

NBER Reporter

NATIONAL BUREAU OF ECONOMIC RESEARCH, INC.

WINTER 1979

Program Report

Economic Fluctuations

Robert E. Hall

NBER's Program in Economic Fluctuations brings together researchers concerned with unemployment, inflation, aggregate real output, and other aspects of the behavior of the economy as a whole.

Individual and collaborative research within the program can be classified under the topics of aggregate demand, aggregate supply, and the interaction of the two in the process of inflation. Work on aggregate demand is currently focusing on two major components, consumption and inventory investment. Under aggregate supply, we are concentrating on the influences of government programs and regulations and on the special characteristics of labor markets that permit high unemployment and continuing wage inflation to coexist. In our work on inflation, we are studying the lagged response of prices to changes in monetary growth, the interaction of the U.S. price level with world prices, the influence of inflation on public opinions about economic issues, and the effect of inflation on the behavior of corporations and financial markets.

One of the major activities of the program is the Project on Inflation. Among the researchers who are at work on topics related to this important national problem are Martin Baily, Robert Barro, Alan Blinder, Dennis Carlton, Rudiger Dornbusch, Martin Feldstein, Stanley Fischer, Jacob Frenkel, Robert Gordon, Robert Hall, Douglas Hibbs, Thomas Sargent, and John Shoven. In addition to its research activities, the group will prepare a set of nontechnical papers on various aspects of inflation for presentation at a pair of conferences to be held in Washington, D.C.

Among the most visible activities of the economic fluctuations program is its dating of business cycles. The Bureau maintains a chronology of the U.S. business cycle going well back into the nineteenth century. A committee chaired by Robert Hall that includes William Branson, Martin Feldstein, Benjamin Friedman, Robert Gordon, Geoffrey Moore, and Victor Zarnowitz meets as required to determine the dates of peaks and troughs in

In This Issue

Program Report: Economic Fluctuations	1
Research Summaries	
Tax Treatment of the Family	4
Secular Changes in Human Stature	6
Changes in the Composition of Household Saving	8
Research on International Modeling	11
Economic Outlook Survey	13
NBER Profiles	15
Conferences	17
Bureau News	18
Current Working Papers	21

This issue of the **Reporter** highlights the Bureau's program of research on economic fluctuations. Next Michael Boskin discusses his work on taxation of families. Then Bureau research on historical patterns of stature is presented. A third summary by Edward Kane analyzes recent changes in household saving behavior. In the last summary, Dennis Warner describes his work in modeling international trade and exchange. Following the quarterly Economic Outlook Survey are a section of biographical sketches, news of NBER conferences, and other NBER news and reports. Short summaries of recent NBER Working Papers constitute the final section of the **Reporter**.

the economy. The unusual behavior of the U.S. economy in 1979 has called particular attention to the activities of this NBER committee.

From time to time, the Program in Economic Fluctuations sponsors conferences on topics of major scientific and national importance. In October 1978, Stanley Fischer organized a Conference on Rational Expectations and Economic Policy.¹ In addition to specialists in the area of economic research, participants in the conference included representatives from a number of federal agencies with responsibilities for monetary and other macroeconomic policies.

Participants in the program also attend small, informal research meetings at Bureau offices several times a

¹ The papers presented at the NBER Conference on Rational Expectations and Economic Policy have been reprinted as NBER Conference Papers Nos. 1-9. A complete list of these papers appears in the **NBER Reporter**, Summer 1979, on page 24.

The National Bureau of Economic Research is a private, nonprofit research organization founded in 1920 and devoted to objective quantitative analysis of the American economy. Its officers and board of directors are:

Honorary Chairman—*Arthur F. Burns*
Chairman—*James J. O'Leary*
Vice Chairman—*Eli Shapiro*
Treasurer—*Charles A. Walworth*
President—*Martin Feldstein*
Vice President—*Charles E. McLure, Jr.*
Director of Finance and Administration—*Sam Parker*

DIRECTORS AT LARGE

Moses Abramovitz	Geoffrey H. Moore
Arthur F. Burns	Michael H. Moskow
George T. Conklin, Jr.	James J. O'Leary
Morton Ehrlich	Peter G. Peterson
Solomon Fabricant	Robert V. Roosa
Martin Feldstein	Richard N. Rosett
Edward L. Ginzton	Bert Seidman
David L. Grove	Eli Shapiro
Walter W. Heller	Stephen Stamas
Walter E. Hoadley	Lazare Teper
Roy E. Moor	Donald S. Wasserman

DIRECTORS BY UNIVERSITY APPOINTMENT

Gardner Ackley, *Michigan*
G. L. Bach, *Stanford*
Charles H. Berry, *Princeton*
Otto Eckstein, *Harvard*
Walter D. Fisher, *Northwestern*
John H. Kareken, *Minnesota*
J. C. LaForce, *California, Los Angeles*
Almarin Phillips, *Pennsylvania*
James L. Pierce, *California, Berkeley*
Lloyd G. Reynolds, *Yale*
Robert M. Solow, *Massachusetts Institute of Technology*
Robert R. Sterling, *Rice*
Henri Theil, *Chicago*
William S. Vickrey, *Columbia*
Burton A. Weisbrod, *Wisconsin*

DIRECTORS BY APPOINTMENT OF OTHER ORGANIZATIONS

Eugene A. Birnbaum, *American Management Associations*
Carl F. Christ, *American Economic Association*
Stephan F. Kaliski, *Canadian Economics Association*
Franklin A. Lindsay, *Committee for Economic Development*
Paul W. McCracken, *American Statistical Association*
Albert G. Matamoros, *National Association of Business Economists*
Douglass C. North, *Economic History Association*
Rudolph A. Oswald, *American Federation of Labor and Congress of Industrial Organizations*
G. Edward Schuh, *American Agricultural Economics Association*
James C. Van Horne, *American Finance Association*
Charles A. Walworth, *American Institute of Certified Public Accountants*

Contributions to the National Bureau are tax deductible. Inquiries concerning contributions may be addressed to Lawrence B. McFaddin, Director of Development, National Bureau of Economic Research, Inc., 1050 Massachusetts Avenue, Cambridge, Mass. 02138.

The **Reporter** is issued for informational purposes and has not been reviewed by the Board of Directors of NBER. It is not copyrighted and can be freely reproduced with appropriate attribution of source. Preparation of the **NBER Reporter** is under the supervision of Donna Zerwitz, National Bureau of Economic Research, Inc., 1050 Massachusetts Avenue, Cambridge, Mass. 02138.

year. The purpose of these meetings is to discuss research in progress and to expose new ideas and findings to friendly criticism at an early stage in the evolution of a research project. Research meetings present an opportunity for interaction among economists at different universities that is not ordinarily available in professional meetings and conferences. In 1979, research meetings were held in Cambridge in January and July; 1980 meetings are planned for Palo Alto in January and Princeton in March.

The economic fluctuations program conducted a summer institute in macroeconomics during the month of July 1979 in Cambridge. The participating researchers spent most of the month focusing on two specific areas: (1) behavior of consumers (led by Frederic Mishkin, joined by Alan Blinder, Marjorie Flavin, Robert Hall, and Fumio Hayashi) and (2) inventories (directed by Alan Blinder, with Andrew Abel, Stanley Fischer, and Jerry Green). In the cases of Hall and Mishkin and of Blinder and Fischer, the institute brought together pairs of economists from different universities who were collaborating on joint research projects.

As an outgrowth of the summer institute, the fluctuations program has recently launched a research group on inventories under the direction of Alan Blinder. This group will discuss current research on the behavior of business inventories, which are widely recognized to have a key role in the business cycle. The research meeting in March 1980 will be devoted entirely to this topic and will provide a unique opportunity for young economists to present their work to more senior members of the profession with interests in this area.

The following paragraphs describe a sample of selected research in which the Program in Economic Fluctuations is engaged.

Consumption

Robert Hall has completed a study of the stochastic characteristics of consumption.² As a test of one of the implications of the life cycle-permanent income theory of consumption, he examines the predictive power of income and other variables for future consumption, given current consumption. If consumers are spending optimally today, so that current consumption embodies all available information about their well-being, then no other information should help predict future consumption. The tests Hall employs are analogous to those used to test the efficiency of financial markets. His findings generally support the life cycle-permanent income hypothesis, although the stock market does have some predictive power. Hall is continuing this research jointly with Frederic Mishkin by studying panel data on consumption by individual households. This rich body of data permits powerful tests and an examination of additional questions about the way that consumers process information about their well-being. Again, the results are generally favorable to the life cycle-permanent income hypothesis. The results will be reported in a forthcoming NBER Working Paper.

² R. E. Hall. "Stochastic Implications of the Life Cycle-Permanent Income Hypothesis: Theory and Evidence," NBER Reprint No. 15, 1978.

In closely related work, Alan Blinder reaches the somewhat different conclusion that consumers overreact to short-term variations in their incomes, relative to the predictions of the life cycle-permanent income theory.³ He studies the response of aggregate consumption to the various temporary tax surcharges and rebates of the 1960s and 1970s and concludes that consumption has responded more than it should have if people treated the change in income as purely transitory, but less than if it were permanent. Blinder plans to continue his empirical research on the life cycle model by studying the response of saving and consumption to social security taxes and benefits.

Inventory Demand

Alan Blinder and Stanley Fischer are engaged in theoretical and empirical research on inventory demand and the role of inventory fluctuations.⁴ In their theory, inventories adjust only gradually in response to a perturbation from equilibrium levels. The theory is then embedded into an otherwise standard macroeconomic model in which markets clear instantaneously and expectations are rational. They reach two principal conclusions. First, disturbances such as unanticipated money will set in motion serially correlated deviations of output from trend. Second, if desired inventories are sensitive to the real interest rate, then even fully anticipated changes in money can affect real variables.

Government-Induced Supply Shifts

Robert Gordon is carrying out research on the relations among price changes, wage changes, and a variety of forms of government intervention in the economy. Payroll taxes, income taxes, and the minimum wage are the subjects of particular scrutiny. Preliminary research indicates that a substantial part of personal income tax changes are shifted forward in the form of higher prices; results for the impact of the social security tax are less emphatic. In further tests, considerable emphasis will be placed on the hypothesis that the slowdown in the growth of aggregate labor productivity, which may have been partly due to government regulations, has itself been a source of inflation. After the price and wage equations are scrutinized for sensitivity to alternative estimation methods and specifications, the results will be summarized in a working paper.

Impact of Expected and Unexpected Changes in the Money Stock

Robert Barro is continuing his investigation of the response of output, unemployment, and prices to expected and unexpected changes in the money stock. He hypothesizes that real variables—output and unemployment—should be influenced only by the unexpected component of monetary movements and that this influence should be transitory. On the other hand, fully anticipated movements in money should affect the price level

point for point. The unexpected part of money stock shifts should have a transitory influence on the proportional relation between money and prices. Barro's work with Marc Rush on this topic is part of the Project on Inflation. Barro's recent theoretical analysis suggests that the key link between unanticipated money movements and output involves movements in the anticipated real rate of return; the theory requires a positive relation between money stocks and the real interest rate. On the other hand, it is possible that the conventional liquidity effect of monetary expansion could show up in an inverse relation between money stocks and the nominal interest rate. Barro and Rush plan to test these hypotheses empirically. Estimation of the anticipated inflation rate—which is the intervening variable between the nominal and real interest rates—will be a key element in this investigation.

Robert Gordon has carried out a parallel investigation of the relation between anticipated movements of the money stock and the corresponding behavior of the price level.⁵ He finds that the hypothesis of proportionality is not supported by the data, in contrast to Barro's favorable verdict on this point. Further work and discussion of the evidence within the group may help to narrow the gap between their findings.

Macroeconomic Role of Government Expenditures

A new program of research by Robert Barro is attempting to measure the effects of fiscal variables on economic activity. Some of the movements in the non-monetary part of the government deficit may have larger effects on output and unemployment when the shifts are unanticipated. Preliminary work has not isolated substantial effects of this kind, however. Barro plans further empirical investigation in this area as part of the Project on Inflation.

Robert Hall has completed an investigation of the effects of the large shifts in aggregate demand that have occurred in the past thirty years because of variations in the level of military activity of the United States.⁶ Bulges in military spending during the Korean War and again during the Viet Nam War were accompanied by increases in real interest rates and by increases in total employment and total output. The movements are consistent with an interpretation that rests on the elasticity of labor supply with respect to temporary increases in the real current wage compared to the discounted future wage. However, the evidence is far from conclusive, and rather different interpretations cannot be rejected.

Structural Characteristics of Labor Markets

Research by Robert Hall on a number of properties of labor markets that have important implications for mac-

³A. S. Blinder, "Temporary Taxes and Consumer Spending," NBER Working Paper No. 283, October 1978.

⁴A. S. Blinder and S. Fischer, "Inventories, Rational Expectations, and the Business Cycle," NBER Working Paper No. 381, August 1979.

