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# NBER Reporter

NATIONAL BUREAU OF ECONOMIC RESEARCH, INC.

SPRING 1979

## Program Report

### International Studies

William H. Branson

In the last decade the U.S. economy has been increasingly affected by disturbances and constraints within the international economic environment. The worldwide problems of high inflation, high unemployment, falling growth and investment rates, and conflicting exchange rate policies have all taken their toll on the U.S. economy. The Organization for Economic Cooperation and Development (OECD), a group of twenty-five of the world's major industrialized countries, including the United States, has projected that its members will have less than full employment until well after 1985, significant reductions in the potential growth rate of productivity, and the possibility of long periods of stagflation and inflation. The world economic situation is further complicated by differing exchange rate philosophies: the U.S. economists see the exchange rate as mainly influencing trade flows, while Europeans typically view the rate as a major influence on domestic price levels. Thus, the United States has advocated more movement in exchange rates than Japan or the European countries have.

The NBER Program in International Studies is a coordinated program designed to organize and focus the best empirical research in the field on important policy problems in the international economy. NBER aims to integrate theoretical, empirical, and applied research efforts into a coherent, problem-oriented framework, and to interpret the results so that they will be accessible to policy makers. Two aspects of the relationship between the international economy and the U.S. domestic economy are being studied: comparative macroeconomics and exchange rate policy.

#### Comparative Macroeconomics

The research for this part of the program focuses on problems of recovery and noninflationary growth in the OECD countries. The basic questions for research are:

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This issue of the **Reporter** highlights the Bureau's program of research on international economics. Next Benjamin Friedman summarizes his work on the determinants of long-term interest rates. Robert Lipsey describes the Bureau research he and Irving Kravis have been doing on international prices, and Victor Zarnowitz presents an analysis of macroeconomic forecasts. Following the quarterly Economic Outlook Survey are a section of biographical sketches, news of NBER conferences, other NBER news and reports, and summaries of three recent Bureau books. Short summaries of recent NBER Working Papers constitute the final section of the **Reporter**.

Why are the recessions so persistent? Why have long-run growth rates fallen? and What are the possible policy options for improving these situations?

In Europe a popular explanation for persistent recession is that real wages are rigid above equilibrium levels. Investigation of the validity of this proposition, of the operation of the economy under this condition, and of policies which could bring recovery is being done by NBER researchers William Branson of Princeton, J. David Richardson of Wisconsin, Jeffrey Sachs of Harvard, and Michael Bruno of Hebrew University (visiting NBER this year).

A second factor in the persistence of recession is continued weakness in investment demand, also a source of slower long-run growth. This investment demand problem has been studied by an OECD team; their model,

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which includes projections of growth, trade, and exchange rates, will be installed on the NBER computer and developed further. It should provide a useful quantitative framework for the Bureau's entire international program. Dennis Warner of Michigan State will be in charge of development and use of the model; Jacques Artus of the IMF, who is informally associated with the NBER international studies program, will provide data for the model on capacity utilization by industry.

A third cause of persistent recession is the increasing pace of structural change in the OECD countries. This structural change could stem from changes in: demand patterns; optimum input combinations due to movements in relative prices of labor, capital, and energy; or competition in manufactured goods from the LDCs (less developed countries). NBER research associates Robert Lipsey, Richardson, and Paul Krugman of Yale are working on various aspects of this structural change hypothesis.

In their study of the international transmission of inflation through the world monetary system, Michael Darby and Anna Schwartz intend to explain the rapid acceleration and recent slowing of inflation throughout the industrial world over the last decade. They are investigating major issues in the short-run inflation transmission process as well as the long-run equilibrium and stability of the world monetary system.

Research on sources of slower productivity growth, changes in equilibrium capital-output ratios, the international allocation of capital, and location of production is being undertaken by Irving Kravis and Robert Lipsey. Specifically, they are examining the influence U.S.-based multinational firms have on the world division of labor, through those firms' choices of international location. The characteristics of these firms that may affect their responses to a host country's variables include size, U.S. market share, capital intensity and other aspects of production methods, and their possession of special technological or marketing skills. Related research by David Hartman considers whether long-term international capital movements are sizable enough to have an impact on U.S. capital formation.

The comparative macroeconomics program will thus develop a coherent picture of long-run international growth prospects.

### Exchange Rate Policy

The program on exchange rate policy focuses on: (1) the role of the exchange rate in stabilization policy; (2) an analysis of alternative exchange rate systems; and (3) the long-run determinants of real exchange rates. There has been a complete transformation in the conventional wisdom about exchange rate determination as a result of research done in the 1970s. Subsequently, the role of short-run conditions in the asset market has come to the fore. The NBER group on exchange rate policy will incorporate this element of the exchange rate into their study of the feedback mechanism from short-run determination of exchange rates, to prices and real variables, and back to exchange rates. This research on exchange rates and stabilization may be one of the most important

outputs of the program over the next few years. The exchange rate group includes: NBER research associates William Branson, Rudiger Dornbusch, Jacob Frenkel, and Paul Krugman, working in cooperation with Willem Buiter, Princeton; Richard Levich, NYU; Charles Freedman, Bank of Canada; Dale Henderson, Federal Reserve Board; Jacques Artus, IMF; and Richard Marston, University of Pennsylvania.

Since 1973, the international exchange rate system has been a mixture of floating and pegging, with an increasing number of countries pegging their currencies to an average of the major currencies (the "currency basket"). The growing use of currency baskets was not anticipated in the 1960s, so the properties of systems in which different countries peg to different baskets have not yet been analyzed. Alternative exchange rate systems, like this one, will be developed and analyzed by the NBER exchange rate group.

The third focus of research by the exchange rate group will be the long-run determinants of current account movements and the equilibrium real exchange rate. Some consensus about determinants of the real exchange rate—the long-run equilibrium path of exchange rates in proportion to relative prices—is required for a stable exchange rate system. Long-run trends in industrial structure, direct investment, and competition all affect real exchange rates. NBER hopes to produce a clear view of these and other determinants of long-run movements in real exchange rates. This research, coupled with the results of work on the feedback mechanism and alternative exchange rate systems, will give a more comprehensive picture of the role of the exchange rate and suggest policy options for using the exchange rate as a stabilizing factor in the world economy.

### **Connection to Other NBER Programs**

The Program in International Studies complements many of NBER's other research programs, since almost every branch of economics has an international aspect. Listed here are some of the more important areas of interaction between research programs.

The Program in Economic Fluctuations is conducting a major study of the determinants and consequences of U.S. inflation, and the international studies group is engaged in work on the relationship among inflation, exchange rates, and noninflationary long-run growth. The two program groups will meet at the 1979 Summer Institute, held at the Bureau's Cambridge office, to share their work and develop it further, in light of each other's findings.

Another area of concern for the Program in International Studies is how the taxation of capital income from abroad affects the international allocation of capital. The Program in Business Taxation and Finance has been studying *domestic* capital accumulation as influenced by business taxation. Attempts to influence national investment through taxation—such as tax incentives for saving—can lead to spillovers into foreign investment. Therefore, it is important that the two groups share their results, in order to get a broader and more realistic picture of their individual concerns.

Similarly, the research of the Program in Labor Studies into the problem of unemployment and the policies for reducing it can be enhanced by the international comparisons of structural unemployment and measures of equilibrium unemployment that are being done by the international studies program.

Finally, the international studies group meets annually with researchers from North America, Europe, and Japan at the International Seminar on Macroeconomics, organized jointly by NBER and the Maison des Sciences de l'Homme in Paris. At these seminars the problems of short-run stabilization and long-run growth in international macroeconomics are discussed and compared. These meetings provide a major forum for the exchange of international economic thought.

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## **Research Summaries**

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### **The Determination of Long-Term Interest Rates**

Benjamin M. Friedman

The rising concern in the 1970s over the U.S. economy's rate of capital formation, due not only to the slowing of productivity gains but also to the relatively sudden recognition of potentially massive needs for capital investment associated with objectives like energy self-sufficiency and pollution abatement, has led in turn to renewed interest in the determinants of investment. Financial influences on the physical investment process, including in particular the yield levels required for business to attract long-term debt and equity funds from the credit markets, have figured prominently in major debates on the role of public policies for stimulating U.S. capital formation. These remarks summarize some of my recent research on this subject and indicate one of the lines of analysis that I will be pursuing in future NBER studies.

#### **Borrowers, Lenders, and Long-Term Interest Rates**

My investigation of the determination of market yields on long-term business borrowing has focused directly on the behavior of corporate borrowers and of lenders, especially the institutional investors that advance the bulk of long-term funds, in the U.S. credit markets. The starting point for my analysis has been the simple truism that, since long-term interest rates are determined in the market in which bonds are bought and sold, for any specific causal factor to affect long-term interest rates it must affect some investor's *demand* for bonds or some

issuer's *supply* of bonds, or both. To the extent that any of the typically discussed influences—expectations of future interest rates, expectations of price inflation, corporations' capital expenditure programs, or government regulation of institutional investors' portfolio choices—actually matter for long-term interest rate determination, they make a difference only by influencing borrowers' and/or lenders' behavior in the bond market.

In a series of studies I have applied this explicit supply-demand approach to investigate specific aspects of long-term interest rate determination. In a paper that focused entirely on bond market investors,<sup>1</sup> for example, I examined the view, familiar to many bond market practitioners but antithetical to most economists' models, that institutions' investable cash flows are an important influence on bond yields. I posited that, because the costs associated with allocating new cash flows are smaller than those of reallocating existing portfolio holdings, in the short run investors' new financial flows are important determinants of their demands for financial assets. The empirical evidence that I found, using disaggregated data for six major categories of investors in the U.S. corporate bond market, showed that investable cash flows are indeed a significant determinant of investors' short-run demands for bonds—and are therefore, by the logic of the supply-demand approach, a significant determinant of bond yields (and hence capital formation) as well.

In an analogous study of corporate borrowing behavior<sup>2</sup> I investigated a number of influences on U.S. corporations' bond-issuing activity. Here the empirical results showed that corporations' bond-financing decisions fundamentally depend not only on currently prevailing yields on bonds versus short-term liabilities but also on their expectations about the future paths of these two yields, and that these expectations of future yields matter in a way which hinges in part on the call protection feature common to virtually all corporate bonds issued in the United States.<sup>3</sup> The results for nonfinancial corporations in particular also supported two additional hypotheses about the effects of attitudes toward risk in determining corporate borrowers' financing choices. The evidence showed that nonfinancial corporations attempt to some extent to "match the maturities" of their assets and liabilities (the share of their total external financing which they seek to do at long term is positively related to their fixed investment in plant and equipment), but that they are more willing to bear the exposure of short-term indebtedness if their internally generated cash flow is large relative to their total debt requirements. By the logic of the supply-demand model these results mean that increased capital expenditure programs tend to *raise*, while

increased retained earnings tend to *lower*, long-term interest rates—even if corporations' total external funds requirements are held constant. These two results bear directly on public policy choices for stimulating physical capital formation by augmenting the availability to U.S. corporations of external and internal funds, respectively.

Two specific subjects that I have investigated using the supply-demand approach to long-term interest rate determination seem particularly worth comment because they feature prominently in current discussions of financial market developments and policies addressed to capital formation. First, how and to what extent do expectations of price inflation influence the level of long-term interest rates? Second, what implications for the structure of interest rates, and hence for capital formation, follow from the increasing institutionalization of the U.S. credit markets, especially the rapid trend toward asset holding via pension funds?

### Inflation Effects

Although it has now become commonplace to associate higher interest rates with inflation expectations, in fact, there has been remarkably little investigation of the economic process(es) by which this effect occurs. The essential motivation underlying the line of research which I pursued on this topic is again that price inflation (like anything else) can influence bond yields only by influencing some lender's and/or some borrower's behavior in the market in which bond yields are set.

In one recent study<sup>4</sup> I analyzed how this effect could work through *lenders'* actions and presented empirical evidence indicating that investors' portfolio behavior does play an important role in the relationship between the expected price inflation and the nominal interest rate. Results based on U.S. data provided evidence that, with all other things equal, five of the six major categories of corporate bond market investors *reduce* their demands for bonds in response to an *increase* in expected inflation. Even life insurance companies, whose liabilities are almost entirely in nominal form, respond to price expectations in this way. In addition, simulation experiments based on this disaggregated model of investors' demands for bonds indicated that, with all other things equal, this response by investors will *raise* the equilibrium nominal bond yield by 0.65 percent in response to a 1 percent *increase* in expected inflation, and that this 0.65 percent adjustment requires approximately four years for completion.

Figure 1 summarizes the effects that I found for inflation expectations operating through the demand side of the U.S. bond market. The light blue solid line in the figure plots the historical quarterly values of the Aa long-term utility bond yield, which averaged 6.07 percent over the 1960–73 simulation period. The gray solid line plots the corresponding simulated values from a dynamic "control" simulation of a version of the supply-demand model of long-term interest rate determination with in-

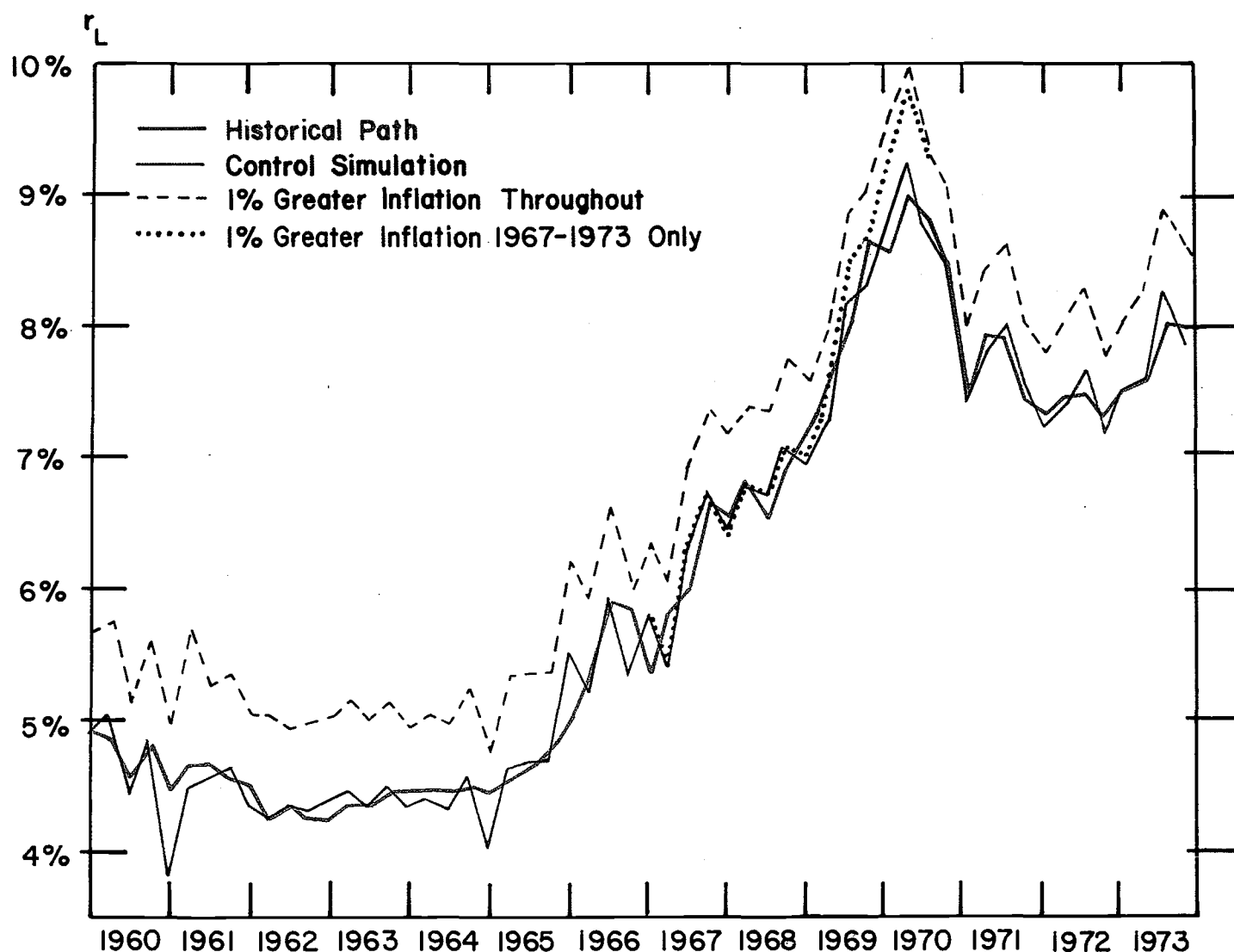
<sup>1</sup>B. M. Friedman, "Financial Flow Variables and the Short-Run Determination of Long-Term Interest Rates," *Journal of Political Economy* 85 (August 1977): 661–689.

