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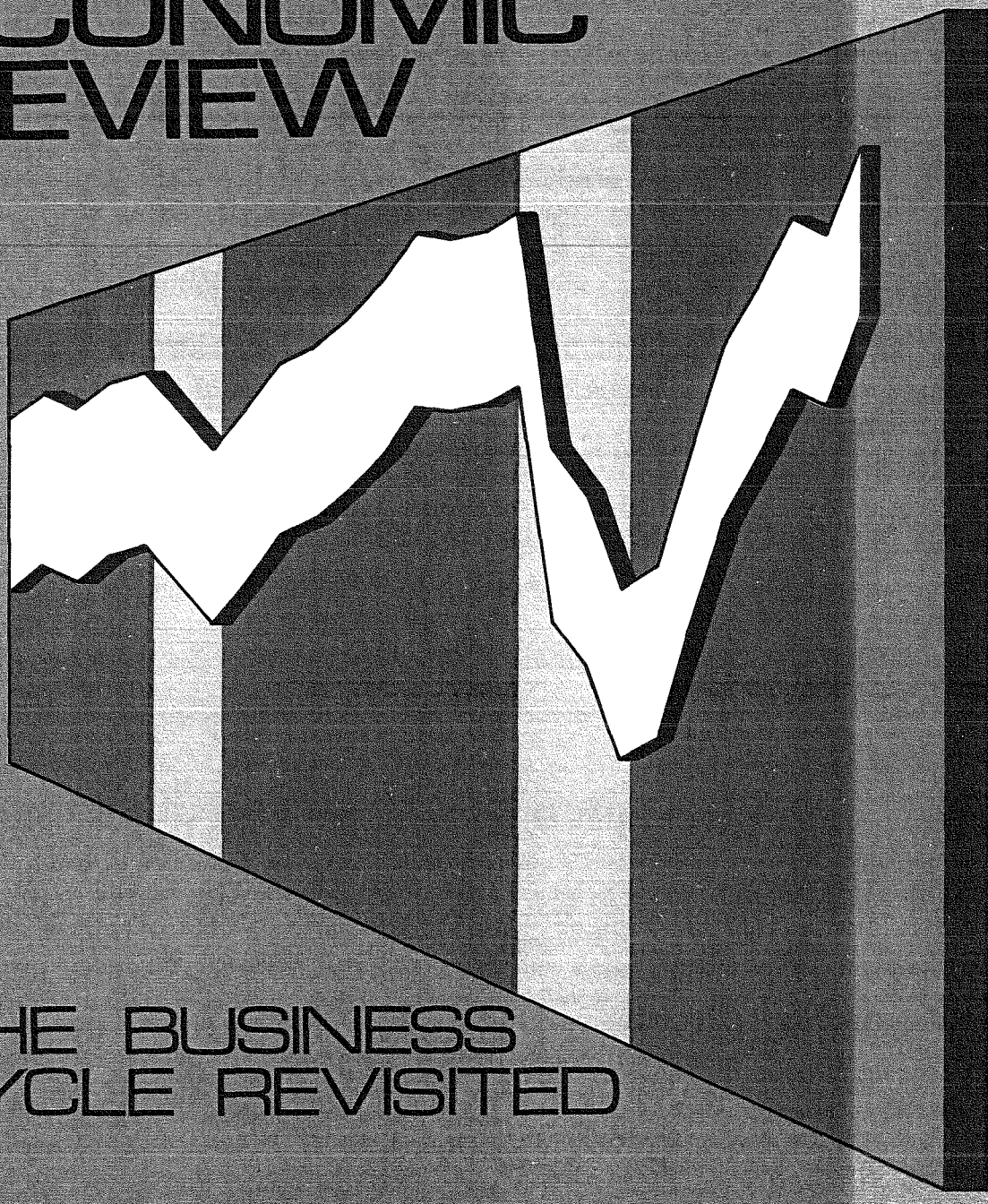

THE BUSINESS CYCLE REVISITED

SPRING 1977

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The Business Cycle Revisited

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Introduction and Summary

Fashions come and go in economic analysis—a prime example being business-cycle analysis, which has received relatively little attention in recent years. This was not true a generation ago; for several decades following the Great Depression, a steady stream of books and articles on the subject flowed from the presses. For example, a standard text like Alvin Hansen's *Business Cycles and National Income* (1951) contained 262 items in its bibliography. But as time passed and the long-awaited Great Postwar Depression failed to arrive, interest dwindled and finally almost ceased. In the midst of the long expansion of the 1960's, many observers proclaimed that the business cycle had been tamed, only to be proven wrong in the tumultuous 1970's.

Interest in business-cycle analysis might have remained fairly mild were it not for the 1974-75 recession—a severe downturn which differed considerably in character from the fairly typical

(and generally mild) downturns which had occurred at irregular intervals over the preceding several decades. The contrast between the recent recession (and recovery) and previous cyclical movements is a major theme of this issue. In searching for explanations for that phenomenon, in several cases we again recur to a theme which has dominated earlier issues of this *Review*—the increased risk and uncertainty resulting from the serious inflation of the 1970's, which has created severe problems for the real economy as well as for financial markets and institutions.

But first, there is the theoretical question of how cycles actually develop, a question addressed by Larry Butler in the opening article. Butler analyzes the six full cycles of the post-World War II period and notes certain common features, such as regularity of movement of GNP components, consistency of income shares, and highly irregular timing of cyclical turning-points. He turns for an explanation to the "rational expectations" literature. In such models, rational transactors equipped with complete (or nearly complete) information act in ways which reduce observed errors in prices and quantities to uncorrelated random noise. A pure rational expectations approach would not generate cycles if the errors were random. Obviously there are cycles in the real world. By introducing limitations on the information available to transactors, one can develop a model where output varies cyclically on the basis of a sequence of random shocks to the economy even when expectations are assumed to be rational. Butler uses a simplifed version of such a rational-expectations model to generate business-cycle fluctuations similar to the ones experienced in the postwar period.

