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report



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THE ENERGY CRISIS AND NEW REALITIES

The pressing economic problems of the day—inflation, unemployment, the threat of further energy shortages—seem, for the moment, to have again overshadowed concern about environmental deterioration. It was, in fact, little more than a decade ago that a significant number of people began to recognize that waterways were becoming choked with debris and that air pollution was a potential health hazard. From this increased public awareness environmentalists began to derive substantial support for their programs. Last year, however, the energy crisis raised anew many questions about the worth of these efforts. As the National Bureau's President, John R. Meyer, notes in the organization's fifty-fourth *Annual Report* (1974), ". . . the energy crisis . . . focused public attention on environmental issues and led to a serious reevaluation of certain recent public policies in this area. Specifically, the energy crisis moved the discussion of environmental issues into a more sophisticated and mature phase in which previously neglected economic questions, such as what are the benefits and costs of these environmental programs, became acutely sensitive and important."

Meyer's testimony before the Subcommittee on International Economics of the Joint Economic Committee of the Ninety-Third Congress, in mid-December 1973 (which appears as the Supplement to this issue of the *National Bureau Report*), is, in part, illustrative of the new realism that he believes the energy crisis has brought to bear on environmental problems. In the transportation industry, which Meyer focuses on in particular, the petroleum shortage will, he expects, influence some long overdue policy and life-style adjustments.

Several of the developments in the National Bureau's program which were undertaken in response to newly emerging environmental issues are outlined below. Apart from studies under the direction of John R. Meyer, administrative responsibility for initiatives in this area have been

The Energy  
Crisis and  
Environmental  
Concerns

assumed by Robert E. Lipsey and Edward K. Smith, vice president of the organization.

## ENERGY AND THE ENVIRONMENT— AN ECONOMIC APPROACH

National Bureau economists have recently begun to mount large-scale efforts directed specifically at examining issues associated with energy use, conservation, and environmental matters. Their approach to these issues builds upon and reflects the methods they have developed, refined, and applied to investigate problems more usually considered within their domain. Moreover, established National Bureau programs in such areas as urban and regional studies, measurement of economic and social performance, and human behavior and social institutions contribute, among other things, data, analytic techniques, and findings relevant to society's use and abuse of natural resources.

Applying  
Cost-  
Benefit  
Analysis to  
Resource Use

To evaluate resource use programs so as to determine the level of use at which society benefits most, cost-benefit analysis is used. The term is applied to any analysis in which a decision must be made on whether to invest resources in a project that yields benefits either in the short run or over a number of years in the future. Usually, most of the costs associated with the project are incurred in the present. In principle, the decision-maker could be a firm, a consumer, or the government. For energy use and environmental matters, economists might use cost-benefit analysis to determine the dollars-and-cents cost to society of present and projected levels of resource or environmental deterioration or the costs of alternative methods of halting the deterioration or abating it by various degrees. On the benefits side, the analysis might be used to calculate the savings that would accrue to society if deterioration were halted or reversed.

One recently completed National Bureau project dealing with automobile emission control is representative of the costs and benefits approach. The project, which was undertaken as part of a National Academy of Sciences study (funded by the Senate Committee on Public Works) of the desirability and feasibility of achieving the goals of the Clean Air Act amendments of 1970, was directed by John Meyer and coordinated by Gregory K. Ingram, a National Bureau research associate. (The report submitted by the National Bureau research team, "The Costs and Benefits of Automobile Emission Control," is volume 4 of the NAS September 1974 submission to the Public Works Committee. Copies are available from the U.S. Government Printing Office.)

Are the  
Goals of the  
Clean Air  
Act  
Economically  
Desirable?

What are present levels of air pollution costing the nation annually? How much will it cost to reduce present pollution levels to the standards established by the Clean Air Act? And, are the legislated standards proposed desirable, too stringent, or too lax? These are among the major questions explored by the National Bureau's research team.

From the outset, the team's efforts were hampered by a lack of information. Clean air legislation constitutes an almost classic example of policy outrunning knowledge and research. To determine the costs and benefits of almost any program requires a synthesis of a large amount of different

kinds of information, often physical as well as economic in character. The need for such data is particularly crucial for determining the value of controlling automotive emissions, because the cost-benefit calculations must depend on the available physical information that links the emission of pollutants to air quality and, in turn, air quality to physical, biological, and medical consequences. This type of information is only beginning to be developed. Moreover, when data become available, particularly, for example, on costs of achieving control standards, technological advance and change may rapidly render quantitative conclusions obsolete. Given such data deficiencies, it appeared that much of the exactness usually associated with National Bureau studies would have to be waived in favor of broad-range estimates based on available data and tempered by reasonable assumptions. The need for conducting the research, however, appeared crucial, for in addition to developing some viable guidelines for discussing the monetary magnitude of the Clean Air Act amendments, it was felt that the study would also underscore the questions that still required answers.

Keeping these qualifications in mind, the team found that the present level of auto emission pollution is costing the United States approximately \$5 billion annually as a most reasonable guess or estimate, although the actual cost could be as low as \$2.5 billion or as high as \$10 billion or \$11 billion. These costs were arrived at by estimating the damage that mobile-source air pollution inflicts upon human health, vegetation, and structural materials and adding this estimate to one of wages lost and medical expenses incurred as a result of illnesses related to or compounded by such pollution. It is estimated that while \$12 billion annually might have to be spent in the first two years or so to achieve the 1976 standards of the Clean Air Act amendments, by 1985 the benefits of attaining these standards (i.e., the savings of, say, \$5 billion annually that auto emission pollution is now costing the United States) would be equal to or exceed the expenditures required to achieve the legislated emission levels. It should be noted, however, that the 1976 standard for oxides of nitrogen ( $\text{NO}_x$ ) is 2.0 grams per mile (gpm) and that a further reduction of this particulate to 0.4 gpm has also been legislated. This second goal appears very stringent and not obviously justified by the information now available. There is little evidence to support a reduction of  $\text{NO}_x$  below 2.0 gpm. Moreover, to get the  $\text{NO}_x$  level down to 0.4 gpm could be very expensive. It also appears that the equipment needed to achieve the lower goal might increase the emission of other harmful particulates, the effects of which may prove more detrimental than those of  $\text{NO}_x$ .

The research team also explored the costs of implementing various strategies for meeting the goals of the Clean Air Act. For example, it may be necessary to develop new or different automotive engine technologies such as the stratified charge engine. Engines of older cars may need to be fitted with modifications to limit their emissions. (The cost of reducing the emissions from small cars, however, would be less than for larger ones.) In addition, since it may be decided that emission controls need only be enforced in high-pollution areas, a two-standard strategy may be indicated. This would mean that in high-pollution areas only autos equipped with the

The  
Potential \$  
Benefits  
of Reducing  
Auto Emissions

The Cost of  
Achieving  
Legislated  
Standards

Strategies for  
Meeting the  
Goals of the  
Clean Air  
Act

requisite emission controls could be used; but, in areas where pollution does not present a problem, autos without such controls would be acceptable. Consideration may also be given to traffic-restricting schemes involving surcharges or special licenses for driving in highly congested areas or the metering of access to freeway facilities during peak hours. Strict restrictions on auto speed in urban areas could also be enforced both to reduce gasoline consumption and make mass transit more attractive. Resources could also be employed to encourage greater use of mass transit facilities by extending or creating additional rail and bus systems, lowering transit fares, and increasing the efficiency of existing systems through the use of express or priority routes.

Another approach involves land use. Depending upon which scheme seems most appropriate, land use planners might choose either to implement projects designed to centralize employment and residences so as to increase mass transit use and walking, or decentralize employment and residences so as to reduce peaks in activity and pollution densities.

While this is by no means a complete listing of the options available for reducing automotive emissions, it is illustrative of the tremendous variety of ways by which the goals of Clean Air Act can be achieved. To sort through these possibilities and evaluate the complex trade-offs and interdependencies that are involved, highly sophisticated methods of systems analysis must be utilized. To perform these analyses, computer simulations, basically of a standard urban transportation model linked to an air quality diffusion model, have been generated. One such model, TASSIM (Transportation and Air Shed Simulation Model), has been developed by Gregory Ingram, partly in connection with his work on the study of the evaluation of the benefits and costs of emission controls on mobile sources of air pollution. Although TASSIM has only been applied to the Boston and Los Angeles regions to test some of the options mentioned above, a few conclusions may be drawn from the preliminary results.