<sup>2</sup>B. M. Friedman, "Substitution and Expectation Effects on Long-Term Borrowing Behavior and Long-Term Interest Rates." To be published in the *Journal of Money, Credit and Banking*.

<sup>3</sup>See also Zvi Bodie and B. M. Friedman, "Interest Rate Uncertainty and the Value of Bond Call Protection," *Journal of Political Economy* 86 (February 1978): 19–43.

<sup>4</sup>B. M. Friedman, "Price Inflation, Portfolio Choice, and Nominal Interest Rates," NBER Working Paper No. 235, revised, December 1978.

FIGURE 1: Simulation Results for the Long-Term Interest Rate



flation expectations acting only on the model's demand side; the simulated average value is again 6.07 percent, and the figure shows that the model reproduces the historical experience with considerable accuracy. The dark blue broken line plots the simulated values of the bond yield from an alternative simulation which differs from the control only in that the expected rate of price inflation is 1 percent *greater* throughout the simulation period. The mean simulated value of the nominal yield in this experiment is 6.72 percent, an *increase* of 0.65 percent above the control simulation mean. Finally, the black dotted line plots the simulated values of the bond yield from a further experiment in which the 1 percent increase in the assumed rate of price inflation, in comparison with the control, begins only in the final quarter of 1966. As of the first quarter of 1967 the simulated nominal bond yield begins to rise above the control path, and by the first quarter of 1971—that is, after four years—the adjustment to the new equilibrium path, which is identical to that of the previous experiment, is essentially complete.

In a further study<sup>5</sup> I conducted a similar analysis of the

effects of expected price inflation on *borrowers'* behavior and found evidence supporting analogous effects on nonfinancial businesses' bond-issuing volume. Simulation experiments based on this model of bond supply and the model of bond demand developed in my earlier paper indicated that, all other things equal, the joint portfolio responses to expected price inflation by borrowers and lenders *increase* the equilibrium bond yield by 0.64 percent, and modestly *decrease* the net quantity of bonds issued and purchased, in response to a 1 percent *increase* in expected inflation. This result follows as the consequence of a slightly greater response by lenders than by borrowers. In other words, because investors and borrowers are not equally sensitive to inflation expectations, after an increase in expected inflation the nominal bond yield cannot simply adjust upward so as to leave both investors and borrowers respectively buying and issuing exactly the same amount of bonds as before. Since it is the investors that are the more sensitive, and since their response to expected inflation is to *reduce*

<sup>5</sup>B. M. Friedman, "Who Puts the Inflation Premium into Nominal Interest Rates?" *Journal of Finance* 33 (June 1978): 833-845.

their bond purchases, the net result of the interaction of the responses on both sides of the market (in addition to the higher bond yield) is a *reduction* in the volume of funds advanced and received in the bond market.

## Pension Effects

In large part because of tax incentives both to workers and to private employers, pension funds in recent years have represented a rapidly growing share of U.S. private saving; the Employee Retirement Income Security Act of 1974 has accelerated this process. Moreover, a variety of currently pending proposals would even further reinforce this shift away from direct saving by individuals toward indirect saving via pensions.

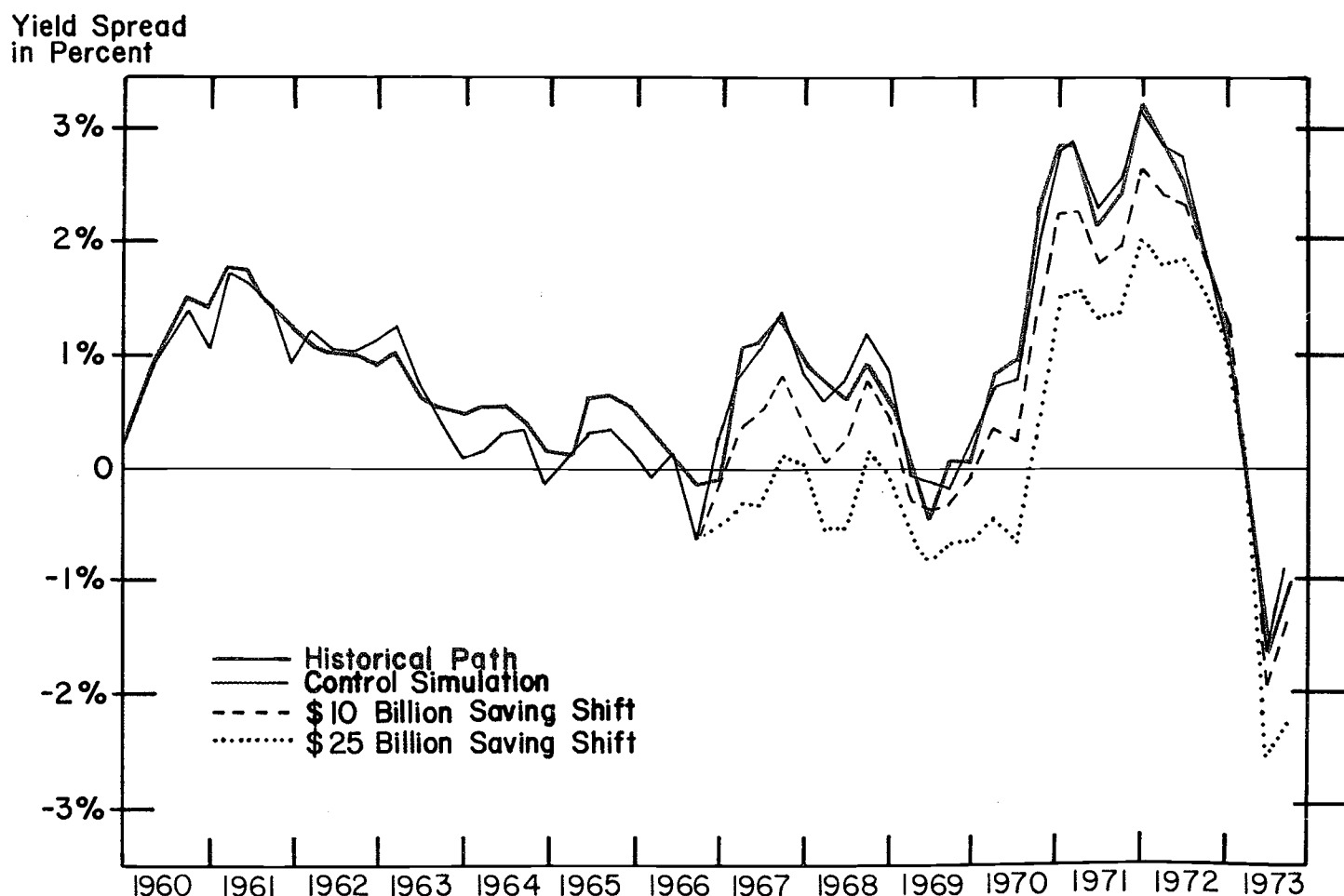
In a recent study<sup>6</sup> I examined the implications of this shift in the explicit context of the term structure of interest rates—that is, the differential between long-term and short-term yields. The basic idea underlying my research was that the *form* of wealth ownership matters for portfolio preferences. Because of a number of factors including tax incentives, timing effects, legal restrictions, and even sheer size effects, it is plausible to expect as-

sets held in pension funds to be invested differently than assets owned directly by individuals. A major element in this story, which sharply changes the risk structure of asset holding, is the overwhelming predominance of contractual annuity distribution arrangements among both private and state-local government pensions. These annuity arrangements make promised pension benefits long-term liabilities, and hence they greatly increase the attractiveness of long-term assets (like corporate bonds and equities) for pension portfolios in comparison to private portfolios. In addition to any effects of pensions on the *amount* of private saving, therefore, pensions also potentially affect the *composition* of private saving.

The results that I found indicated that the differences between pension funds' and individuals' portfolio preferences in the United States are considerable, and hence shifts in the form of wealth ownership from individuals' direct holdings to pension funds can have a major impact on the structure of asset yields. Pension funds hold far greater shares of their total financial assets in long-term instruments (especially corporate bonds and equities) than do individuals, and the difference in their respective allocations of new cash flows is even more pronounced. I also found econometric evidence showing that pension

<sup>6</sup>B. M. Friedman, "The Effect of Shifting Wealth Ownership on the Term Structure of Interest Rates: The Case of Pensions," NBER Working Paper No. 239, revised, January 1979.

FIGURE 2: Simulation Results for the Long-Short Yield Spread



funds' portfolio behavior is more interest-sensitive in this regard than is individuals' behavior.

Although economists have most often considered influencing the structure of asset yields by altering relative asset supplies, when investors have differing portfolio preferences the logic of the supply-demand approach implies that equivalent effects may also follow from a re-channeling of saving. A saving shift toward investors that are less reluctant to bear risk, for example, reduces the premium that the market in aggregate associates with risky assets. A shift toward investors (like pensions) that typically prefer long-term assets reduces the slope of the term-structure yield curve.

Figure 2 summarizes the empirical results that I found for the effects of a shift in the composition of U.S. saving toward the pension form. In the figure the light blue solid line plots the observed historical values of the difference between long-term and short-term interest rates, as measured by the Aa utility bond yield and the prime commercial paper yield, respectively. The gray solid line in the figure plots the corresponding values from a dynamic control simulation of the disaggregated model of bond supply and demand developed in the studies cited above, with the short-term yield taken as given; again the model reproduces the historical experience with considerable accuracy. The dark blue broken line plots the values of the long-short yield spread from a simulation experiment which differs from the control in that annual asset accumulation in the amount of \$10 billion is shifted from households to pension funds during the second half of the simulation period (1967-73). (In other words, this simulation assumes a shift in the *distribution* of wealth holding without any change in the *total*.) This redistribution toward investors with preferences for long-term assets sharply *reduces* long-term yields relative to short-term yields; the average long-short yield spread during 1967-73, after the \$10 billion redistribution, is 0.75 percent—0.37 percent less than the 1.12 percent spread in the control simulation. An analogous annual redistribution in the amount of \$25 billion, indicated by the black dotted line, leads to a similar but even larger effect, almost entirely eliminating the average upward slope of the yield curve; the average long-short yield spread during 1967-73, after the \$25 billion redistribution, is only 0.20 percent—0.92 percent less than in the control simulation. These movements in the term structure are substantial in comparison to those discussed in the context of the "Operation Twist" surrogate debt management operation in the United States during the early 1960s, and they would probably be sufficient to have major implications for aspects of nonfinancial economic activity like capital formation.

## Conclusion

The supply-demand approach to studying the determination of long-term interest rates has proven useful both for investigating the nature of particular market participants' portfolio behavior and for tracing implications of specific external influences on this behavior

through the market. In ongoing National Bureau research I am continuing to extend this line of inquiry, especially emphasizing questions relevant to policies for stimulating U.S. capital formation. Among the principal elements of this current research is an investigation into the interrelationships between the corporate and government bond markets. Recent work has shown that the connection between corporate and government finance is more complex than many policy discussions suggest, and that the government's choice of debt instruments for financing the public debt may be particularly important.<sup>7</sup> An essential requirement for sound policy making for capital formation is therefore the development of reliable empirical estimates of the effects on the private sector's portfolio behavior that follow as a result of financing the government's own financial needs.

<sup>7</sup>B. M. Friedman, "Crowding Out or Crowding In? The Economic Consequences of Financing Government Deficits," *Brookings Papers on Economic Activity*, No. 3 (1978): 593-641.

## Research on International Prices

Robert E. Lipsey

The National Bureau's studies of international prices were originally motivated by the observation that we knew very little about price behavior in international trade. Writers on balance-of-payments adjustment problems and on the competitiveness of the U.S. economy and individual industries ritually complained about the crudity of the available substitutes for price indexes that would reflect changes in the prices charged and paid for American exports and imports. The Bureau contributed the study of *Price Competitiveness in World Trade*, by Irving B. Kravis and me, that developed new measures of price and quantity changes in U.S. export trade and of U.S. price competitiveness relative to Germany, Japan, and the United Kingdom. These pioneering efforts have been continued on a much larger scale and on a more systematic basis by the U.S. Bureau of Labor Statistics, which now regularly publishes measures of U.S. export and import prices. Kravis and I have also extended the scope and time coverage of our original indexes.

The availability of these new measures of international prices presented an opportunity to examine a number of important issues in international economics that had been dealt with before only on a theoretical level or by the use of rough approximations to the desired empirical magnitudes. I will describe here some of the recent or current studies that have grown out of international price research.

### U.S. Competitiveness

The advent of floating exchange rates and the recent deficits in the U.S. trade balance have renewed public interest in the "competitiveness" of the U.S. economy and particularly in the role of relative price changes, or price competitiveness, in influencing the flow of trade. Under



fixed exchange rates the main influences on price competitiveness were differences between countries in rates of inflation or, particularly for individual commodities, in rates of productivity growth. With floating exchange rates an additional factor is introduced—changes in exchange rates. Of course, there were exchange rate changes during the years of “fixed” exchange rates, but the size and frequency of these movements have greatly increased since 1971 for most industrial countries, and they have become the dominant component of relative price changes.

We have concentrated our research on international price competitiveness on machinery and transport equipment. These products account for over half of the manufactured goods exports and almost half of the total exports of the four countries we study: the United States, the United Kingdom, Germany, and Japan. Yet it is a group that has rarely been examined because published price data have been scarce and poor in quality.

Our indexes of U.S. price competitiveness are indexes of foreign price change relative to U.S. price change for the same products. Relative price movements are calculated at a detailed product level<sup>1</sup> and then aggregated up with a common set of (OECD export) weights to form price competitiveness indexes at higher levels. We also calculate export price indexes for each country using the country's own export weights.

The salient facts about changes in U.S. export price competitiveness relative to Germany and Japan from 1953 through 1978 are set out in table 1. Relative to Germany, U.S. price competitiveness increased over the twenty-five years as a whole, despite the fact that, after staying about even for the first eighteen years, U.S. dollar prices have risen about 10 percent more than German DM prices since 1971. The gain in price competitiveness was attributable to the upward revaluation of the DM relative to the dollar by about 15 percent between 1953 and 1971 and 70 percent since then, far out-running the changes in own-currency prices.

<sup>1</sup>Four-digit SITC subgroups.

**TABLE 1: U.S. Price Competitiveness in Machinery and Transport Equipment, Selected Years 1953–1978**  
(1963 = 100)

|                   | Relative to |       |
|-------------------|-------------|-------|
|                   | Germany     | Japan |
| 1953              | 98          | 137   |
| 1971              | 115         | 90    |
| 1974              | 157         | 111   |
| 1975              | 161         | 103   |
| 1976              | 154         | 98    |
| 1977              | 163         | 100   |
| 1978 <sup>1</sup> | 177         | 112   |

<sup>1</sup>Average of first nine months.

The history of U.S. competitiveness relative to Japan is very different. Up to 1971 there was very little change in exchange rates, but Japanese prices in yen fell sharply. There was thus a large decline in U.S. price competitiveness relative to Japan. Japanese prices continued to fall after 1971, but the upward revaluation of the yen by more than 60 percent swamped the later prices changes. However, the decline in Japanese prices was so great that U.S. price competitiveness relative to Japan in 1977 was close to the 1963 level, and even the 1978 exchange rate left U.S. price competitiveness well below the level of the 1950s.

It is often said that German and Japanese exports, particularly in machinery and transport equipment, have been unaffected by the rise in exchange rates and relative export prices, but that does not seem to have been true. After relative German prices rose strongly from 1968 through 1973, relative German export volume declined slightly after 1969 and then sharply from 1972 through 1975. Relative German prices then leveled off from 1973 through 1976 and relative volume began to rise after 1975. In the case of Japan a long decline in relative prices ended in 1971 and was followed by increasing relative prices from 1971 through 1974, decreasing prices for 1974–76, and then another rise. Japanese relative export volume, after rising almost without interruption until 1972 as prices fell, tapered off from 1972 through 1975, a year behind rising Japanese prices, and then rose through 1977, following after a year the period of falling Japanese prices. Thus exports by both Germany and Japan responded, after a year or two, to changes in relative prices.

It is true that the dollar value of German and Japanese exports seems to be little affected at first by exchange rate appreciations, and in fact rises. There is a quantity response to price changes starting after a year or two and finally adding up to enough to outweigh the price change. The effect of price changes seems to cumulate over fairly long periods. When we examine price and quantity changes over five-year periods, the response of relative quantity to relative price appears clear and large. Elasticities of substitution are well over one, implying that a rise in prices leads eventually to a loss in export shares, in values as well as quantities. If these estimates are correct, policy makers need a good deal of patience to see the effects of any relative price changes achieved by devaluation.