The principal achievement of this "new" cycle model is an accurate description of cyclical timing. In the context of Butler's simple model, there is no problem explaining why recessions are short, sharp and irregular in timing. "The timing factor suggests that the economy is subject to random shocks from a variety of sources, and that these will sometimes be severe enough to generate recessions. Further, if the shocks are in fact random, the recessions we observe will be short and sharp."

Herbert Runyon turns to the current scene to examine the impact of inflation on risk-taking and thereby on the dimensions of the cycle. He argues that a high and unanticipated rate of inflation significantly altered the profile of the latest cycle, causing it to differ from the average of other recent cycles. This was clearly apparent from an examination of consumption spending, which normally dominates recovery movements, and inventory investment, which dominates most recession movements.

"Consumers, faced with much greater than expected inflation in the early 1970's, became uncertain and reacted by spending less and saving more, even before real output and employment had started to decline. Businessmen, on the other hand, continued to add to their inventories after output and consumption had turned down, accumulating stocks in anticipation of continued materials price increases." In Runyon's view, the same inflation that caused the consumer to restrict his spending induced the businessman to expand his buying, but in response to inflation rather than demonstrated final demand. And since this severe and unexpected inflation contributed to the distortion of the most recent cycle, we cannot rule out further cyclical episodes of this type as long as inflation remains a threat.

The first two articles look at the business cycle from the point of view of movements in output, that is, the markets for goods and services. The last three look at these movements as reflected in the factor markets—the markets for capital and labor.

Yvonne Levy carries further the notion of cyclical comparability, in analyzing the role of costs and capacity utilization rates in the industrial pricing process. Her study indicates that the major cost-push elements have followed the usual cyclical pattern during the recent recovery period. Typically, total costs per unit of production rise at a relatively slow rate early in the recovery, when output is rising relatively rapidly, and at a faster pace as the recovery matures. But at that advanced stage of the expansion, excess demand pressures relative to available supply cause widespread capacity bottlenecks in the basic materials industries, exerting strong upward pressure on industrial prices.

Yet, in attempting to forecast the direction of

prices in 1977, Levy concludes that such pressures are not yet on the horizon, and that the increase in industrial prices will not be much higher than last year's 6.3-percent rise. Her analysis is based on the 1976 and projected 1977 behavior of labor, material and energy costs, as well as the expected level of capacity-utilization rates in manufacturing. She adds that the favorable late-year supply outlook for most agricultural products, modified by the effects of recent weather problems, suggests a one-percentage-point greater increase than last year in farm and food prices.

Rose McElhattan introduces several variables which determine cyclical behavior in labor supply, with emphasis upon the influence of unemployment-insurance (UI) benefits. Her findings indicate that the payment of UI benefits has weakened the "discouraged worker" effect, so that when jobs become difficult to find, less workers leave the worker force (or are discouraged from entering) than would be the case if no payments were provided for the unemployed.

McElhattan claims that if the discouraged-worker effect is weaker than originally thought, the unemployment rate should have greater amplitude and conform more closely with cyclical changes in aggregate output. However, other economic conditions could be offsetting, including the tendency for increases in unemployment benefits to add to the labor-participation rate. "For example, an increase in UI benefits during an economic downturn acts to increase the labor supply, and thereby to increase the unemployment rate more than would be justified by aggregate-demand conditions alone. This behavior helps to explain the unusual and largely unexpected increases in the labor-force participation rate observed during last year's economic 'pause.'" According to McElhattan's calculations, the large increase in the ratio between UI benefits and weekly spendable earnings between 1976.1 and 1976.3 may have added about 145,000 workers to the labor force and about .14 percentage points to the unemployment rate in the third quarter of 1976.

In the final paper, Larry Butler argues that the unemployment anomalies discussed by McElhattan have disappeared over long periods of time in the past because of market-induced changes in the real wage and in the capital-labor ratio. He then notes, in analyzing the cyclical relationship between unemployment and capacity utilization, that the two bore a stable relationship to one another until 1974, but that subsequently, unemployment has been increasingly higher than would have been predicted on the basis of past cyclical relationships. In contrast, unused capacity has behaved in the recent recession and in the present recovery just as it has in previous cycles. "This observation leads to the conclusion that unused capacity is still a good measure of overall factor-market tightness while unemployment is not. The economy is thus likely to enter a period with available capacity constraining output but with the unemployment rate still well above 6 percent."

Butler argues that the reproducibility of capital helps keep the average level of unused capacity stable over time, as manufacturers adjust their investment demand to keep their capital stock in line with the long-run demand they expect for their output. A portion of any needed adjustment can be accomplished fairly quickly by cutting investment sharply. The fall in fixed investment in 1974-75 was in fact quite sharp, and investment has remained sluggish since, thus accounting for the "normal" behavior of unused capacity despite the continuing low level of income relative to past trends. But he adds that the labor force does not have the same kind of self-adjusting capacity, so the severity of the 1974-75 recession has left us with substantial unemployment two full years after the recession trough.

The "New" Theory of the Business Cycle: Are Recessions Just Random?

Larry Butler*

Business cycles are features of all market-oriented economies. In the United States, there have been six recessions since the end of World War II, separated by generally long-lived periods of expansion. Measured from trough to trough, these cycles have varied in length from just under three years to ten full years. The associated downturns have varied greatly in severity. Until the most recent recession, whose trough was reached in early 1975, it was possible to argue that government stabilization efforts had become increasingly successful, judging by the reduction in observed movements in income. But the last recession, the most severe of the postwar period, destroyed any thoughts that we had in fact learned to control the cycle.

