partially alleviate the problems of a retirement plan supported by taxes on labor income. On the other hand, during this period the large number of elderly persons will be attempting to dis-save by selling their assets to the relatively few younger, accumulating families. Such an imbalance will be equilibrated only by depressed asset prices. The conclusion, thus, is that the problems of the social security system may be partially alleviated by factor price adjustments, while privately funded pension plans will have a problem of their own, namely lower than anticipated liquidation values.

### **Working Paper 217: Altruism in Law and Economics**

*William M. Landes and Richard A. Posner*

A classic example of external benefits is the rescue of the person or property of strangers in high transaction cost settings. To illustrate, A sees a flowerpot about to fall on B's (a stranger's) head; if he shouts, B will be saved. A thus has in his power to confer a considerable benefit on B. The standard economic reaction to a situation in which there are substantial potential external benefits and high transaction costs is to propose legal

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intervention. In the example given, this would mean either giving A a right to a reward or punishing A if he fails to save B. Either method, we show, is costly and may result in misallocative effects. These objections to using the law to internalize the external benefits of rescue would be much less imposing were it not for altruism, a factor ignored in most discussion of externalities. Altruism may be an inexpensive substitute for costly legal methods of internalizing external benefits, though this depends on the degree of altruism, the costs of rescue, and the benefits to the rescuer. Although the general legal rule is not to reward the rescuer (nor to impose liability), the law recognizes the fragility of altruism and entitles the rescuer to a reward in certain instances. These include rewards to professional rescuers on land (normally a physician) and to rescuers at sea. In both instances the costs of rescue are likely to be sufficiently high to discourage rescue unless the rescuer anticipates compensation.

**Working Paper 218:  
A Heterogeneous-Expectations Model  
of the Value of Bonds Bearing Call Options**

*Zvi Bodie and Benjamin M. Friedman*

This paper develops a dynamic programming model of the optimal refunding strategy and the corresponding value of a callable bond. The model differs from previous work on this subject primarily in explicitly admitting the possibility of differences between the issuer's expectations of future interest rates and an investor's corresponding expectations. This generalization facilitates the application of the model to determine what a specific bond (issued, for example, by a particular corporation) is worth to any given investor. Additional analytical features that differ from corresponding aspects of some previous models include the use of a stochastic discounting rate and the use of continuous distributions to characterize the relevant interest rate expectations.

For the bond issuer, his own expectations (together with the bond's coupon and call features) suffice to indicate the critical refunding yield as well as the expected value of the bond in each time period until the bond matures. For an investor, however, the analytical solution of the model and the illustrative numerical examples presented in the paper show that the issuer's expectations and the investor's own both matter if the two differ.

**Working Paper 219:  
The Choice of Diet for Young Children  
and Its Relation to Children's Growth**

*Dov Chernichovsky and Douglas Coate*

In this paper we analyze the choice of diet for young children in low income families in the United States and its relation to the children's growth. Our most important finding is that the education and income levels in low income households are generally sufficient for the provision of adequate diets for children in the household. This conclusion is based on empirical results which show that (1) low income parents have pushed the growth of their children through choice of diet nearly as much as possible, and (2) mother's education and family income are insignificant determinants of the nutrient intakes of children in low income households.

**Working Paper 220:  
Occupational Licensing and the  
Interstate Mobility of Professionals**

*B. Peter Pashigian*

This paper attempts to measure the effect of occupational licensing, restrictions on reciprocity, location-specific investment in reputation, and earnings on the interstate mobility of professionals. While 34 professional occupations are analyzed, special attention is focused on the legal profession. The comparatively low interstate mobility rate of lawyers may be due to state licensing and restrictions on reciprocity, or to the investments made by lawyers to develop local reputations, or to the investments made by lawyers in state-specific law. Tests are conducted to distinguish among these three hypotheses.