Of course, prices are not the only influence on export shares, and their effect is different in different situations. In particular, the elasticity of substitution may be higher for a country with a low initial market share than for one with a high share. An exporter with a low market share may be close to the theoretical case of a small country that is a price taker and thus faces an almost infinitely elastic demand curve. As new production comes on line, faster than the growth of domestic demand, exports increase faster than domestic sales without any reduction in the country's relative export price. Only when the share of export markets has increased substantially

does the demand curve facing the country's exports begin to take on a substantial negative slope, and the elasticities of demand and substitution begin to fall.

In examining export price and quantity changes over five-year intervals we found, as we guessed, that the response to price changes was influenced by initial export shares. The countries with very low market shares in particular commodity groups had much larger gains from price declines than did countries with large initial shares.

For our further work on competitiveness we plan to introduce some supply-side influences, such as changes in the ratio of export to domestic prices of individual products (discussed below), changes in the ratio of export-good to home-good prices, and changes in the ratio of prices to wage rates or unit labor costs.

## Export Prices and Domestic Prices

Theoretical analyses of the international price mechanism almost invariably assume that a country's export price for a particular product is identical to its domestic price. Yet there are good reasons to expect differences if sellers have some degree of monopoly power and if the foreign and domestic markets are sufficiently separated by distance, tariffs, or other barriers to trade. The existence of dumping is an indication that such price differences are possible.

Our price indexes are particularly suited to an examination of this question because they apply the same weighting to domestic prices as to export prices. Therefore, if we find any difference in behavior we know that it represents differences between export and domestic price changes for the same commodities, not simply differences in weights.

In the United States, Germany, and Japan we found that there were surprisingly large divergences between export and domestic price indexes for machinery and transport equipment, which drifted apart by amounts as large as seven to more than ten percentage points.<sup>2</sup> When these divergences were associated with exchange rate changes, a depreciation of an exporter's home currency, for example, led him to raise his export prices relative to his domestic prices, since the depreciation raised foreign demand for his product. Conversely, an appreciation of the home currency led to a fall in the ratio, as exporters found themselves with decreased foreign demand and lower prices charged by competitors.

Several important consequences flow from these price divergencies. One is that the gain or loss in competitiveness expected from an exchange rate change may be offset to some degree by such pricing policies. In the case of the United States, for example, almost half of the depreciation of the dollar from 1971 through 1975 was

offset by a rise in the ratio of export prices to domestic prices. In Germany a fall in the same ratio offset more than half of the effect of the upward revaluation of the DM in 1961. However, when the DM appreciated in the 1970s, the price ratio rose, reinforcing rather than offsetting the appreciation.

The competitive, or demand-side, effects of exchange rates have been discussed widely, but there is another aspect that is often ignored. There are important supply-side implications of these changes in export prices relative to domestic prices. A change in the export-to-domestic price ratio implies a change in export profit margins for individual commodities relative to those on domestic sales. With ratios of before-tax income to sales of less than 5 percent in U.S. machinery and transport equipment industries, a rise of 5 percent in the ratio of export to domestic prices implies a very large increase in margins on export sales compared to those on domestic sales. Even a 1 percent change in the ratio, which has been a frequent occurrence, implies a 20 percent increase in relative margins on export sales, greatly raising the attractiveness of exporting for U.S. producers. Thus the rise of relative U.S. export prices after devaluation, while it blunted the effect of the devaluation in making U.S. goods more attractive to foreign purchasers, had a favorable impact on exports by making exporting more attractive to U.S. producers.

Our examination of the effects of exchange rate changes took us only through 1975, and therefore it included only four years of large exchange rate changes. We are now bringing these indexes up to the present and will soon be looking at a longer period of fluctuations.

## Prices and Balance-of-Payments Theories

In the last few years increasing interest has been expressed in monetary theories of balance-of-payments adjustment, as contrasted with what might be referred to as the standard theory. The data produced by the international price studies, in conjunction with new estimates of country price levels from the International Comparison Study conducted by the United Nations, provide a means of testing the price behavior implied by the two sets of theories.

The standard theory implies, to put it very briefly, that as a result of a change in exchange rates there will be changes in the relation of traded-goods to nontraded-goods prices, changes in the relative price levels of appreciating and depreciating countries, and changes in the volume and composition of trade. The monetary theories, on the other hand, assume the operation of purchasing power parity; therefore they assume no changes in relative price levels and no trade consequences of relative price changes. In its strongest form the theory assumes the operation of the law of one price, especially for tradable goods, or at most very short-term differences in prices, quickly erased by arbitrage.

Our examination of actual price behavior<sup>3</sup> finds a

<sup>2</sup>The export and domestic price indexes are described and analyzed in I. B. Kravis and R. E. Lipsey, "Export Prices and the Transmission of Inflation," *American Economic Review* (February 1977); I. B. Kravis and R. E. Lipsey, "Export and Domestic Prices Under Inflation and Exchange Rate Movements," NBER Working Paper No. 176, May 1977; and I. B. Kravis, R. E. Lipsey, and Eliot R. J. Kalter, "Export Prices and Exchange Rates," NBER Working Paper No. 182, June 1977.

<sup>3</sup>I. B. Kravis and R. E. Lipsey, "Price Behavior in the Light of Balance of Payments Theories," *Journal of International Economics* (May 1978).

world that differs somewhat from that assumed by both theories, but more at variance with that of the monetary theories. We find that price levels and price level movements differ significantly among countries over long as well as short periods. There are substantial differences between export prices and price changes of various countries for the same goods. And, as mentioned earlier, within one country export and domestic prices differ and do not move identically.

Thus, we find that the high degree of international commodity arbitrage often assumed in monetary theories of the balance of payments is not typical of the real world. The price structures of the advanced industrial countries are linked together, but somewhat loosely. Tendencies to price equality are constantly interrupted by new disturbances. New sellers seeking to enter markets, or existing sellers eager to expand market shares, offer low prices for a considerable time. Sellers resist the effects of their own exchange rate appreciations through discriminatory pricing, at least for a time, if they believe that passing through the full effects would cause them to lose hard-won market shares. Thus markets may work in the textbook fashion, but slowly rather than instantaneously. Even a country highly integrated into the world economy has some leeway for altering the relationship between its prices and those of other countries.

### **The Indexing of Commodity Prices**

In the last few years there has been strong pressure from developing countries for schemes that would link, or index, international commodity prices to the prices of manufactured goods, particularly manufactured exports of developed countries. Despite the intensity of the campaign for indexing, little consideration has been given to the long-term effects of such price fixing in view of the economic functions served by price movements.

One difficulty with any commodity price-indexing program is the inadequacy of the existing measures of international prices of manufactured exports. They are almost certainly biased upward to a substantial degree, partly because they are based largely on export unit value data rather than on prices of closely specified goods. In earlier work we estimated that the most frequently used measure of machinery and transport equipment export prices exaggerated the increase between 1953 and 1964 by almost 100 percent. Thus the use of these indexes for establishing a parity ratio for commodity prices would, on this account alone, produce an inflationary bias in the system.

As part of this study we are preparing new indexes of developed countries' export prices of manufactured goods extending back to the early 1950s. These are being built up from detailed export price data for Germany, Japan, and the United States, from more limited data from Sweden and the Netherlands, and from domestic prices for items missing in the export price data and for countries which do not publish export price data. For a few major products we are making use of some of the hedonic price indexes for complex products calculated

by individual investigators, including ourselves, since these provide some solution to problems of quality change not well handled in official price indexes.

M. Ishaq Nadiri and Carl Weinberg have been developing simulation models to use in estimating the economic impact of various indexing schemes on the behavior of output, consumption, and prices and on substitution among commodities and between commodities and synthetic materials. The modeling plan<sup>4</sup> envisages a core model, clearing world markets for goods and services at world price levels and linking a set of regional models for at least five groups of countries: industrialized, developing oil producing, developing oil importing, centrally planned, and a residual group. The core will also include a group of commodity market models at a very disaggregated level, since indexing plans always apply to very specifically defined commodities. Among the questions to be put to the model are: Would indexing stabilize LDC export revenues? Would LDC terms of trade be improved by indexing? and How large would a stockpile of commodities have to be to maintain an indexing plan?

<sup>4</sup>C. B. Weinberg and M. I. Nadiri, "REMPIS: A Regional Econometric Model for Price Indexation Studies," May 1978.

## **The Predictive Value of Economic Models: The Record of Macroforecasts**

Victor Zarnowitz

The 1970s witnessed both an unprecedented proliferation of economic forecasting and considerable disillusionment with its results. The former was a culmination of two decades of strong growth; the latter in large part was a product of unrealistically high expectations. The long expansion of the 1960s was widely mistaken to herald an era of assured success in macroforecasting and economic stabilization policies; instead, it ushered in a period of accelerated inflation and cyclical instability which proved in the main to be unanticipated and uncontrollable.

### **NBER Studies of Economic Forecasting**

In 1963 the National Bureau initiated a research project studying short-term economic forecasting that resulted in more than forty publications, including five books (see the first five references). These reports developed criteria of predictive accuracy, applied them to newly collected samples of forecasts, and analyzed the results intensively with respect to several questions: What are the main factors influencing predictive procedures and performance? What are the more promising tools and targets of macroeconomic forecasting? and What are the dimensions of the quality of forecasts and how should they be measured?

Although the NBER studies are widely used and have stimulated other important contributions in this area, the

progress made so far in developing forecasting methods and applications, while basic, is still very limited. Much further work is needed to move from the measurement of forecast errors to their explanation and to tested inferences on how the errors may be reduced. The National Bureau continues to collect and evaluate data on forecasts of various types, and since 1968 NBER has cooperated with the American Statistical Association in conducting quarterly surveys of predictions by business, academic, and government economists professionally engaged in business conditions analysis. This report summarizes some of the recent results of this continuing effort.

### The Forecasters' Performance in the 1970s

In the turbulent years of 1970-75 inflation was, on the average, strongly underestimated and real growth strongly overestimated, particularly in predictions with longer spans (those for several quarters ahead). The declines in real GNP during the 1973-75 recession were repeatedly missed, which gave rise to a rapid cumulation of errors of a cyclical nature. The negative correlation between the errors in predicting real growth and the errors in predicting inflation made the nominal GNP forecasts more accurate than either their quantity or their price ingredients.

Table 1 covers a collection of forecasts from several well known sources and shows average errors based on comparisons between the predicted and the actual percentage changes. (Rates of change are less affected by trends and data revisions than levels or absolute changes, and they are more interesting analytically.) The evidence confirms the frequently observed rule that the errors depend critically on the economic characteristics of the periods covered. Forecasters perform best when the target periods belong to the same already-recognized phase as the periods of origin, e.g., during

continuing expansions as in 1971-72. They perform worst when the target falls into a new phase that departs sharply from the established pattern, e.g., in forecasts for the 1974 recession made in 1972-73 or in forecasts for the 1975 recovery made in 1973-74. In contrast to such intertemporal differences, any distinctions among the forecasters are relatively unimportant as a source of the recorded variations in accuracy. Thus, predictably, the large forecast errors associated with the 1973-75 upheavals gave way to the generally much smaller errors during 1976-78, a period of another expansion with many familiar features.

The common patterns of error in aggregative predictions from various sources suggest that forecasters react similarly to the observed events. It is very difficult to assess how much of the similarity is attributable to the shared data, experiences, techniques, and judgments and how much to interaction, elements of imitation, consensus formation, etc. Probably both sets of factors are operative.

### The Longer Record

Failures to anticipate large changes in the rate of inflation and downturns in output have occurred often enough in the past, so the concentration of large errors in 1973-75 must not be viewed as either an isolated phenomenon or a symptom of a decline in forecasting abilities. Indeed, the historical record going back some three decades provides more indications of noticeable, although hesitant, advances than of any decline. It is clear that economists today have access to data and techniques of analysis and computation that are far superior to those available years ago. On this basis many had expected much more progress than was actually achieved. However, the stochastic nature of economic processes, changes in the structure of the economy, learning processes affecting responses to policy action, etc., impose

**TABLE 1: Quarterly Multiperiod Forecasts of Percentage Changes in GNP, Real GNP, and IPD: Summary Measures of Error, 1970-75**

| Span of Forecast, in Quarters                                 | Gross National Product (GNP) |     |     | GNP in Constant Dollars |      |     | Implicit Price Deflator (IPD) |     |     |
|---|------------------------------|-----|-----|-------------------------|------|-----|-------------------------------|-----|-----|
|   | Period <sup>1</sup>          |     |     | Period <sup>1</sup>     |      |     | Period <sup>1</sup>           |     |     |
|   | I                            | II  | III | I                       | II   | III | I                             | II  | III |
| Mean Absolute Errors (MAE), in Percentage Points <sup>2</sup> |                              |     |     |                         |      |     |                               |     |     |
| One   | .6                           | .7  | .5  | .8                      | .8   | .5  | .6                            | .3  | .4  |
| Two   | 1.3                          | 2.0 | 1.0 | 2.0                     | 2.1  | 1.2 | 1.5                           | .6  | 1.0 |
| Three   | 1.8                          | 3.1 | 1.4 | 3.2                     | 3.6  | 1.9 | 3.0                           | 1.2 | 1.6 |
| Four  | 2.1                          | 3.8 | 1.7 | 4.3                     | 4.6  | 2.4 | 4.6                           | 2.0 | 2.2 |
| Six   | 2.5                          | 4.3 | 2.6 | 5.2                     | 7.8  | 3.8 | 7.1                           | 4.8 | 3.6 |
| Eight   | 3.1                          | 2.2 | 3.1 | 5.6                     | 10.3 | 5.2 | 8.2                           | 9.6 | 5.7 |

NOTE: The figures are averages of MAE for forecasts from the following sources: American Statistical Association and National Bureau of Economic Research (median predictions from quarterly surveys, 1-4 quarters ahead); Bureau of Economic Analysis, U.S. Department of Commerce (1-4 quarters); Chase Econometric Associates, Inc.; Data Resources, Inc.; General Electric Company; and Wharton Econometric Forecasting Associates, Inc.

<sup>1</sup>Period I: recession, 1973:4-1975:1; period II: recovery, 1975:1-1975:4; period III: total, 1970:3-1975:4.

<sup>2</sup>Based on individual errors, each of which is defined as difference, predicted percentage change minus actual percentage change (according to preliminary estimates prior to the 1976 benchmark revision of the national income accounts).

SOURCE: Victor Zarnowitz, "An Analysis of Annual and Multiperiod Quarterly Forecasts of Aggregate Income, Output, and Price Level," *Journal of Business*, January 1979.

**TABLE 2: Annual Forecasts of Percentage Errors in GNP, Real GNP, and IPD:  
Summary Measures of Error, 1953-76**

| Source or Type<br>of Forecast              | GNP |      | Real GNP |     | IPD |      |
|--|-----|------|----------|-----|-----|------|
|  | MAE | ME   | MAE      | ME  | MAE | ME   |
| <b>1953-76</b>                             |     |      |          |     |     |      |
| Selected Private Forecasts <sup>1</sup>    | 1.2 | -0.7 |          |     |     |      |
| Extrapolations <sup>2</sup>                | 2.3 | -0.1 |          |     |     |      |
| <b>1963-76</b>                             |     |      |          |     |     |      |
| Selected Private Forecasts <sup>1</sup>    | 0.9 | -0.6 |          |     |     |      |
| Michigan Model <sup>3</sup>                | 1.3 | -0.5 | 1.5      | 0.2 | 1.0 | -0.6 |
| Econ. Report of the President <sup>4</sup> | 0.9 | -0.2 | 1.0      | 0.4 | 1.0 | -0.5 |
| Extrapolations <sup>2</sup>                | 1.8 | -0.6 | 2.5      | 0.3 | 1.3 | -0.3 |
| <b>1969-76</b>                             |     |      |          |     |     |      |
| Selected Private Forecasts <sup>1</sup>    | 0.6 | -0.4 | 1.0      | 0.7 | 1.3 | -0.9 |
| Wharton Model <sup>5</sup>                 | 0.9 | -0.2 | 0.9      | 0.5 | 1.4 | -0.6 |
| Econ. Report of the President <sup>4</sup> | 0.8 | 0.2  | 1.2      | 0.8 | 1.4 | -0.6 |
| Extrapolations <sup>6</sup>                | 2.0 | -0.5 | 3.6      | 0.7 | 2.0 | -0.2 |

NOTE: MAE = mean absolute error; ME = mean error (both in percentage point). On the definition of the underlying individual errors, see table 1, note 2.

