Editors' Introduction and Summary

THIS IS THE TWELFTH ISSUE OF *Brookings Papers on Economic Activity.* This publication appears three times a year, and contains the articles, reports, and highlights of the discussion from conferences of the Brookings Panel on Economic Activity. Financed by grants from the National Science Foundation, the Alfred P. Sloan Foundation, and the Alex C. Walker Foundation, the panel was formed to promote professional research and analysis of key developments in U.S. economic activity. Prosperity and price stability are its basic subjects.

The expertise of the panel is concentrated on the "live" issues of economic performance that confront the maker of public policy and the executive in the private sector. Particular attention is devoted to recent and current economic developments that are directly relevant to the contemporary scene or especially challenging because they stretch our understanding of economic theory or previous empirical findings. Such issues are typically quantitative in character, and the research findings are often of a statistical nature. Nonetheless, in all the articles and reports, every effort is made to develop the reasoning and the conclusions in a form both intelligible to the interested, informed nonspecialist and useful to the macroeconomic expert. In short, the papers aim at several objectives—meticulous and incisive professional analysis, timeliness and relevance to current issues, and lucid presentation.

The four principal articles and three reports presented in this issue were prepared for the twelfth conference of the Brookings panel, held in Wash-

ington on November 15–16, 1973. These papers generated spirited discussions at the conference. Many of the participants offered new insights and helpful comments; many had reservations or criticisms about various aspects of the papers. Some of these comments are reflected in the summaries of discussion contained in this issue, some in the final versions of the papers themselves. But in all cases the papers are finally the product of the authors' thinking and do not imply any agreement by those attending the conference. Nor do the papers or any of the other materials in this issue necessarily represent the views of the staff members, officers, or trustees of the Brookings Institution.

Summary of This Issue

In the first article of this volume, William Nordhaus analyzes how energy requirements will be met in the long run. He notes several principal sources of energy in today's economy, including drilled petroleum and natural gas, coal, and hydropower, plus a minor amount of nuclear power. In addition, energy sources such as shale oil, and gasified and liquefied coal, could be made available with present technology, but thus far only at prospective costs that would be uncompetitive with those of other available fuels. Finally, it can be safely predicted that still other sources of energy, such as breeder reactors, will become available with some further technological development. Today's energy is based largely on resources that are cheap to extract but relatively scarce when viewed over a long time horizon. Tomorrow's will depend on more abundant but also more expensive resources. In a free market, the transitions from one source to the next are governed by price.

Nordhaus develops a model of energy use that takes account of the costs and availability of alternative energy sources both now and in the future. He uses it to describe the pattern of uses and prices of various types of energy that would emerge through time in a free competitive market. While he acknowledges some of the ways in which actual prices may differ from those generated by his model, he regards his general outline of resource utilization and price changes as helpful indicators of how the future of energy use is likely to unfold.

Some types of energy are virtually free gifts of nature to mankind, involving very low labor and capital costs. But these are limited in supply and

not renewable. Such low-cost sources of energy are used first; but as they are used up, the price of energy rises. Recognizing this process, the owner of a low-cost energy source, such as a rich field of oil, balances the decision to sell at today's price (and invest the proceeds) against the alternative of keeping his product in the ground and waiting for prices to rise. This assessment determines prices and quantities at all points in time, and generates a rising trend in prices and royalties to the owners of energy resources.

As the fuels of today move up in price, alternative sources of energy—tomorrow's fuels—become a profitable alternative. The world economy gradually makes transitions from the lowest-cost sources to the next least expensive fuel and ultimately to technologies that require much capital and labor but are less dependent on scarce, depletable natural resources. The calculations of Nordhaus' model predict a movement from today's heavy reliance on petroleum and natural gas to deep-mined coal, gasified and liquefied coal, shale oil, and light-water reactors during the century ahead. In the limit of Nordhaus' calculations, reached in the twenty-second century, breeder reactors supply almost all of the world's energy needs. These provide a virtually infinite energy source but at a relatively high price because of their huge capital costs. Thus one optimistic result of Nordhaus' analysis is that the world is not running out of energy: "we should not be haunted by the specter of the affluent society grinding to a halt for lack of energy resources." His second optimistic message is that, while the cost of energy will gradually rise as economies rely on increasingly expensive sources, the increase in cost is not alarmingly fast. From 1970 to 2010, estimated energy costs—relative to the general price level—rise at rates between 1.1 percent per year for electricity and 3.5 percent per year for transportation.