**Working Paper 221:  
Taxation and Aggregate Factor  
Supply: Preliminary Estimates**

*Michael J. Boskin and Lawrence J. Lau*

This paper extends the analysis of aggregate factor supply to a model which accounts simultaneously for the consumption/saving and labor/leisure choices. A translog utility maximization model is used to derive the set of consumption and leisure demand equations; these in turn are estimated on U.S. aggregate time series data. The empirical results are striking: we estimate (quite precisely) substantial own and cross price elasticities for current and future consumption and labor supply. The implied interest elasticity of saving is approximately 0.4. The results suggest that previous studies of labor supply and/or consumption which have ignored cross-price effects are misspecified. We also strongly reject the hypothesis that implicit social security had no effect on factor supply.

**Working Paper 222:  
The Cumulative Unanticipated Change  
in Interest Rates: Evidence on the  
Misintermediation Hypothesis**

*J. Huston McCulloch*

The term structure of interest rates is carefully analyzed over the period 1947-77 in order to construct a monthly series on cumulative unanticipated changes in long-term interest rates. This series is a sort of synthetic interest rate, changes in which over several months or years represent entirely unanticipated changes in interest rates. The behavior of this series is examined over recognized business fluctuations, and it is found to be actually more reliably pro-cyclic than the raw long-term interest rate, in spite of Kessel's finding that the market tends to correctly predict the direction of change of interest rates over phases. That the series is pro-cyclic supports the hypothesis we have put forward in another paper, that business fluctuations may be caused by "misintermediation," by which we mean the traditional mismatching of asset and liability maturities on the part of financial intermediaries.

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**Working Paper 223:  
The Private and Social Costs  
of Unemployment**

*Martin S. Feldstein*

This short note emphasizes and illustrates two basic points:

1. The private costs of unemployment, i.e., the costs borne by the unemployed themselves, vary substantially and are often extremely low. This low private cost is an important cause of the permanently high unemployment rate in the United States.

2. The social costs of unemployment, i.e., the costs of unemployment to the nation as a whole regardless of how they are distributed, must be judged by considering the specific policy by which a worker would be reemployed. It is wrong to regard unemployment as either without cost (because the unemployed enjoy the opportunity for job search and leisure) or as having a cost equal to lost output. Examples are given to show that output may overstate or understate true social cost, depending on the options available for reemployment.

**Working Paper No. 224:  
The Earnings Function:  
A Glimpse inside the Black Box**

*James L. Medoff*

This paper studies the wage determination process for a group of managerial employees in a major U.S. airline. As would be expected, those with greater-than-average schooling, pre-company labor market experience, and company service receive greater-than-average earnings. The analysis also addresses the question of whether or not the managers within a grade level who are paid more receive higher performance ratings by their supervisors. The answer is "no" in the case of those with more pre-company labor market experience (i.e., those who are older) and with more company service. This suggests that the salaries received by managers within a grade reflect their age and tenure with the company more than their present performance.

**Working Paper No. 225:  
Job Satisfaction as an  
Economic Variable**

*Richard B. Freeman*

This paper shows that the level of "job satisfaction" reported by workers provides useful information for predicting and understanding their behavior. The empirical analysis finds job satisfaction a major determinant of labor market mobility. There are a number of puzzling relationships with other economic variables, particularly a finding that union members report lower levels of job satisfaction than similar workers who are not union members.

**Working Paper 226:  
Fluctuations in  
Equilibrium Unemployment**

*Robert E. Hall*

Most recent thought about unemployment views the unemployment rate as fluctuating around a constant equilibrium or natural rate. Unemployment rises above the equilibrium rate when demand is unexpectedly low and falls below it when it is unexpectedly high. The inspiration for this paper is a body of evidence that points, rather, in the direction of a larger role for fluctuations in equilibrium unemployment than is generally recognized.

The theory of why people become unemployed in the first place is not well developed and is the main concern of this paper. Most of the unemployed are looking for new work because their previous jobs ran out. Consequently, the main ingredient of a theory of the flow of workers into unemployment is a theory of the duration of employment. Such a theory is developed here, along reasonably standard lines.

The paper unites this theory of the flow into unemployment with a simple model of unemployment. The resulting model of the labor market does indeed have an equilibrium unemployment rate, but that equilibrium is indeterminate. The market may be in equilibrium with slack conditions and high unemployment or tight conditions and low unemployment. The believer in permanent disequilibrium and permanent unexploited opportunities for profit will not be convinced by this paper that there are any mysteries about unemployment. Rather, the paper does offer a possible alternative explanation of the facts that rests on economic equilibrium and invokes no failure of the principle that individuals follow their own self interests.