⁵R. J. Gordon, "New Evidence That Fully Anticipated Monetary Changes Influence Real Output After All," NBER Working Paper No. 361, June 1979.

⁶R. E. Hall, "Labor Supply and Aggregate Functions," NBER Working Paper No. 385, August 1979.

roeconomics was described in the Summer 1979 issue of the **Reporter**. Briefly, the starting point for his work is an examination of the relationship between employers and workers. In most labor markets, the typical relationship is reasonably long standing, so the labor market is rather different from the wheat market or the stock market. An important economic principle underlying Hall's analysis of fluctuations in employment is efficiency—employers should respect the value of workers' time in determining the level of employment. A joint paper with David Lilien shows how this principle is compatible with the conventional administrative arrangements in the United States where employers make unilateral decisions about the level of employment.⁷ Hall's more recent work in this area explores the implications of efficiency in markets where job turnover is prevalent as well.

Expectations and Quantity Constrained Macroeconomic Systems

A research project directed by Jerry Green, also involving Jean-Jacques Laffont, Takatoshi Ito, and Seppo Honkapohja, is studying the mechanisms through which endogenous quantity constraints influence market allocations and the rationale through which fixed prices may be determined. The general aim of this research is to bring together ideas from modern Keynesian thinking about quantity constraints with the theory of rational expectations. Green and his collaborators have studied inventory accumulation and decumulation as a partial buffer to quantity constraints on the productive sector. In this model, they have developed a specification that allows the testing of a "disequilibrium hypothesis"—that prices are set at their expected market-clearing levels (given known inventories), but that contemporaneous disturbances may lead to rationing—against an "equilibrium hypothesis"—that prices are fully flexible and eliminate any unintended inventory fluctuations (or rationing on the labor market) at all times.

Green and his collaborators consider a class of economic models where aggregate demand and supply equations are derived under the hypothesis of rational expectations, but markets do not clear. Consequently, they find that monetary policy can be effective in stabilizing real output fluctuations, in contrast to the results obtained with completely flexible prices and full market clearing. They are investigating the form of an optimal monetary policy and are determining the theoretical bounds on the extent of reduction in the variance of output that can be obtained in this way.

Laffont is leading an investigation of the econometrics of disequilibrium models: testing, specification, estimation techniques, and coherency restrictions. This work is taking advantage of the fact that nonlinear structural models generated by a disequilibrium hypothesis have a certain piecewise linearity that places restrictions on its parameters.

⁷ R. E. Hall and D. M. Lilien, "Efficient Wage Bargains under Uncertain Supply and Demand," NBER Working Paper No. 306, December 1978.

Implications of Rational Expectations

As a part of the Project on Inflation, Thomas Sargent is carrying out research on the nature of fluctuations in prices, wages, and the money supply within the framework of rational expectations. Sargent's earlier work has identified serious econometric shortcomings in previous research on sources of fluctuations in these key variables. Recently he has developed a technique for identifying the kind of fluctuations that are predicted by a classical macroeconomic model in its modern form, with rational expectations. These "neutral fluctuations" ought to be uncorrelated with real GNP or unemployment. In his empirical work in this area, Sargent is collaborating with Robert Litterman.

Research Summaries

Tax Treatment of the Family

Michael J. Boskin

Researchers in NBER's Program in Taxation are currently reexamining a variety of features of an old problem that is assuming increasing importance: the economic effects of choosing alternative units of account for tax purposes. The unit of account is important in a wide range of applications in economics, from data collection to theoretical modeling of decision making. For example, basic data on the distribution of income are often analyzed with little attention to whether the distribution of income should—or could—be analyzed across households, individuals, families, or some other unit.

In the field of taxation, such analytical and data issues arise quite naturally when we ask, for example, who bears the tax burden and what are the effects of taxes on work effort or on saving? Perhaps more importantly, questions such as how we can collect revenues and achieve certain distributional goals with a minimum distortion of economic choices lead us immediately to analyze the effects of alternative choices of units of account for taxation: individuals, households, families or other tax bases. At the center of such concerns are the economic effects of alternative tax treatments of the family.

The appropriate tax treatment of the family is a basic issue in the design and implementation of direct taxation. Many countries base taxation on the family unit and use personal exemptions, deductions, and/or credits varying with family size. Several countries, the United States among them, allow some type of income splitting among family members.¹ These provisions generally are defended by an appeal to differences in economic circumstances of families of different sizes and economic characteristics. By comparison, many countries rely on the individual rather than the family as the primary unit

¹ For example, Spain, Switzerland, France, Germany, Norway, and the United Kingdom.

of account for personal taxation.² Among OECD countries, only France *requires* families to file a joint return.

While the question of the appropriate unit of account for personal taxation has always been important, its importance is increasing because of the dramatic changes that have occurred in family size and composition in most countries.³ The combined effects in the United States of the post-World War II baby boom and the 1970s baby bust, the recent rapid increase in the labor force participation of married women, the postponement of marriage and childbearing, the increased life expectancy, and the soaring of the divorce rate render the traditional continuously married family with one worker, one child raiser, and several children representative of a dwindling portion of the population.

For example, in the last three decades, the average household size has declined from 3.4 to 2.9 persons, and the percentage of families with a female head has increased by over 60 percent. Further, the labor force participation of married women has almost doubled in this same period.

In two recent papers and a third in progress, I attempt to provide a more systematic treatment of important economic factors involved in the choice of the unit of account for taxation.⁴ Two of the papers deal with analyzing the optimal tax treatment of the family in models of identical family size and composition on the one hand, and different family size on the other. The third paper deals with the interrelationship between the choice of the unit of account for tax purposes and the choice of tax base and tax rates.

Labor supply elasticities are at the center of the economic effects of the choice of tax base, tax rates, and units of account, and hence they are at the core of the design of each optimal component of the tax system. The higher the elasticity of labor supply, the more inefficient high tax rates on labor income will be, and the more difficult it will be to collect incremental revenues to achieve redistribution goals. If the large and growing body of econometric studies that report high labor supply elasticities for wives (and very modest ones for husbands) are correct, taxing husbands and wives at the same rate, as under income splitting, is quite inefficient. Further, in an optimal tax transfer system the tax rates and income guarantees are limited, since the overall average labor supply elasticity cannot be very small. Moreover, a tax on labor income only is unlikely to be very desirable. Thus, heavy progression is unlikely to be optimal in an income tax; forces leading to taxing all income—capital and labor—also may lead to lower progression, and vice versa.

² For example, Canada, Australia, Japan, and the Netherlands. Also, Austria, Denmark, Italy, and Sweden have recently switched to the individual as a unit of account.

³ Documented by Robert T. Michael, Victor R. Fuchs and Sharon R. Scott in "Changes in the Propensity to Live Alone: 1950-1976," NBER Working Paper No. 262, July 1978.

⁴ M. J. Boskin and Eytan Sheshinski, "Optimal Tax Treatment of the Family: Married Couples," NBER Working Paper No. 368, July 1979; M. J. Boskin, "Factor Supply and the Relationships among the Choice of Tax Base, Tax Rates, and the Unit of Account in the Design of an Optimal Tax System," forthcoming in a Brookings Institution volume; M. J. Boskin and E. Sheshinski, "Optimal Tax Treatment of the Family: Family Size," forthcoming as an NBER Working Paper.

In NBER Working Paper No. 368, we develop and analyze a series of models, each of which focuses on a particular aspect of the problem of the tax treatment of the family. First, we examine a model of identical families and discuss the issue of the tax treatment of husbands and wives—or, more appropriately, primary and secondary earners—that minimizes distortion of the labor-leisure or market-nonmarket work choice. A straightforward application of the theory of optimal indirect taxation yields the result that higher tax rates should be levied on the worker with the least elastic supply of labor. After reviewing the econometric evidence on this question, we conclude that the current system of income splitting, under which husbands and wives pool income and hence face equal marginal tax rates is highly inefficient. A substantial efficiency gain would ensue with lower tax rates on the earnings of secondary earners in the family.

We then extend the analysis to the case of differences across households in the ability to produce market income. Introducing the joint density of the wage rates of husbands and wives—due to assortative mating patterns, for example—enables us to discuss the tradeoff between efficiency losses and the distribution of tax burdens inherent in a tax system. After exploring some special cases, we examine data on labor supply elasticities, the correlation in wage rates between husbands and wives, and other factors affecting the choice of optimal tax rates. We also conduct a sensitivity analysis of the optimal tax rates to variations in these parameters. Once again, the optimal tax rates on secondary workers are much lower than those on primary earners. Our best estimate is that optimal tax rates on secondary earners would be only one-half as high as those on primary earners.

In my paper, I present heuristic models of the choice of three major components of the tax system: the tax base, tax rates, and the unit of account. Since it is generally much easier to think about one problem at a time, it is not surprising that such issues are usually analyzed separately. However, in this case, the effects of alternative tax bases, units of account, and tax rates on economic decisions are not independent; hence, the design of an optimal tax system must account for all three simultaneously.

Finally, in a third paper in progress, Eytan Sheshinski and I are exploring the optimal taxation of families of different sizes. In the personal tax system, we have developed a model to choose optimal rates for deductions and credits for family size. We have also generalized the standard theory of optimal indirect taxation—taking commodities rather than households—to account for the fact that different commodities consumed by households have different "scale economies" and hence conversion to adult equivalent consumption units. For example, a television set may be watched by several people simultaneously, but spreading of the consumption of many other commodities is not so easy. This leads to a generalization of the famous "Ramsey rule" for optimal taxation to include factors reflecting the nature of consumption within family units.

The Economic and Demographic Significance of Secular Changes in Human Stature in the United States, 1750-1960¹

Robert Margo, Kenneth Sokoloff,
and Georgia Villaflor

It is now well established that investment in human capital, especially through education, has made an important contribution to the increase of labor productivity and per capita income during the twentieth century. Although improvements in nutrition and health are an outstanding feature of human progress during the last several hundred years, the general tendency of economists, until quite recently, was to treat such advances more as background influences than as main factors in the explanation of the long-term growth of per capita income in the United States and in other industrialized nations. One of the projects in the NBER Program on the Development of the American Economy is an investigation of the significance of this other form of investment in human capital.

Several recent developments have called new attention to the possibility that improvements in nutrition and health may have been far more central to the process of economic growth than is usually presumed—not only for the eighteenth and nineteenth centuries, but for the twentieth century as well. One is the debate over the explanation of the decline in mortality since 1800 in Great Britain, the United States, and other industrialized nations. The traditional view that the post-1800 decline in mortality was due mainly to improvements in medical technology has come under serious challenge. It has been stressed that in the cases of tuberculosis, measles, scarlet fever, and whooping cough, 80 percent or more of the decline in death rates occurred before the development of an effective chemotherapy for the diseases. In the case of bronchitis, pneumonia, and influenza, the mortality rate declined by 40 percent before the discovery of effective drugs. These observations, as well as studies of improvements in public sanitation, have led a number of scholars to argue that rises in real income and advances in nutrition were the major factors accounting for the decline in death rates in Western Europe and the United States prior to World War II. A similar debate has arisen on the relative importance of changes in nutrition, and of spraying with DDT, on the post-World War II decline in mortality in various less developed nations.

The post-World War II emergence of development economics has also turned attention to the economics of nutrition and health. It was rapidly recognized that improvement of the poor state of the nutrition and health of

the citizens was central to the solution of poverty in less developed nations. This finding stimulated the growth of a subfield in the economics of food and nutrition that is concerned with such issues as the impact of systems of food production and distribution on food consumption within families; the links between malnutrition and income distribution; the effect of malnutrition on the supply of labor; the effect of food subsidies, not only on demand and supply in the market for food, but also on demand and supply in nonfood markets; and optimal governmental strategies for improving nutrition and health.

A third development is an increasing recognition of the effect of improved nutrition on labor productivity. This line of analysis has been stimulated by a series of advances in the fields of nutrition, development economics, labor economics, and economic history. During the post-World War II period, nutritionists developed estimates of caloric and nutrient requirements for various occupations and labor tasks. Investigations of the effect of malnutrition, and of its elimination, on labor productivity have been performed both in laboratory studies of human subjects and in observational studies of laborers in actual work situations. These reveal that malnutrition results in substantial declines (as much as 50 percent) in work capacity while at work, as well as a reduction in the number of days at work. Such findings imply that the consumption of food might be introduced as an argument of firm and aggregate production functions.

A number of economic historians have called attention to the role played by the factory system in changing labor discipline and in increasing the intensity of labor. More recently, Fogel and Engerman called attention to the parallel role of the gang system in slave agriculture.² It now appears that such changes in the tempo of labor not only had a large effect on conventionally measured labor productivity but may have been closely related to changes in the level of nutrition. It has been argued that the initial lengthening of the work week in Europe associated with the coming of the factory was made possible by a rise in energy (calories) per worker stemming from new crops and other improvements in agriculture.³ Some economic historians believe that during this phase of the industrial revolution, the supply of human energy was the binding constraint on output; time was relatively cheap and in excess supply. As the cost of food fell and nutrition improved, time rather than nutrition became the binding constraint. This shift, they hold, led to a reduction in the length of the work week and promoted time-saving, but human energy intensive, forms of labor utilization.