The centralization of workplaces and residences seems to increase both peak and overall regional exposure to air pollution. In essence, centralization packs people in with the result that peak pollution rises and simultaneously total population exposure is increased. On the other hand, a 20 per cent decentralization of workplaces from residences would accomplish roughly one-half of the 1976 auto restrictions now sought. Decentralization is, however, rather less effective in reducing peaks or central effects than overall regional exposure. Other suggested possibilities such as metering traffic flows or instituting parking surcharges may actually diminish rather than improve air quality because both schemes would also improve travel times for those going through central areas, thereby increasing the number of through trips and offsetting reductions in pollution per mile. Furthermore, if a surcharge policy does improve air quality in the most central areas, it may do so at the price of deterioration in nearby areas or in overall regional air quality.

Apart from decentralization of workplaces and residences, the most effective ways of curbing automotive emissions according to the results generated by the TASSIM model are by using smaller autos and by increas-

Testing  
the  
Options by  
Computer  
Simulations

ing the number of priority express bus services. The annual cost of applying auto emission controls is cut by approximately \$100 per car by moving from intermediate size to compact or subcompact cars. In broader terms, if the 100 million autos shortly expected in the U.S. fleet are to be equipped with emission controls, \$10 billion annually would be saved by a switch to smaller autos.

An additional economic consideration that affects the desirability of emission standards and is independent of the benefit-cost ratio is the effect of the program on income distribution. While the cost of emission control devices is borne by the car owners, the benefits of the cleaner air they produce are reaped by those who profit from its aesthetic quality or who would have sustained pollution damage if there were no controls. To the extent that the distribution of costs differs from the distribution of benefits, income is redistributed by the program. For example, if federal standards continue to be imposed uniformly across the United States, a car purchaser in a rural area would pay the costs of cleaner air and receive fewer benefits than a city dweller without a car, who would pay nothing. If benefits exceed costs, of course, everyone is potentially better off in the sense that those who sustained the costs could be fully compensated with some benefits left over. If such transfers are not envisioned or considered feasible, however, the distributional impact of the standards remains at issue.

The income ramifications have been explored in some depth by Henry M. Peskin, a National Bureau senior research associate, in "The Distributional Implications of National Air Pollution Damage Estimates," a paper he prepared for the May 15-17, 1974, Conference on Research in Income and Wealth ("The Distribution of Economic Well-Being"). Among other things, Peskin finds that nonwhites experience more air pollution damage than whites. This observation may reflect the unevenness of per capita air pollution damage across regions. While the national average of pollution damage is about \$100 per person per year, it is at least twice as high in such particularly congested and industrialized places as Jersey City (New Jersey), New York City, Erie (Pennsylvania), Detroit, Chicago, and Los Angeles, which contain large inner-city concentrations of housing occupied mainly by nonwhites. Accordingly, if the geographical distribution of damages is as unequal as these results suggest, policymakers may want to concentrate their anti-pollution activities in a similarly uneven manner. In contrast to the findings cited in earlier studies, which were not as geographically broad, Peskin also finds that in per capita terms the rich are more exposed to polluted air than the poor because the rich, too, primarily reside in urban as opposed to rural areas. On this basis, and disregarding equity consideration in determining how much different income groups should pay for a cleanup program, policymakers may conclude that the rich should be willing to bear a proportionately larger tax burden because it is in their own interest.

The belief that air pollution may cause or at least contribute to illness or death has been one of the major motivations underlying public support of clean air legislation. There is, nevertheless, considerable uncertainty as to the magnitude of the health effects of air pollution levels prevailing in major

Who Will  
Pay for  
and Who  
Will Profit  
From  
Cleaner  
Air?

Geographical  
Distribution  
of Air  
Pollution  
Damage

Air  
Pollution  
and  
Health

cities across the United States. Until recently, no study had been undertaken to assess the economic impact or costs of illnesses and deaths that may be traced in whole or in part to air pollution. Since the ultimate objective of policies designed to deal with air pollution problems is to attain ambient levels of pollution for which the corresponding social costs balance social benefits, there appears to be a critical need for the translation of physical effects (e.g., increased pollution-associated illnesses) into economic terms. The results can then be compared to the societal costs associated with more stringent air quality criteria and abatement activities.

Mobile vs.  
Stationary  
Sources  
of Air  
Pollution

Toward this end, Eugene P. Seskin, a National Bureau Research Associate, has undertaken a study entitled "An Analysis of Air Pollution and Its Health Effects in the Washington, D.C., Metropolitan Area." To date little if any attempt has been made to separate the effects of damage from stationary sources of pollution (e.g., industrial plants) and mobile ones. Washington was selected because while most cities suffer more from stationary sources of pollution than from mobile ones, in Washington the reverse is true. Accordingly, it is anticipated that the results generated by this study will be freer of the effects of stationary sources of pollution than would be the case if cities such as New York, Boston, or Chicago had been chosen. The primary objective of this study, which is being funded jointly by the Environmental Protection Agency and the Department of Transportation, is to quantify the economic costs of air pollution due to its debilitating effects on the health of the exposed population. If it is proved that there is a significant association between air pollution in metropolitan Washington and health effects, an investigation of the relationship between specific pollutants and specific health effects will be undertaken. A comparison of the health effects of air pollution in Washington with the health effects of pollution in other metropolitan areas may follow. The economic impact of air pollution on health, including both direct costs (e.g., medical treatment expenditures) and indirect costs (e.g., work days lost), will be assessed. Moreover, if data are available, an analysis of the distributional effects of health-related air pollution damage will be made. It is hoped that if this last analysis can be completed, it will further expand and substantiate the distributional findings generated in the Seskin study described above. Finally, it is hoped that data will be available to permit an analysis of the relationship between commuting behavior and its related health effects. The results should prove important in assessing the potential benefits of anti-pollution policies associated with the automobile and in evaluating the health-related aspects of various transportation strategies.

The  
Impact  
of Water  
Pollution  
Controls  
on Industry

Members of the National Bureau's research staff have also been exploring some of the effects of legislation designed to conserve and promote cleaner water. J. Royce Ginn of the senior research staff, and Robert Leone and An-loh Lin, research associates, recently completed a two-year study supported by the Army Corps of Engineers to determine the impact of rising water costs on industries that use water in their processes—primarily paper, chemical, petroleum, and primary metals industries. It was found that the relative increase in the cost of water, caused by the increasing cost of treating effluent water so as to comply with ever stricter water pollution controls, has prompted firms to economize on the use of water and to place emphasis

on the recirculation of the water they do use. Accordingly, water use per unit of output is declining, largely because rates of recirculation have risen. In the absence of recirculation, however, it was also found that over the period covered by the study, 1954 to 1968, gross water used per unit of output would generally have remained unchanged or increased only slightly.

This last result may have been occasioned by the effect of technical change on water use. For example, industries that use water primarily for processing have often been forced to make fundamental process changes to accommodate increases in water cost. Since water prices in those industries have in some cases risen from around 1 cent per 1,000 gallons to as high as \$1.50 per 1,000 gallons, the need to alter water-use patterns is often a prime investment consideration. Moreover, because most of those higher costs are associated with effluent treatment, the water-use decision in industry is typically viewed as a pollution problem. The same industries, however, often find it economically feasible to treat effluents because of the rising value of recyclable pollutants contained in the effluent. Finally, it is interesting to note that although water-use costs have increased substantially in some cases, no identifiable tendency has been discerned for new plants or plant expansions to be located in areas with abundant or low-cost water. The only consistently discernible pattern involved the rather marked preference for coastal sites or sites along navigable waterways.

Water Use  
Patterns  
Altered by  
Technical  
Change

Although the National Bureau does not engage in research designed to promote specific public policies, it is very likely that many of the findings of the air and water pollution studies just described will be useful to the formulation and evaluation of future legislation in these areas. As was noted toward the outset of this article, legislated standards for clean air and, for that matter, clean water, were often adopted before adequate research had been performed to evaluate the consequences of policy choices. In most instances, however, the time period delineated for compliance is long enough to enable affected groups to develop technology and reassess their processes so that the specified goals can be achieved in an orderly and cost-conscious manner.