**Working Paper 227:  
Saviors, Finders, Good Samaritans, and  
Other Rescuers: An Economic Study  
of Law and Altruism**

*William M. Landes and Richard A. Posner*

This paper uses economic analysis to illuminate a variety of legal rules relating to rescue, a term we use broadly to describe any attempt to save a person or property from some peril. We first develop a model of a competitive market in rescues as a benchmark for judging whether the legal rules of rescue can be viewed as attempts to simulate the operation of a competitive market in rescues. The model explicitly incorporates the possibility of rescues motivated by altruism. We then apply the model to a variety of legal settings in which rescue questions arise.

We show that the well-developed body of rules governing rescue at sea (including the principles governing salvage awards and the rule of general average) are consistent with the economic model of professional (nonaltruistic) rescue and appropriate in the maritime setting. The rules of the common law governing rescues on land (e.g., the physician who treats a passerby in distress) are also

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examined and found to be in the main consistent with our economic model when altruism is taken into account, as are the differences between the maritime and common law rules. We then examine the choice between compensation and liability as methods of inducing rescue, and show that the common law's decision not to impose liability for failure to rescue (the "Good Samaritan" rule) may be consistent with efficiency because of the "tax" effects of such liability. We conclude that the array of legal rules and doctrines examined provides support for the hypothesis that the common law (including traditional maritime law) has been heavily influenced by a concern with achieving efficient allocation of resources.

**Working Paper 228:  
Estimating the Family Labor  
Supply Functions Derived  
from the Stone-Geary Utility Function**

*Michael D. Hurd*

The Stone-Geary utility function defined over an index of goods, the leisure of the husband, and the leisure of the wife is used to derive the earnings functions of the husband and the wife. The parameters of the utility function are estimated from the parameters of the earnings functions in a way that accounts for a number of theoretical and statistical problems. The effect of family composition on utility is estimated by specifying and estimating adult equivalents in consumption and leisure of various categories of children. On the statistical side the following difficulties are all considered: nonlinear constraints across equations, endogenous marginal income tax rates, variations in tastes in the population, heteroscedasticity, and truncation of the left-hand variable. The data come from the 1967 Survey of Economic Opportunity. The results are generally good and support the view that the effects of family composition on utility can be estimated from behavioral relationships. Alternative results that ignore the complicated statistical problems are presented; they imply that the statistical problems are empirically important and should not be ignored.

**Working Paper 229:  
On the Accuracy and Properties of  
Recent Macroeconomic Forecasts**

*Victor Zarnowitz*

The aim of this study is to contribute to the measurement and analysis of errors in economists' predictions of changes in aggregate income, output, and the price level. Small sample studies of forecasts can be instructive, but their limitations must be recognized. Compilation of consistent forecast records extending over longer periods of time is necessary to establish a reasonably reliable base for assessments of forecasting behavior and performance. Thus, the historical record of post-World War II forecasts assembled in the 1960s by the NBER is here extended and updated.

The end-of-year predictions of annual percentage changes in GNP earn good marks for overall accuracy when judged according to realistic rather than ideal standards. Moreover, they are found to have improved significantly in the period since the early 1960s compared with the previous years after World War II.

The corresponding predictions for GNP in constant dollars (real growth) and the GNP implicit price index (inflation) are considerably poorer. The former suffer from large turning point errors, the latter from large underestimation errors. Indeed, forecasts of inflation are not much better than projections of the most recently observed inflation rates, and they lag behind the actual rates much like such projections. But the errors in forecasts of real growth are negatively correlated with the errors in forecasts of inflation, which helped to make the nominal GNP predictions more accurate.