While these various streams of research have led to a new emphasis on the significance of changes in nutrition for long-term economic growth, there remains considerable uncertainty over the magnitude of the nutritional effects. The major obstacle to progress on these

¹ This research summary is adapted from a considerably more comprehensive, unpublished manuscript: Robert Fogel, et al., "The Economic and Demographic Significance of Secular Changes in Human Stature: The U.S., 1750-1960," April 1979.

² R. Fogel and Stanley Engerman, *Time on the Cross, 2 vols.* (Boston: Little, Brown & Co., 1974).

³ Herman Freudenberger and Gaylord Cummins, "Health, Work, and Leisure before the Industrial Revolution," *Explorations in Economic History* 13 (January 1976): 1-12.

issues has been the lack of a measure of nutrition. The NBER project is confronting the problem of a paucity of direct evidence by making use of the work of physiologists. This body of literature indicates that information on height can be utilized to measure the extent of malnutrition and its distribution within and across particular populations. Data on both height and weight, by age, are especially desirable for identifying a population's "average nutritional status." While such joint distributions are sometimes available, only data on height have thus far been recovered in such quantities that they can be used to construct time series extending back into the eighteenth century. Even without observations of weight, height-by-age data can be quite accurate indicators of the average nutritional status of a population.

Physiologists have studied the effects of nutritional deficiencies and illness on the height-by-age profile through observational studies of human populations and laboratory experiments on animals. Three statistics are particularly useful: the age at which the adolescent growth spurt peaks, the age at which final height is attained, and the change in final heights over time. During childhood, short periods of malnutrition or prolonged spells of moderate malnutrition merely delay the onset of the adolescent growth spurt. Severe, prolonged malnutrition may completely erode the typical growth-spurt pattern and cause permanent stunting. If malnutrition is sustained but moderate over an extended period, growth will continue beyond the age at which it normally ceases in well-fed adolescents. Hence, the age at which growth terminates is an important indicator of nutritional status, especially for older adolescents. There is a clear pattern of "catching-up" after periods of malnutrition, but the longer the periods and the more severe the malnutrition, the more likely the terminal height will fall below what it would have been under conditions of good nutrition.

Although the project is at an early stage, research to date has already yielded striking findings. The secular growth pattern of native-born U.S. whites prior to 1910 appears to be different from that of most European populations. Similarly, the experience of native-born U.S. blacks diverges from that of blacks in the Caribbean or in Africa. By the time of the American Revolution, native-born whites appear to have achieved nearly modern final heights, and to have been an average of 2 to 4 inches taller than European populations. An analysis of a sample of recruits from the Revolutionary military indicates that while the terminal heights of southern males are 68.5 inches, the stature of soldiers from the Middle Atlantic and New England were 68.2 and 68.0 inches, respectively. The average final heights of native-born recruits in the French and Indian War were somewhat shorter than in the Revolutionary War, but not substantially so. Thus, it seems likely that the secular increase in final heights in the United States began before 1750. These results suggest that improvements in nutrition must have occurred very early and rapidly in America.⁴

⁴K. Sokoloff and G. Villaflor, "Colonial and Revolutionary Muster Rolls: The New Evidence on Nutrition and Migration in Early America," NBER Working Paper No. 374, July 1979.

TABLE 1: Mean Final Heights of U.S. Native-Born White Males in Three Wars

	Age Category	Sample Size	Sample Mean (Inches)	Standard Error (Inches)	
American Revolution	25-35	775	68.3	0.11	
Civil War	Gould Sample	25-30	123,472	68.2	0.01
	Baxter Sample	25-34	59,931	68.2	—
World War II	20-24	119,443	68.2	0.01	

NOTE: Computed from data in colonial muster rolls, Gould, Baxter, and Karpinos. The Revolutionary and Gould samples are based on inductees. The Baxter and World War II samples include rejectees. Maximum mean height in the World War II sample is achieved by the 20-24 age category. There is no evidence of truncation in the Gould sample. A chi-square test indicated that the normal distribution cannot be rejected. The data in Baxter's summary do not permit the calculation of the standard error of the mean.

The estimated mean final heights of males for three wars, reported in table 1, do not necessarily imply a perfectly flat secular trend between 1778 and 1943. Contrary to the popular impression that there have been continuous improvements in nutrition and increases in height for a century, various bits of data suggest that there may actually have been cycles in stature. For the period between the Revolution and the Civil War, the evidence for this observation is drawn from several sources. For native-born blacks, the analysis of the information contained in both the coastwise manifests (records for slaves that were transported by ship) and the Civil War military records reveals that there was a significant decline in stature for the cohorts born during the late 1820s and 1830s. The pattern for native-born whites in the Union Army is remarkably similar. Although the factors accounting for the two trends may not be the same, both black and white cohorts seem to have experienced deteriorating nutritional or health conditions during this era. Our preliminary analysis suggests that much of the decline in black heights is related to the shift in population from the upper South to the lower South, and variations in plantation size and crop mix. The trend in final heights of whites, although still unexplained, may be attributable only to the influx of immigrants during the antebellum period. There are also signs of a significant cyclical fluctuation in stature between the Civil War and World War II.

Multiple regression analysis has been employed to relate final heights of native-born Americans to socioeconomic characteristics such as occupation, migration experience, urban birth or residence, race, and place of birth. We find that the difference between the heights of the urban and rural populations increased after the French and Indian War. From virtually identical final heights at the time of this early conflict, the rural born had gained an advantage of 0.8 inches by the time of the Revolution, with the gap being maintained at such a level well into the nineteenth century. Differences in stature also appear to have increased during the antebellum era. From only minor discrepancies in final heights

between farmers and other occupational groups during the colonial period, significant differences had emerged before the Civil War. Blue-collar recruits are nearly 0.8 inches shorter than farmers, after adjusting for urban-rural status. Systematic variation was also detected over the region of birth, race, and migratory experience. A particularly interesting finding is that migrants across state lines were approximately an inch taller than non-migrants.

Some Economic and Demographic Issues Raised by the Findings

The downward shift in the height profile of the native-born whites during the last two or three decades of the antebellum era does not mean that the profiles of every subpopulation declined. The decline might have been heavily concentrated within the urban population. The rate of urbanization accelerated sharply after 1820, and conditions of life in the larger cities deteriorated. There is evidence of an upward trend in the mortality rates in several northeastern cities. But the decline might have been a consequence of an increased flow of immigrants; laboratory experiments on animals have revealed that malnutrition in one generation affects the size of subsequent generations. The patterns observed in the height-by-age data are also consistent with other evidence that the period between 1820 and 1860 was marked by a substantial increase in the inequality of the income distribution, with the wages of common laborers falling relative to that of other groups.

More generally, the levels of nutrition observed over time have substantial implications for the study of the U.S. mortality experience. The evidently high level of nutrition in America at the time of the Revolution may well provide a partial explanation of the high fertility rates and low mortality rates, relative to Europe, that characterized the early U.S. demographic experience. As the consumption of food is a major component of the standard of living in preindustrial societies, the advantage in height also provides strong evidence of the superior material conditions enjoyed by the average American during the period. However, despite the fact that the increase in height between the French and Indian and Revolutionary Wars coincided with some improvement in crude death rates, a substantial portion of the pre-1850 decline in national mortality rates appears to be explained by other factors besides changes in nutrition. The late eighteenth and early nineteenth centuries were characterized by the narrowing of sharp interregional differences in mortality rates between New England and the South. Crude mortality rates in Massachusetts appear to have remained in the fifteen to twenty-five per thousand range throughout this period, while the rates for whites in the South declined from roughly fifty per thousand to the vicinity of twenty-five per thousand.⁵ The higher mean final heights in the South tend to dispel the notion that the southern mortality rates were linked to lower levels of nutrition in that area. On the contrary,

superior nutritional circumstances may have operated to close the gap between regional death rates by counteracting some of the factors that contributed to producing higher mortality in the South (disease pool, climate and so on). Yet it should be emphasized that our investigation is still at a preliminary stage, and our results and conclusions remain tentative.

We are currently preparing to study the relationship between mortality and nutrition (or height as an index of nutrition) more directly. Utilizing genealogical and military data from the eighteenth and nineteenth centuries, we are beginning to link estimated mortality rates from areas smaller than states with mean final heights for the geographic regions. We will also be introducing our measures of nutritional status into production functions for both the agricultural and manufacturing sectors, as well as relating height data by country of residence in the northeast to the expansion of the manufacturing sector. The results may not be unambiguous, since the intensification of labor that enhanced productivity and accompanied the growth of the manufacturing sector could have led to an increase in the per capita energy output of laborers relative to the consumption of calories and nutrients, and this may have produced a decline in stature. It cannot be assumed, therefore, that the decrease in final heights after 1825 necessarily implies a reduction in per capita food consumption. It might seem unlikely that the stature of whites, who were free and experienced most of their growth by age 20, would be much influenced by changes in labor organization. During the nineteenth century, however, especially before 1860, boys commonly entered the labor force before the peak of their adolescent growth spurt (before age 16). Consequently, a decline in height could have resulted because there was an increase in the per capita energy output of these young workers without a corresponding increase in the per capita consumption of calories and nutrients. British investigations of child labor in factories during the nineteenth century tend to support this hypothesis. Children of a given socioeconomic class, working in factories, were substantially shorter at each age than children of the same class who were not so employed.

Changes in the Composition of Household Saving¹

Edward J. Kane

Even when society as a whole is doing little to stop inflation, a venturesome household can neutralize inflation by suitably reallocating its wealth. It can do so by shifting its wealth (as far as transactions costs permit) into a collection of assets and liabilities whose overall rate of return promises to improve with anticipated and unanticipated increases in inflation. But most portfolios

¹ This research is part of NBER's project on the Changing Roles of Debt and Equity Finance in the United States. A NBER Working Paper by Professor Kane summarizing part of this work, "Accelerating Inflation and the Distribution of Household Saving Incentives," is forthcoming.

⁵ R. Fogel, et al., "The Economics of Mortality in North America, 1650-1910: A Description of a Research Project," *Historical Methods*, 11 (Spring 1978): 75-108.

that protect against unanticipated inflation are speculative, in that they threaten to develop substantial losses if unanticipated deflation should occur instead.

This study describes how, in the middle and late 1960s, households in different economic and demographic classes reallocated their "transactable savings" to cope with accelerating inflation. I define transactable savings to mean essentially noncontractual savings: savings that are not administered for households by insurance companies, pension funds, or the U.S. social security system.

I use cross-sectional data from the 1962 and 1970 Surveys of Consumer Finances to estimate both the composition of household portfolios of transactable savings and prospective rates of return on these portfolios. My purpose is to cast some light on how accelerating inflation affects the incentives to save of different households and to map out resulting differences in the distribution of opportunities for accumulating personal wealth.

My data set neglects claims on pension funds and on wealth accumulated in collectibles, food inventories, and consumer durables that are not built into homes. Aggregate Flow of Funds data for the household sector developed by Cagan and Lipsey suggest that these unmeasured asset categories captured about half of the flow of net household saving between 1962 and 1970.² This proportion may be somewhat higher for younger and less wealthy households.

As Cagan and Lipsey have shown, Flow of Funds data covering the household sector as a whole show virtually no change in balance sheet ratios between 1962 and 1970. Moreover, although households' aggregate ratio of tangible to intangible assets rises sharply after 1972, Cagan and Lipsey argue that the increase can be attributed to capital appreciation on a relatively unchanging collection of assets, with no need to presume an *active* shift into inflation protected assets. My cross-sectional research indicates that the apparent passivity in aggregate household portfolio ratios conceals some important shifts in asset holding among wealth and age classes.

In the contemporary United States, the redistributive effects of accelerating inflation can be properly understood only in conjunction with long-standing federal and state policies to promote homeownership and housing construction whose qualitative effects on incentives to save vary with the rate of inflation. These policies consist principally of income tax preferences available to homeowners and a grab bag of programs and political forces that act to slow inflation induced increases in the nominal rate of interest charged on mortgage funds.

My analysis features the concept of regulation constrained portfolio balance. I show that accelerating inflation has, in the presence of comprehensive ceilings on deposit interest rates, altered the incentives to save of different types of households. The effect has been to bias "*small*" savers toward leveraged investments in tangible assets (especially real estate) and "*large*" sav-

ers toward certificates of deposit and marketable bonds. Small savers with disadvantaged access to credit are simply victimized.