Nordhaus' basic model assumes a world with free international trade and competition in energy. For comparison, he also explores the case in which the United States achieves complete self-sufficiency in energy sources. While, over the next twenty years, the total cost of meeting energy demand is about half again as high in this case as with free trade—an added average annual cost of energy of $16 billion—it does not necessarily exceed the costs in the real world of short-run disturbances and monopolistic pricing. Still, Nordhaus notes, it would be less expensive to finance an oil storage program that would protect against several years of import disruptions than to pay the estimated cost of self-sufficiency in energy. Moreover, in a

real world subject to supply disruptions and extravagant prices for imported oil, Nordhaus can see a justification for developing capacity in those areas where domestic resources are abundant—intensified drilling for oil and gas, heavier use of coal, and the development of clean synthetic fuels such as shale oil and liquefied coal.

Nordhaus' message on petroleum prices is, if anything, the opposite of the conventional story. Even before the Mideast war, the price of crude oil was inflated considerably above the competitive price he calculates. While he cannot pinpoint the sources of this discrepancy, he suggests that it arises partly from excessive royalties charged by producing countries and partly from U.S. import restrictions and prorationing of U.S. production. He concludes that, as a long-run policy, it would be unwise to jack up the prices of energy products or embark on a policy of permanent rationing, in the interests of artificially preserving energy resources. Long-run alternatives to present energy sources are available at reasonably predictable prices. Thus a dollar's worth of energy saved is no more deserving than a dollar's worth of idle labor or wasted capital prevented.

In the second article, Stephen Goldfeld presents a broadly ranging review, updating, and synthesis of quantitative research on the demand for money. Using aggregate quarterly data for the United States since the early fifties, Goldfeld finds that the quantity of money—the sum of currency and demand deposits—demanded in any quarter can be tracked reasonably well with the aid of only a few explanatory variables: the level of gross national product, interest rates on time deposits and on short-term commercial paper, and the level of money holdings in the previous quarter.

The elasticity of real money demand with respect to real GNP is found to be approximately two-thirds, meaning that a 3 percent increase in real GNP adds only 2 percent to the inflation-corrected demand for money. This less-than-proportionate response suggests that there are economies of scale in holding cash balances, a phenomenon initially inferred in theoretical work by William Baumol and James Tobin. Also, as these writers had theorized, the economies of scale do not apply to inflation: Goldfeld finds that an increase in prices of 3 percent, for example, would raise the demand for nominal cash balances by an equivalent 3 percent, leaving real demand unchanged.

Because higher interest rates increase the income forgone in holding money rather than interest-bearing assets, they create incentives to econo-

mize on cash balances. According to Goldfeld's basic estimates, the demand for money would be reduced 2 percent if interest rates on both time deposits and commercial paper rose by one-tenth (say from 6.0 to 6.6 percent). Both the income and interest effects on the demand for money build up over a considerable period of time: between one-seventh and one-third of the total impact is exerted in the initial quarter; after seven quarters, more than nine-tenths of the ultimate effect is operative.

Goldfeld is impressed by the sturdiness of the basic econometric equation he uses to explain the demand for money. The key coefficients are not very different over varying sample periods, nor does any evidence of instability in money demand emerge for different subperiods of the past generation. The typical error in explaining money demand for any given quarter, given the level of GNP, interest rates, and previous money holdings, is below one-half of 1 percent, revealing an excellent statistical fit. Even so, that typical error, approaching 2 percentage points in the annual rate of growth of money demand for a quarter, does not match the degree of precision that some economists strive for in their prescriptions for monetary policy.