<sup>1</sup>Average of forecasts from the following sources: Livingston survey, *Fortune* magazine, Harris Trust and Savings Bank, IBM Economic Research Department, National Securities and Research Corporation, Conference Board Economic Forum, R. W. Patterson (University of Missouri), Prudential Insurance Co., UCLA Business Forecasting Project.

<sup>2</sup>Assumes that next year's percentage change will be the same as the average percentage change in the four previous years.

<sup>3</sup>Source: Research Seminar in Quantitative Economics, University of Michigan. Based on several working models.

<sup>4</sup>Forecasts by the Council of Economic Advisers (CEA). Based in part on verified references from statements in the *Economic Report*.

<sup>5</sup>Source: *Wharton Economic Newsletter*, Econometric Forecasting Unit, Wharton School of Finance and Commerce, University of Pennsylvania.

<sup>6</sup>Assumes that next year's percentage change will be the same as that of the previous year.

SOURCE: Victor Zarnowitz, *An Appraisal of Short-Term Economic Forecasts*, NBER, 1967; V. Zarnowitz, "Forecasting Economic Conditions: The Record and the Prospect," in *The Business Cycle Today*, NBER, 1972; and V. Zarnowitz, "An Analysis of Annual and Multiperiod Quarterly Forecasts," *Journal of Business*, January 1979.

severe limitations on the predictability of economic change (and thus also on the effectiveness of stabilization policies).

The largest errors on record in the GNP forecasts were made in the early post-World War II period when expectations of a depression prevailed and persisted in the face of expanding activity. Table 2 is a partial summary of the annual (end-of-year) predictions for 1953-76 and subperiods. It shows that, on the average, changes in GNP and IPD were underestimated and changes in real GNP were overestimated, both by margins of less than one percentage point (see the mean errors, ME). Comparisons of the mean absolute errors (MAE) for the GNP forecasts suggest some improvement over time: the MAE average 1.2, 1.0, and 0.8 percentage points for 1953-76, 1963-76, and 1969-76, respectively. For real GNP, too, the 1963-68 predictions are on the whole more accurate than the 1969-76 predictions. Mechanical trend extrapolations are considerably worse than the forecasts for both current-dollar GNP and constant-dollar GNP.

Forecasts of percentage changes in IPD are moderately better than simple extrapolative models according to the MAE statistics, but they underestimate the actual inflation rates much more. Indeed, predictions of price change have much in common with projections of the last observed rate of inflation, and so they tend to lag behind the actual change (this applies to many quarterly as well as annual forecasts). Thus, when inflation accelerates, as in 1973-74 and 1978, it is widely underpredicted,

and when it decelerates, as in 1975, it is more often than not overpredicted.

The relatively favorable record of annual predictions does not imply that forecasters can perform well the more difficult task of predicting quarterly changes within the year ahead and even beyond it. Forecasts for the year as a whole can be satisfactory when based on a good record for the first two quarters; they tend to be more accurate than forecasts with longer spans. Beyond a few quarters ahead the predictive value of contemporary macroeconomic predictions must be rather heavily discounted.

### Prediction and Measurement

Deficiencies of economic information—that is, the lags, gaps, and errors in data and measures—represent an important source of forecasting inaccuracy. Economic data are subject to errors due to inadequate sampling and concepts, concealment, falsification, poor collection methods, etc. The uncertainty about economic measures tends to increase with the complexity of the processing performed on the underlying data and with the distance between the user and the processor. Most economic time series lag well behind their reference periods and many undergo large revisions (GNP and related data are prominent examples). The effective information lag includes not only the time required for incremental data to be produced and transmitted but also the time required for the signals to be extracted from the data by the user. For many noisy series such lags are lengthy.

There is no general presumption that the measurement errors are random; in fact, they are often systematic and their sources and forms vary so much that the biases may be difficult to detect. Biased measurement may lead to biased judgments and expectations, hence to serious and broadly diffused decision errors. It takes some time before such errors are discovered, and the corrective reactions which then follow are apt to be sharp and similarly widespread. Measurement of short-term changes in the economy is particularly difficult, and current signals are particularly liable to be misinterpreted in times of strong shocks and surprising developments. The period 1973-76 provides substantial evidence in support of these statements.<sup>1</sup>

Forecasts of GNP, and of many other important variables, are adversely affected by errors in both the preliminary data and the base level estimates. In the past forecasters tended to underestimate the initial levels (base) as well as the changes in GNP and real GNP (table 3). These errors, then, added up to larger average errors of the same type in the predicted future levels. (For in-

dustrial production, perhaps because of the availability of monthly data, base errors were smaller and less systematic.) In 1963-76 data errors averaged about one-third of the corresponding errors in predicting annual percentage changes in GNP, real GNP, and IPD (see the MAE figures in the middle section of table 3). The decompositions of mean square errors reveal an interesting difference between the forecasts for the 1970s and those for the earlier years: the former show typically smaller errors when compared with revised data than when compared with provisional data, whereas historically, the opposite results prevailed (see the last section of table 3 and note the different signs of the interaction terms  $M_{\epsilon\eta}$  in 1953-63 and 1970-75).

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**TABLE 3: Annual and Four-Quarters-Ahead Forecasts of GNP and Other Variables: Summary Measures of the Effects of Data Errors, 1953-76**

|   | Mean Absolute Error (MAE) |                                |                     | Mean Error (ME)        |                                |       |
|---|---------------------------|--------------------------------|---------------------|------------------------|--------------------------------|-------|
|   | Base <sup>1</sup>         | Change                         | Level               | Base <sup>1</sup>      | Change                         | Level |
| <i>Annual, 1953-63</i>                                      |                           |                                |                     |                        |                                |       |
| GNP (Billion dollars)                                       | 2.9                       | 8.4                            | 10.0                | -2.1                   | -3.2                           | -5.2  |
| Real GNP (1947-49 = 100)                                    | 3.8                       | 8.5                            | 10.6                | -3.5                   | -3.8                           | -7.3  |
| Industrial Production (1947-49 = 100)                       | 1.3                       | 4.1                            | 4.3                 | 0.8                    | -0.8                           | -0.09 |
| <i>Annual, 1963-76<sup>2</sup></i>                          |                           |                                |                     |                        |                                |       |
|   | Data Errors ( $\eta$ )    | Forecast Errors ( $\epsilon$ ) |                     | Data Errors ( $\eta$ ) | Forecast Errors ( $\epsilon$ ) |       |
| GNP (percentage points)                                     | 0.3                       | 0.9                            |                     | -0.3                   | -0.5                           |       |
| Real GNP (percentage points)                                | 0.4                       | 1.2                            |                     | -0.1                   | 0.3                            |       |
| IPD (percentage points)                                     | 0.4                       | 1.0                            |                     | -0.3                   | -0.6                           |       |
| <i>Decomposition of Mean Square Error (MSE)<sup>3</sup></i> |                           |                                |                     |                        |                                |       |
|   | $M_{\eta}$                | $M_{\epsilon}$                 | $2M_{\epsilon\eta}$ | $M_u$                  |                                |       |
| GNP, 1953-63 (annual levels)                                | 39.3                      | 136.8                          | 53.8                | 229.9                  |                                |       |
| Four Quarters Ahead, 1970-75                                |                           |                                |                     |                        |                                |       |
| GNP (percentage points)                                     | 0.2                       | 5.8                            | -0.2                | 5.7                    |                                |       |
| Real GNP (percentage points)                                | 0.3                       | 11.1                           | -0.4                | 11.0                   |                                |       |
| IPD (percentage points)                                     | 0.1                       | 8.4                            | -0.8                | 7.7                    |                                |       |

NOTE: The forecasts for 1973-76 (annual) and 1970-75 (four quarters) are based on the materials used in tables 2 and 1, respectively. The forecasts for 1953-63 are from the sources listed in table 2. Forecast errors are defined as differences, predicted value minus actual value, where the latter are preliminary estimates.

<sup>1</sup>The forecaster's estimate of the initial level from which a change is predicted. For the individual and mean errors, base error plus change error equals the level error.

<sup>2</sup>Forecasts errors  $\epsilon_t$  equal predicted minus actual percentage changes, where the latter are based on first official estimates for the preceding year. Data errors  $\eta_t$  equal the percentage changes in the same preliminary estimates minus the corresponding changes in revised figures taken from U.S. Department of Commerce, Bureau of Economic Analysis, *Handbook of Cyclical Indicators*, May 1977.

<sup>3</sup> $M_{\eta}$  = MSE for data errors;  $M_{\epsilon}$  = MSE for forecast errors based on provisional estimates for the actual values;  $M_u$  = MSE for forecast errors based on revised estimates for the actual values. The decomposition equation is  $M_u = M_{\eta} + M_{\epsilon} + 2M_{\epsilon\eta}$ , where the last term measures the interaction between  $\epsilon_t$  and  $\eta_t$ .

SOURCE: Victor Zarnowitz, "Information, Measurement, and Prediction in Economics," Mimeographed, University of Chicago, 1979.

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## Economic Outlook Survey

### Fourth Quarter 1978

Inflation, as measured by the annual rate of change in the GNP implicit price index (IPD), will remain steady at 7.4 percent in the current quarter (1978:4) and the next two quarters; then it will decelerate somewhat to 6.6 percent in the second half of 1979. Growth in real GNP will slow from an estimated 2.8 percent annual rate in 1978:4 to 1.2 percent in the spring and summer of 1979. These are the representative (median) predictions from a survey of professional economic forecasters which was completed in the first ten days of November 1978. The survey covers analysts from business, government, and the academic world.

#### Inflation to Remain Steady in the Near Future

The previous (August) survey's forecast of inflation in 1978:3 was quite accurate at 7.4 percent (the current revised estimate is 7.1 percent). For the year 1978 as a whole the median prediction is now 7.3 percent; for the year 1979 it is virtually the same, 7.4 percent. However, the mean probability distribution of price level changes expected in 1978-79 is skewed in the direction of higher inflation rates: about one-third of it falls in the range of 7 to 7.9 percent, slightly over two-fifths in the range of 8 percent and higher, and less than one-fourth in the range of less than 7 percent. The moderation of inflation pressures to nearly 6.5 percent p.a. in 1979:3 and 1979:4 is presumably associated with the anticipated slowdown in economic activity next year.

#### Lower Growth in Output, Some Rise in Unemployment during 1979

GNP in 1972 dollars will reach \$1,417 billion in 1979, 2.4 percent up from 1978. The annual rates of growth in the four consecutive quarters of 1979 will be 2 percent, 1.2 percent, 1.2 percent, and 1.6 percent, according to the median forecasts. A year hence, in 1979:4, real GNP is expected to be about \$1,424 billion at annual rate, or 1.4 percent higher than in the current quarter.

Output in manufacturing, mining, and utilities is pro-

jected to gain at an annual rate of 2.8 percent in each of the first two quarters of 1979 but to record an equivalent loss in the second half. Thus the index of industrial production (1967 = 100) should average approximately 149 next year, that is, 2.8 percent higher than in 1978; but its predicted value for 1979:4 is 148, the same as for 1978:4.

The rate of unemployment will creep up slowly from the estimate of 6 percent of the labor force in the current quarter to 6.6 percent a year from now. The average for 1979 is put at 6.4 percent, only moderately higher than the 6 percent estimate for 1978.

#### Probability of Recession Relatively High

As these figures show, the prevailing view among the forecasters remains that a slowdown rather than an absolute decline is the most likely prospect for the economy. However, the means of the forecasters' estimated probabilities of a decline in real GNP rise from 21 to 33 chances in 100 between 1978:4 and 1979:4, continuing a gradual upward trend in these assessments noted in our recent releases. These probabilities exceed the highest previously recorded in the survey (in May-December 1973, prior to the last recession, the comparable estimates rose to 28 chances in 100). The risk of a recession, therefore, appears relatively high in the light of these figures.

#### Declines in Housing Starts, Real Consumer Outlays for Durables

Housing starts are seen as decreasing from about 2 million units at annual rate in the current quarter to 1.6 million units a year, hence by about 19 percent. The annual 1978-79 change is from 2 million units to 1.7 million units, or 14 percent. These declines are larger than those projected in the August survey, but not drastically so.

Consumer expenditures for durable goods in current dollars will reach \$212 billion in 1979:4 and increase about 5 percent from 1978:4. In real terms, however, this would mean a decline of between 2 and 3 percent, at the inflation rates projected in the survey. For the year 1979 as a whole, compared with 1978, the corresponding decline would be less, about 1 percent.

#### Less Growth for Business Investment, Weakening Profits

Business expenditures for new plant and equipment in current dollars are to reach \$173 billion in 1979:4, a little more than 8 percent higher than the estimate for this quarter. In real terms this translates into little if any growth in new productive capacity. The projected annual increase for 1978-79 is 10.8 percent, less than the rise of 12.3 percent anticipated in 1977-78, but once more slightly higher than the projected increase in GNP, which is about 10 percent for 1978-79.

Forecasts of investment in business inventories, while also scaled down, still call for a positive change in each quarter of the coming year. According to the median predictions, change in inventories will decline from a \$19 billion annual rate in 1978:4 to \$11 billion in 1979:4.

## Projections of GNP and Other Economic Indicators, 1978-1979

|   | Annual              |                  |        |                    |                    | Quarterly          |       |       |                |       |       |                    |                    | Percent Change |  |
|---|---------------------|------------------|--------|--------------------|--------------------|--------------------|-------|-------|----------------|-------|-------|--------------------|--------------------|----------------|--|
|   | 1977<br>Ac-<br>tual | 1978<br>Forecast | 1979   | Percent Change     |                    | 1978               |       | 1979  |                |       |       | Q378<br>to<br>Q379 | Q478<br>to<br>Q479 |                |  |
|   |                     |                  |        | 1977<br>to<br>1978 | 1978<br>to<br>1979 | Q3<br>Ac-<br>tual  | Q4    | Q1    | Q2<br>Forecast | Q3    | Q4    |                    |                    |                |  |
|   |                     |                  |        |                    |                    |                    |       |       |                |       |       |                    |                    |                |  |
|   |                     |                  |        |                    |                    |                    |       |       |                |       |       |                    |                    |                |  |
| 1. Gross national product (\$bil.)                    | 1887.2              | 2104.2           | 2317.8 | 11.5               | 10.2               | 2141.1             | 2196  | 2249  | 2292           | 2345  | 2385  | 9.5                | 8.6                |                |  |
| 2. GNP implicit price deflator (1972 = 100)           | 141.6               | 152.0            | 163.3  | 7.3                | 7.4                | 153.6              | 156.4 | 159.2 | 162.0          | 164.6 | 167.3 | 7.2                | 7.0                |                |  |
| 3. GNP in constant dollars (bil. 1972\$)              | 1332.7              | 1383.8           | 1417.2 | 3.8                | 2.4                | 1394.3             | 1404  | 1411  | 1415           | 1419  | 1424  | 1.8                | 1.4                |                |  |
| 4. Unemployment rate (percent)                        | 7.0                 | 6.0              | 6.4    | -1.0 <sup>1</sup>  | 0.4 <sup>1</sup>   | 6.0                | 6.0   | 6.1   | 6.3            | 6.5   | 6.6   | 0.5 <sup>1</sup>   | 0.6 <sup>1</sup>   |                |  |
| 5. Corporate profits after taxes (\$bil.)             | 102.1               | 118.2            | 125.3  | 15.8               | 6.0                | 124.3 <sup>2</sup> | 126.1 | 126.9 | 125.1          | 123.6 | 125.6 | -0.6               | -0.4               |                |  |
| 6. Plant and equipment expenditures (\$bil.)          | 135.8               | 152.5            | 168.9  | 12.3               | 10.8               | 155.1 <sup>3</sup> | 159.7 | 164.5 | 167.9          | 170.2 | 173.1 | 9.7                | 8.4                |                |  |
| 7. New private housing units started (ann. rate mil.) | 1.99                | 1.97             | 1.70   | -1.0               | -13.7              | 2.08               | 1.98  | 1.85  | 1.72           | 1.63  | 1.60  | -21.6              | -19.2              |                |  |
| 8. Change in bus. inventories GNP accts. (\$bil.)     | 15.6                | 18.3             | 14.6   | 2.7 <sup>4</sup>   | 3.7 <sup>4</sup>   | 17.6               | 18.8  | 18.3  | 14.8           | 14.0  | 11.3  | -3.6 <sup>4</sup>  | -7.5 <sup>4</sup>  |                |  |

Source: American Statistical Association and National Bureau of Economic Research, Business Outlook Survey, November 1978. The figures on each line are medians of 26 to 30 individual forecasts.

<sup>1</sup> Change in rate, in percentage points.