Both to hedge against the risk of inflation that is inherent in their nontransactable savings and to eke out a positive *net* real aftertax rate of return on their transactable funds, all but the wealthiest U.S. households found it advantageous to substitute investments in housing and investment real estate (and presumably also in collectibles, food inventories, and consumer durables) for traditional financial vehicles for savings. Influenced by the cost of transactions and by tax differentials, the nation's oldest and wealthiest households shifted their transactable wealth differently. They moved, on balance, out of home equity and traditional deposit accounts into certificates of deposit, marketable bonds, and equity in investment real estate.

Although both patterns of portfolio rebalancing make sense *ex ante*, the resulting balance sheets prove noticeably riskier than the portfolios held by the corresponding sets of households in 1962. When in the 1970s bond prices declined and stock values failed to increase with unanticipated inflation, real returns earned by most wealthy households fared badly *ex post*. These developments have left our nation's wealthiest households anxious and confused, particularly about the ability of common stocks to act as an inflation hedge. On the other hand, trends in housing prices have rewarded and reassured those generally less-wealthy investors that shifted heavily into real estate, especially those who dared to leverage themselves to the hilt.

Disaggregating household behavior, particularly by wealth and age, helps to explain a number of puzzling special features of the 1975-79 macroeconomic recovery. These features include: the dominant role of consumer spending; unprecedented increases in household debt; changing patterns of financial intermediation; the improving quality of owner occupied housing; and the growing speculative boom in residential real estate. My analysis portrays each of these developments as a reasonable response to changes in the savings incentives facing households of different means.

Consolidated Balance Sheets for Households in Different Age Classes

Survey data depicting the composition of household assets indicate that between 1962 and 1970 the combination of accelerating inflation and deposit rate ceilings has markedly changed the age distribution of real estate ownership. This is shown in table 1. Even as early as 1970, households whose heads were less than 55 years in age had sharply increased the proportion of their accumulated savings held as equity in real estate, while older households had shifted their funds out of both real estate equity and "regulated financial assets" (deposits and U.S. savings bonds) into "unregulated financial assets" (stocks, marketable bonds, and mutual funds). Moreover, with their holdings of regulated assets, older households moved funds from other categories into certificates of deposit (CDs). In 1970, survey households whose heads were 55 years old or older owned approxi-

² Phillip Cagan and Robert E. Lipsey, *The Financial Effects of Inflation* (Cambridge, Mass., Ballinger Publishing Co., 1978).

TABLE 1: Percentage Breakdown of Household Portfolios of Transactable Financial Assets and Real Estate Equity by Age Class in 1962 and 1970

(Proportions Stated in Percentage Points)

Age of Household Head (in Years)	Financial Assets			Real Estate Equity			Percent of Sample Respondents
	Regulated	Unregulated	Total	Equity in Home	Equity in Investment Real Estate	Total	
1962 Data Set							
Under 25	19.5	57.4	76.9	8.8	14.4	23.2	9.1
(Under 25 deleting wealthy outlier)	(29.0)	(33.7)	(62.7)	(14.1)	(23.1)	(37.2)	(9.1)
25 to 34	18.9	12.2	31.1	48.1	20.8	68.9	19.5
35 to 44	13.1	20.1	33.2	50.2	16.6	66.8	23.4
45 to 54	14.6	20.0	34.6	51.0	14.4	65.4	19.5
55 to 64	17.6	17.7	35.3	47.1	17.6	64.7	13.3
65 and over	27.0	12.8	39.8	42.0	18.2	60.2	15.3
2,117 Respondents	18.1	17.9	36.0	47.1	16.9	64.0	100.1
1970 Data Set							
Under 25	44.8	8.7	53.5	36.1	10.4	46.5	10.0
25 to 34	19.9	8.1	28.0	53.2	18.9	72.1	18.3
35 to 44	14.4	14.7	29.1	47.7	23.3	71.0	18.9
45 to 54	15.7	10.4	26.1	55.0	18.8	73.8	20.0
55 to 64	16.9	27.5	44.4	37.3	18.4	55.7	16.5
65 and over	21.2	25.9	47.1	32.6	20.2	52.8	16.3
2,576 Respondents	17.8	20.2	38.1	42.1	19.8	61.9	100.0

SOURCE: Calculated from Survey of Consumer Finances data tapes. For a description of these surveys, see G. Katona, L. Mandell, and J. Schmiedeskamp, *1970 Survey of Consumer Finances* (Ann Arbor: Survey Research Center, Institute of Social Research, 1971).

NOTE: Components of totals may not add to 100.0 because of rounding.

mately 55 percent of reported net transactable wealth; 75 percent of total CDs, deposits, and stock market investments; and 85 percent of marketable bonds. In 1962, this age group owned approximately 40 percent of respondents' net transactable wealth, and (except that they held only 15 percent of marketable bonds) allocated their funds fairly evenly across individual asset categories.

Presumably, older households find the in-kind return on housing less valuable as their children grow up and set up households of their own. However, they can economically afford to undertake certain reallocations because they are, on average, *large savers*. My interpretation of these data implicitly attributes observed changes in portfolio distributions between 1962 and 1970 to differences in the ability of households of different ages to protect themselves both against increases in inflation and inflation risk and against unfavorable regulatory developments in financial markets. I simply presume that 1962 portfolio patterns were determined predominantly by life cycle considerations. However, since the 1962 survey was taken about a year into a cyclical recovery and the 1970 survey was taken at the beginning of an economic decline, cyclical influences probably affect the results, too. During the months of the 1962 survey, unemployment was cyclically high but falling. In 1970, unemployment was low but rising. Although aggregate unemployment rates were not greatly different, unemployment among males aged 20 to 24 averaged 11.2 percent in the 1962 survey months and only 7.7 percent during the 1970 interview period. The poorer labor market outlook in 1962 may well have made young households more hesitant to undertake homeownership.

However, the dramatic increase in the proportion of transactable wealth that young households placed in regulated assets and real estate equity seems far too large to attribute to this small difference in unemployment rates. In 1962, only 6.2 percent of households whose heads were under age 25 owned their homes, but by 1970, 20.3 percent of households in the counterpart age class were homeowners. The youngest class in 1970 quadrupled the portfolio weight carried by its 1962 counterpart. (Even if we eliminate one outlying wealthy household from the 1962 age class sample, the 1970 portfolio weight for home equity is still 2.5 times its 1962 value.) Because households in the youngest age class had generally smaller families in 1970 than 1962 (so that they presumably found the continuing services of a given living space less productive), they must have anticipated substantial future appreciation in housing prices to justify this allocational pattern. It is possible that this inflation spawned increase in the propensity of young families to undertake leveraged homeownership also reflects a generational difference in both borrowers' and lenders' attitudes toward risk bearing. The young have to live with the consequences of accelerating inflation over a longer economic horizon than anyone else. In the face of contemporary inflation, modern lending officers and young would-be borrowers may be less inhibited psychologically by conventional attitudes about the alleged "prudence" of "staying out of debt." But by plugging in plausible assumptions about anticipated yields on alternative assets, I show that this substantial portfolio reallocation was not enough to bring the average 1970 portfolio rate of return for this age class up to the level earned by older households.

Implications

My research develops parallel evidence for households classified by wealth, sex, race, and family income. The analysis establishes the role that real estate played in the late 1960s as the ordinary citizen's chief hope against accelerating inflation in the face of comprehensive deposit rate ceilings. By expanding their proportionate holdings of real estate, households with below-average wealth were able to anticipate positive real aftertax rates of portfolio return despite painful interest rate ceilings on the deposits and savings bonds in which their transactable wealth had traditionally been concentrated. By discriminatorily reducing the efficiency of financial intermediation, interest rate ceilings have biased investments by *small* savers toward tangible assets (especially real estate) and investments by very *large* savers toward unregulated financial assets.

Although these reconstituted portfolios made sense in 1970, they appear unnecessarily risky *ex ante* for both groups. With real estate investments protected against unanticipated inflation and stocks and bonds proving surprisingly vulnerable to it, so far the nation's wealthiest households have fared less well *ex post* than the average homeowner. However, precisely because homeowners' portfolios of transactable wealth are protected against unanticipated inflation, they remain exposed to substantial deflation risk. As they come to realize this, homeowners may begin to function politically as an explicit constituency for inflation.

Research on International Modeling

Dennis Warner and Hannu Halttunen

One objective of NBER's Program in International Studies is to bring both practical and empirical research to bear on important international economic issues. As part of this effort, we have been developing an integrated model, incorporating parts of the international economy into a more general framework that can be used for analysis of a wide range of problems, including exchange rate determination and alternative currency arrangements.

The proximate goal of our modeling effort is to simulate aggregate output (GDP) and demand paths for each of the OECD (Organization for Economic Cooperation and Development) countries and for three multicountry, non-OECD regions. We plan to use these projections with a trade model for further research. So far, we have used our model in two exercises: (1) to study the sensitivity of current accounts and trade balances to variations in GDP growth paths for various countries; and (2) to use the equations of the trade model to test the performance of different exchange rate regimes, given paths for real output.

The current model builds on earlier work that we did as part of the OECD Project Interfutures that was directed by William Branson, director of NBER's Program in International Studies. Further development is currently

in progress at NBER. (NBER Working Papers No. 389 and 390 describe the model as of the end of the 1979 NBER Summer Institute.)

Macroeconomic Input

The macroeconomic model focuses on long-run growth paths of real GDP for the OECD countries. It does not, at present, model cyclical departures from the long-run full-employment path. In the model, the level of potential output is determined by exogenously imposed trends in the working-age population—labor force participation, labor productivity, and full-employment unemployment rates. The model assumes that in the long run, government policies will keep aggregate demand at the potential output level; that is, the governments will direct their economies from the current, below potential, levels to full employment by some future date specified outside the model.

To derive the long-term investment requirements for each sector in ten OECD countries, we use the projected GDP figures in a small submodel that includes projections of capital-output ratios, output shares for each sector, and depreciation rates. Table 1 presents sample results from a rather optimistic run of the output and investment models for a selection of the countries.

The departure of GDP from potential in 1978 is large for Japan, Germany, and Belgium; moderate for the United Kingdom and the United States; and very small for Canada. In this run, we assumed very low full-employment unemployment rates for the first three countries. If all of the countries are to achieve the full-employment output paths by 1990, rather high average real growth rates are required. For these target unemployment rates, Germany and the United States suffer from the most serious capital shortfalls. In order to eliminate this shortfall by 1990, Germany would need an extremely high investment ratio throughout its economy.

Trade and Exchange Rates

The trade model has been developed for studying currency arrangements, transmission of disturbances among countries, and long-run trends in equilibrium real exchange rates. Currently, the domestic output models do not show the response of output to demand conditions, so there is no feedback from the international (demand) side to the level of real domestic activity. Therefore, we limit our investigation to experiments that depend on a given output path.

The international model may be separated into two sectors, trade and finance. The trade sector has been constructed by combining the empirical research of several authors into a small, easily handled model with a similar structure for all countries. The GDP projections, domestic price levels, and import prices determine imports for three categories: nonoil goods, nonfactor services, and oil. Exports are determined by imports and by trade share matrices, which change over time according to relative import prices. Import prices are an import-share weighted average of trading partners' export prices in the importer's currency. The export prices are a trade weighted average of the domestic and competitors' export prices.

TABLE 1: Results from Output and Investment Models for Selected Countries

Country	Percent	Percent	Equilibrium	GDP Growth Rate		I/y Ratio ⁴	
	GDP Gap 1978 ¹	Capital Gap 1979 ²	1973 K/y Ratio ³	1978-90	1975-80	1979-90	1975-78
Canada	1.2	2.3	3.0	3.4	4.6	.21	.23
United States	6.7	7.7	2.8	3.1	2.7	.19	.18
Japan	14.4	-1.4	2.7	7.3	6.8	.27	.30
Belgium	16.5	1.4	2.6	5.0	5.3	.20	.21
Germany	14.3	16.2	4.0	5.1	5.4	.36	.21
United Kingdom	7.0	1.5	2.9	3.9	3.3	.21	.19

¹Percent GDP Gap = 100 times Potential GDP minus Actual GDP, divided by Potential GDP.

²Percent Capital Gap = 100 times Potential Capital Stock minus Actual Capital Stock, divided by Potential Capital Stock.

³Equilibrium 1973 K/y Ratio = 1973 Actual Capital Stock divided by 1973 Actual GDP.

⁴I/y Ratio = Gross Domestic Investment divided by GDP.

The current account balance is derived from the trade balance given by the trade sector by adding net investment income (a percentage of last period's stock of net foreign assets) and an exogenous level of other current account items. The cumulative value of the current account is the country's net foreign asset position. The net foreign asset positions of the major countries provide the basis for the determination of exchange rates in the model. The exchange rate equations reported by Branson and Halttunen¹ and by Branson, Halttunen, and Masson² have been adapted for Canada, Japan, the United Kingdom, France, Germany, Italy, and the United States. Exchange rates vary according to changes in the relative net foreign positions in each country. The long-run equilibrium rates are reached when each country has a zero balance on current account.