Despite the varying depth and duration of these business cycles, they have displayed striking similarities both in the U.S. and in other market-oriented economies. In each cycle, for example,

1. the major components of output have moved together;
2. the output of producer goods and consumer durable goods have fluctuated much more than the output of non-durable goods and services; and
3. both wages and profits have moved with output, although with a greater variability in the profits share of income. Thus income and its components have displayed a highly consistent relationship to each other.[1]

The principal features of the expansions we have experienced include the consistency of income shares and the highly irregular timing of cyclical turning points. In this article we attempt to explain the feature of timing—why recessions occur when they do—which is probably the least understood feature of the cycle. In fact, both regularities and erratic timing have been so pronounced as to require an explanation of observed cycles, that is, a *theory* of the cycle. According to the "new" theory of the cycle analyzed here, cyclical events can be seen as arising from random shocks to the economy. In this paper, we will discuss *how* such shocks can generate cycles, and more importantly, *why* we should expect them to do so in market economies.

Our analysis shows, first, that the renewal of interest in "shock" theories of the cycle stems from the recent development of the "rational expectations" literature in economics. According to that view, the public forms expectations, particularly of prices, which incorporate knowledge of both the economic structure and of the behavior of policymakers, and may offset the actions of policymakers. In this context, the business cycle can only be explained as the economy's response to "outside" shocks. The rational explanations approach is closely related to much of the pre-Keynesian theoretical tradition. As this development has proceeded, however, the new expectational models have become difficult to distinguish from older Keynesian models, which attempted to explain cycles in terms of the failure of certain prices to adjust quickly enough to clear markets (especially the labor market). The new cycle models provide important insights, the most important being the view of the cycle as a sequence of random shocks to the economy. We use a simplified version of such a model to generate business-cycle fluctuations similar to the ones experienced in the postwar period.

Despite the challenge of finding a common explanation for observed cycles and price move-

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ments, little work on such a theory was done from the mid-1930's until quite recently. The reasons for this hiatus are outlined in Section 1 below. Section 2 describes the recent development of the rational expectations literature, which has been the source of the recent renewal of interest in "shock" cycle theory. Section 3 provides a discussion of the principles governing the new "random shocks" cycle model. Finally, Section 4 provides a description of a very simple "new" cycle model.

I. From Classical to Keynesian Theory

Classical economic theory is based on the assumption that all prices can move to levels which equate supply and demand in each market. In such a world, people offer labor and capital as long as they find it to be profitable, and wages and interest adjust automatically to clear the labor and capital markets. There are no unused resources in this world, and in particular no involuntary unemployment, for the real wage adjusts to equate the supply of and the demand for labor. Though this classical approach provides an elegant way of showing how relative prices are determined, it essentially assumes away the business cycle and thus does not further our understanding of the rather large observed short-term movements in output and employment.

During the early 1930's and even before, theorists were aware of the need for some device which would allow the integration of classical value theory with the harsh facts about income and employment fluctuations which characterized business cycles. A large business-cycle literature existed, much of it focusing on the role of monetary factors in the cycle. The literature often emphasized the role of institutional rigidities in keeping the economic system away from classical equilibrium, and thus tended to favor removing such obstacles in order to dampen the cycle. Much of this work sounds quite modern, especially in its description of how external shocks initiate cycles. As a statement of what the "new" cycle theory is about, it would be hard to improve on this passage from Gottfried Haberler (1937):

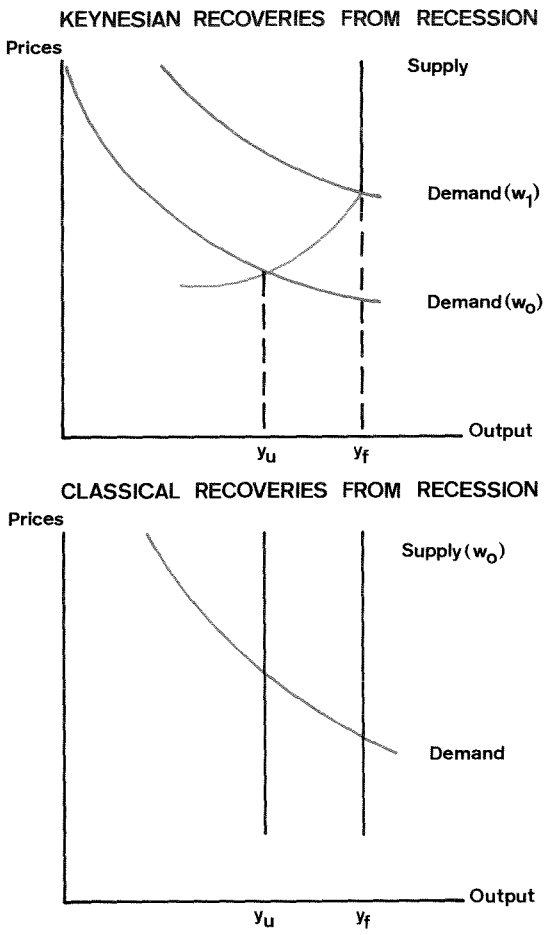
> We can compare the economic system with a pendulum or with a rocking-chair. A rocking-chair may be made to perform fairly regular swings by quite irregular impulses (shocks) from outside. (Besides, it may have a mechanism installed which makes it swing without outside forces operating on it.) In the explanation of the movement of the chair we must now distinguish two factors: the structure of the chair and the impulses from the outside—endogenous and exogenous factors. The structure of the chair is responsible for the fact that irregular shocks are transformed into fairly regular swings. An ordinary chair would ordinarily respond quite differently, although some kinds of impulse are thinkable (regular pushes and pulls) which would make it move in regular swings.[2]

Classical business cycles thus consisted of a sequence of shocks to an economy which, in most respects, was able to produce a fairly quick return to full relative-price equilibrium and thus full employment.