Forecasts for the year as a whole can be satisfactory when based on a good record for the first two quarters; they tend to be more accurate than forecasts with longer spans. An examination of the recent multiperiod predictions from well-known econometric models and business outlook surveys shows that the errors for real growth and inflation cumulated rapidly beyond the spans of 2 to 4 quarters. Previous studies have shown the cumulation to be as a rule less than proportional to the increase in the span, but in the period of recession and recovery 1973-75 the build-up of errors was much greater. Again the nominal GNP forecasts benefited from offsetting errors as the rise in prices was heavily underestimated and the downturn in real activity was missed. Forecasters were generally unprepared for the concurrence of accelerating inflation and slowing, then declining, output rates: they optimistically (and probably also from a lingering faith in a simple Phillips trade-off) kept anticipating less inflation and more growth.

At the present time, the predictive value of detailed multiperiod forecasts reaching out further than a few quarters ahead must be rather heavily discounted. No doubt, in periods less turbulent than the recent past the longer forecasts can be considerably more accurate, but this fair-weather argument is not very persuasive or helpful.

**Working Paper 230:  
Family Size and the Distribution  
of Per Capita Income**

*Edward T. Lazear and Robert T. Michael*

This paper addresses the question of how to make comparisons of per capita income among families of different sizes. We hypothesize that the transformation of money income into utility-producing service flows differs by family size. For 8000 families from the nationwide BLS consumer expenditure survey we estimate expenditure patterns based on the behavior of single persons and compare these with observed family expenditures. Using previously estimated price and income elasticities and these implied expenditure shifts, we infer the differences in the price of the service flows for families of different sizes. These price differences reflect different rates of transformation of money into service flows and are used



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to construct price indices with which we adjust observed nominal income into its real income equivalent. Comparisons with other equivalence scales are made. Our estimates suggest considerable scale effects among households of sizes one to five.

### **Working Paper 231: Who Puts the Inflation Premium into Nominal Interest Rates?**

*Benjamin M. Friedman*

In order for expectations of price inflation to affect interest rates, they must affect the behavior of borrowers and lenders or both. This paper analyzes the emergence of the inflation premium in long-term interest rates as the explicit result of borrowers' and lenders' behavior in the bond market in response to price expectations. The object of this analysis is not only to estimate the magnitude of the inflation premium due to this portfolio behavior but also to evaluate the respective contributions to it of borrowers' and lenders' responses.

The empirical results presented in this paper indicate that both borrowers' and lenders' portfolio behavior plays an important role in the relationship between interest rates and inflation expectations. Estimation results for U.S. data provide evidence that, all other things being equal, nonfinancial business corporations increase their supply (net issuance) of bonds in response to an increase in expected inflation; these results mirror the bond investors' responses found by the author in a previous paper. Partial equilibrium experiments based on the combined model of bond supply and bond demand indicate that, all other things being equal, the portfolio responses to expected price inflation by borrowers and lenders together increase the bond yield by 2/3 percent, and modestly decrease the net quantity of bonds issued and purchased, in response to a 1 percent increase in expected inflation. This result follows as the consequence of a slightly greater response by lenders than by borrowers.

### **Working Paper 232: Inflation, Tax Rules, and the Long-Term Interest Rate**

*Martin Feldstein and Lawrence Summers*

This paper studies the interaction of taxes and inflation in determining the interest rate on long-term bonds.

The first section presents explicit calculations based on the actual tax and depreciation rules that have existed during the past 25 years. The deduction of interest payments in calculating taxable income implies that firms can afford to increase the interest rate that they pay by more than the rate of inflation. Offsetting this is the use of historic cost depreciation rules which makes the potential interest rate rise by less than the rate of inflation. On balance we find that the potential interest rate rises by approximately the same amount as the rise in inflation.

Our econometric estimates confirm that the nominal long-term interest rate does rise by approximately the rate of inflation. Although our evidence is thus roughly consistent with the traditional conclusion of Irving Fisher, it should be clear that both the mechanism and the

implications are quite different. For the individual lender, the rise in the nominal interest rate is sufficient to keep the *real* return *before tax* unchanged, but implies a very substantial fall in the real return *after tax*. For example, an investor who pays a 50 percent marginal tax rate will find that a real net-of-tax return of 2 percent in the absence of inflation becomes negative when there is a 4 percent rate of inflation.