The exchange rates of the sixteen smaller OECD countries and the less developed countries (LDCs) that do not produce oil are determined by an adjustable peg rule that changes the effective, or trade weighted, exchange rate of each country in response to movements in its current account balance. Exchange rates of OPEC nations and centrally planned economies (CPEs) are fixed vis-a-vis the U.S. dollar.

This relatively simple exchange rate model is not the final product of the project. Currently, research is in progress with the goal of incorporating more recent empirical findings into the model. One of the exercise's primary purposes is to provide a framework for testing the feasibility and efficacy of various exchange rate models and systems of exchange rate pegging.

An Illustrative Experiment

In order to illustrate the model, these simulations assume that GDP follows an optimistic path toward full recovery by 1990. The figure for aid to the LDCs is taken from World Bank 1976 SIMLINK simulations. The capital inflow to the CPEs declines steadily from its 1976 value to zero by 1990. The remaining exogenous time series are the price of oil and OPEC imports. For these runs, we set the real oil price index equal to the actual price (as of July 1980) for the years 1975-79 and equal to the actual

1979 value for the years 1981-90. OPEC imports are equal to actual imports from 1975-79 and then increase, so that OPEC has a zero balance on current account by 1990. These assumptions provide the input for the standard (base) run. For the second simulation, it was assumed that Germany's growth rate of output was, on average, one percentage point higher than in the base run. Here we compare the results of the two simulations to illustrate some of the cross-country linkages present in the model. Table 2 contains a summary comparison of the two simulations.

Due to the higher growth rate in the second simulation, Germany's current account is lowered, and its real exchange rate depreciates by 23 percent by 1990. This exchange rate depreciation lowers the relative price of German exports, giving Germany an additional 1.4 percent of the world's nonoil goods market by 1990 and causing a 0.4 percent increase in the average domestic inflation rate.

In this simulation, the countries affected most strongly are France, Italy, the United Kingdom, Belgium, and the Netherlands. For all countries, there are two primary channels of influence: the exchange rate determination system and the current account. The exchange rates of France, Italy, and the United Kingdom are linked directly to Germany's current account. Initially, Germany's current account worsens due to higher import demand, while their current accounts improve because of higher exports to Germany. This causes the exchange rates of France, Italy, and the United Kingdom to appreciate and Germany's to depreciate. In the longer run, the appreciation of the three currencies outweighs the direct stimulus from Germany's import demand and their current accounts weaken. All three lose market shares and experience a decline in their inflation rates.

For the smaller European countries, the effects are somewhat different. With the exception of Ireland, whose exchange rate is closely linked to the United Kingdom's, all countries experience an improved trade and current account balance because of increased German demand. All of their exchange rates appreciate slightly, and their inflation rates are lowered. Here it must be remembered that output is always kept at an exogenous level so that there is no labor market pressure on costs: the only pressure comes from the change in prices of imported goods and services.

¹"Asset-Market Determination of Exchange Rates: Initial Empirical and Policy Results," J. Martin and A. Smith, eds., *Trade and Payments Adjustment under Flexible Exchange Rates*, (New York: Macmillan, 1979).
²"Exchange Rates in the Short Run: The Dollar-Deutschemerk Rate," *European Economic Review* (October 1977).

TABLE 2: Changes Caused by Increased German Growth

	Nonoil Goods Exports (Percent Shares of World)			Real Exchange Rate (1975 = 100)			Cumulative Current Account (Billion U.S. \$)			Inflation Rate (Annual Percent)
	1979	1985	1990	1979	1985	1990	1979	1985	1990	
1. Canada	.0	-.1	.0	.0	-1.1	.1	.1	.2	.1	.0
2. France	.0	-.2	-.4	.3	9.6	13.3	-.2	-6.7	-5.3	-.3
3. Germany	.0	.9	1.4	-.6	-15.6	-23.1	-.7	-38.1	-57.2	.4
4. Italy	-.1	-.1	.0	.7	12.7	8.8	-.2	-20.1	-55.7	.0
5. Japan	.0	-.2	-.2	.0	-.9	-.8	.2	1.7	1.7	-.2
6. United Kingdom	-.1	-.1	-.1	.5	10.4	14.1	-.2	-9.0	-19.1	-.1
7. United States	.0	-.2	-.3	-.1	-.8	-.4	.4	3.5	4.2	.0
8. LDCs	.0	-.3	-.4	.0	1.4	2.1	.2	8.6	8.6	-.1
9. OPEC	.0	-.1	-.1	.0	-.8	-.4	.2	12.2	-47.0	—
10. CPEs	.0	.0	-.1	.0	-.8	-.4	.0	.5	.6	—
11. Australia	.0	-.1	.0	.0	-.4	-.4	.0	-.3	-.4	.0
12. Austria	.0	.0	.0	.2	.2	2.6	.1	2.5	4.9	-.2
13. Belgium-Luxembourg	.0	.1	.1	-.1	1.9	4.6	.2	5.1	10.0	-.3
14. Denmark	.0	.0	.0	.0	1.9	3.9	.0	2.1	4.1	-.2
15. Finland	.0	.0	.0	.0	2.2	3.8	.1	2.1	4.7	-.2
16. Iceland	.0	.0	.0	.0	1.4	2.4	.0	.1	.0	-.2
17. Ireland	.0	.0	.0	.2	2.2	2.0	.0	-.2	-.5	-.1
18. Netherlands	.0	.2	.0	-.1	2.1	4.9	.4	10.0	19.5	-.3
19. Norway	.0	.0	.0	.0	1.3	2.3	.0	.5	.7	-.1
20. Portugal	.0	.1	.0	.1	2.7	4.0	.0	2.1	5.1	-.3
21. Spain	.0	.1	.0	.1	2.7	3.5	.0	2.6	2.9	-.2
22. Sweden	.0	.1	.1	.0	2.5	4.3	.0	3.4	6.3	-.1
23. Switzerland	.0	.0	.0	.0	1.9	2.3	.0	1.1	1.7	.0
24. Greece	.0	.0	.0	.0	.9	1.3	.1	.9	1.6	-.2
25. New Zealand	.0	.0	.0	.0	1.5	2.0	.0	.2	.1	.0
26. Turkey	.0	.0	.0	.0	1.8	2.6	.0	1.8	4.1	-.1

The effects on the non-European countries are relatively small. OPEC does experience a significant increase in its current account due to increased oil exports to Germany. The effects on Canada, Japan, the United States, Australia, and New Zealand are very small.

Future Research

Currently, we are concentrating on further development of the structure of the model and its use as a research instrument. We are particularly interested in two aspects of the model: exchange rate determination and the linkages between the domestic and international sectors. We are integrating the research results of several members of the Program in International Studies, and others, into the model. Thus far, our simulations have indicated some anomalies and shortcomings in our adaptation of the exchange rate equations of Branson, Haltunen, and Masson. The more sophisticated system developed recently by Healy may improve the performance and internal consistency of the model.

With Branson, we are also investigating ways to increase the model's linkages between the domestic and international sectors. Heading the list of priorities in this area are the inclusion of: (1) money supplies and their effect on domestic price levels and exchange rates and (2) a set of simple short-run aggregate demand models to enable the simulation of actual, as opposed to potential, output paths and the feedback effects of changes in net trade flows.

Economic Outlook Survey

Fourth Quarter 1979

Victor Zarnowitz

According to the median forecast from the latest survey by the American Statistical Association and NBER of professional economic forecasters, the total output of the economy (real GNP) will decline in the current quarter and the first half of 1980 at an average annual rate of about 2.9 percent. During the same three-quarter period, industrial production, plant and equipment expenditures, business inventory investment, housing starts, and consumer outlays on durable goods are all expected to decline. The recession implicit in these predictions by the group of thirty-two economists is relatively moderate and short. The rate of unemployment is projected to rise from 6.2 percent of the labor force in 1979 to 7.5 percent in 1980:4. The rates of inflation will show an irregular and modest decline in the course of the next year, but the GNP implicit price deflator is predicted to rise 8.8 percent in 1979-80, the same as in 1978-79.

The Predicted Decline and Rise

The unexpected rebound of the economy in 1979:3 (when real GNP made up for its loss in the previous quarter instead of declining further as had been widely anticipated) led to an upward revision of the levels of the

Projections of GNP and Other Economic Indicators, 1979-80

	Annual				
	1978 Actual	1979 Forecast	1980 Forecast	Percent Change	
				1978 to 1979 Forecast	1979 to 1980 Forecast
1. Gross national product (\$ bil.)	2127.6	2361.6	2531.8	11.0	7.2
2. GNP implicit price deflator (1972 = 100)	152	165.3	179.8	8.8	8.8
3. GNP in constant dollars (bil. 1972\$)	1399.2	1427.2	1408.6	2.0	-1.3
4. Unemployment rate (percent)	6.0	5.9	7.3	-0.1 ¹	+1.4 ¹
5. Corporate profits after taxes (\$ bil.)	121.5	142.3	133.0	17.0	-6.7
6. Plant and equipment expenditures (\$ bil.)	153.8	173.4	183.7	12.7	5.6
7. New private housing units started (ann. rate mil.)	2.02	1.74	1.47	-13.9	-15.5
8. Change in bus. inventories GNP accounts (\$ bil.)	14.1	21.9	5.2	+7.8 ³	-15.7 ³

	Quarterly							
	1979 Q3 Actual	1979 Q4 Forecast	1980 Q1 Forecast	1980 Q2 Forecast	1980 Q3 Forecast	1980 Q4 Forecast	Percent Change	
							Q3 79 to Q3 80	Q4 79 to Q4 80
1. Gross national product (\$ bil.)	2392	2434	2464	2497	2550	2616	7.3	6.6
2. GNP implicit price deflator (1972 = 100)	167.1	171	174.4	178	181.6	185	8.5	8.7
3. GNP in constant dollars (bil. 1972\$)	1430.8	1425	1410	1400	1407	1417	-1.3	-1.7
4. Unemployment rate (percent)	5.8	6.2	6.8	7.4	7.4	7.5	1.7 ¹	1.6 ¹
5. Corporate profits after taxes (\$ bil.)	147.9 ²	140	133	130	133	137	2.3	-10.0
6. Plant and equipment expenditures (\$ bil.)	175.3	179	180	183	184	188	7.5	5.0
7. New private housing units started (ann. rate mil.)	1.83	1.67	1.47	1.38	1.43	1.60	-25.0	-21.9
8. Change in bus. inventories GNP accounts (\$ bil.)	20.0	15.0	3.0	2.5	5.4	10.0	-14.3 ¹	-16.6 ¹

SOURCE: American Statistical Association and National Bureau of Economic Research, Business Outlook Survey, November 1979. The figures on each line are medians of thirty-two individual forecasts.

¹Change in rate, in percentage points.

²Actual not available. Based on BEA survey of anticipations.

³Change in billions of dollars.

forecasts in 1979:4 and 1980:1 but not to a more optimistic appraisal of next year's prospects. Indeed, the balance of the surveyed predictions is that the decline will deepen as it is displaced by one quarter into the future. Thus, according to the latest survey, GNP in 1972 dollars will be \$1,425 billion in 1979:4 (\$23 billion higher than the median August prediction) and \$1,406 billion in 1980:3 (\$11 billion lower than the August figure). The trough will occur in 1980:2 when real GNP is expected to average \$1,400 billion, to be followed by a sluggish initial recovery (the level of output projected for 1980:4 being \$1,417 billion). These forecasts suggest a "shallow saucer" pattern of movement, which would resemble that observed in 1970 and contrast with the "V type" recession and recovery development of 1974-75.

The pattern described by the median forecasts is shared by a large majority of the survey members, but the distributions of the individual predictions for the longer spans disclose considerable dispersion, even apart from a few outlying predictions, and are skewed to the right (the means exceed the medians). The reported probabilities that real GNP will decline average between 55 and 70 percent for the quarters 1979:4, 1980:1, and 1980:2, then decline to 31 and 17 percent for 1980:3 and 1980:4, respectively.

A Peak in Inflation

The rise in the implicit price deflator is estimated at over 2.3 percent in the current quarter, which compounds to an annual rate of nearly 9.7 percent. The corresponding annual rates of inflation for the four successive quarters of 1980 are, according to the median predictions, 8.2 percent, 8.5 percent, 8.3 percent, and 7.7 percent. Thus the survey indicates that inflation is at its peak right now and, while remaining high, will follow a slow but significant downward trend next year. This pattern is much like that predicted in the August survey, but the levels of inflation anticipated then were, on the average, about three fourths of one percent lower.

The distributions of the individual forecasts of the price level are remarkably tight and symmetrical (much more so than those of the GNP forecasts), so that the above averages are highly representative. The estimated probabilities that the GNP price index will increase 8 to 10 percent in 1980, as compared with 1979, average no less than 62 chances in 100; still larger rises are given a mean probability of 27 chances in 100.