The Keynesian alternative to this analysis was developed in the middle and late 1930's, with the main tools of Keynesian theory in place in J.R. Hicks' *Value and Capital* (1939). This disequilibrium approach, which drops the classical assumption that all markets clear simultaneously, has come to characterize almost all macroeconomic work since Keynes. Specifically, Keynes assumed that wages are inflexible downward in the short run when output is below its full-employment level, so that a fall in prices leads to a rise in real wages and a fall in the demand for labor. This produces an underemployment equilibrium, which can be eliminated only by aggregate stimulus, in the form of expansive fiscal and monetary policy.

The distinction between the Keynesian and classical cycle models is illustrated in Chart 1. The curves describe aggregate supply and demand for output as functions of the price level. The principal difference between the two models lies in the supply curves. The vertical classical supply curve (lower panel) embodies the assumption that prices can always adjust to produce full-employment output. In contrast, the Keynesian aggregate supply curves (upper panel) assume the presence of a rigid wage rate W_0, which may yield a less-than-full-employment level of output Y_u. Expansive policy will shift the demand schedule to the right and eventually produce full employment at the level Y_f. In the bottom panel,

Chart 1



recession comes instead from a classical shock to supply, which reduces output to Y_u. Given the vertical aggregate supply curve, which reflects the assumption of flexible prices, the price effects of the shock work through the economy, and the supply curve shifts back to full employment at the output level Y_f.

The Keynesian revolution replaced the quite sophisticated relative-price mechanism of the classical model, where wages adjust to clear the labor market, with the simple assumption that nominal wages are determined "outside of the model." There was an advantage to such a shift—real income is no longer always at the full employment level—but this advantage was purchased at some cost. The relative-price mechanism, with flexible wages playing a major adjustment role, is the heart of the classical model, serving to allocate scarce labor and capital and also to determine the mix of output. Yet the old question of integrating such a price mechanism with a cycle-generating mechanism failed to surface until the late 1960's, thirty years after the Keynesian revolution.

There is a cogent theoretical reason for this anomaly. Once one accepts the key role of underemployment disequilibrium in the Keynesian short-term apparatus, it becomes clear that there is no necessary contradiction between a Keynesian short run and a classical long run. The former is characterized by disequilibrium in at least some markets, the latter by full equilibrium. In particular, it is easy to devise models in which an increase in, say, money supply increases real incomes in the short run but affects only prices in the long. Out of equilibrium, both price and output respond to a shock; on return to equilibrium, only prices are affected by the shock.[3] Keynesian theorists, in developing a way of describing the behavior of economic units which are not in equilibrium, did not see a clear need for a separate cycle theory. Their cycle theory was one of aggregate demand disequilibrium, with only a limited role for and no explanation of price movements.

The disequilibrium-equilibrium dichotomy is best exemplified in the natural rate hypothesis (NRH), first presented by Milton Friedman in 1968.[4] Suppose the economy is in equilibrium at some unemployment rate, level of income, and inflation rate. The NRH says that if there is no difference between the actual and expected rate of inflation, unemployment will be at some fixed level, which we define as its natural rate. If the economy is shocked by, let us say, a permanent increase in the growth of money, the unemployment rate will be at its old NRH level when the economy returns to equilibrium, and all of the increase in money growth will be translated into an increase in the rate of inflation. Friedman's proposition follows *entirely* from the properties of the classical model. In the absence of changes in taste or technology, the new equilibrium must be at the same level of real income, and thus at the same level of unemployment, as the old, and all of the increased money growth must appear as an increase in inflation. It is only in the "short run" that increased money supply will increase

output, and thus employment.

The NRH makes no direct statement about the way people form expectations; it just assumes that people do form them, and are correct in the long run. The NRH can thus be considered a direct application of Keynesian disequilibrium theory, early versions of which date from the late 1930's. The NRH, or something very like it, should thus have long been part of the Keynesian macroeconomic tradition. But until the late 1960's none of the main macro-models used any version of the NRH. Most instead contained a Phillips curve, which traces a relation between the rate of inflation and the rate of unemployment. The principle here differs from the NRH, which traces a relation between the difference between the *actual* and *expected* rates of inflation and the rate of unemployment. The NRH thus allows for an accelerating inflation, while the Phillips curve does not.

The importance of the distinction between what people *expect* to occur and what does occur cannot be overemphasized. In a pure classical model, the distinction does not matter, because people have perfect foresight. But if they do not have perfect foresight, they must have some means of forming expectations about their future incomes and prices. The major Keynesian macromodels assume that these expectations are formed as weighted sums of past values of the variables themselves. This device has the virtue of greatly limiting the amount of information which is relevant to the explanation of any one variable, and therefore makes the specification and estimation of particular equations relatively easy.

II. Rational Expectations

That Keynesian approach has a drawback, however, in that it is not based on any notion of how rational people form expectations. But the problem can be dealt with by assuming that people have the ability, based on all currently available information, to form unbiased estimates of future quantities and prices. Most of the economic theory based on this "rational expectations" model is close in spirit to the classical model.

Suppose someone believes that a certain set of prices will prevail, and sets his demands accordingly. Then in terms of *expected* prices, he will be in a classical world. He can be induced to move away from his equilibrium set of demands for goods only when actual prices turn out to be different from his expected price set. If actual prices are different, he immediately incorporates this new information in his expectations and moves to a new set of equilibrium demands. Except for random shocks to his demands caused by unexpected price movements, he is always in equilibrium. Moreover, the random shocks must be unrelated to earlier shocks in order for them to affect individual behavior, for if they were not, the information would be built into the next set of expectations. Because these shocks are random, there can be no possibility that a shortfall of demand in the current period will increase the probability of a further shortfall next quarter. In this world, the mere process of forming expectations prevents business cycles.