Our estimates also indicate that corporate tax reductions and liberalized depreciation may have raised the real interest rate by about 50 basis points over the past two decades. Since this represents only about one fourth of the potential increase implied by the changing tax rules, our evidence implies that the changes designed to stimulate corporate investment were not offset by induced increases in the interest rate.

### **Working Paper 233: Job Mobility and Earnings over the Life Cycle**

*George G. Borjas*

The paper analyzes the effects of job mobility on earnings both at young and at older ages. The model takes into account the discontinuity of earnings across jobs, the decline of human capital investment within the job and over the life cycle, and the effects of mobility on the slope of the earnings profile. Careful attention to the functional form of the earnings equation indicates why the coefficient of the current segment is usually larger than the coefficient of the previous segments. Findings from the NLS data include:

1. Mobile individuals at all ages invest significantly less in on-the-job training.
2. Although job mobility is associated with significant wage gains (across jobs), there is a substantial wage differential between the mobile and the nonmobile at older ages.
3. The explanatory power of the earnings equation is significantly increased by accounting for the effects of job mobility; job mobility is an important determinant of the wage structure.

### **Working Paper 234: Inflation and the Excess Taxation of Capital Gains on Corporate Stock**

*Martin Feldstein and Joel Slemrod*

The present study shows that in 1973 individuals paid nearly \$500 million of extra tax on corporate stock capital gains because of the distorting effect of inflation. A detailed analysis shows that the distortion was greatest for middle income sellers of corporate stock.

In 1973, individuals paid capital gains tax on more than \$4.5 billion of nominal capital gains on corporate stock. If the costs of these shares are adjusted for the increases in the consumer price level since they were purchased, the \$4.5 billion nominal gain becomes a real capital loss of nearly \$1 billion. As a result of this incorrect measurement of capital gains, individuals with similar real capital gains were subject to very different total tax liabilities.

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These findings are based on a new body of official tax return data on individual sales of corporate stock.

**Working Paper No. 235:  
Price Inflation, Portfolio Choice,  
and Nominal Interest Rates**

*Benjamin M. Friedman*

Among the different kinds of economic behavior which may account for the familiar Fisherian relationship between nominal interest rates and expected price inflation, portfolio behavior is the most plausibly flexible in the short run. Since substitution into real assets is not a practical portfolio alternative for many investors, however, it is not obvious a priori how important lenders' portfolio behavior can be in bringing about the adjustment of interest rates which Fisher's theory associates with expected inflation. Given the importance of this adjustment for questions of both monetary theory and monetary policy, the underlying economic behavior merits explicit investigation.

The empirical results presented in this paper provide evidence that lenders' portfolio behavior does play an important role in the expected-price-inflation/nominal-interest-rate relationship. First, results indicate that five of the six major categories of investors in the U.S. long-term bond market reduce their demands for bonds in response to an increase in expected inflation. Secondly, the results of multi-equation partial-equilibrium experiments indicate that, with all other things unchanged, this response by investors will raise the equilibrium nominal bond yield by about 2/3 percent in response to a 1 percent increase in expected inflation.

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**ASA-NBER Business  
Outlook Survey,  
February 1978**

*This report summarizes a quarterly survey of predictions by about fifty business, academic, and government economists who are professionally engaged in forecasting and are members of the Business and Economic Statistics section of the American Statistical Association. Charlotte Boschan of the NBER and Victor Zarnowitz of the Graduate School of Business of the University of Chicago and NBER are responsible for tabulating and evaluating these surveys.*

Total output of the economy (real GNP) will increase from \$1,338 billion in 1977 to \$1,395 billion in 1978, using dollars of 1972 purchasing

power. The price level (GNP implicit price deflator, 1972 = 100) will increase from 141.3 in 1977 to 149.7 in 1978. Thus, output will grow 4.3% and the rate of inflation will be 5.9% in 1978, according to the median forecasts. These annual rates of real growth and inflation are the same as those obtained in the previous survey released in December 1977. The estimates for the last quarter of 1977 which were published in the meantime generally confirmed the preceding survey predictions, but the bad weather and disappointing news early this year could have caused the forecasters to lower their expectations, and it is interesting to note that they have not done so.