Higher Unemployment

The unemployment rate will average 7.3 percent of the labor force during the year 1980, compared with esti-

mated 5.9 percent for 1979. It will rise to 7.4 percent or slightly higher for the rest of the year. Few of the surveyed economists disagree with the forecast of rising unemployment and most are relatively close to the averages given above. For instance, the interquartile range for 1980:4 is 6.6 percent to 7.9 percent, and the highest rate predicted is 8.4 percent.

Production and Profits

The index of industrial production (1967 = 100) will decline to a trough of 145 in 1980:2, down 4.7 percent from its level of 152.2 reached in 1979:1 and again in 1979:3. The median forecast for 1980:4 is 149.6, up 3.2 percent from the trough level. The average for the year 1980 will be 147, 3.1 percent below the level for 1979.

Corporate profits after taxes are expected to decline from \$148 billion in 1979:3 (a preliminary estimate) to \$130 billion in 1980:2, then rise to \$136 billion in 1980:4. This would be a relatively small and short movement compared to past cyclical declines in nominal profits. The projection for 1980 as a whole is \$133 billion, down 6.7 percent from the 1979 level (all figures for profits are at annual rates).

Fixed Investments and Inventories

Current-dollar expenditures on plant and equipment will increase slowly during 1980—by less than 5 percent for the four quarters ending 1980:4. The rise in capital goods prices will presumably be larger, implying a moderate decline in real fixed investment by the business sector.

The current-dollar change in business inventories is expected to decrease substantially from the annual rates of \$20 billion to \$30 billion that prevailed earlier this year. It is projected at \$15 billion in the current quarter, at levels between \$2 billion and \$6 billion in each of the first three quarters of 1980, and at \$10 billion in 1980:4. This is a larger adjustment than that anticipated in the August survey, but it is still relatively moderate in that inventory adjustment does not turn negative.

Housing and Consumer Durables

In residential construction, too, a larger decline is now foreseen: new private housing starts are to fall to annual rates of 1.4 million units in both 1980:2 and 1980:3, whereas the lowest median figure in the previous survey was 1.6 million units. The forecasts for 1979:4, 1980:1, and 1980:4 are 1.7, 1.5, and 1.6, respectively (all in millions). The year-to-year comparisons yield declines of 13.9 percent for 1978-79 and 15.5 percent for 1979-80.

Consumer expenditures for durable goods are seen as a source of weakness. In current dollars, their preliminary value for 1979:3 is \$213.7 billion at an annual rate, almost equal to their value in 1979:1 and estimated to be more than 2 percent lower in real terms. The median forecasts describe a decline of 2.5 percent to \$208 billion in 1980:1, then a rise of 5.8 percent to \$220 billion in 1980:4. But these figures include the effects of rising prices and hence underestimate the downward, and overestimate the upward, movement in constant-dollar outlays for durables. After adjusting for inflation, the pattern

of fluctuation implied by these predictions is considerably more symmetrical.

Assumptions

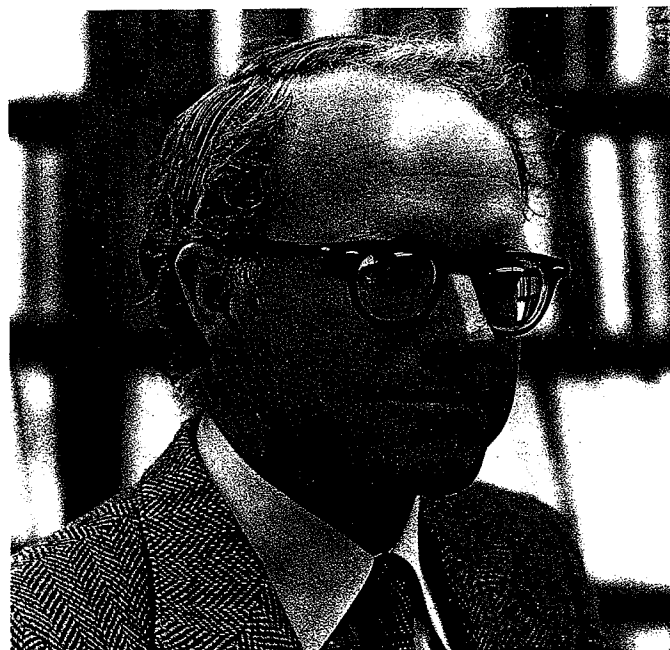
Eighteen of the twenty-three forecasters who reported their views on prospective fiscal policy state that they assumed that there would be a tax cut of between \$15 billion and \$25 billion (the others expect a windfall profits tax or unchanged tax policy). Ten of the survey members state that monetary policy will be unchanged and twelve that it will be tightened (none think that it will be eased). Other assumptions reported by some of the thirty-two participants are the conventional ones at this time: oil price increases, no major war or major strikes or new wage-price controls.

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 Economics Statistics Section of the American Statistical Association. Victor Zarnowitz of the Graduate School of Business of the University of Chicago and NBER and James Poterba of NBER were responsible for tabulating and evaluating this survey.

NBER Profiles

Robert E. Hall

Robert E. Hall, director of NBER's research Program in Economic Fluctuations since 1978, may hold some sort of record for moving from coast to coast. Hall was born in Palo Alto, California, and did his undergraduate work in economics at the University of California, Berke-



ley, where he received a B.A. in economics. He then moved to Cambridge for graduate work at MIT and received his Ph.D. in 1967.

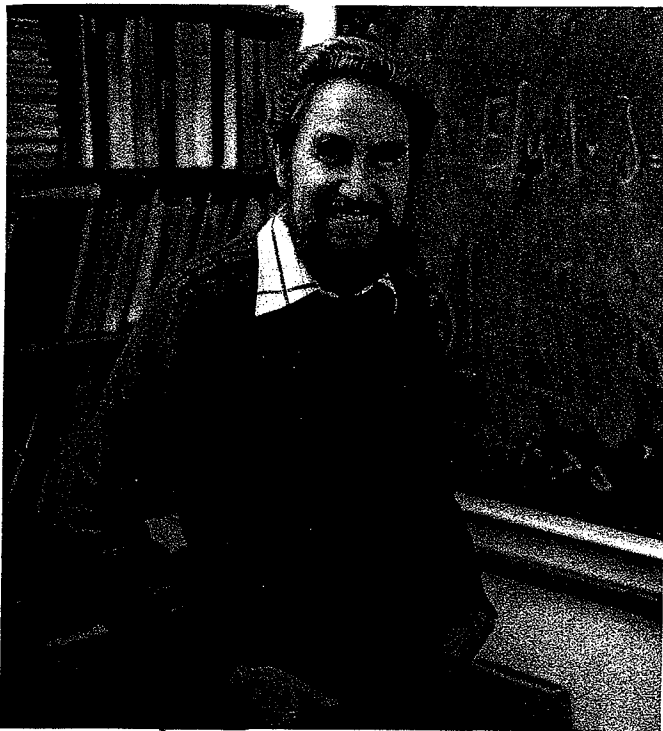
Returning to Berkeley, Hall was first an assistant professor and then an acting professor of economics between

1967 and 1970. Then he came back to MIT, where he was an associate professor of economics from 1970-74 and a professor of economics from 1974 to 1978. During his last year at MIT, Hall was also a fellow of the Center for Advanced Study in the Behavioral Sciences at Stanford University. Since 1978, Hall has been a professor of economics at Stanford and a senior fellow at Stanford's Hoover Institution.

Hall has written numerous publications dealing with labor markets, taxation, inflation, and other economic concerns. He is a fellow of the Econometric Society and has served as a senior adviser to the Brookings Panel on Economic Activity and as a member of the Census Advisory Committee on Population Statistics. His wife, Bronwyn, is a computer scientist specializing in economic applications. The Halls have two children, Christopher and Anne.

Zvi Griliches

Zvi Griliches, director of NBER's Program in Productivity and Nathaniel Ropes Professor of Political Economy at Harvard, has long ties with NBER; he spent the year 1959-60 as a faculty research fellow at the Bureau. Born in Lithuania in 1930, Griliches is a survivor of the



Holocaust. As he puts it, he "did the whole Exodus bit": Dachau, British camp in Cyprus, and the Israel Independence War.

In 1951, he came to the United States, where he studied agricultural economics at the University of California at Berkeley, receiving the B.S. and M.S. degrees in 1953 and 1954, respectively.

Griliches then enrolled at the University of Chicago, where he received his Ph.D. in economics in 1957. He

taught there until 1969. When he left, he was a full professor, and he assumed the same rank at Harvard. His research interests are in technological change in agriculture and industry, the measurement of quality change, the economics of education, and econometric methods of data analysis. He has published a long list of books, journal articles, discussions, and comments in these areas.

Griliches has received numerous awards and honors for excellence in economics, including the John Bates Clark Medal (1965), election to the National Academy of Sciences (1975), and election to the presidency of the Econometric Society (1975). He was coeditor of *Econometrica* from 1968 to 1977.

He has advised and consulted with many corporations, foundations, and commissions; these include the Board of Governors of the Federal Reserve System and the National Science Foundation. He is currently a member of the National Academy of Science's Panel on Ability Testing. Griliches and his wife, Diane (Asseo), live in Newton, Massachusetts, and have two children, Eve and Marc.

Richard B. Freeman

Richard B. Freeman has directed NBER's Program in Labor Studies since 1978 and is a professor of economics at Harvard. He received a B.A. from Dartmouth in 1964 and a Ph.D. from Harvard in 1969.

After serving as a research economist for the Area Redevelopment Administration, the Committee for Eco-



nomics Development (CED), and the Harvard Economic Research Project, Freeman taught at Yale and then the University of Chicago. He joined the Harvard faculty in 1975.

In addition to his teaching responsibilities, Freeman has consulted with many foundations and organizations including the Congressional Budget Office and the Organization for Economic Cooperation and Development. A prolific author, Freeman has written numerous books and articles dealing with trade unionism, youth unem-

ployment, economic discrimination, and other labor related issues.

In his leisure time, Freeman enjoys playing basketball. He is also working on a novel.

Conferences

Taxation of Capital

Over one hundred economists from universities, business, and government attended NBER's Conference on the Taxation of Capital on November 16 and 17 in Cambridge. In the opening session on Friday morning, two papers were discussed: "General Equilibrium Impacts of Replacing the U.S. Income Tax with a Progressive Expenditure Tax" by Donald Fullerton, John Shoven, and John Whalley and "Tax Policy in a Life Cycle Model" by Lawrence Summers.

The paper by Fullerton, Shoven, and Whalley takes a general equilibrium approach to the analysis of welfare costs associated with current taxes on capital. The authors use a multi-sector model to simulate the existing tax structure and the effects of changing to an alternative tax system. Specifically, they examine a number of plans—including an integration of the present personal and corporate income taxes and a pure consumption tax—that would eliminate the distortions and inequities that result from the double taxation of dividends. Their results suggest that the largest efficiency gain would occur through integration of the income taxes.

Summers's paper reexamines the incidence and welfare consequences of capital income taxes within a life cycle model. His results indicate that the elimination of capital income taxation would have substantial economic effects: a complete shift to consumption taxation might result in annual welfare gains of more than \$150 billion, or at least 10 percent of GNP.

In the afternoon, Michael Boskin discussed "The Effects of Taxes and Demographic Changes on Savings," a paper he coauthored with Lawrence Lau. The paper deals with aggregation theory as used to estimate a consumer demand function. Since one wants to predict future consumption, which is dependent upon future prices and other variables that cannot be observed, Boskin and Lau seek to identify permanent attributes that also correlate with consumption (to substitute for variables that cannot be observed). They ask how changes in attributes such as age structure or life expectancy affect basic economic decisions. Among their preliminary findings is the fact that, with respect to the consumer demand function, age is an important attribute, but family size is not.

Next Paul Menchik and Martin David presented their study of "The Effects of Personal Income and Social Security Taxes on Life Saving and Bequests." In their

paper, they use actual income tax and probate record data to analyze the relationship between lifetime resources and bequests. They find a significant relationship between earnings and bequests among the wealthiest group in their sample, but not among the lower income groups.

The final paper discussed on Friday was "Public Employee Pensions and Aggregate Capital Accumulation" by Robert Inman and Laurence Seidman. Inman and Seidman consider the effects of public employee pensions on both household and government savings. They use the context of an individual life cycle model and incorporate both public employee pension wealth and government expenditures, taxes, and deficits into the model. Empirical results suggest that public employees reduce their private savings roughly dollar for dollar with gains in their "pension wealth."

Three papers were discussed on Saturday: "Inflation, Aggregate Demand, Capital Accumulation, and Productivity" by Liam Ebrill and Uri Possen; "Why Do Companies Pay Dividends?" by Martin Feldstein and Jerry Green; and "Causes in the Decline in Aggregate Share Values: Profitability, Taxes, and Risk" by Patric Hendershott.