The essence of the cycle is a close relation between successive movements in output, and a model whose response to a shock is an immediate return to equilibrium might not seem to be the best vehicle for analyzing such cyclical movements. However, that would ignore a key assumption in the analysis, which is that information is costless. It is possible to devise models where all individuals have rational expectations, but do not adjust fully to new information because the cost of acquiring that information is too high to be worthwhile. This approach could lead to an integrated value and cycle theory, where everyone responds rationally to available price and output data, and yet where short-term output movements are not necessarily random.

III. Random Shocks Model

A basic way of introducing non-random errors is to place some limitation on the amount of information people have at their disposal. Suppose, for instance, that my information set does not include the price of natural gas in New York. If a shortage of gas develops in New York and the price goes up there, I should in principle respond to the increase immediately. But if I do not know of the shortage, or if I do not know how it will affect California prices, I will have no response until the New York price increase spills over to the California market. The aggregate response will be a relatively slow adjustment in both price and quantity, as information about a shock in one segment of the economy slowly becomes reflected in prices in all segments. Shocks will affect output over a span of time, and movements in output will be a moving sum of a number of successive shocks and will be related. That is, a cycle will be possible. Placing arbitrary limits on the information sets available to transactors is not elegant theoretically, but it does yield the real world's highly correlated errors.

Edmund Phelps' labor-market theory, utilizing the natural rate hypothesis,[5] indicates how the arbitrariness in this problem of information content can be eliminated. Unlike Friedman, Phelps and his followers have emphasized the short-run, rather than the long-run, properties of the NRH. In Phelps' approach, most of the emphasis has been on the role of search and other costs of finding employment, which implies that people bargain about their *incomes* rather than about their *wages*. For example, a construction worker with a high probability of being laid off during bad weather is likely to insist on a higher wage rate than a factory worker with the same skills, to compensate for working fewer hours. Thus, there is a conscious tradeoff between the wage rate and the probability of being laid off.

This result implies that expectations primarily concern quantities rather than price. For what people do is to maximize the value of the stream of their future wages, taking into account any future loss from unemployment. In this environment, despite the rationality of expectations of both prices and quantities, there is no presumption that adjustment to a new classical equilibrium will be instantaneous. It is hard to tell this world from Keynes' (or, more properly, Hicks') on any matter of principle, except that the rational-expectations literature would add one requirement: that the model used should itself generate the expectations of the variables in question. Though such a model need not contain the simple, uncorrelated errors of the pure rational expectations model, we could interpret (as that literature does) the observed errors in the model as a sequence of random shocks to the economy.

As has been known for some time, random events in time series can generate cyclical movements which have a close resemblance to economic cycles. Also, a great portion of the movement in most economic time series can be explained by the series' past history. Because the logic behind the rational-expectations approach involves the ability of transactors to reduce errors in observed price and output forecasts to randomness, the main contribution of this approach may be its ability to explain these correlated error processes and at the same time provide a reasonably good explanation of the business cycle. Yet we cannot be sure that this approach will provide an adequate description of cyclical movements. The difficulty of providing a reasonable expectational interpretation of a model increases enormously with the number of separate errors we must consider, as does also the difficulty of estimating very general lag structures. A general 12-variable model of output with 10 lags on each variable would require the estimation of $12 \times 10 = 120$ parameters, and thus would exhaust the available quarterly postwar data. The basic approach, then, must consist of capturing as much movement as possible in a small number of variables, as we attempt to do in the following model, which contains only one relevant random error.

IV. A Simple Model

Suppose the path of real income through time can be described entirely by its past history, as follows:

(1) $y = .09y^* + 1.4y_{-1} - .49y_{-2} + e$, where

y is real income,
y^* is the trend level of real income at a 3½-percent annual trend growth,
y_{-1} and y_{-2} are past values of this real-income deviation from trend, and
e is random error, uncorrelated with its own past values.[6]

We may ask two questions:

a. Is there a plausible world where this model holds?
b. How well does the model explain observed business cycles?

The answer is yes to the first question. Suppose the world to be a place where the citizenry fixes its real consumption expenditure as a percentage "a" of its expected income.[7] Then rational expectations would indicate that

$$c = ay^e = a(.09y^* + 1.4y_{-1} - .49y_{-2})$$

If we next assume that the rest of income is i, equal to investment plus government expenditure, then

$$i = y\text{-}c = (1\text{-}a)\,(.09y^* + 1.4y_{-1} - .49y_{-2}) + e$$

This simple model is compatible with both classical theory and certain empirical observations on the business cycle. First, real income is independent of nominal magnitudes in the long run, and even in the short run is randomly shocked by those magnitudes only through their impact on the error term. In the long run (say, 20 quarters ahead), the expected value of real income is y^*, the trend level of real income. This fact is compatible with Keynesian and classical theory, and also with the natural rate hypothesis. But the model also says that a rise in nominal magnitudes, such as monetary or fiscal policy variables, will exert a single-period shock effect on the real economy, through its potential effect on the random error term. The model incorporates fiscal or monetary influences into this error term by assuming that the size of these effects is too small to be distinguishable from random noise.

The effect on income of any such shock will dissipate only slowly. It will be felt first through its direct impact, then in the following quarter through its effect on the y_{-1} term, in the quarter after that through its effect on both y_{-1} and y_{-2}, and so on, with the equation used as a forecaster of longer and longer periods ahead. The results of such a forecast sequence are given in the table below. This model is compatible with short-term restoration of *price* equilibrium to the economy, as in the pure rational-expectations model, but it is not compatible with short-term *quantity* equilibrium.