To meet the problems generated by the energy crisis of the fall of 1973, however, legislation requiring almost immediate compliance had to be enacted. The direct and indirect effects of numerous alternative energy allocation programs required rapid assessment. For this purpose, the Department of Commerce used IDIOM, a large-scale model created by Stephen P. Dresch and Robert D. Goldberg, research associates with the National Bureau's public finance research program. IDIOM (Income Determination Input-Output Model) was originally developed, chiefly under the aegis of a grant from the Economic Development Administration, to assess the differential effects of alternative changes in federal tax, transfer, and expenditure policies on such factors as output, employment, and capital requirements by industry; employment by occupation; and pollution generation and raw materials requirements. The simulations were carried out at both the national and regional level. IDIOM has also been used in a study (funded in part by the Ford Foundation) for the United Nations to project the domestic economic consequences of various types (strategic versus non-strategic) and degrees of disarmament policies using alternative compen-

IDIOM:  
A Tool for  
Evaluating  
Alternative  
Energy  
Policies



Evaluating  
the Impact  
of a 100%  
Excise Tax on  
Petroleum  
Products

satory plans. The model has proved to be particularly valuable to researchers and policymakers alike because it serves the dual functions of providing a skeletal structure on which a developmental research effort can be based while simultaneously permitting concrete analysis of current policy options.

During the energy crisis, IDIOM was first used to evaluate the impact of a 100 per cent excise tax on petroleum products. The model was run under two assumptions. The first was that there would be no compensating federal policies with the outcome that employment would decline by more than 2 per cent. The second was that per capita federal transfer payments would be introduced to maintain constant total employment at the national level; additional transfers of more than \$10 billion were required. The results of this effort indicated, among other things, that the regional impact on gross domestic product of the proposed excise tax would be concentrated most heavily in Wyoming. As would be expected, of course, Louisiana, Oklahoma, and Texas would also be affected, but the impact on Wyoming would be most severe because in that state the largest percentage of manufacturing payrolls—28 per cent—pertains to the extraction of petroleum and related products. It was also found that while reductions in petroleum consumption would reduce air pollutants, the largest relative pollutant reduction would occur in solid waste, which would fall 4.5 per cent if no compensating federal policies were employed and 1.9 per cent if transfer payments were instituted.

IDIOM  
and  
Project  
Independence

IDIOM was next used to estimate energy needs for Project Independence—the national goal of energy self-sufficiency. Since Project Independence must concentrate on the incremental changes required to attain energy self-sufficiency, estimates of basic or, more accurately, base-line economic requirements in 1980 were first required so that incrementals could then be added and compared to expected capacities. Accordingly, IDIOM was programmed to make a base-line industrial projection for 1980. Among other things, it was found that with no change in productivity from 1970 on, about 130 million employees would be required to satisfy the final-demand structure of 1980. Since the Bureau of Labor Statistics estimates that with 4 per cent unemployment there will be about 102 million employees in 1980, a productivity increase of about 22 per cent (i.e., about 2 per cent per year) from 1970 to 1980 must be realized just to satisfy base-line demands. Furthermore, the indicated increases in employment by occupation in the service industries may result in a shortage of workers skilled in the occupations needed for the project. The required growth in energy-producing and energy-oriented industries may well exceed the expected growth in gross domestic product, implying that difficulties might be encountered in getting even more resources shifted to those sectors. The same patterns arise for capital and raw materials requirements.

The use of IDIOM on energy-related matters has been carried on in close cooperation with the Systems Analysis Group of the Bureau of Competitive Assessment and Business Policy of the U.S. Department of Commerce. The model has become a central component of the group's analytic capabilities in the area of energy policy, especially in its regional and interindustry aspects.

## PROFILES

From the National Bureau's inception, continuous and close collaboration between members of its Board of Directors and staff has shaped the broad lines of its research agenda. Accordingly, the last annual meeting of the National Bureau's Board followed two days of intensive Board and staff meetings at which several phases of current research were reviewed and proposals for new investigations were considered. Panels of staff members presented reports on work under way or anticipated in the following general areas: data analysis and econometrics; financial institutions and inflation; industrial organization, advertising, and marketing; law, population, and health; and international studies. In each case, the panelists responded at length to questions, criticisms, and suggestions raised by directors and staff members.

At this fifty-fourth annual meeting of the Board, which was held at the National Bureau's office in Palo Alto, California, on September 30, 1974, J. Wilson Newman assumed the Board's chairmanship, succeeding Walter W. Heller who had served in this capacity for three years. Moses Abramovitz was elected to succeed Mr. Newman as vice chairman. Directors elected or appointed to their first terms include:

- Andrew F. Brimmer — Director at Large — Harvard University
- Frank L. Fernbach — Director at Large — United Steelworkers of America
- Rudolph A. Oswald — Director at Large — Service Employees International Union
- J. C. La Force — Director by Appointment of the University of California at Los Angeles
- Paul W. McCracken — Director by Appointment of the American Statistical Association

Considerable demands are made on the time and effort of those who serve on the National Bureau's Board. Nevertheless, throughout the organization's history, almost all of its directors have accorded their National Bureau responsibilities high priority. The three directors profiled below exemplify this tradition.



**Moses Abramovitz,**

vice chairman of the National Bureau's Board of Directors, joined the Board in 1968 as a Director by Appointment of Stanford University. This appointment came exactly thirty years after he first came to the National Bureau as a Research Fellow.

After receiving an A.B. from Harvard University in 1932 and a Ph.D. from Columbia University in 1939, Mr. Abramovitz became a staff member of the National Bureau's business cycles program. His initial investigation concerned the behavior of commodity stocks and plant capacity. With the nation's entry into World War II, however, he was enlisted as a part-time consultant to the Office of Price Administration, and in 1945-46 he served as an adviser to the U.S. Delegation to the Allied Commission on Reparations. Consequently, during the war years his research at the National Bureau was significantly impeded. The results of his first NBER investigation, the parameters of which had broadened considerably as the years passed, did not appear, therefore, until May 1948, with the publication of *The Role of Inventories in Business Cycles* (National Bureau Occasional Paper #26). This paper drew upon some of the results subsequently set forth in his monograph, *Inventories and Business Cycles*, a volume published by the National Bureau in 1950.

Mr. Abramovitz remained a member of the National Bureau's research staff until 1969. He left the Bureau's facilities in 1948, however, after serving for two years as director of business cycle studies, to accept an appointment as professor of economics at Stanford University. His distinguished career at Stanford has led to his being named chairman of the department of economics in 1971, and Coe Professor of American Economic History in 1972. His professional colleagues throughout the United States honored him in 1969 by electing him vice president of the American Economic Association. In 1968 he was invited to spend a year at All Souls College in Oxford England as a visiting fellow.

Apart from his academic duties and research pursuits, Professor Abramovitz served as economic adviser to the Secretary General of the Organization for Economic Cooperation and Development during 1962-63, and he was a member of the President's Task Force on Economic Growth during 1970.

To express their affection and admiration, a group of colleagues and friends prepared a collection of essays in honor of Professor Abramovitz which were published on the occasion of his sixtieth birthday in a volume entitled *Nations and Households in Economic Growth*, edited by Paul A. David and Melvin W. Reder. The essays, which cover such topics as the individual and social welfare significance of quantitative indices of economic growth; the mechanisms of economic-demographic interdependence and their bearing, particularly, on "long swings" in the rate of growth; and the changing role of international relations in processes generating national economic development and domestic economic instability, reflect the broad range of interests that has occupied Professor Abramovitz most recently within the disciplines of economics and economic history. In the words of the editors, the volume is designed as an "expression of appreciation of the exacting standards of scientific inquiry, depth of insight, and modesty of exposition that continue to be the hallmarks of Abramovitz's own scientific contributions."



**Robert V. Roosa**

has been a Director at Large of the National Bureau since 1966. In addition, he serves on the organization's Executive Committee and is vice chairman of the Development Committee.

Mr. Roosa is a partner in the private banking firm of Brown Brothers Harriman & Co. Before joining this firm in 1965, he was for four years Under Secretary of the Treasury for Monetary Affairs, and preceding that was with the Federal Reserve Bank of New York for fifteen years, having become vice president in 1956. During World War II he served in the Army for three years, including one year on General Bradley's staff and ending as captain in the Office of Strategic Services. Before entering the service he taught various courses in economics at the University of Michigan, Harvard, and MIT from 1939 to 1943. He was also a special assistant to the U.S. Ambassador to Great Britain in 1945.