Goldfeld conducts a number of statistical experiments designed to refine the explanation of the demand for money. He improves slightly over his basic explanation of money demand by including the change in wealth (as well as the level of GNP) as an explanatory variable and also by using separate equations to track currency and demand deposits, the two components of the narrowly defined money stock. He finds that no single equation can explain the demand for broadly defined money (which includes time deposits) as satisfactorily as the basic equation tracks narrowly defined money. And he has only limited success in estimating separate demand functions for various types of holders—households, businesses, and governments—perhaps because of inaccuracies in the data allocating money among categories of holders. In another of his experiments, Goldfeld presents statistical evidence that suggests—at least on one interpretation—that as a result of more rapid expected inflation, the real demand for money is depressed directly (over and above the indirect effect from higher interest rates).

The regularity and dependability of the demand for money that Goldfeld finds is on the whole reassuring to economic theorists, econometricians, and policy makers. According to these findings, extra money created by the Federal Reserve will be absorbed by demanders through some combination

of higher incomes and lower interest rates—in line with the presumed intentions of an expansionary monetary policy. But the investigation of the demand for money does not permit Goldfeld to pinpoint the monetary impact on GNP. Such an estimate would require a companion exploration of an even more difficult territory—the relationship of the demand for goods and services to interest rates (and availability of funds) and to income. Nonetheless, Goldfeld has a few specific lessons for policy making at the conclusion of his paper. First, he develops the point that, although the demand for money is reasonably stable in relation to income and interest rates, the velocity of money—its annual rate of turnover—is not stable. On the contrary, fluctuations of interest rates and income produce marked changes in velocity in the short run; Goldfeld notes that "any policy prescription that does not take this into account may be very misleading." Second, he illustrates some possible scenarios for 1974; they suggest that, if nominal GNP is to rise by 7 percent during the course of the year and short-term interest rates are to decline, the money supply must rise by at least 6 percent and perhaps by as much as 7½ percent.

In the third article, William Gibson discusses analytically the arguments for and against protecting homebuilding from the impact of restrictive credit conditions. On the one hand, the sensitivity of homebuilding to tight money gives a restrictive monetary policy leverage in curbing aggregate demand and thus in restraining inflationary pressures. On the other hand, the sharp declines in homebuilding produced by tight money may be viewed as reflecting inequitable and inefficient burdens imposed on an industry with particular social priority.

Gibson notes that, regardless of the stance of monetary policy, some federal policies operate continuously to stimulate homeownership and home construction. Gibson finds several possible justifications for special governmental aid to housing, but he notes that these do not argue necessarily for stabilizing homebuilding each and every year. In principle, any given average amount of long-term support could be provided regardless of the magnitude of fluctuations in the industry so long as homebuilding runs at an above-target pace in times of easy money to compensate for the below-target activity in times of credit restraint.

Several characteristics of residential building make it particularly suitable for absorbing a substantial portion of the impact of monetary restraint. First, housing is one of the longest-lived investment goods, and a restrictive monetary policy ideally should cause the largest cutback in the output of

the most durable goods. Postponing the construction of a housing unit for one year sacrifices only the *annual* rental value of that unit, which may be roughly 10 percent of the building cost. That loss of services is thus only a small fraction of the resources—labor and material—that become available for other uses as a result of the deferment.

Second, compared with other long-lived assets, housing takes a remarkably short time to build—perhaps three or four months for a single-family home. Thus, when a housing start is postponed, the saving of material and labor resources takes place rapidly, whereas it would occur very slowly after, say, a decision to delay starting a dam.

Third, the reasonably good mobility of the resources used in homebuilding provides another social advantage associated with the sensitivity of homebuilding to restrictive credit conditions. When housing is cut back as a result of tight money, many of its workers are likely to find jobs in nonresidential construction and others in industries outside of construction. These shifts can alleviate inflationary pressures without necessarily reducing aggregate employment or output. Indeed, Gibson confirms an earlier finding of Craig Swan (*Brookings Papers*, 2:1971) that a reduction of employment in construction causes no evident increase in the unemployment of construction workers, so long as the unemployment rate of the overall economy does not rise. Nonetheless, as Gibson cautions, the substitute jobs may be poorer and lower paying than the work lost in residential construction.