<sup>2</sup> Actual not available. Based on average forecast.

<sup>3</sup> Actual not available. Based on BEA survey of anticipations.

<sup>4</sup> Change in billions of dollars.

Corporate profits after taxes, which were expected in the previous survey to show small gains at least in current dollars, now are seen as declining slightly (by less than 1 percent in the year ahead). In real terms, of course, this would signify a substantial decline, which the forecasters allocate mainly to the spring and summer quarters of 1979.

### Forecasters' Assumptions

Most forecasters assume that monetary policy will be tighter and that interest rates will continue high, but that the rates may peak in the first half of 1979. The 1978 tax legislation and the rise in the social security tax will come into effect in 1979; some respondents say this indicates a "moderate budgetary restraint." Some foresee no mandatory controls; others assume that such controls will be imposed "late in 1979." The guidelines are viewed as ineffective or, at best, mildly effective. Those who quantify the expected OPEC-engineered energy price hike set it at 10 percent or less, but no energy "crisis" is anticipated.

The national defense purchases are predicted to rise nearly 9 percent in the year ahead, to about \$112 billion in 1979:4.

*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 Charlotte Boschan and Dennis Bushe of NBER were responsible for tabulating and evaluating this survey.*

## NBER Profiles

### William H. Branson

William H. Branson, director of the NBER Program in International Studies, is a professor of economics and international affairs at Princeton University. He has just finished three years as deputy director of the OECD Project Interfutures in Paris, and he is a regular visiting professor at the Institute for International Studies in Stockholm. He has also been a visiting professor at the Institute for Advanced Studies in the Social Sciences in Vienna, a senior staff economist on the Council of Economic Advisers in Washington, and a lecturer on international economics at the Central Bank of Finland. While he was in Paris, Branson and three French colleagues organized the Paris Seminar on International Monetary Theory.

Branson's principal areas of research are international macroeconomics and trade, although he has published in public finance and economic demography and served as consultant to the New Jersey negative income tax experiment. Currently, Branson's NBER research is on exchange rate determination, the effect of exchange rate movements on the U.S. economy, and exchange rate policy. He is also working on the determinants of trade in a "many country, many commodity, many factor" world. His work has appeared in leading U.S. journals, such as the *American Economic Review*, the *Journal of Politi-*





*cal Economy*, and the *Quarterly Journal of Economics*. He has also written for international journals, such as the *European Economic Review* and the *Journal of International Economics*.

In 1972-73 Branson was an international affairs fellow of the Council on Foreign Relations, and he is now a member of the council. He has served as consultant in international economics to the Ford Foundation, and is consultant to various U.S. government agencies and the OECD. He was a member of the Brookings Panel on Economic Activity from 1970-72 and has served as a senior adviser to the group since then. Branson is also associate editor of the *Journal of Finance*, the *Review of Economics and Statistics*, and north Holland's *Studies in International Economics*. He is coeditor of the *Journal of International Economics*.

Branson took his B.S. at the U.S. Naval Academy at Annapolis in 1959 and served as a naval officer until 1964. He was supply officer on a destroyer in the Pacific for three years and spent the next two years at the Navy Regional Finance Center in Oakland, California. While there he studied economics at Berkeley and received his M.A. in 1964. He moved to MIT, receiving a Ph.D. in 1967, and then on to Princeton to teach.

## Benjamin M. Friedman

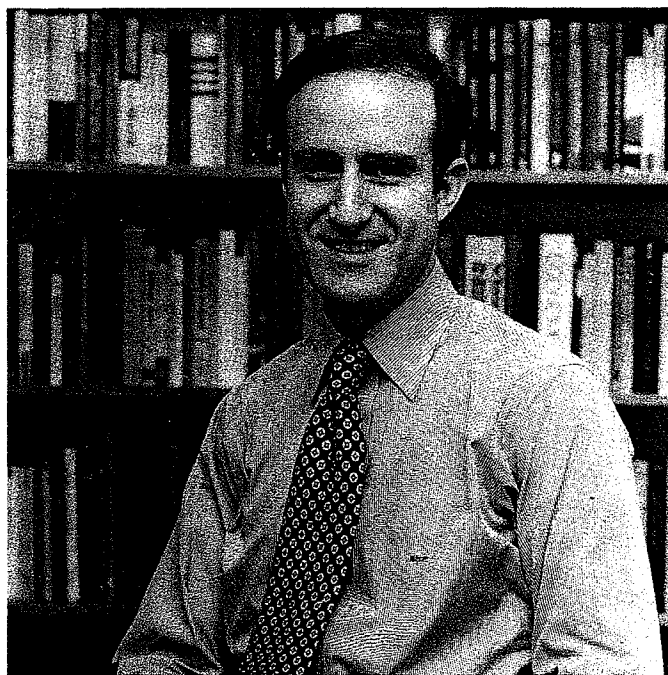
Benjamin M. Friedman, the program director for Monetary Economics and Financial Markets at the National Bureau, is an associate professor of economics at Harvard University, where he has been a member of the faculty since 1972. Friedman's recent research interests have primarily focused on financial markets and their role in influencing macroeconomic activity and have included such subjects as the determination of

long-term interest rates, financial impacts on capital formation, and implications for public policy.

Friedman received the A.B., A.M., and Ph.D. degrees in economics from Harvard University; during his graduate study there he was a junior fellow of the Society of Fellows. In addition, he received the M.Sc. in economics and politics from King's College, Cambridge, England, where he was a Marshall scholar.

Friedman's interest in the financial markets includes both academic and practical experience. During 1971 and 1972 he worked at Morgan Stanley & Company, investment bankers, in New York. Prior to 1971 he served as a staff consultant to the Board of Governors of the Federal Reserve System. In this capacity he was a member of the staff committee which studied the 1970 Federal Open Market Committee decision to shift toward a greater emphasis on monetary and reserve aggregates in its operations and policy planning procedures. He also worked as a staff consultant, and subsequently as consultant to the president, at the Federal Reserve Bank of Boston. In addition, he worked briefly for the U.S. Department of State and the Federal Reserve Bank of New York.

Friedman is the author of *Economic Stabilization Policy* (1975), the editor and one of the authors of *New Challenges to the Role of Profit* (1978), and the author of

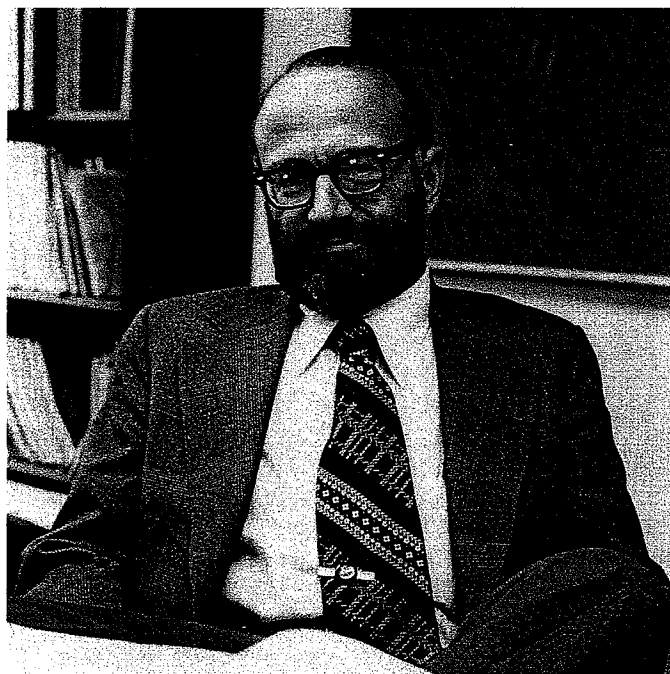


numerous journal articles on monetary economics, macroeconomics, and economic policy. His other current professional activities include serving as an associate editor of the *Journal of Monetary Economics*, a member of the Brookings Panel on Economic Activity, and an academic consultant to the Federal Reserve Board. The participants in the College Requirement Equities Fund recently recognized Friedman's financial expertise by electing him to their Board of Trustees. He was also recently elected to membership in the Council on Foreign Relations.

Financial markets are a family interest for Friedman and his wife Barbara, who works in Boston as an equity portfolio manager. Friedman is also a habitual reader and a squash devotee, who plays regularly for one of Harvard's teams in the Boston men's squash league.

## Robert E. Lipsey

Robert E. Lipsey got an unusually early start at the National Bureau, beginning work as a teenager after courses at the Juilliard School of Music, a B.A. from Columbia College, and a first year of graduate work, also at Columbia. After working as an assistant for Geoffrey Moore and Solomon Fabricant, he began his own research on long-term trends in U.S. trade from which he



earned his Ph.D. at Columbia in 1961 and published *Price and Quantity Trends in the Foreign Trade of the United States* (1963). Collaboration with Raymond Goldsmith, and a fondness for large quantities of numbers, resulted in the two-volume *Studies in the National Balance Sheet of the United States* (1963), followed by publications on U.S. construction statistics and consumer capital formation. In the early 1960s Lipsey began a series of studies with Irving Kravis on the measurement of international prices that resulted in the volume on *Price Competitiveness in World Trade* (1971) and numerous papers. In addition to price research, he has recently been studying the causes and effects of foreign investment by U.S. firms. His tendency to wander into various subjects outside the international area reappeared in the past year in the book on *Financial Effects of Inflation* with Phillip Cagan. During his career at the Bureau Lipsey has at various times been a research associate, the director of international and financial stud-

ies, the vice president for research, and most recently, director of the Bureau's New York office.

Outside the Bureau, Lipsey taught at Columbia for several years and has been a professor of economics at Queens College, City University of New York, since 1967. He is a fellow of the American Statistical Association and has been a consultant to various government agencies including the Federal Reserve Board and the Commerce, Labor, and Treasury departments. In occasional moments away from the Bureau and Queens, Lipsey collects old, dusty books, hikes, swims, plays tennis outdoors at any temperature above 30°, attends chamber music concerts, and plays the piano in a fashion that belies his earlier training.

Lipsey and his wife, Sally, a professor of mathematics at Brooklyn College, have three daughters: Marion, an architecture student at City College; Carol, a doctoral student in chemistry at Columbia; and Eleanor, who recently received her M.A. in social service administration at the University of Chicago.

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## Bureau News

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### Grafton Youth Unemployment Conference

A team of NBER economists has been involved in a study of problems of youth unemployment under grants from the International Business Machine Corporation, the Sloan Foundation, and the U.S. Department of Labor. Preliminary results from that research were presented at a working conference for participants in the research and for representatives from the Labor Department. The conference was held in Grafton, Vermont, on November 3 and 4, 1978. The program for the conference included the following papers:

Charles Brown, "Dead-End Jobs and Youth Unemployment"

Kim Clark and Lawrence Summers, "The Dynamics of Youth Unemployment"

Joseph Cooper, "A Pilot Survey of Unemployed Youth"

David Ellwood, "Teenage Unemployment: Permanent Scar or Temporary Blemish"

Richard Freeman, "Economic Determinants of Geographic and Individual Variation in the Labor Market Position of Young Persons"

Richard Freeman and James Medoff, "The Youth Labor Market in the United States: An Overview"

Robert Meyer and David Wise, "High School Preparation and Early Labor Force Experience"

Michael Wachter, "Time-Series Changes in Youth Joblessness"

In addition to the authors of the papers, the following

people participated in the conference: Burt Barnow, Department of Labor; Gary Chamberlain, Harvard; Jerome Culp, Rockefeller Foundation; Randy Filer, Brandeis; Alan Gustman, Dartmouth; Linda Leighton, Columbia; Robert Lerman, Department of Labor; Glen Lowry, Rockefeller Foundation; Ernest Martin, Office of Youth Programs; Donald Nichols, Department of Labor; Albert Rees, Princeton; and Ernst Stromsdorfer, ABT Associates.

Charles Brown studies the hypothesis that occupational characteristics have an impact on unemployment even when personal characteristics are held constant. In "Dead-End Jobs and Youth Unemployment" he analyzes how characteristics associated with dead-end jobs affect unemployment rates among young men.

In "The Dynamics of Youth Unemployment" (NBER Working Paper No. 274), Kim Clark and Lawrence Summers analyze the incidence and characteristics of unemployment spells among young persons. They find that over half of youth unemployment spells end in labor force withdrawal rather than employment, suggesting that unemployment statistics considerably understate the problem of youth joblessness.

David Ellwood assesses the long-term consequences of youth joblessness in "Teenage Unemployment: Permanent Scar or Temporary Blemish." He focuses on separating differences in employment and wages that are causally related to early nonemployment from differences that are due to unobserved personal characteristics correlated with early nonemployment. He finds that nonemployment has a small and short-lived adverse effect on future employment, but a less moderate and possibly long-term deleterious effect on wages.

"Economic Determinants of Geographic and Individual Variation in the Labor Market Position of Young Persons," a paper by Richard Freeman, analyzes aggregate data on standard metropolitan statistical areas and survey data on individuals to identify the determinants of the youth labor market problem. Freeman concludes that employment of the young depends on both demand and supply conditions and bears a close relationship to other social factors.

In "The Youth Labor Market Problem in the United States: An Overview" Richard Freeman and James Medoff use quantitative data from various national sources to assess the magnitude of the youth joblessness problem. They measure the changes in youth employment relative to adult employment over the last thirty years and examine the extent to which youth joblessness is concentrated among blacks. Finally, they highlight striking differences between data sets in reported rates of school attendance, unemployment, labor force participation, and employment.

"High School Preparation and Early Labor Force Experience" by Robert Meyer and David Wise analyzes a longitudinal survey of 1972 high school seniors to determine the relationship of work experience, vocational training, and academic achievement during high school to employment and wages following high school. They

find that work experience, but not vocational training during high school, has a significant positive association with both the number of weeks worked and the wage rates in the years just after high school.

## **Taxation of Capital: A Call For Papers**

On November 2 and 3, 1979, the National Bureau of Economic Research will hold a conference in Cambridge on the taxation of capital. The program, organized by Professor Peter Mieszkowski of the University of Houston and NBER, will consist of seven papers with two formal discussants assigned to each paper. There will be no published proceedings.

The conference will emphasize empirical research on issues such as tax incidence and income distribution; the effects of personal and corporate taxes on saving, investment, and financial structure; and the various impacts of property, wealth, and inheritance taxes. Other possible topics include tax aspects of private and public pensions and the effect of pensions on capital formation. Although priority will be given to empirical work, including simulation results, submission of purely theoretical papers on these topics is welcome.

Papers will be selected on the basis of abstracts of about 500 words or, when possible, completed papers. Some preference will be given to papers by younger members of the profession. Any research that will not have been published at the time of the conference may be submitted. The deadline for submissions of abstracts and papers is May 1, 1979. Authors chosen to present papers will be notified by May 31. Finished papers must be ready for distribution to conference participants by September 30, 1979. NBER will pay the expenses of those chosen to give papers at the conference. Abstracts and papers should be sent to Professor Mieszkowski at the address below:

Professor Peter Mieszkowski  
National Bureau of Economic Research  
1050 Massachusetts Avenue  
Cambridge, Mass. 02138

## **Social Security Conference Held**

A conference held at the Palo Alto office of the National Bureau on December 28 and 29, 1978, brought together NBER and other researchers interested in problems of social security. The conference was organized by Michael Boskin, the director of Bureau research on social insurance. The following papers were given:

Alan Blinder, Roger Gordon, and Donald Wise,  
"Market Wages, Reservation Wages, and Retirement Decisions"

Richard Burkhauser and Jennifer Warlick, "Disentangling the Annuity from the Redistributive Aspects"

Jerry Green, "Mitigating Demographic Risk through Social Insurance" (NBER Working Paper No. 215)

John Hagens, "A Reexamination of the Link between Social Security and Saving"

Arden Hall and Terry Johnson, "Social Security, Health, and Retirement Plans"

Lawrence Kotlikoff and Lawrence Summers, "Dividing Capital Accumulation into Its Life Cycle and Intergenerational Transfer Components"

Edward Lazear, "Why Is There Mandatory Retirement?"

Anthony Pellechio, "The Social Security Earnings Test, Labor Supply Distortions, and Foregone Payroll Tax Revenue" (NBER Working Paper No. 272)

Other participants at the conference were: Marcy Avrin, Stanford University and NBER; Marian Brown, Pomona College; Rita Campbell, Hoover Institution; Michael Darby, UCLA and NBER; Martin Feldstein, Harvard University and NBER; Victor Fuchs, Stanford University and NBER; Robert Hall, Stanford University and NBER; James Heckman, University of Chicago and NBER; Marjorie Honig, Columbia University; Michael Hurd, State University of New York at Stony Brook; Mordecai Kurz, Stanford University and NBER; Harold Luft, University of California at San Francisco; Robert Michael, Stanford University and NBER; Fred Nold, Hoover Institution; Joseph Pechman, Brookings Institution; John Pencavel, Stanford University; John Shoven, Stanford University and NBER; Robert Spiegelman, SRI International; and John Turner, Social Security Administration.