He received an A.B. from Michigan in 1939, an M.A. in 1940, and a Ph.D. in 1942. Michigan awarded him an honorary DSc for business administration in 1962 and he received an honorary LL.D. from Wesleyan in 1963. During his career he has written numerous books and articles including *Monetary Reform for the World Economy*, *The Dollar and World Liquidity*, *Federal Reserve Operations in the Money and Government Securities Market*, *Free Versus Fixed Exchange Rates*, and, with Milton Friedman, *The Balance of Payments*.

His financial and administrative expertise, his grasp of world problems, and his ability to get things done, have led numerous companies to seek his membership on their boards. He is a director of Brown Harriman & International Banks, Ltd. of London, the American Express Company, The Anaconda Company, Owens-Corning Fiberglas Corporation, Texaco Inc., and the Council on Foreign Relations, Inc., where he chairs the Committee on Studies. In addition he is a member of the Board of Trustees of the Sloan-Kettering Cancer Institute; The Rockefeller Foundation, where he is chairman of the Finance Committee; and TIAA/CREF. He also is a member of the Board of Governors of the United Nations Association of the United States and of the Advisory Committee on Reform of the International Monetary System and The New York Stock Exchange Advisory Committee on International Capital Markets.

When a little more than a year ago the National Bureau mounted a substantial fund raising effort to meet the requirements of a matching grant awarded to the organization by the Alfred P. Sloan Foundation, Mr. Roosa was chosen chairman of a newly created Development Committee. That this Committee was highly instrumental in the organization's ability to meet

the stipulations of the grant is, in large measure, due to Mr. Roosa's leadership and energies. His interest in the National Bureau's work and practical affairs makes him a highly valued member of the Board.



**Joseph H. Willits,**

who now serves the National Bureau as a director emeritus, was first appointed to the Board of Directors by the University of Pennsylvania in 1927. In 1934 he was named president of the National Bureau (a position which is today comparable to vice chairman of the board), and two years later he was elected Chairman of the Board and Executive Director of the organization. He continued in the administrative post of Executive Director and as a member of the Board until 1939 when he resigned to become Director of Social Sciences of the Rockefeller Foundation. When he left this position in 1954 to become Director of the Educational Survey at the University of Pennsylvania, he accepted nomination to the National Bureau's Board as a director at large. In 1969, shortly before his eightieth birthday, he asked to be relieved of his responsibilities as a director. His resignation was accepted by the Board with deep regret and with the proviso that he continue to contribute his advice, counsel, and wisdom to the National Bureau as a director emeritus.

Mr. Willits received an A.B. from Swarthmore College in 1911, and an A.M. in 1912. He was granted a Ph.D. from the University of Pennsylvania in 1916. Swarthmore awarded him an LL.D. in 1937 and the University of Pennsylvania followed suit in 1939. He began his professional life as an instructor of geography and industry in 1912 but moved quickly up the academic ladder and by 1933 he was Dean of the Wharton School of Finance and Commerce, a post which he held until he joined the Rockefeller Foundation in 1939. When he returned to the University of Pennsylvania in 1954 as Director of the Educational Survey, his work involved examinations of excellence, mediocrity, and critical processes in universities.

In economics his interests centered on questions of labor relations and employment. As early as 1915 he mounted a study of unemployment in Philadelphia. Simultaneously, he was appointed to the Philadelphia Association for Discussion of Employment Problems, on which he served for six years. Between 1917 and 1919 he gained some first-hand knowledge of employment problems as employment superintendent of a U.S. naval aircraft factory. Shortly thereafter he was appointed Director of the Industrial Research Department of the University of Pennsylvania. In addition, he was in charge of studies in labor relations for the U.S. Coal Commission.

He has been a member of the Pennsylvania State Industrial Board, the Pennsylvania Memorial President's Commission for Employment, the Federal Advisory Council of the U.S. Employment Service, and the President's Emergency Board on Railway Wages. His publications include *The Unemployed in Philadelphia*, 1915 (with others), *What the Coal Commission Found*, 1925, *Studies of Labor Relations for the U.S. Coal Commission*, and various other brochures on labor subjects. He has also edited three volumes of the *Annals of the American Academy of Political and Social Sciences*.

With characteristic diffidence, Mr. Willits has said that the principal tasks of his professional life have involved "hunting for, identifying and serving superior talent." To these tasks and the myriad others he so capably performs, Mr. Willits brings an extraordinary combination of tact, energy, and wisdom.

## RECENT PUBLICATIONS

### EXPLORATIONS IN ECONOMIC RESEARCH

Donald E. Farrar, Editor

Subscription price: \$15.00 per year (\$16.00 outside U.S.A.)

Single copies: \$5.00

Published: Quarterly (first issue Summer 1974)

This journal is designed to promote publication and increase the exposure of research findings generated within the program of the National Bureau of Economic Research. It provides a focal point for publication of research papers in such areas as economic growth; business cycles, including studies of inflation and inflationary expectations; industrial organization and location; transportation and regional development; corporate and public finance; human capital; housing; and natural resources and environmental concerns. While on occasion, all or a large portion of an issue may be focused on a particular subject area, in general the opportunity to assemble special issues will be relinquished in order to reduce delays between the completion and publication of research results.

In addition to major articles, *Explorations in Economic Research* will also regularly feature a summary of the *ASA-NBER Business Outlook Survey*. Released jointly by the American Statistical Association and the National Bureau on a quarterly basis since December 1968, the survey records forecasts for one to five quarters ahead. Participants constitute a panel of economists and economic statisticians who are members of the Business and Economic Statistics section of the ASA. They are asked to forecast short-term economic change using eleven major variables. The forecasts are collected and tabulated and a brief analysis with a set of summary tables is prepared by the National Bureau's staff. The reader is thus offered a systematic, analytical record of short-term economic forecasts.

All articles appearing in this journal (with the exception of the *ASA-NBER Business Outlook Survey* summaries) undergo the National Bureau's full review procedure, and accordingly they are official NBER publications.

### A DISEQUILIBRIUM MODEL OF DEMAND FOR FACTORS OF PRODUCTION

M. Ishaq Nadiri and Sherwin Rosen

Price: \$12.50

Published: June 28, 1974

How do firms adjust their production processes to meet constantly changing demand and market conditions? To answer this question, the authors of this volume have constructed a novel model of short-term business behavior. For the first time light is shed on the dynamic interrelationships between inventories, labor force utilization, and new equipment in helping to make more accurate predictions of production, employment, and investment decisions.

An example may best illustrate the idea behind the model. Suppose a

firm expects a permanent increase in sales, making expansion of its productive capacity advantageous. Since the acquisition of new equipment and possible construction to add space take time, the firm initially draws upon available inventories, adds overtime to work schedules, and hires additional production workers. New equipment may be ordered simultaneously and building plans may get under way, but during the waiting period the firm's use of labor is disproportionately high relative to its capital, and current costs rise. These costs are slowly reduced, however, as the installation of equipment proceeds. On the other hand, in situations where increased sales are not considered permanent, the cost of changing plant capacity is too great to warrant new investment in equipment and space. The firm then has an incentive to meet as much as possible of the sales increase by expanding its use of existing labor and equipment, with a view to cutting back once sales fall to their previous level and inventories are restocked.

The model takes account of the costs of the different ways in which industries adjust their utilization rates and their stocks of manpower and machine power to meet changing production demands. The interactions and feedbacks between such factors as decisions about equipment and labor are also explicitly reflected. The model is estimated for total manufacturing and its component subsectors using quarterly data over the 1947-1969 period.

## **THE ROLE OF THE COMPUTER IN ECONOMIC AND SOCIAL RESEARCH IN LATIN AMERICA**

Nancy D. Ruggles, Editor

Price: \$17.50

Published: July 31, 1974

Revolutionary advances in computer and data processing equipment have ushered in a new era of economic and social analysis. The ability of the computer to process large bodies of data makes possible new methods of research, employing highly disaggregated, or "micro" data. Not only are such methods more powerful in testing hypotheses, but they make possible entirely new kinds of research applicable to a broadened range of economic and social problems.