Quarter Ahead	Effect of Shock e_0 on Real Income in Quarter K
0	e_0
1	$1.40e_0$
2	$1.47e_0$
3	$1.37e_0$
4	$1.20e_0$
5	$1.01e_0$
6	$.82e_0$
7	$.66e_0$
8	$.52e_0$
.	.
.	.
.	.
12	$.18e_0$
16	$.06e_0$
20	$.02e_0$

The model is also compatible with one of the broader cyclical generalizations—the much greater amplitude of movements in investment than of movements in consumption. In the short run, the impact of any shock to income falls entirely on investment, because consumption is a fixed function of past income. As the model transmits shocks, they appear initially as unanticipated investment, and are then built into consumption over a span of time. Two consecutive large negative shocks to real income—a recession, by the normal definition—will produce a large decline in real investment and only a small movement in consumption.

How well does this simple model describe the cyclical movements of the past several decades? The standard error of the above equation, fitted

to quarterly U.S. data for the 1952-75 period (96 quarters), is 4.0 percent of GNP, with an annual trend growth in income of 3.5 percent of GNP. These figures may be used to indicate how well the model describes actual cycles. Based on the relation between trend growth and standard error, the probability of any one observation showing an actual decline in income is .19,[8] and thus 18 quarters of decline (.19 x 96) should occur in the period of fit. There actually were 18 quarters of decline in the observation period, but this is true almost by definition. The method of fit was designed to produce empirically uncorrelated errors, with high and low errors in roughly the frequency predicted by the bell-shaped curve of the normal statistical distribution.

More interesting is how well the equation predicts a second decline following the first—that is, the actual occurrence of a recession, defined as two quarters of consecutive decline in real GNP. Because the equation's lagged GNP terms make for a very sluggish GNP response to the first decline, the second decline is considerably more likely than the first, with a probability of .38. The probability of two consecutive declines is thus .19x. 38 = .073. The equation thus "predicts" .073 x 96 = 7 recessions in the period, in contrast to the 5 recessions which actually occurred.

Where the equation begins to slip is in predicting longer recessions. Similar, though somewhat more involved, calculations of the type used above yield for the 1952-75 period:

Length of Recession (Quarters)	Predicted Number	Actual Number
2 or more	7	5
3 or more	3	4
4 or more	1	2
5	0	2

Thus the relation tends to slightly understate the frequency of long recessions, and to overstate the frequency of short recessions.

The real problem, though, lies in the prediction of recovery periods. Each of the 5 recessions in the 1952-75 period, including the most recent one, has been followed by about six quarters of extremely high economic growth. The model simply failed to pick up these fluctuations. The model predicts relatively slow turnarounds in real growth rates, so that (for example) a two-quarter recession followed by three quarters of very high real growth would be marginally less probable than a recession of five quarters. And as the table indicates, the model predicts no such lengthy recessions.

The explanation has to do with the nature of simple autoregressive schemes. Whatever their virtues, such schemes tend to say that a variable's level next quarter will be quite similar to its level this quarter. In rate-of-growth terms, our equation says that this quarter's expected growth rate for GNP will equal 60 percent of the trend growth of 3½ percent plus 40 percent of last quarter's actual growth, plus a small weight moving the level of income back toward its trend line.[9] So in a fundamental way, the equation does not have the capacity to produce large quarter-to-quarter swings in the level of income, though the relatively high standard error suggests the occurrence of large *unsystematic* swings in growth rates. Thus the model reproduces the observed short, sharp pattern of recessionary decline with more precision than it does the long, high growth pattern of early recovery.

We have argued that even this simple random-shocks model—a type favored in the "new" cycle theory—can be used to generate behavior which is strongly reminiscent of some of the main characteristics of the observed business cycle. It does so imperfectly, and in particular somewhat understates the duration of the typical downturn and the strength of the ensuing early recovery. But this model assumes a single-source random event, which must thus incorporate every aspect of random influence on the economy from the ordinary monetary and fiscal shocks to world commodity-price booms. Because of the frequent difference in character of these different influences, it should be possible to improve on the single-shock model by providing a better explanation of the sources of shocks.

V. Summary and Conclusions

Interest in a "new" business-cycle model began with the development of rational-expectations models in the late 1960's. In these models, it was found that with complete (or nearly complete) information, rational transactors would act in a way which would reduce observed errors in both prices and quantities to uncorrelated random noise. In the case of non-random errors, transactors would incorporate their information in succeeding price forecasts. No cycle, in the ordinary sense, would be possible. The next step in developing a cyclical model involved the attempt, by now largely successful, to provide limitations on the information available to transactors, which would allow for serially correlated observations in quantities and perhaps prices as well.

We argued initially that, in light of this development, it has become much harder to tell these models apart from the much older (and numerous) Keynesian disequilibrium models. Models which embody both rational expectations and slow adjustment are clearly feasible. In the work of Phelps and others, quantity disequilibrium in the labor market results from discontinuous search and transactions costs of various kinds—factors which tend to limit the information available to transactors in that market. And in the rational-expectations model with correlated errors, quantities at least do not fully adjust to shocks instantly, so that this model fits into the Hicksian dichotomy between short-term disequilibrium and long-term equilibrium. Moreover, Phelps' argument is essentially that people bargain over their incomes and not their wages, trading future layoffs against wage increases. Thus the formation of rational quantity (and price) expectations adds one requirement to the usual disequilibrium model, that the model itself generate expectations. In that event, it will be possible to interpret observed errors as they are interpreted in the "new" cycle theory (and in our simple model), as a sequence of random shocks to the economy.

The principal achievement of the "new" cycle model is an accurate description of cyclical timing. In the context of our very simple model, there is no problem in explaining why recessions are short, sharp, and irregular in timing. The timing factor suggests that the economy is subject to random shocks from a variety of sources, and that these will sometimes be severe enough to generate recessions. Further, if the shocks are in fact random, the recessions we observe will in fact be short and sharp. The major thing missing from our simple model is an adequate description of Haberler's "rocking chair": the perception of the economy embodied in the model is too simple to explain how the economy works itself out of recession.