## Capital Formation Meeting

On January 5 participants in the National Bureau's special research project on capital formation who are interested in business taxation and finance met at the Bureau's Cambridge office. At that meeting two papers were discussed: "Effects of Inflation on the Taxation of Capital Income in the Corporate Sector," by Martin Feldstein and Lawrence Summers, and "The Effect of Factor Price Changes on Replacement Investment and Market Valuation," by John Shoven and A.P. Slepian.

A working session was devoted to discussion of the use of Compustat tapes and other microeconomic data on firms to study corporate financial behavior. NBER research associates and visitors participating in the conference were: Alan Auerbach, Harvard University; David F. Bradford, Princeton University; Phillip Cagan, Columbia University; John Ciccolo, Boston College; Daniel Feenberg; Martin Feldstein, Harvard University; Benjamin Friedman, Harvard University; Roger Gordon, Princeton University; David Hartman, Harvard University; Mervyn King, University of Birmingham, England; Charles McLure, Rice University; Peter Mieszkowski, Federal Reserve Bank of Boston; Stewart C. Meyers, MIT; and John Shoven, Stanford University.

The Feldstein-Summers paper (NBER Working Paper No. 312, summarized in the Current Working Papers in this issue) is an attempt to determine the extent to which corporate profits for tax purposes, and therefore taxes on corporate-source income, are overstated because of inflation and current accounting principles. Taxes are increased by the use of historical cost depreciation and first-in, first-out inventory accounting in a time of inflation. The benefit from inflation that results on the debt side of the corporate balance sheet is offset because the gains that are untaxed at the corporate level are taxed to holders of corporate debt and equity.

Shoven and Slepian presented an analysis in which changes in factor prices (induced, for example, by the energy crisis) leave firms with capital stocks that are not optimal. The ex post nonoptimality of prior investment is one possible explanation of a value of Tobin's  $q$  (the ratio of the market value of physical assets to their replacement value) of less than unity. A low value for  $q$  for existing capital can therefore be quite consistent with rapid replacement investment so long as the value of  $q$  for marginal investment is high.

During the working session on microeconomic data Roger Gordon and David Bradford discussed work in which they use models of portfolio choice to estimate the effect of dividend policy on share prices and, in particular, to assess the share value increase per dollar of retained earnings. Phillip Cagan described his efforts to use Compustat data to adjust figures from corporate income statements and balance sheets for the effects of inflation. Cagan plans to use his inflation-adjusted corporate reports to see whether the stock market accurately utilizes available information in valuing corporate securities.

Grants have been received from the Carthage Foundation, the General Electric Foundation, the W. R. Grace Foundation, the Mellon Foundation, and the Olin Foundation for support of the Bureau's research on capital formation.

## Economic Fluctuations Discussed

On January 18 and 19 Robert Hall, the National Bureau's director of research on economic fluctuations, convened a meeting in Cambridge to discuss macroeconomic work being done at the Bureau. The following papers were discussed:

Martin Baily, "Labor Productivity and Other Cyclical Puzzles"

Alan Blinder and William J. Newton, "The 1971-74 Controls Program and the Price Level: An Econometric Post Mortem"

Robert Hall, "Intertemporal Substitution and Aggregate Fluctuations"

James Medoff, "The Cross-Industry Pattern of Cyclical Employment Fluctuations"

Thomas Sargent, "Techniques for the Application of

## Rational Expectations Models to Economic Time Series"

Participants in the meeting who did not present papers included: Alan Auerbach, William Branson, Rudiger Dornbusch, Martin Feldstein, Stanley Fischer, Benjamin Friedman, Robert Gordon, Jerry Green, John Shoven, and Christopher Sims.

Martin Baily discussed how cyclical lags in the relation of demand to employment and man-hours affect productivity in manufacturing. These cyclical relationships appear to explain some of the productivity decline of the past few years.

Alan Blinder reported on a study of the effect of the 1971-74 program of price controls. According to his estimates, described in a paper written with William Newton (NBER Working Paper No. 279), controls reached their maximum effectiveness in February 1974, but prices then rose rapidly so that by early 1975 prices were higher than they would have been without the controls program.

Robert Hall analyzed the idea originally proposed by Robert Lucas and Leonard Rapping that labor supply increases when government spending increases aggregate demand. He linked this to the cyclical variability of interest rates. His analysis finds no strong or clear relation between cyclical variations in demand and real interest rates. The evidence therefore neither rejects nor strongly confirms the original Lucas-Rapping theory.

James Medoff's study showed how industry characteristics affect the responsiveness of employment to cyclical changes in product demand. There appear to be substantial differences in this responsiveness among industries, with a lower responsiveness in industries in which nonlabor costs account for a larger share of total costs.

Thomas Sargent described new econometric techniques for estimating models of economic behavior that could be used to analyze how firm and household behavior would respond to a major change in economic policy. Unlike traditional econometric methods, the Sargent procedure implicitly allows the response rules of private behavior to change when government policy rules change.

## International Research Group Meets

The Bureau's Program in International Studies was discussed at a meeting held at the Cambridge offices on November 30, 1978. The meeting was chaired by William Branson, director of the program. Participants in that meeting were: Jacques Artus, Willem Buiter, Rudiger Dornbusch, Martin Feldstein, Chuck Freedman, Jacob Frenkel, David Hartman, Paul Krugman, Richard Levich, Robert Lipsey, Richard Marston, J. David Richardson,

Jeffrey Sachs, Anna Schwartz, and Guy Stevens.

Research in the Bureau's program in international economics is currently organized into two major components: comparative macroeconomics and analysis of exchange rate policy. The studies in the first component will include: the analysis of the difficulties of achieving noninflationary growth in the developed countries; the examination of the determinants of investment, including long-term international capital flows; and the macroeconomic modeling of the economies of the member nations of the OECD. Among the topics to be considered under exchange rate policy are: the feedback from short-term exchange rates to prices and real variables and back to exchange rates, the pegging of currencies to "currency baskets," and the long-run determinants of movements in the current account and the equilibrium exchange rate. The Bureau's program in this area is discussed further in the Program Report in this issue.

Members of the Bureau's Program in International Studies and representatives from several foreign universities and research institutions especially interested in macroeconomic aspects of international economic relations will participate in the 1979 summer institute to be held at the Cambridge office of the Bureau. The summer workshop will meet jointly with the workshop on macroeconomics, to be headed by Robert Hall.

## Income and Wealth Conference

The national income and product accounts of the United States are the subject of the next meeting of the Conference on Research in Income and Wealth, scheduled for May 3-4, 1979, at the Sheraton-Park Hotel in Washington, D.C. Topics to be covered include the deflation of current-dollar magnitudes, user experience with the accounts, and accounts data. The conference will also include a major paper on the conceptual basis and evolution of the national accounts that, among other things, will assess changes in the light of criticisms raised in earlier conferences.

The rapid rate of inflation has brought problems associated with the deflation of GNP into prominence. The May meeting devotes several papers to deflation issues, both theoretical and applied.

The accounts are used most frequently to monitor the short-run macroeconomic performance of the economy and consequently are of vital importance in forecasting and in formulating stabilization policies. A session for users of the national accounts will include a paper on the effects of revisions of the structure and accuracy of an econometric model. In addition, a round table of prominent users of the accounts will discuss the accounts in their cyclical as well as their long-run aspects. Another session will be devoted to the Creamer Report, a critique of and recommendations concerning the statistics and the estimating techniques employed by the Bureau of

Economic Analysis in constructing the accounts.

Interested researchers who are not members of the conference but who wish to attend should write to Maureen Kay, Conference Secretary, Conference on Research in Income and Wealth, NBER, 1050 Massachusetts Ave., Cambridge, Mass. 02138. There will be a registration fee of \$10 for nonmembers.

## CEME Conference

The steering committee of the Conference on Econometrics and Mathematical Economics (CEME) met recently to discuss future directions. This conference, organized in 1970, is intended to stimulate discussion and research on the frontiers of econometric and mathematical economic theory and methodology and on applications in empirical economic studies. Support for the conference since its inception has been provided by the National Science Foundation.

The conference is organized into seminar groups which meet periodically at leading universities and research centers throughout the United States. Participants in the seminars are both senior and younger scholars; the exact composition of the groups depends on the topics and research being conducted in the field. Most groups meet once or twice each year. Some meetings are organized around presentation and discussion of formal papers, while others have a focus on planning and informal reports on research, sometimes on a common theme involving many participants. Meetings of the seminars are generally planned by the seminar leaders, but sessions on subjects of special interest are frequently organized and arranged by others with the leaders' guidance.

Current seminar groups and their leaders are:

*General Equilibrium*, Kenneth Arrow and Gerard Debreu

*Evaluation of Econometric Models*, James Ramsey  
*Comparison of Econometric Models*, Lawrence Klein

*Decision Rules and Uncertainty*, Daniel McFadden  
*Distributed Lags and Time-Series Analysis*, William Wecker

*Optimal Growth and Resource Allocation*, Joseph Stiglitz

*Bayesian Inference*, Arnold Zellner

*Industrial Organization*, James Prescott

*Analysis of Panel Microdata*, James Morgan

*Public Economics and Nonmarket Decisions*,  
Mancur Olson

*Decentralized Economic Planning*, Roy Radner

*Global Modeling*, Bert Hickman

*Monetary and Fiscal Analysis*, William Brainard

Since their inception, seminar groups have held nearly a hundred sessions, have produced more than three hundred working papers, and have published several books and numerous articles in professional journals.

These have been broadly circulated, which has made the results of seminars widely available. For example, several collections of CEME papers have been published in the *American Economic Review*, the *Bell Journal of Economics*, the *International Economic Review*, and the *Journal of Political Economy*. The Comparison of Econometric Models Seminar has published one volume of papers, the Bayesian Inference Seminar has produced two volumes, and the Evaluation of Econometric Models Seminar has two volumes in press. Royalties from the Bayesian volumes have been used to create the Savage Memorial Trust Fund and to provide awards for the best thesis in Bayesian analysis.

Besides its regular seminar program, CEME seminar groups periodically hold special meetings on selected topics. Two sessions of this nature were conducted in late 1978, one by the evaluation and comparison of econometric model groups and the other by the public economies and nonmarket decisions group. The latter meeting included invited papers and participation by noted scholars from abroad. Special arrangements for funding from a non-CEME source were made.

Scholars interested in organizing meetings or participating in the program should contact either the seminar leaders listed above or Gary Fromm, who serves as chairman of the steering committee of CEME.

## Changing Roles of Debt and Equity

The National Bureau of Economic Research has recently received a grant from the American Council of Life Insurance for a major study of the changing roles of debt and equity finance in the U.S. economy's capital markets. The primary objectives of this research program will be twofold: first, to interpret theoretically and evaluate empirically the respective roles played by debt and equity in financing capital formation in a world of rapid (and unpredictable) price inflation, complex and continually evolving patterns of intermediation, increasing internationalization of financial flows, powerful tax incentives and disincentives, and pervasive regulatory and other institutional constraints; and second, to assess the practical opportunities for public policy to exploit a richer understanding of the underlying economics of debt and equity finance so as to promote an adequate rate and desirable balance of U.S. capital formation and, at the same time, enhance financial stability.

In recent years widespread fears that U.S. capital formation would be inadequate to meet accepted policy objectives—including not only overall economic growth targets but also specific goals in such areas as environmental protection and energy self-sufficiency—have led first to claims of a potential saving-investment imbalance and then to suggestions of a mismatch, not in the totals, but in the intended specific forms of financial capital transfer. Problems of private versus equity financing, and of long versus short maturity within the debt struc-

ture, have featured prominently in these discussions. The relevant implications for public policy to promote capital formation involve not only the amount but also the structure of taxation of business profits and private returns to investment. In addition, implications of the risk structure of securities, including in particular the prospect that risk-free government debts could crowd out risky private liabilities (not to mention equities), have also raised issues which directly involve both aggregative fiscal and debt-management policies. Even at the most fundamental level, however, both the theory and the measurement of the performance of the financial markets are currently inadequate to contribute to answering the central questions raised in these public policy discussions.

This project will involve researchers drawn from three of the Bureau's major research programs (monetary economics and financial markets, business taxation and finance, and international finance). Benjamin Friedman of Harvard University, director of the National Bureau's Program in Monetary Economics and Financial Markets, will serve as the overall coordinator for this specific research study. He will be joined on the steering committee by David Bradford of Princeton University, director of the Bureau's Program in Business Taxation and Finance; William Branson, also of Princeton University, director of the Bureau's Program in International Studies; and Martin Feldstein of Harvard University, president of the Bureau.

The specific research to be undertaken will emphasize questions such as the following:

1. To what extent does the actual risk distinction between debt and equity in today's U.S. markets correspond to standard principles such as the conventional notion of senior and residual claims?
2. What are the appropriate quantitative measures of yield and risk, and what patterns have these measures shown over time?
3. Once appropriate measuring sticks for yield and risk are apparent, how do the financial markets determine the prevailing tradeoff between risk and reward?
4. How does the U.S. tax system affect investors' and securities issuers' behavior with respect to both the size and the composition of their debt and equity market participation?
5. What impact on investors' and securities issuers' behavior follows as a result of the federal government's direct debt-issuing activity?
6. What impact on investors' and securities issuers' behavior, in the specific context of debt and equity, follows as a result of market regulation?
7. How have investors and securities issuers responded to inflation per se (that is, to aspects of inflation not already included in questions 1-6)?
8. What implications follow from the increasing internationalization of the U.S. debt and equity markets?

## Business Cycle Dating

Based on forecasts made by government agencies and private forecasters, there is widespread expectation that the U.S. economy may go into recession during late 1979 or 1980. In anticipation of the need to watch macroeconomic developments even more closely over the next year, the National Bureau's Business Cycle Dating Group met in Cambridge on January 18. Participating in that meeting, which was chaired by Robert Hall, the director of NBER's program of research on economic fluctuations, were William Branson, Martin Feldstein, Benjamin Friedman, Robert Gordon, and Geoffrey Moore.

## New Bureau Books

### Cagan and Lipsey: Financial Effects of Inflation

Two research associates of the National Bureau, Phillip Cagan and Robert Lipsey, have recently published *The Financial Effects of Inflation*. This monograph reports on a study undertaken with support from the American Council of Life Insurance. It begins with a review of the standard mid-1960s view of the financial effects of inflation and then describes how experience with inflation over the past decade has shattered presumptions based on that view.

Conventional wisdom has held that the economy could follow an inflationary trend with no more fluctuation than in periods of stable prices and that financial markets adjust to inflation and find ways to protect savers. Cagan and Lipsey find that these propositions have not stood the test of experience over the last decade.

Among the particularly unsettling effects of inflation on financial institutions and markets are high and widely fluctuating interest rates, inability of common stocks to keep pace with the general rise in the price level, and difficulty of long-term financing. It seems almost certain that financial practices will evolve through further attempts to provide a positive real rate of return in the face of inflation and eliminate some of the uncertainty induced by inflation.

*The Financial Effects of Inflation* may be ordered for \$12.50 from Ballinger Publishing Company, 17 Dunster Street, Cambridge, Mass. 02138.

### Eisner: Business Investment

Few questions in economics are more important and more puzzling than the determinants of business investment. *Factors in Business Investment*, by Robert Eisner, uses individual firm data of the annual McGraw-Hill surveys of capital expenditures from 1956 through 1969 combined with accounting data and coded to preserve confidentiality, to understand what determines business investment in inventory, plant, and equipment. Although



recognizing that relative costs of labor and capital play a role in determining investment, Eisner places relatively more emphasis on such demand-side influences as changes in sales and sales expectations.

Eisner's large multifirm, multiyear body of data permits an analysis of variance and covariance with a variety of cross sections and time series. His findings support a flexible accelerator explanation of investment in which changes in demand perceived as long-run or "permanent" interact with profits and other factors which influence the timing of the investment undertaken and realized.

Following an introductory chapter in which he discusses issues to be resolved, his theoretical framework, and the data to be used, Eisner turns in chapter 2 to a discussion of sales expectations and realizations. Chapter 3 is devoted to inventory investment and chapters 4 and 5 to an extended analysis of capital expenditures. Short-run and long-run investment plans and realizations are discussed in chapters 6 and 7. Chapter 8 compares investment for expansion and investment for replacement and modernization. Chapter 9 ties together some of the major findings in a conclusion.