To most effectively and efficiently utilize this technological tool, the research community must be kept abreast of existing computer methodologies, capabilities, and applications, and additional needs must be discerned. This volume contains papers presented at a conference designed to promote such interchange between researchers based in the United States and those in Latin American countries.

One paper discusses the creation of synthetic data to surmount the difficulty researchers have in obtaining adequate data for families and individuals. Researchers receive most of their raw data on individuals and families from government agencies. To safeguard the confidentiality of personal information, however, these agencies remove all identification before providing data. Each set of data is therefore incomplete and two sets cannot be exactly combined. To fill the need for detailed information about indi-



viduals while completely preserving privacy, Benjamin A. Okner and Joseph Pechman have combined different collections of data into a set composed of synthetic individuals and families that have the same characteristics—income, age, tax payments, et cetera—as the real population.

Other papers contained in this volume include Charlotte Boschan's description of the NBER data bank, which covers two thousand time series, and Julio Borales Vergara's account of the Latin American Demographic Center's Data Bank, currently being employed in fertility and migration studies. Ivan Fellegi and Simon Goldberg report on Statistics Canada's decision to keep their basic statistical information in the form of microdata, making it possible to produce a wide variety of tabulations on demand.

James Schultz has produced a simulation of the effects of possible changes in the Social Security System on the distribution of income among the aged population of the future. Guy Orcutt and other members of the Urban Institute explore microanalytic models of household behavior as a general-purpose tool. Lawrence Klein and Abel Beltran del Rio describe a macroeconomic model for Mexico and discuss the application of such models to the problems of developing countries. Robert E. Lipsey and Irving Kravis evaluate price data used to explain international trade flows. Silvio Ronchetti and Guy Bertaud, dealing with the European Economic Community, try to develop retail price measures and comparisons of living standards.

These and other articles provide a contemporary overview of the role of the computer, its almost limitless possibilities, and the day-to-day achievements and frustrations as economists and social scientists interact with programmers to advance the frontiers of research.

## **SCHOOLING, EXPERIENCE, AND EARNINGS**

Jacob Mincer

Price: \$10.00

Published: May 30, 1974

Work experience is no less important than school education in determining earnings over a lifetime. In fact, even though the correlation between schooling and earnings is strongest during the first decade of working life, the effect of schooling on earnings realized during the early working years is relatively weak. It is work experience, moreover, not merely age, that positively affects lifetime earnings. Insofar as work experience reinforces extensive schooling, however, earnings in later years will be significantly raised as a result of the earlier investments of time and money made in acquiring job-related skills. These are some of the conclusions that may be drawn from Jacob Mincer's analysis of the symbiotic relationship that exists between schooling and experience, and their combined influence on lifetime earnings.

Mincer first derives and estimates the relation between accumulated investments in human capital of workers and their earnings. He develops a human capital earnings function as a means of measuring the relation between earnings and various forms of human capital such as schooling and

experience. He then uses this function to answer two questions: (1) Can the intricate yet rather stable patterns of the "earnings structure" be understood in terms of human capital investment behavior? (2) How much of the existing inequality in the distribution of labor incomes can be attributed to individual differences in investment in human capital?

Since the earnings function is capable of generating separate estimates of returns to schooling and to post-school investments, the answer to the first question, is unequivocally "yes." Indeed, the earnings function also distinguishes among the contributions of the several kinds of human capital investment such as schooling, experience, health, and mobility.

In answer to the second question, Mincer finds that the human capital variables explain close to 60% of the relative differences in individual annual earnings of male workers in 1959. By contrast, some other researchers who ignore the role of experience, attribute very little significance to human capital accumulation. Mincer also finds that the human capital earnings function explains over 75% of the relative skill differentials in earnings of close to 500 male occupations in the United States in 1959. The implicit rate of return on the schooling component of occupational investment is about 10%.

## **FOREIGN DOLLAR BALANCES AND THE INTERNATIONAL ROLE OF THE DOLLAR**

Raymond F. Mikesell and J. Herbert Furth

Price: \$7.50

Published: March 21, 1974

The factors responsible for the enormous accumulation of foreign dollar balances since 1957 and the relevance of these holdings to the United States economy are examined in this volume. The underlying purpose of this inquiry is to provide a better understanding of the international role of the dollar in the past and to suggest what the international functions of the dollar may be in the future. Mikesell and Furth explore such questions as the future private foreign demand for American dollars and the future of the Eurodollar market, as contrasted with that for other Eurocurrencies. They also discuss the future importance of the dollar as an official reserve medium, as an intervention currency used by foreign monetary authorities in order to influence the exchange value of their currencies, and as an international standard of value. The authors advance reasons for a continued strong role of the dollar in each of these capacities, in part because no other currency or noncurrency asset possesses to the same degree the essential qualities for performing these functions.

In their historical analysis, Mikesell and Furth describe the types of dollar balances held and their distribution among the three major categories of foreign holders—governments, commercial banks, and private individuals and firms. Special attention is given to the growth of the Eurodollar market, since the largest share of the liquid dollar assets held by nongovernmental entities plus a substantial volume of foreign-government dollar assets are in the form of Eurodollar deposits (i.e., deposits in foreign banks

or foreign branches of U.S. banks denominated in U.S. dollars). The authors also analyze the factors that govern the preference functions of foreign private liquid asset holders, which, in turn, determine the demand for American dollars (i.e., liquid dollar assets held in the United States), Eurodollars, and nondollar currencies.

At the time this book was completed (April 1973), the Committee of Twenty (C-20) established by the International Monetary Fund was in the initial stages of formulating a program of international monetary reform. The authors therefore relate their findings to the major issues under consideration by C-20, including the composition of official reserves, currency convertibility, the intervention currency, and the standard in terms of which currency parities might be expressed. In February and March of 1973, the world shifted from a system of pegged rates to a managed floating rate system. At that time, the governments of the major financial powers confidently expected to return to some kind of a par value system following the formulation by C-20 of an agreed blueprint for a new international monetary order. C-20 has thus far been unable to reach agreement, however, on certain basic issues for a new international monetary order, and the uncertainties created by the petroleum crisis and the high rates of inflation in virtually all developed countries have eroded confidence in the ability to maintain parities once they have been established. In the light of these events, the following quotation from this book has special relevance:

It is quite possible that the partial floating rate system in effect since February 1973 might continue with the dollar serving as the principal intervention currency. Under this system, major foreign countries are intervening in the foreign-exchange market to control the dollar value of their currencies but at the same time are avoiding any substantial additional accumulation of American dollars. This may well prove to be the most feasible means of achieving and maintaining a pattern of exchange rates consistent with general balance-of-payments equilibrium. (p. 111)

### **THE MEASUREMENT OF ECONOMIC AND SOCIAL PERFORMANCE**

A record of the proceedings of the 38th Conference on Research in Income and Wealth

Milton Moss, Editor

Price: \$17.50

Published: February 18, 1974

At a time when the U.S. national economic accounts have been enjoying worldwide acceptance by nearly all classes of users, critics have challenged the concept of gross national product, the principal output of the accounts, both as a goal of national effort and as a measuring rod of economic performance. They charge that the pursuit of high growth in GNP distorts national priorities, does not improve or may even worsen distribution of income, and irreparably damages the environment. The failure of GNP to include appropriate measures of economic performance of households and

governments distorts its function as an accurate index of economic growth. Since GNP fails to allow for the disamenities associated with industrial growth, particularly air and water pollution, it gives incorrect indications of changes in welfare.

This collection of papers, presented at a Conference on Income and Wealth in November 1971, brings together divergent points of view, including those of the professional users of accounts and those responsible for their compilation. The conference was designed to explore improved methods of appraising performance and to seek more useful and comprehensive accounting designs. Because of heightened public concern with pollution, explicit attention was given to the problem of assessing the impact of production and consumption on the physical environment. Innovations in attempts to measure nonmarket activities and discussions of the allocation of time were emphasized.

The debate in this book develops around the theme of the changing impact of households, governments, and businesses on economic growth in recent decades. Discussions in the summary of the conference emphasize the considerable change in households over the years as married women have increasingly devoted more time to paid work in the market and, in consequence, less time to work in the home. Investment by persons and families in tangible capital equipment and in education has increased sharply, thus changing the pattern of time and expenditure allocated to work both in the market and nonmarket sectors and to investment and consumption. The increase in the volume and variety of government services and in related capital investment has been another major feature of economic change.