FOOTNOTES

1. The consistency of these similarities is documented by Herbert Runyon in this issue of the **Review.**

2. Gottfried Haberler, **Prosperity and Depression,** Geneva, League of Nations, 1939. His book is perhaps the culmination of the classical cycle-theory tradition. With its late date, it contains an extensive discussion of Keynesian theory, but little reference to the formal disequilibrium theory which was then emerging.

3. This statement summarizes what Samuelson calls the "neoclassical synthesis" of Keynesian and classical theory.

4. Milton Friedman, "The Role of Monetary Policy," **American Economic Review,** 1968, pp. 1-17.

5. Edmund Phelps, "Money-wage Dynamics and Labor-Market Equilibrium," **Journal of Political Economy,** 1968, pp. 678-711. Friedman and Phelps are given credit for simultaneous authorship of the NRH. It is of course a feature of the older classical model as well.

6. This relation is in fact the best description of real income solely in terms of its past values and a random error, as fitted by Box-Jenkins methods to real GNP data for the 1952-75 period.

7. This formulation is a very simple version of the standard behavioral explanation of movements in consumption, the permanent-income hypothesis. For a more detailed explanation of the relation between permanent income and rational-expectations hypothesis, see Kurt Dew, "Market Response to Economic Policies," this **Review,** Fall 1976, pp. 20-30.

8. This calculation assumes normally distributed errors with a mean of 3.5 percent and a standard error of 4.0 percent. Zero growth in the calculation is .88 standard errors below the mean, and 19 percent of the normal distribution is more than .88 standard errors less than the mean.

9. This small weight is what gives the model its long-run classical properties.

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Inflation and the Business Cycle

Herbert Runyon*

This paper examines the characteristics of the five post-Korean War business cycles. We emphasize particularly the most recent recession, which was the severest of the group and was distinguished from the others by a high—and largely unanticipated—rate of inflation. Indeed, there is reason to believe that inflation contributed significantly to the severity of the 1973-75 recession. The magnitude and unexpectedness of this price upsurge led to changes in behavior that were most evident in consumption spending and inventory investment.

Our basic approach is to analyze the contribution of the major sectors of the economy to fluctuations in real output, as measured by gross national product in 1972 dollars.[1] Essentially, we analyze the cycle by identifying the sectors that contribute to cyclical turning points. Additionally, we note the common characteristics of the observed recessions and recoveries of the past two decades. The recessions have been short in length, while the recoveries have shown considerable regularity in their pattern of growth—but not their duration, which has varied substantially over time.

Our central thesis is that consumption spending and inventory investment were distorted from their usual pattern of behavior in the 1973-75 period, as the high rate of inflation altered the expectations and responses of consumers and businessmen in the recession phase of the cycle. Consumers reacted to the uncertainty introduced by a large and unanticipated inflation rate by restraining expenditures and increasing savings, despite continued increases in income and employment prior to the cyclical peak. Conversely, businessmen reacted to accelerating price increases of materials by increasing their stocks of such goods, despite the decline in real output.

I. Characteristics of Recoveries

The similarities of the five post-Korean cyclical recoveries can be seen by comparing the cumulative growth of real output for each of those periods (Chart 1). Eight quarters after the cyclical trough, the average annual growth rates ranged between roughly 5 and 6 percent. (For those recoveries which lasted at least twelve quarters, the growth range narrowed somewhat, to about 4 to 5 percent.)

Strong early growth is no particular guarantee of the longevity of recovery (and vice versa), since the first two years of the great 1961-69 expansion represented one of the weakest of all recoveries. Yet that recovery became the longest cyclical expansion in the 123-year annals of the National Bureau of Economic Research. The current recovery has been at or close to the top of the growth range for its first eight quarters. It should be remembered, however, that that recovery was preceded by the most severe post-Korean recession—and that rapid recovery does not always imply a sustainable recovery.

In all cyclical recovery periods, personal consumption expenditures have constituted the largest share of the increase in total output, varying between 48 percent and 65 percent in individual cycles (Table 1). This magnitude is to be expected, since consumption expenditures generally account for nearly two-thirds of total spending in the economy. Yet despite its size, consumption spending is not the most active sector in promoting the expansion of total output. Consumption

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spending is constrained by income, which in turn equals the total value of the components of output, as described in the usual definitional equation of income determination.

$$Y = C + I + X + G$$

when

Y = income (i.e., market value of output)
C = consumption spending
I = investment spending
X = net exports
G = government spending

Thus, all of the major sectors of the economy contribute to total income, varying in degree from recovery to recovery. But the relation of consumption to income is a special one, with its level determined by the level of income. This relationship—the consumption function—is usually defined as

$$C = f(Y_D)$$

where Y_D is disposable (after tax) income. The relationship is highly stable in the long run but less so in the short run. Changes in fiscal policy may alter after-tax income and hence consumption. Individuals may choose to save rather than consume. Yet short-term shifts in the savings rate are compatible with a stable long-term savings rate in the context of permanent income.[2] (Permanent income is a theoretical concept wherein the individual is regarded as allocating his income over his lifetime rather than limiting its disposition to the year in which it is earned. That is to say, this year's consumption or saving decisions are usually made with an eye to lifetime income.)