Gibson does stress one type of social cost that may stem from wide fluctuations in housing. They may have serious adverse consequences for the longer-term efficiency of the industry. Because homebuilders cannot plan on a stable production path over time, they must retain flexibility in their labor and capital equipment in order to expand and contract output rapidly. As a result, they may shun certain productive processes and investments that would be efficient at some particular predictable level of output. Moreover, the riskiness of entrepreneurial activity in homebuilding may discourage people from entering that industry or investing in it. The only direct evidence that Gibson can obtain about the supply of capital to homebuilding comes from a limited group of large-scale homebuilders whose equity shares are traded on a public exchange. In a statistical analysis of the price-earnings ratios of such homebuilders, Gibson finds that these ratios respond to fluctuations in homebuilding in a nonlinear way that may raise the average cost of capital to the industry over the cycle.

Gibson fears that an effort to shield homebuilding by relaxing monetary

policy in periods of excess-demand inflation would compromise the social objective of price stability. He doubts that fiscal restraint is a realistic political alternative to monetary restraint. He sees some appropriate role for government mortgage programs that try to spread the impact of tight money to other industries. But he cites work by Barry Bosworth and James Duesenberry indicating that such a diffusion of the impact weakens the potency of a given dose of monetary restraint in the short run. Hence, the more federal credit programs are used to bolster the supply of mortgages in periods of tight money, the higher market interest rates might have to be pushed and the lower the money supply might have to be held in order to achieve a desired cutback in aggregate demand. Hence Gibson concludes that federal mortgage supports should be "used sparingly in the future."

In the last major article of this issue, George Perry analyzes four available measures of operating rates in manufacturing—the Federal Reserve Board index, the Wharton School index, the McGraw-Hill utilization survey, and an index that he constructs from the McGraw-Hill survey of capacity growth. While these four measures of average manufacturing operating rates were in substantial agreement through 1965, they have diverged in the years since then. By the middle of 1973, operating rates were estimated at 96.4 by Wharton, 86.9 by the McGraw-Hill utilization survey, 83.4 by the FRB index, and 81.4 by the index inferred from the McGraw-Hill capacity survey. Thus, as Perry notes, the answer to the crucial question of how much unused capacity existed in American industry in 1973 "depends to an altogether unacceptable degree on which of the widely used measures one looks at."

Three of the four measures of operating rates under review—all but the FRB index—are available in sufficiently disaggregated form to permit tests of their performance as predictors of price changes, investment, and additions to capacity. The two McGraw-Hill measures are reliable predictors in each of these tests. And while the Wharton index does not perform well in simple equations designed to predict future capacity growth, it is useful in predicting investment and price changes.

Perry notes other characteristics of the alternative measures that affect their usefulness for some purposes. Operating rates calculated from the McGraw-Hill capacity survey display marked time trends in several industries, resulting from an accumulation of small errors in annual estimates of capacity growth. The Wharton index, because it is constructed by defining

capacity in individual industries by the cyclical peaks in their actual output, is inherently unable to distinguish differences in the intensity of utilization at successive cyclical peaks. Each is considered a point of full utilization at the industry level. Thus, while both these measures forecast adequately when short-run changes in capacity utilization tell most of the story, they are not useful for comparing the intensity of utilization among alternative cyclical peaks or other points that are separated widely in time.

The FRB index is eclectic in its construction. It relies on the McGraw-Hill capacity survey and estimates of the manufacturing capital stock for gauging changes in capacity in the short run, and adjusts for drift through time in these by linking them to estimates of capacity implied by the McGraw-Hill utilization survey. In recent years, however, this index has wandered away from the utilization survey, as both the capital stock and the capacity survey have apparently overstated the actual growth in manufacturing capacity. As a result, the FRB index currently understates utilization rates substantially, with most of the error concentrated in the portion of the index for advanced processing industries. Perry recommends that the index be revised and that the method of its construction be altered to keep it closer to the utilization survey in the future.