These changes have generated several important proposals for new measurement frameworks. They include a plan to construct a capital account for the tangible or physical capital of households and government and for the intangible capital of households and enterprises; to develop a new accounting procedure for environmental pollution and its abatement; and to undertake a major extension in the accounts for the nonmarket activities of households, organized around the allocation and evaluation of householders' time.

Other recommendations include extending the efforts to merge data from different record sets and surveys. For example, income data from tax returns might be merged with demographic data from census surveys, and the resultant microdata sets could be aggregated within a consistent national accounting framework. Since the calculation of the level of total economic effort is substantially altered if nonmarket activities are included, these methods are of special import to persons advocating reexamination and expansion of the current accounting frameworks.

Proposals are also discussed for appraising the quantity and quality of services provided by governments and educational institutions. Contributors question whether the fundamental difficulty of evaluating these activities is the lack of a measure for the physical output of the service.

## POSTWAR PRODUCTIVITY TRENDS IN THE UNITED STATES, 1948-1969

John W. Kendrick

Price: \$15.00

Published: January 18, 1974

"The story of productivity, the ratio of output to input, is at heart the record of man's efforts to raise himself from poverty." With these words, the author begins his second book devoted to estimating and analyzing productivity trends in the United States. At the time of publication of his earlier volume, *Productivity Trends in the United States*, in 1961, economic growth was a widely accepted national goal. During the following decade the intellectual climate changed appreciably, until now all forms of economic growth are no longer accepted uncritically as necessarily good for the nation. Increasing emphasis is being placed on the costs of growth in terms of environmental deterioration. Some commentators would even slow down or level off the growth of real income per capita. Kendrick believes, however, that the more critical attitude toward economic growth reduces neither the importance of productivity change nor the desirability of understanding more about it.

Diverting resources from the production of final goods to the intermediate outlays required to combat pollution will reduce the measured rate of advance in productivity and real income per capita, since the real gross national product estimates fail to reflect most changes in the quality of life. Nevertheless, whatever the rate of economic growth, increased productivity remains one of its most important components and contributes to the goals it serves—rising levels of living, increased leisure, adequate national security, and provision for future growth as well as a better environment. Differing rates of productivity in various industries, however, will be an important element affecting employment trends, and costs and prices in different sectors of the economy.

Accordingly, in this new volume, the author focuses on postwar productivity trends by industry groupings for the period 1948-1966, with preliminary aggregate estimates through 1969. The earlier estimates for aggregates have been revised for the period since 1929, and the industry estimates have been revised beginning with 1948.

Kendrick begins with a discussion of the concepts of productivity and its component variables, and a summary of his methods and sources of estimation. He stresses his concept and estimation of total factor productivity within the framework of the national economic accounts, as the ratio of real product to the associated real factor costs.

He also deals with rates of change of productivity in the economy as a whole and its major segments. The trend rates of growth in total factor productivity in the private domestic economy are examined. Kendrick concludes that there has not been a significant acceleration in the trend rate of growth in total factor productivity since World War II, compared with the period beginning around World War I. The rate of advance in real product per man-hour and per unit of "labor input" (weighted man-hours) has,

however, shown significant acceleration since World War II due to a much faster rate of increase in capital per unit of labor input than prevailed during the interwar period.

The author quantifies the contribution of productivity to economic growth, as measured by the trend rate of increase in net national product. Since World War II, gains in total factor productivity have accounted for more than half of aggregate economic growth, and since 1948, for almost all the increase of 2.4 per cent a year in "planes" of living, as measured by NNP per capita.

Kendrick is also concerned with patterns of productivity change and interrelationships among rates of change in productivity, output, and associated variables. In the final chapter he points out that, as was found for earlier periods, there is a significant positive correlation for the period 1948-1966 between rates of change in productivity and in output. Since there was no significant correlation of productivity changes with input price movements, productivity gains were negatively correlated with price changes in output.

Kendrick remains convinced that measures of tangible factor inputs (unadjusted for quality changes) and the associated total and partial productivity measures, are a useful point of departure for analyzing growth and changes in economic aggregates and structure. In the last analysis, he maintains, it is not crucial whether certain variables are counted as inputs or as factors affecting productivity, so long as these variables are correctly sorted out and identified.

## REPRINTS

The following papers by National Bureau staff members are available from the National Bureau in reprint form. Please address requests to the Publications Department.

Fabricant, Solomon, "Perspective on Productivity Research," *The Review of Income and Wealth*, September 1974.

Ferber, Robert, and Seymour Sudman, "Effects of Compensation in Consumer Expenditure Studies," *Annals of Economic and Social Measurement*, Vol. 3, No. 2, April 1974.

Fisher, Franklin M., Robert M. Solow, and James R. Kearl, "Aggregate Production Functions: Some CES Experiments," Working Paper No. 136, Massachusetts Institute of Technology, August 1974.

Lease, Ronald C., Wilbur G. Lewellen, and Gary G. Schlarbaum, "The Individual Investor: Attributes and Attitudes," *Journal of Finance*, Vol. XXIX, No. 2, May 1974.

Moore, Geoffrey H., "The Analysis of Economic Indicators," *Scientific American*, Vol. 232, No. 1, January 1975.

———, "Economic Forecasting—How Good A Track Record?" *The Morgan Guaranty Survey*, January 1975.

Popkin, Joel, "Commodity Prices and the U.S. Price Level," *Brookings Papers on Economic Activity*, January 1974.

Shiller, Robert J., "A Distributed Lag Estimator Derived from Smoothness Priors." *Econometrica*, Vol. 41, No. 4, July 1973.

#### MIMEOGRAPHED AND XEROXED PAPERS

The following papers by National Bureau staff members are available upon request from the authors. The National Bureau does *not* have a supply of these studies.

Fuchs, Victor R., "A Note on Sex Segregation in Professional Occupations," *Explorations in Economic Research*, forthcoming.

Dresch, Stephen P., "The Crisis of the Scholarly Enterprise," *New Directions for Higher Education*, March 1975.

———, "Demography, Technology and Higher Education: Toward a Formal Model of Educational Adaptation," *Journal of Political Economy*, Vol. 83, No. 2, March/April 1975.

———, "Educational Saturation: A Demographic-Economic Model," *AAUP Bulletin*, March 1975.

Ebanks, Walter W., "A New Index of the Physical Volume of Economic Activity," February 1975.

Finan, William T., "The International Transfer of Semiconductor Technology Through U.S.-Based Firms," February 1975.

Marsten, Roy, and Thomas Morin, "An Algorithm for Nonlinear Knapsack Problems," Technical Report 95, Operations Research Center, Massachusetts Institute of Technology, May 1974.

———, "Branch-and-Bound Strategies for Dynamic Programming," Working Paper 750-74, Sloan School of Management, Massachusetts Institute of Technology, September 1974.

———, "A Hybrid Approach to Discrete Mathematical Programming," Sloan School of Management, Massachusetts Institute of Technology, February 1975.

Shiller, Robert J., "The Gibson Paradox and Rational Expectations," presented at the December 1974 meetings of The Econometric Society.

Tsurumi, Hiroki, "Bayesian Test of the Product Cycle Hypothesis," November 1974.

Wachtel, Paul, "The Effect on Earnings of School and College Investment Expenditures," Working Paper Series, New York University Graduate School of Business Administration, January 1975.

———, "Survey Measures of Expected Inflation and Their Potential Usefulness," Working Paper Series, New York University Graduate School of Business Administration, December 1974.

#### NBER WORKING PAPER SERIES \*

Requests for copies of these papers must be sent directly to the authors. Distribution is at the author's discretion.