This book is available for \$17.50 from Ballinger Publishing Company, 17 Dunster Street, Cambridge, Mass. 02138.

## **Fuchs and Newhouse: Physician and Patient Behavior**

Nine papers on "The Economics of Physician and Patient Behavior," presented at a conference at NBER in Palo Alto, California, January 27-28, 1978, have recently been published by the *Journal of Human Resources* in a special 1978 supplemental issue. The papers were edited by Victor R. Fuchs and Joseph P. Newhouse. The conference, which was supported in part by a grant from the Robert Wood Johnson Foundation, attracted leading health economists from Stanford, Harvard, Princeton, Northwestern, Vanderbilt, City University of New York, University of North Carolina, Washington University, and the Rand Corporation.

The papers consider three major questions on the economics of physician and patient behavior: the role of the physician, the role of the consumer and insurance, and the role of public policies. The papers are analytical and behavioral; they are not oriented explicitly to policy. Two of the main concerns that are explored are quantity and price. Explanations for changes in these areas are sought by developing and empirically testing models of the determinants of demand and supply.

### **The Role of the Physician**

Most physicians believe the role of the physician in influencing the cost of medical care is substantial; however, many economists have been skeptical, preferring other explanations for the observed positive correlations among utilization, price, and physician-to-population ratios.

Jerry Green's paper examines models that might explain the observed behavior of prices and quantities in

medical care markets and includes a consideration of equilibrium and disequilibrium models under assumptions of monopoly or competition. An empirical test of the hypothesis that physicians do not induce demand is proposed, and one set of data is examined which fails to reject the no-inducement hypothesis.

Victor Fuchs's empirical study, on the other hand, provides evidence that surgeons do influence the demand for operations. Other things equal, a 10 percent increase in the surgeon-to-population ratio results in about a 3 percent increase in per capita utilization. Moreover, differences in supply seem to have a perverse effect on fees, raising them when the surgeon-to-population ratio increases. Surgeon supply is in part determined by factors unrelated to demand, especially by the attractiveness of the area as a place to live.

Barry Friedman, in his paper on nonprice rationing, takes physician control over utilization as a starting point. He develops a model in which such behavior provides long-term benefits to both patients and their physicians. These benefits motivate an "implicit contract" whereby physicians are "authorized" to use methods other than price to ration their time.

Mark Pauly pursues empirically the physician's role in determining hospital costs. He finds that medical staff characteristics, particularly the specialty mix and the number of staff physicians relative to patients, significantly affect costs. Indeed, the medical staff variables are as important as measured medical case mix in explaining cost variation across fifty California community hospitals.

### **The Role of the Consumer and Insurance**

The hypothesis that physicians exert some influence on the demand for medical care does not preclude an independent role for the consumer. Conventional demand variables such as income, price, and insurance may influence either the consumer's or the physician's decisions.

Michael Grossman and Anne D. Colle investigated the demand for pediatric care within a broad analytical framework encompassing characteristics of the child, the family (especially the mother), and the physician price and availability variables. Family income is found to have a significant positive effect on demand; the size of the effect is considerably larger than that typically reported in studies of adults' demand for medical care. Welfare programs, including Medicaid, substantially raise utilization among children from low-income families. The mother's schooling and the number of children in the family are also extremely important determinants of pediatric care utilization.

Joseph Newhouse's paper (written with M. Susan Marquis) investigates the effects of insurance on the demand for care. The hypothesis that the quantity of care received by an individual is determined by the average insurance coverage in a community, but not by the individual's own insurance, is tested and rejected. The paper also presents some preliminary results from the experi-



mental Health Insurance Study indicating that medical care utilization by families participating in the experiment did vary depending upon the extent of coverage of their insurance plan.

Charles Phelps develops a theory of demand for preventive medical service from a model of an expected-utility-maximizing consumer. He explores the costs and benefits of preventive care with special emphasis on the interaction with the demand for acute care and how the presence of health insurance can distort utilization. Phelps also explores possible tradeoffs between preventive medical care and other health-preserving behavior such as changes in smoking and dietary patterns. He concludes with a note of skepticism concerning the cost effectiveness of inducing additional *medical* preventive procedures.

### **The Role of Public Policies**

Two papers deal with the impact of public policies on health care markets. Frank Sloan, with the help of Janet Mitchell and Jerry Cromwell, investigates the determinants of physician participation in state Medicaid programs. In particular, they measure the extent to which participation is influenced by the level of Medicaid fee schedules, the complexity of the reimbursement forms, and delay in payment. Significant effects are observed for all the principal policy instruments.

Roger Feldman's study (with James Begun) on the effects of the price advertising ban in optometry is particularly timely because the question of price advertising of medical services is now the subject of lively policy debate. Holding quality constant, he finds that prices are 5 percent higher in states that ban advertising than in states that do not. The unadjusted difference in price is much larger, but it is partially offset by higher quality in states that ban advertising.

Copies of this supplemental issue of the *Journal of Human Resources* may be obtained for \$5.00 post-paid from the National Bureau of Economic Research, 1050 Massachusetts Avenue, Cambridge, Mass. 02138.

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## **Current Working Papers**

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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, NBER, 1050 Massachusetts Avenue, Cambridge, Mass. 02138. Please make checks payable to the National Bureau of Economic Research, Inc.

Abstracts of all Working Papers issued since October 1978 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.

### **Do Multinational Firms Adapt Factor Proportions to Relative Factor Prices?**

**Robert E. Lipsey, Irving B. Kravis, and Romulado A. Roldan**

Working Paper No. 293

October 1978

It has been alleged that multinational firms fail to adapt their methods of production to take advantage of the abundance and low price of labor in less developed countries and therefore contribute to the unemployment problems of these countries. This paper asks two questions: Do multinational firms adapt to labor cost differences by using more labor-intensive methods of production in LDCs than in developed countries? and Do multinational firms' affiliates in LDCs use more capital-intensive methods than locally owned firms?

We concluded that both U.S.-based and Swedish-based firms do adapt to differences in labor cost, using the most capital-intensive methods of production at home and the least capital-intensive methods in low wage countries. Among host countries, the higher the labor cost, the higher the capital intensity of production for manufacturing as a whole, within individual industries and within individual companies.

When we attempted to separate the capital-intensity differences into choice of technology and method of operation within a technology we found that firms appeared to choose capital-intensive technologies in LDCs but then responded to low wage levels there by substituting labor for capital within the technology. Similarly, U.S. affiliates appeared to use technologies similar to those of locally owned firms but to operate in a more capital-intensive manner mainly because they faced higher labor costs.

### **How Important Is Disaggregation in Structural Models of Interest Rate Determination?**

**Benjamin M. Friedman**

Working Paper No. 294

November 1978

This paper addresses the frequently expressed view that structural (that is, explicit supply-demand) models of interest rate determination are cumbersome to estimate and difficult to use because they depend crucially on sectoral disaggregation.

The paper shows that, to the contrary, an *aggregated* structural interest rate model does almost as well for U.S. data as the analogous *disaggregated* model. The difference in empirical performance between these two models is small in comparison with the range for alternative nonstructural interest rate models familiar in the literature.

The principal conclusion to be drawn from this result is that the potential burdensomeness of disaggregation in some circumstances need not be a drawback to the usefulness of structural interest rate models.

## **Interest Rate Expectations Versus Forward Rates: Evidence from an Expectations Survey**

**Benjamin M. Friedman**

Working Paper No. 295

November 1978

This paper uses survey data to compare market participants' interest rate expectations to the forward rates implied by the prevailing term-structure yield curve.

The data provide evidence showing that the term premium (calculated as the difference between the forward rate and the corresponding expected rate) is consistently and significantly positive, and that it also varies positively with interest rate levels. By contrast, the data provide no evidence to show that the term premium varies either with Treasury debt supply variables or with familiar macroeconomic series (except to the extent that these series may also vary with interest rate levels).

## **The Effect of Inflation on the Prices of Land and Gold**

**Martin Feldstein**

Working Paper No. 296

November 1978

Traditional theory implies that the relative price of consumer goods and of such real assets as land and gold should not be permanently affected by the rate of inflation. A change in the general rate of inflation should, in equilibrium, cause an equal change in the rate of inflation for each asset price. The experience of the past decade has been very different from the predictions of this theory: the prices of land, gold, and other such stores of value have increased by substantially more than the general price level. The present paper presents a simple theoretical model that explains the positive relation between the rate of inflation and the relative price of such real assets. More specifically, in an economy with an income tax, an increase in the expected rate of inflation causes an immediate increase in the relative price of such "store of value" real assets. The behavior of real asset prices discussed in this paper is thus a further example of the nonneutral response of capital markets to inflation in an economy with income taxes.

## **A Model of Diffusion in the Production of an Innovation**

**Michael Gort and Akira Konakayama**

Working Paper No. 297

November 1978

This paper is an attempt to explain diffusion in the production of an innovation. Diffusion in production is defined as the increase in number of producers, or net entry, in the market for a new product. It is to be distinguished from the more familiar problem in the literature on technical change, namely, the diffusion among pro-

ducers in the use of new products and, hence, of changes in production processes for "old" products (or services).

The empirical results confirm that a simple model—simple in terms of number of variables—is sufficient to explain most of diffusion in the production of an innovation. The principal variable that explains diffusion of entry is the demonstration effect. The principal variable that retards entry is the accumulated experience and goodwill of existing firms. A limiting force is the population of potential entrants. None of these variables appears to lend itself readily to influence by public policy.

The first stage in diffusion—the interval from first commercial introduction of the product to entry by competitors—varies greatly in duration. Institutional variables, including public policy, may have a greater impact on the length of this first stage, which is not covered by this study, than on the diffusion process in the periods examined in this paper.

## **A Status Report on Tax Integration in the United States**

**Charles E. McLure, Jr.**

Working Paper No. 298

November 1978

Recent years have seen considerable interest in the integration of the corporate and personal income taxes. Full integration, under which corporate-source income would be taxed only to shareholders, has significant economic advantages, but it suffers from severe practical difficulties. Some, but not all, of its advantages could be realized through dividend relief. Alternative means of providing dividend relief include a deduction for dividends paid, an application of a lower corporate rate to distributed income than to retained earnings, and an allowance for shareholders of a dividend-received credit for corporate taxes imputed to have been paid on their behalf. The proper treatment of tax preferences and international flows of corporate-source income raise important issues of tax administration and public policy. It is necessary, for example, to decide whether tax preferences are to be passed through to shareholders or nullified when preference income is distributed. Beyond that, "stacking rules" are required for the presumptive allocation of dividends between preference and taxable income. Further research on both economic effects and administrative feasibility is necessary for an adequate appraisal of integration.

## **Labor Supply Estimates for Public Policy Evaluation**

**George J. Borjas and James J. Heckman**

Working Paper No. 299

November 1978

In recent years the study of labor supply has occupied the attention of a large number of economists. With the growth in interest in the topic and with the inevitable di-

versity of economic models and statistical methods proposed by new entrants in the field, the literature has developed its own folklore. The principal legend is that the empirical estimates of the same parameters obtained from the set of available studies display such diversity that they are of little use to policy makers. This paper disputes the folklore. We claim that there is more agreement than disagreement once a few reasonable criteria based on recent theoretical work are used to eliminate certain studies from consideration, and once we are careful about posing the question we seek the estimates to address.

## **Monetarist Interpretations of the Great Depression: An Evaluation and Critique**

**Robert J. Gordon and James A. Wilcox**

Working Paper No. 300

November 1978

The paper examines two different aspects of macroeconomic behavior in the United States during the period between 1929 and 1941—both the proximate determinants of the severity and duration of the slump in nominal income, and the factors influencing the division of those changes in nominal income between changes in the price level and in real output.

The first question, the sources of nominal-income movements, has been the subject of much recent controversy and debate. The statistical analysis in the paper suggests that both extreme monetarist and nonmonetarist interpretations of the decade of the 1930s are unsatisfactory and leave interesting features of the data unexplained. The paper takes the intermediate view that both monetary and nonmonetary factors were important and places considerable emphasis on the interaction among construction, consumption, the stock market, and the Hawley-Smoot tariff in its explanation of the severity of the first two years of the contraction.

The second section, on the nature of the aggregate supply response in the 1930s, concludes that neither the equilibrium aggregate supply approach nor the expectational Phillips curve approach appears at all adequate. The statistical relation appears to have been between price change and changes in unemployment or output. The similarity of the supply response in Europe to that in the United States both contradicts those who claim that New Deal legislation was mainly responsible for the U.S. price-output pattern, and raises an interesting set of questions for further research.

## **Should We Organize? Effects of Faculty Unionism on Academic Compensation**

**Richard B. Freeman**

Working Paper No. 301

November 1978

This paper uses the American Association of University Professors surveys for the period 1965 to 1976 to ex-

amine the effect of faculty unionism on faculty pay. It compares estimated effects of unionism on compensation from cross-section regressions of faculty pay on union organization and from a longitudinal model designed to correct cross-section estimates for "unobserved characteristics" of schools that are correlated with unionism. The major findings are that: (1) unionism raises faculty pay, but the extent of the effect varies greatly by estimating model and time period covered; (2) the number of years a school has been organized has a stronger effect on pay than the standard 0-1 union dummy variable; (3) unionism raises the fringe benefit share of compensation; (4) the estimated coefficient on faculty unionism in cross-section regressions overstates the union impact because unionized schools tend to have been higher paying even before organization.

## **Tax Policy in a Life Cycle Model**

**Lawrence H. Summers**

Working Paper No. 302

November 1978

This paper employs a realistic life cycle growth model to examine alternative tax policies. Both long-run steady states and transition paths following tax changes are explicitly considered. The results suggest the welfare cost of capital income taxation has been seriously underestimated. For reasonable parameter values, the present value of the welfare gain from a shift to consumption or wage taxation is comparable to one year's GNP. These large estimates differ from previous estimates for two main reasons. First, the multiperiod model used in the paper suggests that a very high interest elasticity of savings is likely to obtain for almost any plausible parameter values. The traditional assumption of a zero or small interest elasticity of savings is shown to be inconsistent with a realistic formulation of life cycle savings. Second, the welfare calculations in the paper incorporate the general equilibrium effects of tax changes. The most important of these is the increase in gross wages which results from the increased capital intensity arising from eliminating capital taxation.

## **Towards an Understanding of the Real Effects and Costs of Inflation**

**Stanley Fischer and Franco Modigliani**

Working Paper No. 303

November 1978

The traditional view that, because money is neutral, inflation produces no appreciable real effects is shown to hold approximately only for an economy whose institutions are fully inflation proof, e.g., a fully indexed one. But the real effects are shown to become more and more widespread and serious as the institutions of the economy are more nearly nominal. The paper examines in succession the consequences of nominal government

institutions (tax systems, definition of taxable income, accounting procedures); of nominal private institutions and accounting conventions (long-term nominal contracts, measurement of income), even when current and future inflation was and is fully anticipated. It finally examines the effects of unanticipated inflation that is not incorporated in existing nominal long-term contracts, and of uncertain future inflation. Whenever possible an attempt is made to discuss the social cost of various real effects, even though current research leaves us a considerable distance from assessing social costs of inflation.

## **The Changing Cyclical Behavior of Wages and Prices: 1890-1976**

**Jeffrey Sachs**

Working Paper No. 304  
December 1978

The persistence of inflation during periods of high unemployment poses the central problem for macroeconomic policy in coming years. The extent of success in reducing both inflation and unemployment will depend strongly on the short-run responsiveness of wage inflation to unemployment and excess capacity. This paper studies changes in the cyclical responsiveness of inflation in 1890-1976, and concludes that a given shortfall in production relative to potential now "buys" a smaller reduction in the rate of inflation than in the past. In 1890-1929 a 1 percent decline in industrial production reduced inflation about 0.45 percent; for 1950-1976, the same output decline is estimated to slow inflation only about 0.1 percent.

The analysis makes use of two methods to study the changing cyclical behavior of inflation. Following an innovative study by Cagan, calculations are made for wage and price inflation before and after eighteen business cycle peaks. While inflation slows in almost every recession, the declines in inflation in recent years are less pronounced than earlier, even when controlling for business cycle severity. In a second section of the study econometric evidence is provided that also strongly supports the hypothesis of increasing rigidity of wage and price inflation over the business cycle.

In the last section of the paper some possible reasons are cited for the declining responsiveness of inflation to unemployment. Ironically, successful macroeconomic policy might be in part responsible. To the extent that activist macroeconomic policy breaks the link between current unemployment and expectations of future unemployment, it is argued, unemployment today will not induce wage cuts in contracts for future periods. Also, the tremendous increase in duration and coverage of collective bargaining agreements is suggested as an important force behind the shifting behavior of wages and prices during the period of study.