All in all, Perry concludes that the McGraw-Hill utilization survey is the single most reliable measure for comparing pressures on capacity in successive business cycles. He discovers a bias in this index that causes it to overstate capacity growth in periods when output grows rapidly and understate it during periods of slow growth in output. But this can be adjusted for and is of minor importance in evaluating utilization at roughly comparable stages of successive business cycles.

Considering all his evidence, Perry concludes that manufacturing capacity has grown slowly in recent years—at only a 2.6 percent annual rate from 1969 to 1972, according to the utilization survey which he prefers. He conjectures that stiffer environmental regulations and accelerated economic obsolescence of facilities (possibly associated with shifting patterns of international trade in industrial products) help explain this slow capacity growth. As a result of it, average operating rates in manufacturing during 1973 were high relative to the unemployment rate, or any other measure of the intensity of labor utilization. However, Perry notes that genuine shortages of capacity were confined to a small number of industries, such as steel, paper, and petroleum refining, while others operated with ample spare capacity.

Perry concludes that manufacturing capacity problems account for only a small part of the accelerating inflation that occurred in 1973. Operating rates in price-sensitive industries, while relatively high, were not as high as in earlier periods, such as 1966, when prices rose much less rapidly. He offers his judgment that the industrial price acceleration of 1973 is more importantly traceable to two factors: soaring industrial materials prices, which rose rapidly throughout 1972 and accelerated to a 36 percent rate of increase in the first half of 1973; and the end of Phase II controls on prices.

In the first shorter report of this issue, Lawrence Klein and Virginia Long further the discussion of capacity utilization measurements. They suggest that an appropriate measure of aggregate capacity should reflect limitations on production resulting from shortages of intermediate products or from bottlenecks in particular industries whose effects can be traced through an input-output analysis. While granting that construction of a formal capacity measure that incorporates such characteristics is still at the early research stage, they argue that the Wharton methodology, which Perry had questioned in his paper, may capture some such effects. They discuss some of the uses in which the Wharton measure of capacity utilization has been successful in the large-scale Wharton econometric model of the economy. In addition to helping explain prices and investment, they report, the utilization variables have proven significant in helping to explain international trade flows.

In assessing the state of capacity utilization in 1973, Klein and Long reaffirm the evidence of the Wharton index that high operating rates achieved by the start of that year were signaling significant inflationary pressures. They note that Wharton estimates of operating rates were surpassing critical values in a growing number of U.S. industries and were historically high in several other industrialized nations as well.

In the second shorter report, Robert Hall and Richard Kasten present new evidence on the relative occupational success of black and white young men in the late 1960s, illuminating some of the issues raised in Richard Freeman's study (*Brookings Papers*, 1:1973). They estimate that, in 1969, the average wage rate earned by black men aged 17 to 22 was 16 percent below that received by their white counterparts. Nearly half of that gap is

attributable to the greater concentration of blacks in lower-paying occupations, and the remainder—a little more than half—to the lower wages blacks receive within a given occupation.

The authors focus on the racial difference in occupational distribution, and find that, for these young men, it is fully explained by the difference in characteristics, or "endowments," that black and white youths brought to the labor market in 1969. They use three measures of endowment: the socioeconomic status of fathers, the highest grade of school completed, and test scores. Their results imply that a black youth born in 1949 with endowments matching those of the average white experienced the same occupational success as the average white in 1969; he apparently encountered no discrimination in finding a good job. That degree of equality was not true of older blacks and is viewed as an indication of social progress in the labor market. But even for young blacks, equality in wage rates within occupations was not achieved, and, even more important, the endowment of the average black youth put him at a disadvantage in finding a good job. Indeed, the racial gap in endowment was as large for males born in 1949 as for those born in 1943, suggesting that no progress had been made during the sixties in raising the relative endowments of black youths. Hall and Kasten stress the failure to narrow the educational gap, and hence suggest caution "in making optimistic interpretations of the very significant recent improvement in the relative earnings of blacks."