- 47 *The Distribution of Earnings and Human Wealth in Life Cycle Context*, L. A. Lillard, July 1974.
- 48 *Protection and Competitiveness in Egyptian Agriculture and Industry*, Bent Hansen and Karim Nashashibi, forthcoming.
- 49 *Years and Intensity of Schooling Investment*, Arleen Leibowitz, August 1974.
- 50 *Measuring the Effect of an Anti-discrimination Program*, Orley Ashenfelter and James Heckman, August 1974.
- 51 *Age, Experience and Wage Growth*, Edward Lazear, August 1974.
- 52 *Transportation/Communication Considerations in the Location of Headquarters for Multi-Establishment Manufacturing Firms*, Warren Lavey, August 1974.
- 53 *Progress in Human Capital Analyses of the Distribution of Earnings*, Jacob Mincer, August 1974.
- 54 *Bilateral Trade as a Development Instrument Under Global Trade Restrictions*, Karim Nashashibi, forthcoming.
- 55 *Social Costs of Monopoly and Regulation*, Richard A. Posner, September 1974.
- 56 *Comparison of Robust and Varying Parameter Estimates of a Macro Econometric Model*, Thomas F. Cooley, September 1974.
- 57 *Varying-Parameter Supply Functions and the Sources of Economic Distress in American Agriculture, 1866-1914*, Thomas F. Cooley and Steven J. De Canio, September 1974.
- 58 *A Monte Carlo Study of Two Robust Alternatives of Least Square Regression Estimation*, Richard Hill and Paul W. Holland, September 1974.
- 59 *An Analysis of Firm Demand for Protection Against Crime*, Ann P. Bartel, October 1974.
- 60 *The Variances of Regression Coefficient Estimates Using Aggregate Data*, Roy E. Welsch and Edwin Kuh, October 1974.
- 61 *Factoring LP Block-Angular Bases*, William Orchard-Hays, November 1974.

\* A listing of NBER Working Papers 1-46 appears in the National Bureau's 54th Annual Report (1974), pages 151-2.



- 62 *The Private Enforcement of Law*, William M. Landes and Richard A. Posner, November 1974.
- 63 *Censored Regression Models with Unobserved Stochastic Censoring Thresholds*, Forrest D. Nelson, December 1974.
- 64 *Data Analysis, Communication, and Control*, Roy E. Welsch, December 1974.
- 65 *Rational Distributed Lag Structural Form—A General Econometric Model*, Kent D. Wall, December 1974.
- 66 *Detecting and Assessing the Problems Caused by Multicollinearity: A Use of the Singular-Value Decomposition*, David A. Belsley and Virginia C. Klema, December 1974.
- 67 *Human Capital and Labor Supply: A Synthesis*, Alan Blinder and Yorum Weiss, January 1975.
- 68 *On a General Computer Algorithm for the Analysis of Models with Limited Dependent Variables*, Forrest D. Nelson, October 1974.
- 69 *Ridge Estimators for Distributed Lag Models*, G. S. Maddala, October 1974.
- 70 *Analysis of Qualitative Variables*, G. S. Maddala and Forrest D. Nelson, October 1974.
- 71 *On the Theory of Productive Saving*, Isaac Ehrlich and Uri Ben-Zion, January 1975.
- 72 *The Goodness of Match*, Edward N. Wolff, January 1975.

FINANCIAL STATEMENTS OF THE  
NATIONAL BUREAU OF ECONOMIC RESEARCH, INC.  
Years Ended June 30, 1974 and 1973, and  
REPORT OF INDEPENDENT CERTIFIED  
PUBLIC ACCOUNTANTS

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*Report of Independent Certified Public Accountants*

The Board of Directors  
National Bureau of Economic Research, Inc.

We have examined the balance sheets of National Bureau of Economic Research, Inc. as of June 30, 1974 and 1973 and the related statements of revenues and expenditures and changes in fund balances and of functional expenditures for the years then ended. Our examinations were made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, the financial statements identified above present fairly the financial position of National Bureau of Economic Research, Inc. at June 30, 1974 and 1973 and the results of its operations for the years then ended, in conformity with generally accepted accounting principles applied on a consistent basis after the restatement for the change, with which we concur, in the segregation of funds as described in the summary of significant accounting policies.

Hurdman and Cranstoun  
Certified Public Accountants

New York, New York  
September 12, 1974

**National Bureau of Economic Research, Inc.**  
**Balance Sheet**  
**June 30, 1974 and 1973**

	Assets		Liabilities and Fund Balances	
	1974	1973	1974	1973
<b>Current fund:</b>			<b>Current fund:</b>	
<b>Unrestricted:</b>			<b>Unrestricted:</b>	
Cash	\$ 47,678	\$ 10,235	Accounts payable and accrued expenses	\$ 187,017
Time deposits	215,552	356,874	Accrued employee benefits	160,093
Certificate of deposit	225,000	100,000	Capitalized lease obligation (Note 2)	24,208
Advances to other funds:			Fund balance	371,318
Current fund—restricted	143,582	291,044		420,452
Sustaining fund	174,811	41,778		553,762
Accrued interest and other receivables				
Furniture, equipment, and leasehold improvements (Notes 1 and 2):				
Furniture and equipment	138,577	56,166		
Capitalized equipment lease	38,576	34,033		
Leasehold improvements	16,393	16,393		
Less accumulated depreciation and amortization	(41,942)	(19,367)		
Total current fund—unrestricted	151,604	87,225		
Total current fund—unrestricted	\$ 958,227	\$ 974,214		
<b>Restricted:</b>			<b>Restricted:</b>	
Grant and contract pledges	\$4,151,475	\$3,708,390	Advances from current fund—unrestricted	\$ 143,582
Less grant and contract pledges due in subsequent years	3,709,617	3,034,045	Fund balance (advance payments received for restricted research projects)	298,276
Total matured and receivable	441,858	674,345	Total current fund—restricted	\$ 441,858
Total current fund—restricted	\$ 441,858	\$ 674,345		
<b>Sustaining fund:</b>			<b>Sustaining fund:</b>	
Cash	\$ 124,275	\$ 29,192	Liabilities:	
Investments (Note 3)	9,013,461	8,700,522	Advances from current fund	\$ 41,778
Total sustaining fund	\$9,137,736	\$8,729,714	Fund balance (Note 3)	\$9,137,736
			Total sustaining fund	\$9,137,736
				\$8,729,714

The accompanying summary of significant accounting policies and notes are an integral part of the financial statements.

**National Bureau of Economic Research, Inc.**  
**Statement of Revenues and Expenditures and Changes in Fund Balances**  
**Years Ended June 30, 1974 and 1973**

	1974		1973		Sustaining Fund
	Current Fund		Current Fund		
	Restricted	Unrestricted	Restricted	Unrestricted	
<b>Revenues:</b>					
Grants (Notes 3 and 4) .....	\$3,307,969	\$ 250,000	\$ 450,000	\$	
Contributions and subscriptions .....		585,722	423,340		
Interest and dividends .....		466,638	402,533		
Royalty income and sales of publications and other services .....		208,938	101,730		
Net gain on sales of investments .....					358,891
Miscellaneous .....		17,231	7,137		
<b>Total revenues</b> .....	<b>3,307,969</b>	<b>1,528,529</b>	<b>1,384,740</b>	<b>358,891</b>	
<b>Expenditures:</b>					
(per accompanying statement):					
Research programs .....	3,307,969	1,255,660	888,018		
Fund raising .....		120,063	80,841		
Distribution of publications .....		78,628	28,141		
General publicity .....		37,614	40,039		
General and administrative .....		1,188,455	952,026		
Applied to projects .....		(1,188,455)	(952,026)		
<b>Total expenditures</b> .....	<b>3,307,969</b>	<b>1,491,965</b>	<b>1,037,039</b>		
Excess of revenues over expenditures .....		36,564	347,701		358,891
Net decrease in advance payments received for restricted research projects .....		(85,025)	(17,317)		
Transfers to sustaining fund .....		(3,417)			
Net change for year .....		33,147	347,701		358,891
Fund balances, beginning of year .....		553,762	400,618		8,329,045
Fund balances, end of year .....	<b>\$ 298,276</b>	<b>\$ 586,909</b>	<b>\$ 383,301</b>	<b>\$ 553,762</b>	<b>\$8,687,936</b>

The accompanying summary of significant accounting policies and notes are an integral part of the financial statements.