This survey was conducted during the two weeks ending on February 10, 1978. Probably because of the bad weather, only 26 members participated (the usual number is 40-50).

**Inflation, Growth, and Unemployment in  
the Year Ahead**

The median predictions for the year ahead from the current quarter, that is, for the period Q1 1978-Q1 1979, spell rises of 10.3% for GNP in current dollars, 6% for the implicit price deflator, and 3.9% for GNP in constant dollars. The projected quarter-to-quarter changes in GNP decline slightly (from 2.7% per quarter in Q2 1978 to 2.4% in Q1 1979), but there are no clear patterns of either speedup or slowdown in the underlying forecasts of inflation and real growth.

The industrial production index (1967 = 100) is expected to rise 5% both between 1987 and '98 and between Q1 1977 and Q1 1978.

The rate of unemployment will be 6.3% of the labor force in the year 1978 as a whole, which means that a significant improvement is foreseen relative to the 7% average rate for 1977. Much of that gain, however, lies already in the past: unemployment in Q1 1979 will be 6.1% according to the median survey forecast, only 0.3 percentage points down from the estimated rate for the current (Q1 1978) quarter.

**Corporate Profits and Business  
Investment**

Profits after taxes in the corporate sector will rise 9.2% between 1977 and 1978, 7.8% between Q1 1978 and Q1 1979. These figures imply that the forecasters continue to see profits as growing more slowly than in the recent past and more slowly than aggregate income as measured by GNP.

Business expenditures on plant and equipment are expected to rise 10.7% in 1978, the same as nominal GNP. The gains in successive quarters will

### Projections of GNP and Other Economic Indicators, 1978-79

	Annual					Quarterly							
	1976 Actual	1977	1978 Forecast	Percent Change		1977 Q4 Actual	1978				1979 Q1	Percent Change	
				1976 to 1977 Actual	1977 to 1978 Forecast		Q1	Q2	Q3 Forecast	Q4		Q4 77 to Q4 78	Q1 78 to Q1 79
1. Gross national product (\$ bil.)	1706.4	1890.4	2092	10.8	10.7	1965.1	2013	2067	2118	2169	2220	10.4	10.3
2. GNP implicit price deflator (1972 = 100)	133.9	141.3	149.7	5.5	5.9	144.3	146.5	148.5	150.6	153.1	155.3	6.1	6.0
3. GNP in constant dollars (bil. 1972\$)	1274.6	1337.6	1395	4.9	4.3	1361.4	1375	1389	1403	1414	1428	3.9	3.9
4. Unemployment rate (percent)	7.7	7.0	6.3	-0.7 <sup>a</sup>	-0.7 <sup>a</sup>	6.8	6.4	6.3	6.3	6.2	6.1	-0.6 <sup>a</sup>	-0.3 <sup>a</sup>
5. Corporate profits after taxes (\$ bil.)	92.1	102.7	112.1	11.5	9.2	105.8 <sup>b</sup>	108.9	110.9	112.0	116.5	117.4	10.1	7.8
6. Plant and equipment expenditures (\$ bil.)	120.2	137.0	151.6	14.0	10.7	142.4 <sup>c</sup>	146.0	149.8	153.6	157.0	160.0	10.3	9.6
7. New private housing started (ann. rate mil.)	1.54	1.99	1.95	29.2	-2.0	2.21	2.08	2.00	1.90	1.82	1.80	-17.6	-13.5
8. Change in bus. inventories GNP accounts (\$ bil.)	13.4	17.8	17.2	4.4 <sup>d</sup>	-0.6 <sup>d</sup>	11.9	15.5	19.0	17.4	17.1	17.7	5.2 <sup>d</sup>	2.2 <sup>d</sup>

SOURCE: American Statistical Association and National Bureau of Economic Research, Business Outlook Survey, February 1978. The figures on each line are medians of 34 to 38 individual forecasts.