## **The Percent Organized Wage (POW) Relationship for Union and for Nonunion Workers**

**Richard B. Freeman and James L. Medoff**

Working Paper No. 305  
December 1978

This paper analyzes the relation between the percent of workers organized in a product market and the wages received by union workers and by nonunion workers. It argues that the greater the union coverage of a sector is, the lower the elasticity of demand for the product of organized firms will be (since there will be fewer nonunion competitors) and as a result the elasticity of demand for union labor will be lower and the union wage gains will be larger. Estimates of the link between coverage and wages using information on individuals and on establishments shows the expected positive relation for union workers across manufacturing industries. By contrast, nonunion wages in manufacturing appear to be unrelated or only modestly related to the percentage organized. Estimates of the link between the percentage of construction workers unionized in a state and the wages of union and nonunion construction workers reveal relationships similar to those for manufacturing. Overall, the results strongly suggest that the percent organized is an important determinant of union wages and of the union-nonunion wage differential.

## **Efficient Wage Bargains under Uncertain Supply and Demand**

**Robert E. Hall and David M. Lilien**

Working Paper No. 306  
December 1978

This paper examines efficient arrangements between employers and workers for handling shifts in the demand for and supply of labor. Efficiency is achieved when the marginal revenue product of labor equals the marginal value of time. The problem is to set up contractual provisions so that employment can vary as supply and demand change. Where the shifts are observable and outside the control of the parties to the contract, a fully contingent contract can achieve efficiency. However, these conditions are rarely met in practice and contingent labor contracts, apart from cost of living escalators, are almost never found. The paper investigates noncontingent contracts that are efficient or approximately efficient. It shows the impossibility of full efficiency in the face of shifts in both supply and demand and the feasibility of efficiency when only demand or only supply shift. It argues that very nearly efficient contracts are possible when demand shifts are much larger than supply shifts, and shows that the type of contract appropriate for this case bears strong resemblance to collective bargaining agreements in the United States. In particu-

lar, it shows that the current state of demand should be completely irrelevant in the process of renegotiating a labor contract.

## **Restriction of International Production: The Effects on the Domestic Economy**

**David G. Hartman**

Working Paper No. 307

December 1978

This paper examines the argument that restricting domestic firms' production abroad by, for example, imposing a tax on foreign-source income, can increase domestic welfare and alter the income distribution to favor labor. These arguments follow directly from a characterization of the international producer as a facilitator of capital flows. The available evidence suggests, however, that U.S. multinational firms have a much broader role than transferring abundant U.S. capital abroad. In this paper the firm is viewed as able to compete abroad for a variety of reasons, including an ability to make use of technological and other cost advantages over local producers. Then, the effect of its operations abroad on the domestic capital stock is no longer so obvious. It is argued that at most a part of the marginal capital employed abroad is obtained at the expense of the capital stock of the domestic economy. The paper then presents a simple model which indicates that domestic labor can either gain or lose relative to capital, and home country welfare can either increase or decline, as a result of restricting the foreign operations of domestic firms. The results depend on the ultimate source of the capital placed abroad, the relative factor intensity of production by the multinational firm, and whether the multinational firm produces the home country's importable or exportable good. Since none of the cases considered seems totally implausible, the case for reducing international production cannot be made on the traditional grounds without further empirical evidence.

## **Income and Race Differences in Children's Health**

**Linda N. Edwards and Michael Grossman**

Working Paper No. 308

January 1979

In this paper we explore income and race differences in nine measures of the health of children aged 6 through 11. We show that when health measures from midchildhood are the subject of analysis, both income and race differences are much less pronounced than they are in infant mortality and birth weight data. We do find differences in the health status of black and white children and of children from high- and low-income families, but these differences by no means overwhelmingly favor the white or high-income children. With respect to differences by race, whether or not they are adjusted for differences in associated socioeconomic factors, black

children in many cases are in better health than their white counterparts. In the case of income differences in health, the high-income children do appear to be in better health according to most measures, but their advantage is greatly diminished when one controls for related socioeconomic factors like parents' educational attainment. Even so, for measures relating to the "new morbidity," such as the presence of allergies or excessive tension, children from higher income families are in worse health.

## **How Elastic Is the Demand for Labor?**

**Kim B. Clark and Richard B. Freeman**

Working Paper No. 309

January 1979

This paper investigates the magnitude of the elasticity of demand for labor in time-series data using more general and complete models of demand than have been previously employed. It argues that previous analyses have imposed two invalid constraints in calculations, which bias downward estimated elasticities. The first invalid constraint is the assumption that real capital prices have an equal opposite effect to real wages in the demand equation. We show on measurement error grounds that this constraint should not be imposed in econometric work even when long-run homogeneity of prices correctly characterizes the market. The constraint is rejected in the data. The second invalid constraint is that all explanatory variables have the same lag distribution. We argue that this constraint is invalid when decisions are made under uncertainty and find that it is also rejected by the data. The principal positive empirical finding is that with the constraints relaxed, the elasticity of demand with respect to real wages is much larger than the estimates in the literature, indicating much greater price responsiveness on the demand side of the labor market than has previously been thought.

## **Domestic Saving and International Capital Flows**

**Martin Feldstein and Charles Horioka**

Working Paper No. 310

January 1979

This paper uses new statistical estimates to compare two views of international capital mobility. With perfect world capital mobility, there would be little or no relation between the amount of saving generated in a country and the domestic investment in that country. In contrast, if portfolio preferences and institutional rigidities impede the flow of long-term capital among countries, increases in domestic saving would be reflected primarily in additional domestic investment. The statistical evidence presented here on the relation between domestic investment and saving implies that the truth lies closer to the second view than to the first. *International differences in domestic savings rates among major industrial*

*countries have resulted in almost equal corresponding differences in domestic investment rates.*

The paper discusses the compatibility of this evidence with the obvious international mobility of short-term liquid capital and with the existence of substantial international flows of long-term portfolio and direct investments. There is a brief discussion of the relevance of the new evidence for the optimal national saving policy and for the analysis of tax incidence.

## **Monetary Policy under Exchange Rate Flexibility**

**Rudiger Dornbusch**

Working Paper No. 311

January 1979

The paper presents an evaluation of exchange rate theories and the empirical evidence in the field. The analysis is extended to sketch the role of flexible exchange rates in a macroeconomic context, in particular for the case of the United States.

Among exchange rate theories "asset-market" models are now recognized as the most attractive formulation. These models emphasize the determination of exchange rates as part of short-run asset market equilibrium. Prominent among these theories is the "monetary approach." A review of the evidence finds the empirical support for the view quite weak. An alternative approach emphasizes the imperfect substitutability of assets and views exchange rate determination as linked to the relative supplies of financial assets denominated in domestic and foreign currency. Empirical support for this view is only starting to come in now.

The paper offers a criticism of the manner in which empirical tests of exchange rate models have been conducted. It is shown that, along lines familiar from macroeconomics or finance, only unanticipated changes in the determinants of exchange rates should affect the deviations of exchange rates from the interest parity trend. Such a formulation suggests that the explanatory variables are the innovations—such as unanticipated money—in the determinants of exchange rates, not their actual levels.

There is a brief review concerning the evidence of exchange rate effects on inflation and trade flows. The review concludes that exchange depreciation does exert a significant effect on domestic inflation, given the rate of unemployment, but that there do remain effects on competitiveness. Changes in real exchange rates in turn do exert an important long-run effect on trade flows, although the lags are quite pronounced.

## **Inflation and the Taxation of Capital Income in the Corporate Sector**

**Martin Feldstein and Lawrence Summers**

Working Paper No. 312

January 1979

This paper presents a detailed examination of the ef-

fect of inflation on the taxation of capital used in the non-financial corporate sector of the U.S. economy. In contrast to previous studies of the relation between inflation and corporate tax burdens, we consider not only the tax paid by the corporations themselves but also the tax paid by the individuals and institutions that provide capital to the corporate sector.

According to our calculations, the effect of inflation with the existing tax laws was to raise the 1977 tax burden on corporate sector capital income by more than \$33 billion, an amount equal to 77 percent of the real aftertax capital income of the nonfinancial corporate sector (including dividends, retained earnings, and real interest). This extra tax raised the total effective tax rate from 45 percent to 69 percent of capital income in the nonfinancial corporate sector.

A separate analysis for each of twenty manufacturing industries shows substantial variation among these industries in the relative importance of this increased taxation. Inflation therefore can distort the allocation of capital among industries as well as the total volume of corporate capital formation.

The paper considers the role of corporate debt in detail. Inflation distorts taxation by allowing corporations to deduct nominal interest payments that exceed real interest but then taxes lenders on their nominal receipts. Our analysis shows that the additional taxes paid by lenders exceed the tax saving by corporate borrowers. Since the difference between the relevant tax rates of borrowers and lenders is quite small, the mismeasurement of interest income and expenses can be ignored without seriously distorting the evaluation of the overall effect of inflation on the taxation of corporate sector capital.

## **A Note on Stochastic Rationing Mechanisms**

**Takatoshi Ito**

Working Paper No. 313

January 1979

There are a couple of well-known unsatisfactory properties in the notion of effective demand defined by Benassy and one by Dreze. This is why recent authors in disequilibrium analysis study the stochastic rationing mechanism. Douglas Gale proved the existence of the equilibrium with stochastic rationing mechanism. However, Gale's rationing mechanism requires an economic agent to know all the individual effective demands from the other agents. This creates the informational problem. Green examined a rationing scheme which depends only on the individual effective demand and the aggregate signals. However, he did not consider conditions on rationing mechanisms to show the existence of temporary equilibrium.

The purpose of this paper is to show a couple of sufficient conditions for the existence of temporary equilibrium preserving all properties Green considered on rationing mechanisms. We also discuss the possibility of balancing demand and supply in realization instead of in the mean.

## **The Effect of Social Security on Private Saving: The Time-Series Evidence**

**Martin Feldstein**

Working Paper No. 314

February 1979

This paper reviews the studies by Barro, Darby, and Munnell as well as my own earlier time-series study and presents new estimates using the revised national income account data. The basic estimates of each of the four studies point to an economically substantial effect that is very unlikely to have been observed by chance alone. Although including variables like the government surplus (Barro) or a measure of real money balance (Darby) can lower the estimated coefficient of the social security wealth variable, this paper explains their inappropriateness in the aggregate consumption function. Use of the new Department of Commerce data on national income and its components improves my earlier estimates and shows that the unemployment variable does not belong in the consumption function once the level of income and its rate of change are included.

## **An Empirical Analysis of the Fixed Coefficient "Manpower Requirements" Model, 1960-1970**

**Richard B. Freeman**

Working Paper No. 315

February 1979

The fixed coefficient "manpower requirements" model is one of the most widely used tools in the empirical analysis of labor skills. The model has the advantage of providing information on the effect of changes in the industrial composition of an economy on demand for labor in highly disaggregated occupations at the cost of neglecting factor substitution. This study examines the ability of the fixed coefficient model to explain changes in employment in three-digit occupations in the United States from 1960 to 1970 and develops an "augmented requirements" model which uses changes in wages as well as fixed coefficient shifts in demand to analyze changes in employment. The paper finds that: (1) by themselves, the requirements shifts account for much of the change in employment among detailed occupations in the period studied, although standard errors of estimate are sizable; (2) even with crude adjustments for factor price effects, demand for detailed skills is far from zero elastic; (3) the fixed coefficient model seems to work not because demand and supply are economically unresponsive but because the variation in the wage structure and corresponding incentive to alter input coefficients is moderate relative to the variation in the shift in demand due to changes in industrial mix.

## **The Effect of Demographic Factors on Age-Earnings Profiles**

**Richard B. Freeman**

Working Paper No. 316

February 1979

This paper examines the effect of the increased number of young persons in the job market on their earnings relative to the earnings of older workers. The principal finding is that the age-earnings profile of male workers appears to be significantly influenced by the age composition of the work force. When the number of young workers increased sharply in the 1970s, the profile "twisted" against them, apparently because younger and older male workers are imperfect substitutes in production. The effect of changes in the relative numbers of workers of different ages on age-earnings profiles is especially marked among college graduates. By contrast, the age-earnings profile of female workers, which tends to be quite flat, appears to be little influenced by the age composition of the female work force, possibly because the intermittent work experience of women makes younger women and older women closer substitutes in production.

Whether the sizable decline in the earnings of the large cohort of young workers entering the market in the 1970s relative to the earnings of older cohorts will persist, creating a lifetime "size of cohort" earnings effect, or whether the new entrants of the 1970s will significantly catch up in earnings in future years remains to be seen. The dependence of the age-earnings profile on demographically induced movements along a relative demand schedule suggest that standard human capital models of the profile, which posit that earnings rise with age or experience *solely* as a result of individual investment behavior, are incomplete.

## **International Aspects of Dividend Relief**

**Charles E. McLure, Jr.**

Working Paper No. 317

February 1979

This paper examines international aspects of the provision of relief from the double taxation of dividends that now occurs under the "classical" American system of taxing corporate income to both corporations and shareholders. It begins with reviews of the recent American debate over integration and dividend relief, the systems of dividend relief now being used in Europe, and commonly accepted standards for judging international tax policy. These standards are employed in the appraisal of existing arrangements in Europe, possible alternative systems for international taxation in a world of dividend relief, and using the European-American situation as an example, relations between countries with dividend relief and those with classical systems.

## **Information, Measurement, and Prediction in Economics**

**Victor Zarnowitz**

Working Paper No. 318

February 1979

This paper examines the flow of production and use of economic information and analyzes the effects of measurement errors, particularly as transmitted through expectations and forecasts. Economic data are subject to a variety of errors, and the uncertainty about economic measures tends to increase further with the amount and complexity of the processing performed on the underlying data as well as with the distance between the user and the processor. With some exceptions, economic time series lag significantly behind their reference periods and may undergo large revisions. The effective information lag includes not only the time required for incremental data to be produced and transmitted but also the time required for the signals to be extracted by the user. This lag is substantial for many important series.

In general, there is no presumption that the measurement errors are random: Systematic errors are frequent and their sources and forms vary so much that they may be difficult to detect. In times of strong shocks and surprising developments (as occurred earlier in this decade), measurement of short-term changes in the economy is particularly difficult and current signals are apt to be often misinterpreted. This can result in broadly diffused decision errors which in time are discovered, leading to sharp corrective reactions.

Aggregative predictions from well-known and influential sources show certain common patterns of error, which suggests that forecasters react similarly to the observed events and unanticipated shocks. Forecasts of GNP and related variables are adversely affected by errors in both the preliminary data and the base level estimates. There is some support here for the hypothesis that information lags play a significant role in generating business cycles, but it is important to note that the errors involved in predicting the future are typically much larger than the errors involved in estimating the present or recent past.

## **Applied Welfare Economics with Discrete Choice Models**

**Harvey S. Rosen**

and **Kenneth A. Small**

Working Paper No. 319

February 1979

Economists have been paying increasing attention to the study of situations in which consumers face a discrete rather than a continuous set of choices. Such models are potentially very important in evaluating the impact of government programs upon consumer wel-

fare. But very little has been said in general regarding the tools of applied welfare economics in discrete choice situations.

This paper shows how the conventional methods of applied welfare economics can be modified to handle such cases. It focuses on the computation of the excess burden of taxation, and the evaluation of quality change. The results are applied to stochastic utility models, including the popular cases of probit and logit analysis. Throughout, the emphasis is on providing rigorous guidelines for carrying out applied work.

## **A State Price Index**

**Victor R. Fuchs, Robert T. Michael,**

and **Sharon R. Scott**

Working Paper No. 320

February 1979

No cross-sectional consumer price index is currently available by state, and the BLS's cross-sectional "family budget" index for metropolitan areas is not well suited for cross-state analyses. In this paper we propose an algorithm for constructing a state-specific Laspeyres price index using conveniently available information from the Census of Business and the Survey of Current Business.

The index is calculated for each state (and for Census divisions and regions) for 1967 and 1972. Its characteristics are discussed, and it is used to deflate nominal per capita income by state. Comparing "real" income by state with nominal income by state, the former has substantially less variation cross sectionally but greater variation over time (between 1967 and 1972).

## **The Efficient Level of Public Library Services**

**Malcolm Getz**

Working Paper No. 321

February 1979

Criteria for determining the efficient mix of branches, hours, stock, and new acquisitions are developed and applied to the branch operations of the New York Public Library. A method based on traveling costs is used to value library use at each branch. The relationship between library operations and library use is estimated using a two-stage technique. The costs of library operations are explored. Marginal benefit-cost ratios are presented. The study finds that the New York Public Library operates too many branches for too few hours of service.



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