**National Bureau of Economic Research, Inc.**  
**Statement of Functional Expenditures**  
**Years Ended June 30, 1974 and 1973**

	1974				1973				
	Service Departments	General Administrative	Fund Raising, Distribution of Publications, and Publicity	Research Programs	Service Departments	General Administrative	Fund Raising, Distribution of Publications, and Publicity	Research Programs	
Salaries	\$184,914	\$ 636,692	\$ 54,727	\$1,828,921	\$173,869	\$510,969	\$ 48,692	\$1,701,459	\$2,434,989
Fringe benefits	29,417	156,127	8,240	231,612	21,929	86,935	7,037	185,905	301,806
Outside services	(11)	54,626	48,809	134,374	673	69,136	27,772	108,957	206,538
Publications and printing	3	62	7,683	121,356	14,571	96	10,985	155,287	166,368
Occupancy costs	23,748	91,889	5,751	126,078	33,224	23,147	881	112,828	196,210
Furniture and equipment expenses	90,609	31,481	177	8,337	2,482	13,874	1,763	49,180	106,432
Books and supplies	10,206	31,716	4,122	11,205	504	28,350	2,737	906	19,025
Travel and meetings	683	39,910	4,580	169,107	4,419	58,800	8,678	121,170	152,761
Telephone, postage and delivery	87,991	86,112	4,439	39,831	8,082	7,538	4,008	61,926	133,823
Outside computer services	325,927	(1,284)	34	33,491	37,377	37,377	—	398,525	418,153
Annual report	—	27,888	—	27,888	—	33,598	—	33,598	33,598
Miscellaneous	29,957	3,308	(12)	15,101	47	(21,281)	170	11,010	(10,054)
	783,444	1,158,527	138,550	2,719,413	259,800	876,867	115,829	2,907,153	4,159,649
Interdepartmental allocations:									
General and administrative	(18,083)	18,083	—	—	(37,782)	37,782	—	—	—
Fund raising, distribution of publications, and publicity	(21,115)	—	21,115	—	(5,514)	—	5,514	—	—
Research programs	(732,401)	—	—	732,401	(179,127)	—	—	179,127	—
	11,845	1,176,610	159,665	3,451,814	37,377	914,649	121,343	3,086,280	4,159,649
Transfer of remaining service departments' expenditures	(11,845)	11,845	—	—	(37,377)	37,377	—	—	—
	\$ -0-	1,188,455	159,665	3,451,814	\$ -0-	952,026	121,343	3,086,280	4,159,649
Allocation of general and administrative expenditures		(1,188,455)	76,640	1,111,815		(952,026)	27,678	924,348	—
Total	\$ -0-	\$236,305	\$4,563,629	\$4,799,934	\$ -0-	\$149,021	\$4,010,628	\$4,159,649	\$4,159,649

The accompanying summary of significant accounting policies and notes are an integral part of the financial statements.

**National Bureau of Economic Research, Inc.  
Summary of Significant Accounting Policies**

Following is a summary of the significant accounting policies of the Bureau:  
*Grants and contracts*

The National Bureau of Economic Research, Inc. undertakes specific research projects funded by private organizations and United States Government agencies under grants and contracts providing for reimbursement of specific expenditures. Funds advanced in excess of such expenditures are returnable to the grantor.

Revenues from restricted grants and contracts are recognized to the extent that amounts reimbursable under the terms of the grants or contracts are expended. Amounts received in excess of sums spent are recorded as restricted fund balances until such funds are expended. Reimbursable amounts generally include corporate general and administrative expenditures applied to projects based on stipulated overhead rates; for certain projects, provisional rates are used which are subject to review. General and administrative expenditures not applied to reimbursable projects are allocated to all other Bureau projects based on salaries and fringe benefits charged to such activities.

The Bureau also receives unrestricted grants which are recognized as revenues when payments are received.

*Furniture, equipment, and leasehold improvements*

Furniture and equipment are stated at cost and depreciated using the straight-line method over the following estimated useful lives:

Furniture .....	10 years
Equipment .....	5 years
Capitalized equipment lease .....	5 years

The cost of improvements to leased facilities are being amortized on a straight-line basis over the lives of the applicable leases.

*Changes in presentation and classifications*

In 1974, the restricted and unrestricted assets and liabilities of the current fund have been segregated on the accompanying balance sheet, rather than presented as a single fund, and the comparative 1973 presentation has accordingly been restated. Certain general and administrative and research program expenditures for 1973 have also been restated to conform with classifications adopted in 1974. In addition, a computer service department was established in 1974 to control and allocate outside computer costs that were formerly charged directly to research program and administrative accounts.

These restatements and reclassifications had no effect on excess of revenues over expenditures or fund balances.

**National Bureau of Economic Research, Inc.**  
**Notes to Financial Statements**  
**June 30, 1974 and 1973**

**1. Depreciation and amortization**

Depreciation and amortization amounted to \$22,575 and \$13,149 in 1974 and 1973, respectively.

**2. Capitalized lease obligation**

The Bureau entered into a financing lease agreement for automated bookkeeping equipment. The lease agreement requires annual payments, including interest, of \$8,072 through 1978, when a final payment of \$2,242 is due.

**3. Sustaining fund**

The purpose of the sustaining fund is to provide revenue for the support of Bureau activities. The sustaining fund consists primarily of original amounts of five grants from foundations, plus accumulated net gains from sales of investments, reduced by amounts transferred to the current fund as authorized by the Executive Committee. Dividends and interest are recorded as current fund revenues. A balance of \$214,386 from one of these original grants has been received in July 1974 and, accordingly, will be reported as fiscal 1975 revenue. There are no donor-imposed restrictions on the use of principal or income from any of these grants.

Market values and unrealized appreciation (depreciation) of investments held in the sustaining fund, for long-term purposes, are summarized as follows:

	Cost	Quoted Market Value	Unrealized Appreciation (Depreciation)
June 30, 1972	\$8,456,368	\$10,368,754	\$1,912,386
June 30, 1973	8,700,522	9,320,699	620,177
June 30, 1974	9,013,461	8,031,209	(982,252)

**4. Current fund grant**

In fiscal 1970, the Bureau was awarded a \$2,000,000 grant for general program support over the ensuing seven-year period. In accordance with the terms of the grant, however, payments are being made over a five-year period; accordingly, \$200,000 and \$400,000 are included in unrestricted grant income in 1974 and 1973, respectively. As of June 30, 1974, \$1,700,000 had been received from this grant.

**5. Rental expense and lease obligations**

Rental expense for real property under all lease agreements was \$237,000 for 1974 and \$196,000 for 1973.

The Bureau is committed under lease arrangements covering real estate. Minimum annual rental commitments under existing noncancellable leases with a remaining term of more than one year are as follows:

1975	\$170,000
1976	170,000
1977	160,000
1978	130,000
1979	110,000
1980 to 1984	50,000
1985 to 1989	50,000
1990 to 1993	36,000
	<u>\$876,000</u>

Certain of the lease arrangements contain escalation clauses covering increased costs for real estate taxes and operating services.

Included in the above tabulation is a 20-year lease executed in connection with the establishment of a West Coast branch. The annual rental requirement is approximately \$10,000, based on 7½ % of the financed cost of construction of the office facilities, plus real estate taxes and insurance. The Bureau, however, has the option to pay the lessor all or any portion of such financed cost, thereby reducing the annual rental requirement. The lease also contains options to renew for two additional 10-year terms. Although the lease is cancellable by the Bureau, modified rental payments would be required for the remaining term of the lease if it cannot be assigned or the premises sublet.

#### 6. Taxes

The Bureau qualifies under Section 501(c)(3) of the Internal Revenue Code of 1954 as a publicly supported organization that is exempt from Federal income tax.



## NATIONAL BUREAU REPORT

**National Bureau Report** is exempted from the rules governing submission of manuscripts to, and critical review by, the Board of Directors of the National Bureau. Each issue, however, is reviewed and accepted for publication by the Research Committee of the Bureau and a standing committee of the Board.

**National Bureau of Economic Research** is a private, nonprofit, organization founded in 1920 as a center for independent and impartial economic research. In the belief that such research can contribute significantly to the sound treatment of economic problems, it has sought to conduct its activities under conditions that safeguard the scientific nature of the findings and that help make them authoritative and acceptable to persons of different interests and opinions. The National Bureau is supported in part by grants from philanthropic foundations, business associations, and support for particular studies may be forthcoming from government agencies. The National Bureau is also supported in part by investment income on capital-sum grants, and in part by unrestricted contributions and subscriptions from companies, banks, labor organizations, foundations, and individuals.

Further information regarding contributions can be obtained from the office of the Assistant Vice President, Donald R. Gilmore. Information regarding subscriptions can be obtained from the Subscriptions Department.

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