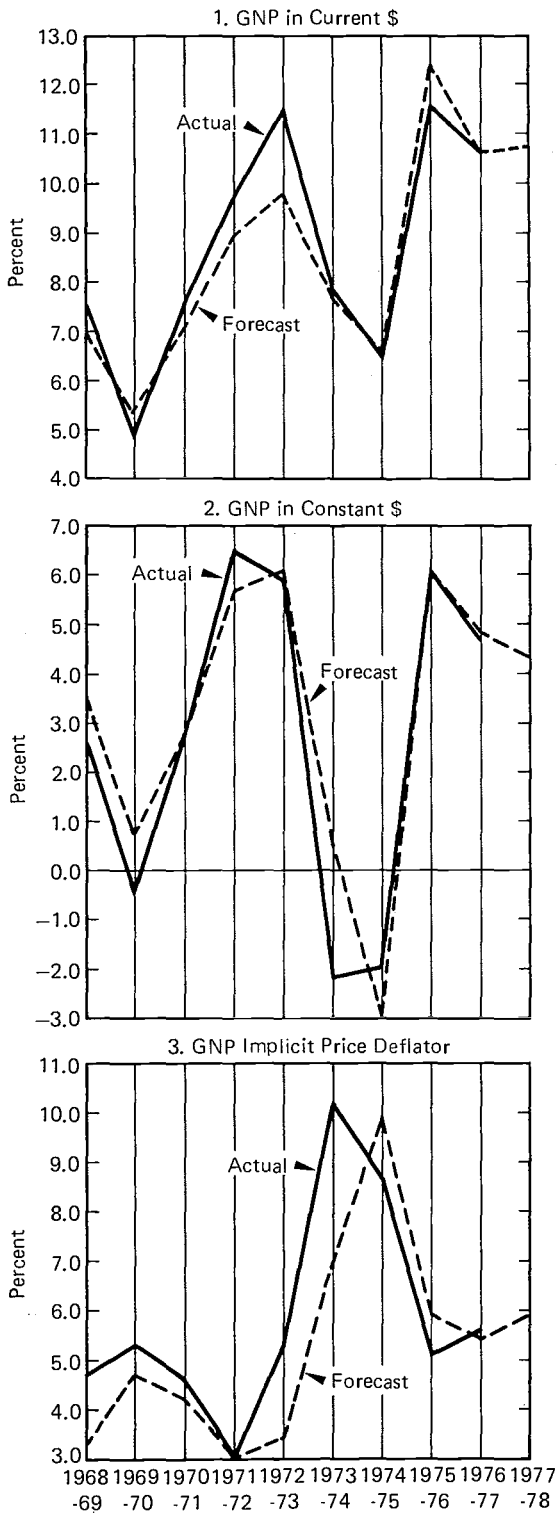
<sup>a</sup> Change in rate, in percentage points.

<sup>b</sup> Actual not available. Based on average forecast.

<sup>c</sup> Actual not available. Based on BEA survey of anticipations.

<sup>d</sup> Change in billions of dollars.

Actual and Forecast Year-to-Year Change in GNP,  
ASA-NBER Survey, 1968-78



steadily decrease, however, from 2.6% in Q2 1978 to 1.9% in Q1 1979 (measured at quarterly rates). In the year ahead, Q1 1978-Q1 1979, business capital outlays will increase by 9.6%.

Allowing for inflation, then, these forecasts suggest only modest gains in real terms for business profits and investment in fixed capital.

Investment in business inventories is expected to rise moderately in this quarter and the next to annual rates of about \$16 billion and \$19 billion, respectively, then to stay near the level of \$17 billion during each of the three following quarters through Q1 1979.

### Housing Starts and Consumer Expenditures for Durable Goods

For some time now realizations exceeded expectations in the area of residential construction, so that forecasts were revised upward and the anticipated peak in housing starts was shifted forward in time. This still applies to the present survey. The median forecast has starts declining slowly but steadily from 2.2 million units in Q4 1977 to 2.1 million in the current quarter and 1.8 million a year hence.

Consumer expenditures for durable goods are projected to rise nearly 8% between 1977 and 1978, and 7.6% between Q1 1977 and Q1 1978. They continue to be seen as a relatively weakening component of GNP.

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