In the final report of this volume, Robert J. Gordon analyzes the impact of the price and wage control programs of 1971–73, continuing the monitoring of controls by the Brookings panel (*Brookings Papers*, 2:1971; 1:1972; 2:1972; 1:1973). Using equations developed earlier for predicting wages and prices, he compares the actual course of wages and prices during the control period with the course predicted from the estimated equations. Gordon finds that the control program has had strikingly different results on wages and on prices. During Phases I and II of the control period, prices fell noticeably behind their predicted levels, given the actual behavior of wages and other costs in the period. Prices continued to fall behind during the first three quarters of 1973, although at a slower rate; by the third quarter, they were 2.5 percent below the level Gordon would have predicted in the absence of controls, given unit labor costs. In contrast to this, Gordon finds that wages were only indirectly affected by the con-

trols. Given the actual path that prices, output, and unemployment took, the actual wages in the third quarter of 1973 approximately matched the level that Gordon would have predicted in the absence of controls.

In Gordon's judgment, although the control program has slowed the rate of price inflation, it cannot be viewed as a success because the improvement has come from containing prices relative to costs. Gordon reasons that such a squeeze on profit margins can be maintained only for a short period and that this improvement can thus be expected to vanish, leaving behind no long-run effect on inflation attributable to the control program.

Participants in the Conference

Participating in the conference and discussing these papers were the members of the Brookings panel, the senior advisers to the panel, and a number of guests with special expertise in the material covered. The members of the panel for 1973 are:

Richard B. Freeman *Harvard University*
William E. Gibson *Brookings Institution*
Stephen M. Goldfeld *Princeton University*
Robert J. Gordon *Northwestern University*
Edward M. Gramlich *Brookings Institution*
Saul H. Hymans *University of Michigan*
Stephen P. Magee *University of Chicago* and *Brookings Institution*
William D. Nordhaus *Yale University*
Arthur M. Okun *Brookings Institution*
Joseph A. Pechman *Brookings Institution*
George L. Perry *Brookings Institution*
Thomas J. Sargent *University of Minnesota*

Senior advisers attending the twelfth conference were:

Gardner Ackley *University of Michigan*
William C. Brainard *Yale University*
William H. Branson *Princeton University*
Daniel H. Brill *Commercial Credit Corporation*
James Duesenberry *Harvard University*

David I. Fand *Wayne State University*
Alan Greenspan *Townsend-Greenspan Company, Inc.*
Robert E. Hall *Massachusetts Institute of Technology*
Walter W. Heller *University of Minnesota*
Charles C. Holt *Urban Institute*
Hendrik S. Houthakker *Harvard University*
John H. Kareken *University of Minnesota*
Lawrence R. Klein *University of Pennsylvania*
Franco Modigliani *Massachusetts Institute of Technology*
William Poole *Federal Reserve Bank of Boston*
Robert M. Solow *Massachusetts Institute of Technology*

Those guests whose writings or comments are incorporated into this volume were:

Henry J. Aaron *Brookings Institution*
Barry Bosworth *Brookings Institution*
Nathan Edmonson *Federal Reserve Board*
Murray F. Foss *Council of Economic Advisers*
Douglas Greenwald *McGraw-Hill Publications*
Richard A. Kasten *Massachusetts Institute of Technology*
Lawrence B. Krause *Brookings Institution*
Virginia Long *Wharton Econometric Forecasting Associates*
Arnold H. Packer *Committee for Economic Development*
Joel Popkin *Council of Economic Advisers*
Michael L. Wachter *University of Pennsylvania*

Several others at Brookings contributed to the quality and style of this volume. Mendelle T. Berenson edited the manuscript; Evelyn Fisher reviewed the accuracy of the facts and figures; Andrew S. Carron, Joanne D. Culbertson, and Ellen B. Hahn assisted in the research; and Mary Green and Evelyn Taylor prepared the manuscript.