Ebrill and Possen develop a macroeconomic model in which the nominal return on some assets is taxed and on other assets is not taxed. They observe that an increase in the rate of inflation leads to a decline in measured savings and the capital stock and, for a period, to a decline in labor productivity. This analysis conforms with the recent U.S. experience and lends itself to possible policy implications.

Feldstein and Green focus on an area that has been puzzling economists for some time: with dividends taxed as high as 70 percent and retained earnings virtually untaxed, why do corporations pay dividends? They suggest that retaining a larger share of earnings would increase a firm's growth and relative size and thus make the firm riskier and reduce the market price of its securities. Moreover, shareholders in different tax brackets have different dividend preferences. The combination of these two factors is offered as the reason why firms pay dividends.

Hendershott's paper deals with observed declines in real aftertax bond yields and the relative value of shares during a period of increasing inflation. He explains the falling bond yields as a result of the continued use of historic cost depreciation methods and the taxation of nominal capital gains. However, falling share values, Hendershott believes, are due mostly to the substitution of housing for equity at a time when the income from owner occupied housing is taxed more favorably than corporate income.

Although a conference volume will not be produced, individual papers are available at \$1.00 per copy, or \$8.00 for the entire set. A brief summary of the conference papers will be available in 1980 and will be distributed to all **Reporter** recipients without charge. To place advance orders, write to: NBER Conference Papers, 1050 Massachusetts Avenue, Cambridge, Massachusetts 02138.

Productivity Project Announced

Zvi Griliches, director of NBER's Program in Technical Change and Productivity, recently announced plans for a two-year research project entitled "Patents and R and D and Productivity: Explorations in the Economics of Technological Change." This is one of a number of studies being developed as part of the Bureau's program on productivity. The project, directed by Griliches and M. Ishaq Nadiri, NYU and NBER, assisted by Ariel Pakes and other NBER researchers, will study the ways in which the production of knowledge can influence the economy. One major part of the project will use information on patents and on the value of the firm as the two indicators of the "knowledge" produced by R and D. Patent counts and market valuation equations will be incorporated into conventional models of the R and D-productivity relationship; this should yield information on: (1) the lag between R and D and growth in knowledge; (2) the depreciation rate in the value of patents; (3) the average expected value of patents; (4) the estimated rate of return on R and D expenditures; and (5) the appropriateness of patents as a measure of inventive output.

The researchers intend to add the data on patents and on the market value of the firm to two existing data sets, a sample of 127 large firms for 1963-72 and a sample of 250 large firms for 1955-1975, and to update both sets through 1977. Further, they hope to assemble a third data set on 800 large firms for the period 1972-77.

During the course of this project, the Bureau plans to sponsor a number of conferences and seminars at the Cambridge and New York offices. Papers will be published on the work of this group, and a conference volume will probably appear as a final statement of findings.

Debt and Equity Group Meets

Members of the project on the changing roles of debt and equity in the U.S. economy met at NBER's Cambridge office on October 23 to discuss preliminary drafts of five papers.

Roger H. Gordon and Burton G. Malkiel, "Taxation, Bankruptcy, and Corporation Finance"

Robert J. Shiller, "Do Stock Prices Move Too Much to Be Justified by Subsequent Changes in Dividends?"

David G. Hartman, "International Effects on the U.S. Capital Market"

Edward J. Kane, "Accelerating Inflation and the Distribution of Household Savings Incentives"

Roger H. Gordon and David F. Bradford, "Taxation and the Stock Market Valuation of Capital Gains and Dividends: Theory and Empirical Results"

The meeting was chaired by project director Benjamin

M. Friedman. In addition to the authors, project participants Zvi Bodie, Bureau President Martin Feldstein, Gerald Pogue, V. Vance Roley, and John Shoven attended, as did Bureau Research Associate Laurence Kotlikoff.

Gordon and Malkiel discussed their model of corporate financial decisions in the presence of uncertainty and the possibility of bankruptcy. Using their model to measure distortions introduced by the existing tax structure and excess burden costs, the authors find that efficiency costs of tax incentives that increase debt-equity ratios are substantial (perhaps 10 percent of corporate tax revenues).

Shiller's paper examines the theory that movements in real stock prices can be explained by "new information" about subsequent real dividends. He concludes that this view is, at best, academic and that it does not describe observed movements in stock price data.

Hartman explores the role of international capital flows in the U.S. capital market. He finds the international effects on the domestic market to be potentially of major importance. Both foreign holdings of U.S. government securities and international holdings of equity and private debt are shown to have significant effects on long-term interest rates in the United States.

Kane analyzes the effect of accelerating inflation on household saving. He finds that inflation has biased small savers, limited by the interest rate ceilings of banks, toward tangible assets (especially real estate), while large savers have moved increasingly toward certificates of deposit and marketable bonds.

Finally, Gordon and Bradford look at the question of why firms pay dividends. They find that during 1926-78, the relative value of capital gains to dividends in the stock market has tended toward \$1.00, but has followed a cyclical path ranging from \$.04 to \$1.37. Their results are consistent with the behavior of firms maximizing their share values, but less consistent with the behavior of shareholders maximizing their return. They plan to do further work on the subject, considering influences other than taxes.

International Comparisons of the Taxation of Capital

Donald Fullerton

Considerable research has been done recently on real aftertax rates of return on capital; studies using various methodologies have measured rates of taxation and rates of return for several countries. Their results are crucial for understanding the distribution of tax burdens, efficiency effects of taxation, saving rates, and a host of other issues. These individual efforts, although useful, have not produced comparable estimates of the burden of taxes on capital in various nations. A study based on similar methodologies could help address many of the above issues by shedding light on differential rates of savings, growth, productivity, inflation, and more.

NBER is now coordinating such an effort. It will com-

pare taxation of capital in four countries. The study is expected to take several years to complete. Helmut Lauer and Willi Leibritz of the Institute for Economic Research (IFO) in Munich; Gunnar Eliasson and Jan Sodersten of the Industrial Institute for Economic and Social Research in Stockholm; Mervyn King of the University of Birmingham in England and NBER; and Donald Fullerton of Princeton University and NBER will use a common methodology and comparable data to produce results for their own countries.

At the first meeting of the international tax comparisons group in August, it soon became apparent that there were two general approaches to the measurement problem. One approach postulates a hypothetical project (HP) and calculates the country's effective marginal tax rate on capital for that activity. The other approach uses national accounting (NA) data to obtain information on the various taxes paid by productive sectors on their incomes after they are corrected for inflation. From these data, an effective tax rate that was actually paid by that sector can be calculated. This second approach is used by Feldstein and Summers in NBER Working Paper No. 312, "Inflation and the Taxation of Capital Income in the Corporate Sector."

The Bureau group working on international comparisons of capital taxes will use both approaches. The hypothetical project (HP) approach will be undertaken first. It uses statutory tax rules together with a set of assumptions about asset mix, type of financing, rate of inflation, and characteristics of ownership. The procedure begins with an assumed real gross-of-tax rate of return (say 10 percent) and calculates the real net-of-tax rate of return.

The calculations will be done for one industry (manufacturing) for three asset types (machinery, buildings, and inventories), three sources of finance (debt, internal equity, external equity), several rates of inflation (zero, an arbitrarily selected rate common to all four countries, and each country's recent average rate), several categories of owners (households, pension funds, life insurance, other corporate owners, and banks), and households in various marginal tax brackets. These calculations will allow for corporate income taxes, personal income taxes, and subnational taxes on capital income and will incorporate statutory rules for depreciation allowances, investment tax credits, and other incentives.

The HP approach has the advantage of highlighting special features of the tax structure of each country. It builds in the sensitivity of each tax to the rate of inflation. By considering only the broadly defined "manufacturing" sector, it considers an activity with a technology, type of finance, and business organization that might well be undertaken in any of these four developed nations.

The NA approach, on the other hand, gives an estimate of the effective rate of tax actually paid. It considers the mixed types of assets, means of finance, and patterns of organization actually used in each of the four countries. This approach uses aggregate data on inventory valuation adjustments, capital consumption adjustments, corporate dividends, retained earnings, and taxes to calculate the proportion of real capital income absorbed by business taxes. By combining the result

with aggregate information on the ownership of assets and personal taxes paid, a total effective rate of tax is obtained.

Business Cycle Committee Cautious

The Committee on Business Cycle Dating met on October 25, but again it postponed identification of a peak in the business cycle. The group's continued caution was based on recent strength in the economy: real gross national product and retail sales adjusted for price increases grew from the second to the third quarter, while industrial production, employment, and unemployment remained stable.

The committee did note that growth in the economy has faltered in the period since the first quarter of 1979. Specifically, real gross national product has been roughly stationary; under normal conditions it would have grown at an annual rate of about 3 percent. Also, in a substantial fraction of industries, industrial production and employment have actually declined.

Overall, the group felt that the indicators did not give a clear picture of the state of the business cycle. Therefore, the committee planned to meet again in late December when two more months of data were available.

New Directors Named

Five new members, two by university appointment and three at large, were elected to NBER's Board of Directors at its annual meeting on September 24. The five are Morton Ehrlich, Michael H. Moskow, Robert R. Sterling, Donald S. Wasserman, and Burton A. Weisbrod.

Ehrlich joined Eastern Airlines in 1969; he is senior vice president for planning and a director. Prior to 1969, he was a senior economist with the National Industrial Conference Board and an economist with the Federal Reserve Bank of New York. Ehrlich received his Ph.D. in economics from Brown University.

Moskow received a Ph.D. in economics from the University of Pennsylvania in 1965. Since 1977, he has been associated with Esmark, Inc., in Chicago, where he is currently vice president of corporate development and planning. Prior to 1977, Moskow held a number of high level government positions including senior staff economist of the Council of Economic Advisers, under secretary of the U.S. Department of Labor, and director of the Council on Wage and Price Stability.

Sterling, dean of the Jesse Jones Graduate School of Administration at Rice University, is an NBER director by appointment of that university. He is also a Jesse Jones Distinguished Professor at Rice. Sterling received the Ph.D. from the University of Florida in 1964. Prior to joining the Rice faculty, he was director of research of the American Accounting Association. He has written many books on accounting, and he has received the

gold medal of the American Institute of CPAs twice, in 1968 and 1974.

Wasserman, who holds the M.B.A. degree from the University of Pennsylvania, is director of research and collective bargaining services of the American Federation of State, County, and Municipal Employees (AFSCME). Before joining AFSCME in 1967, Wasserman was an economist with the International Association of Machinists. He also serves on the Labor Advisory Committee of the U.S. Department of Labor's Bureau of Labor Statistics.

Weisbrod, appointed by the University of Wisconsin, is a professor of economics whose research interests are in the nonprofit sector. He received the Ph.D. from Northwestern University in 1958. In addition to his teaching post at Wisconsin, Weisbrod has served as senior staff economist with the Council of Economic Advisers and as a visiting professor at Yale University.

Boskin Heads NBER West

Michael Boskin, professor of economics at Stanford University and director of NBER's Program on Social Insurance, has been named to succeed Robert Michael as director of NBER's Palo Alto office beginning July 1, 1980. Boskin, who received the Ph.D. from the University of California, Berkeley, in 1971, has taught at Stanford since 1971 and was a visiting professor at Harvard in 1977. His areas of interest within economics include public finance, econometrics, economic theory, and labor studies.

Under Boskin's leadership, the California office of the Bureau, like the Cambridge and New York offices, will continue to engage in research on a broad range of economic issues. In addition to work on social insurance and taxation, research in Palo Alto will include topics in health economics and an analysis of private pensions, which is part of a major NBER project on pensions.

Easterlin Volume Available

Population and Economic Change in Developing Countries, edited by Richard A. Easterlin, a volume containing papers and comments presented at a Universities-National Bureau of Economic Research Conference of the same title, is now available. This volume brings together recent research on the causes and consequences of population change in less developed countries (LDCs) by a number of leading economists in the field of population and includes comments by fellow economists and demographers.

The principal empirical concern of the first five papers is the demographic transition—the shift from high to low mortality observed in the history of developing countries. Four of the papers contribute new ideas relating to fertility transition: (1) the role of the cost of children (Lindert); (2) tastes and natural fertility (Easterlin, Pollak, and Wachter); (3) the relation between infant mortality

and fertility (Ben Porath); and (4) the value of time (Schultz). One paper (Preston) studies the mortality transition, providing an important breakthrough from qualitative speculation to quantitative analysis. A sixth paper (Todaro) provides a valuable survey and critique of the literature on internal migration in developing areas.

The remaining three papers contribute new analyses to the effects of population change in LDCs—Kelley writes on family saving and income; Kuznets, on income distribution; and Lee, on the balance between population and economic resources. Two underlying themes throughout the volume are a respect for facts and an effort to match theory with reality. The volume also shows a growing sensitivity of economic research to the value and importance of demographers' contributions.

Population and Economic Change in Developing Countries is the first volume in a series of NBER books to be published by the University of Chicago Press. It should be ordered directly from the University of Chicago Press, Order Department, 11030 South Langley Avenue, Chicago, Ill. 60628. The cost of the volume is \$38.00.

Reprints Available

The following NBER reprints, intended for nonprofit educational and research purposes, are now available. (See the **Reporter**, Summer and Fall 1979, for titles 1–19.)

20. *The Effect of Social Security on Early Retirement*, Michael J. Boskin and Michael D. Hurd, 1978.
21. *Realized Returns on Common Stock Investments: The Experience of Individual Investors*, Gary G. Schlarbaum, Ronald C. Lease, and Wilbur G. Lewellen, 1979.
22. *An Analysis of Brokerage House Securities Recommendations*, John C. Groth, Wilbur G. Lewellen, Gary G. Schlarbaum, and Ronald C. Lease, 1979.
23. *Short-Run and Long-Run Effects of External Disturbances under a Floating Exchange Rate*, Willem H. Buiter, 1978.
24. *Housing Decisions and the U.S. Income Tax*, Harvey S. Rosen, 1979.
25. *Social Security and Consumer Spending in an International Cross Section*, Robert J. Barro and Glenn M. MacDonald, 1979.
26. *Price Behavior in the Light of Balance of Payment Theories*, Irving B. Kravis and Robert E. Lipsey, 1978.
27. *Further Evidence on Expectations and the Demand for Money during the German Hyperinflation*, Jacob A. Frenkel, 1979.
28. *Optimal Expectations and the Extreme Assumptions of Rational Expectations Macromodels*, Benjamin M. Friedman, 1979.
29. *Do Private Pensions Increase National Saving?* Martin Feldstein, 1978.
30. *Share Valuation and Corporate Equity Policy*, Alan J. Auerbach, 1979.

31. *Inflation and the Choice of Asset Life*, Alan J. Auerbach, 1979.
32. *Money and the Price Level under the Gold Standard*, Robert J. Barro, 1979.
33. *Second Thoughts on Keynesian Economics*, Robert J. Barro, 1979.
34. *Interest Rate Expectations versus Forward Rates: Evidence from an Expectations Survey*, Benjamin M. Friedman, 1979.
35. *The Effect of Demographic Factors on Age-Earnings Profiles*, Richard B. Freeman, 1979.

These reprints are free of charge to corporate associates and other sponsors of the National Bureau. For all others, there is a \$1.00 charge per reprint to defray the costs of production, postage, and handling. Advance payment is required on orders totalling less than \$10.00. Reprints must be requested by number, in writing, from: Reprint Series, National Bureau of Economic Research, 1050 Massachusetts Avenue, Cambridge, Mass. 02138.

Current Working Papers

Individual copies of NBER Working Papers are available free of charge to corporate associates and other supporters of the National Bureau. Others can receive copies of the Working Papers by sending \$1.00 per copy to Working Papers, National Bureau of Economic Research, 1050 Massachusetts Avenue, Cambridge, Mass. 02138. Please make checks payable to the National Bureau of Economic Research, Inc.

Beginning with Working Paper No. 401, *Journal of Economic Literature* (JEL) subject codes will be listed after the date of each Working Paper. Abstracts of all Working Papers issued since November 1979 are presented below. For earlier Working Papers, see previous issues of the NBER **Reporter**. The Working Papers abstracted here have not been reviewed by the Board of Directors of NBER.

Rank-Order Tournaments as Optimum Labor Contracts

Edward P. Lazear and Sherwin Rosen
 Working Paper No. 401
 November 1979
 JEL Nos. 022, 821

It is sometimes suggested that compensation varies among individuals much more dramatically than would be expected by looking at variations in their marginal products. This paper argues that a compensation scheme based on an individual's relative position within the firm rather than his absolute level of output will, under certain

circumstances, be the preferred and natural outcome of a competitive economy. Differences in the level of output among individuals may be quite small, yet optimal "prizes" are selected in such a way that induces workers to allocate their effort and investment activities efficiently.

In particular, by compensating workers on the basis of their relative position in the firm, one can produce the same incentive structure for risk-neutral workers that the optimal and efficient piece rate produces. It might be less costly, however, to observe relative position than to measure the level of each worker's output directly. This results in the payment of prizes, wages that for some workers, greatly exceed their presumed marginal products. When risk aversion is introduced, the prize salary structure no longer duplicates the allocation of resources induced by the optimal piece rate. For activities that have a high degree of inherent riskiness, payment based on relative position will dominate.

Analysis of Pension Funding under ERISA

Jeremy Bulow
 Working Paper No. 402
 November 1979
 JEL No. 521

This paper begins by describing the tax, funding, and insurance aspects of the Pension Reform Act of 1974. Next, the implications of those laws are analyzed from the standpoint of the funding decision of the firm. The tax advantage of early funding appears to be quite small. Because there are insurance and other reasons (related to asymmetries in the pension law) why firms might wish to underfund their plans, there is no good reason to expect all firms to fund to the limit.

The final section discusses the magnitude of the firms' unfunded pension liability, properly defined. The debt is shown to be quite small. A major reason for this is the substantial increase in long-term nominal interest rates, which have decreased equally both the present value of accrued benefits and unfunded pension obligations.

Inflation, Tax Rules, and the Stock Market

Martin Feldstein
 Working Paper No. 403
 November 1979
 JEL Nos. 023, 313, 321

This paper shows how the interaction of tax rules and expected inflation can substantially decrease the share price per dollar of pretax earnings. The current analysis extends my earlier study (NBER Working Paper No. 276) by recognizing corporate debt, retained earnings, and the role of diverse shareholder investments. As before, the analysis separates household and institutional investors.

The Investment Tax Credit: An Evaluation

Alan J. Auerbach and **Lawrence H. Summers**

Working Paper No. 404

November 1979

JEL Nos. 132, 323

Since 1954, the U.S. government has made numerous adjustments in the tax treatment of corporate income with the aim of influencing the level and composition of fixed business investment. The effects of these reforms, principally changes in the investment tax credit, are evaluated using a macroeconometric model. We find little evidence that the investment tax credit is an effective fiscal policy tool. Changes in the credit have tended to destabilize the economy and have yielded much less stimulus per dollar of revenue loss than has previously been assumed. The crowding out of "nonfavored" investment has been sufficient to offset a large percentage of the increase in the stock of equipment resulting from the use of the credit. We are led to conclude that the reliance on the investment tax credit and other investment tax incentives should be reduced. If a credit is to be maintained, it is of the utmost importance that its effect on all sectors of the economy be considered. We analyze several possible neutrality criteria but conclude that no simple rule can guide the optimal structuring of incentives.

Inequality between and within Families

Eytan Sheshinski and **Yoram Weiss**

Working Paper No. 405

November 1979

JEL No. 024

Differences in expenditures and output between families reflect the effect of simultaneous increases in children's ability on the willingness of parents to transfer resources to them. Differences within families also reflect the attitudes of parents toward disparity among children. In this paper, we characterize the conditions on parents' preferences that determine whether differences between families exceed differences within families. For an additive utility, differences in expenditures within families always exceed differences between families. This may also be true for the maximum-minimum utility function if an increase in ability reduces the marginal utility of income. Differences in output (utility or income) within families can also exceed differences between families. In this case, the implication for income distribution is that equality is enhanced by a higher correlation of ability between brothers.

International Adjustment with Wage Rigidity

William H. Branson and **Julio J. Rotemberg**

Working Paper No. 406

November 1979

JEL No. 023

Two of the puzzling macroeconomic phenomena of the 1970s have been the persistent stagnation in Europe and the disagreement between the United States and Europe on the feasibility of recovery by demand expansion. This paper develops the hypothesis that the source of both the stagnation and the policy differences is stickiness of the money wage in the United States and stickiness of the real wage in Europe and Japan. A real wage that is sticky above its equilibrium level in Europe and Japan would account for stagnation and infeasibility of recovery by demand expansion. The theoretical models are developed in both the one-commodity-bundle and two-commodity-bundle cases. The empirical results confirm that in the United States, the nominal wage adjusts slowly toward equilibrium, while in Germany, Italy, Japan, and the United Kingdom, the real wage adjusts slowly.

Dynamic Adjustment and the Demand for International Reserves

John F. O. Bilson and **Jacob A. Frenkel**

Working Paper No. 407

November 1979

JEL No. 430

Although there have been a large number of empirical studies of the demand for international reserves, there have not been many successful demonstrations that deviations of the actual stock of reserves from the target level defined by the demand function trigger a process of adjustment. This paper presents new evidence that suggests that (1) central banks do have a target level of international reserve holdings and (2) the adjustment of actual reserves toward the target level is quite rapid. In addition, an economic theory of the speed of adjustment is presented and tested. The evidence suggests that central banks adjust more rapidly to reserve deficiencies than to surpluses, that the speed of adjustment is positively related to the divergence between the actual level of reserves and the target level, and that countries that hold abnormally large quantities of reserves do so, in part, in order to adjust more slowly. Finally, the paper examines the applicability of the model to the current regime of managed flexible exchange rates. The evidence suggests that the move toward greater exchange rate flexibility has not significantly altered the reserve-holding behavior of the world's central banks.

Energy Efficiency, User Cost Changes, and the Measurement of Durable Goods Prices

Robert J. Gordon

Working Paper No. 408

November 1979

JEL No. 926

This paper develops the theory of price measurement when quality change is "nonproportional," yielding increases in the user value of a given product in a different proportion than the increase in production cost associated with the quality improvement. The theoretical section demonstrates that nonproportional quality change is treated consistently by properly defined input and output price indexes; that both types of indexes should be based on quality adjustments that use the criterion of user value rather than production cost; and that if improvements in energy efficiency are embodied in a good by its manufacturer, the prices of new models should be adjusted for the user value of these cost savings.

The proposed approach is applied in a case study of the commercial aircraft industry. In contrast to the official price index for aircraft that rises at a 2.5 percent annual rate between 1957 and 1972, a new index is developed that *declines* at a 7.1 percent annual rate over the same period. The new index implies that output and productivity in the aircraft industry grew much faster between 1957 and 1972 than previously believed, while total factor productivity in the airline industry grew much less rapidly. The proposed quality adjustments for individual aircraft types are corroborated by price ratios observed in the used aircraft market.

Taxation and the Stock Market Valuation of Capital Gains and Dividends: Theory and Empirical Results

Robert H. Gordon and David F. Bradford

Working Paper No. 409

November 1979

JEL Nos. 313, 521

Dividends seem to be more heavily taxed than capital gains. Why then do corporations pay dividends rather than repurchase shares or retain earnings? Either corporations are not acting in the interests of shareholders, or shareholders desire dividends sufficiently for nontax reasons to offset the tax effect.

In this paper, we measure the relative valuation of dividends and capital gains in the stock market, using a variant of the capital asset pricing model. We find that dividends are not systematically valued differently from capital gains. This finding is consistent with share price maximization by firms but inconsistent with the fact that most shareholders pay a heavier tax on dividends.

We also show that the relative value of dividends pro-

vides an indirect measure of a marginal Tobin's q . The measured value of dividends relative to capital gains tends to be higher during prosperous periods, as is consistent with this interpretation. We hope that this time-series on a marginal Tobin's q will prove to be useful in forecasting the rate of investment.

On Forecasting Interest Rates: An Efficient Markets Perspective

James E. Pesando

Working Paper No. 410

November 1979

JEL No. 313

This paper reviews, from an applied forecasting perspective, the properties of short-term and long-term interest rates in an efficient market. The paper emphasizes that efficient markets do not preclude economic agents from successfully forecasting movements in short-term interest rates. For brief forecast intervals, however, *ex ante* changes in long-term rates are sufficiently close to zero that economic agents are not likely to improve upon the no-change prediction of the "martingale model." Economic agents, in effect, are not likely to succeed in forecasting *short-term* movements in long-term interest rates. An analysis of three sets of Canadian interest rate forecasts provides results that are consistent with the theoretical discussion. Further, these results parallel those obtained in recent studies of recorded forecasts in the United States, although the authors of these latter studies apparently failed to appreciate the nature of their findings.

What Is Labor Supply and Do Taxes Affect It?

Harvey S. Rosen

Working Paper No. 411

November 1979

JEL Nos. 320, 810

There is much econometric literature written on the impact of income taxes on hours of work and labor force participation rates. It has long been understood, however, that the concept of "labor supply" is more general than "hours of work." Individual differences in skills, motivation, and health will influence the effective labor supply associated with any given number of hours of work. The purpose of this paper is to suggest some ways to learn about the effects of taxes on these other, and possibly very important, dimensions of labor supply.

NBER Reporter

Nonprofit Org.
U.S. Postage
Paid
Boston, MA
Permit No. 55932

National Bureau of Economic Research, Inc.
1050 Massachusetts Avenue
Cambridge, Massachusetts 02138

Address Correction Requested