Chart 1

CUMULATIVE CHANGE IN REAL OUTPUT IN CYCLICAL RECOVERIES

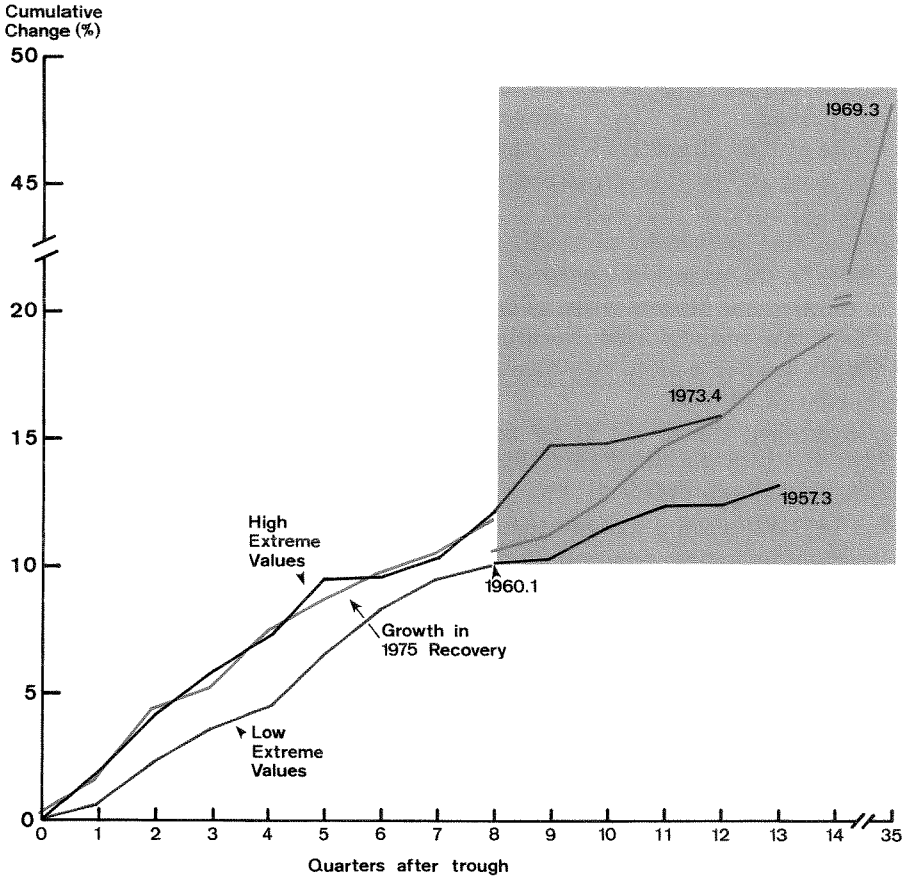


Table 1
Cumulative Changes in Major GNP Sectors in Five Recovery Periods
(Percent of Change in Real GNP)

	Recovery Period					
	1954.2-1956.2	1958.1-1960.1	1960.4-1962.4	1970.4-1972.4	1975.1-1977.1	Average Share
Cumulative change Real GNP	100.0	100.0	100.0	100.0	100.0	100.0
Consumption	61.1	48.3	49.7	64.9	64.6	57.7
Residential Construction	4.9	12.3	7.3	15.6	12.2	10.5
Business Fixed Invest.	16.8	7.1	8.3	12.9	5.5	10.1
Inventory Invest.	15.5	26.3	11.7	5.7	18.7	15.6
Net Exports	4.0	-0.5	-3.4	-1.3	-5.9	-1.4
Government	-2.3	6.5	26.4	2.2	4.9	7.5
Addendum:						
Change in Real GNP (Billions of 1972 dollars)	61.9	77.3	73.9	130.8	135.7	95.9

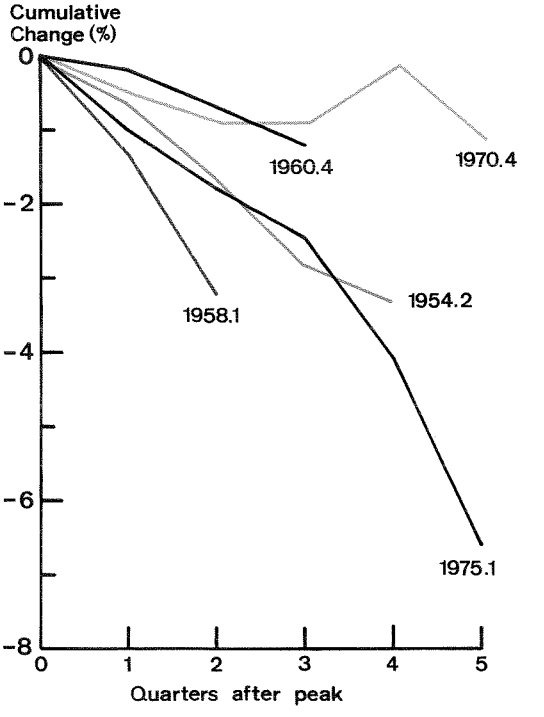
II. Characteristics of Recessions

A common characteristic of recessions is their relatively short duration—from two to five quarters (Chart 2). And unlike the situation in recoveries, the paths of contraction of real output tend to diverge as recessions continue. The brief 1957-58 recession was the most severe for any two-quarter period. The two longest recessions—those of 1969-70 and 1973-75—were respectively the least and most severe in overall terms of the period covered. Yet each of these lengthy recessions was marked by some unique features. In 1969-70, the recession tended to be prolonged by the General Motors strike of late 1970. In 1973-75, the initially mild downturn culminated after a year in a steep two-quarter decline reminiscent of 1957-58.

Inventory investment stands out as far and away the major factor in the cumulative recession declines in real output (Table 2). The sole exception was 1953-54, when a massive reduction in government spending occurred in the wake of the Korean War demobilization. In contrast, consumption spending has generally contributed least to cyclical downturns, declining only in the 1957-58 and 1973-75 recessions. In both instances, this was due to a fall in durable-goods purchases—chiefly autos, the most volatile portion of consumer spending. In each of these cases, the decline in consumer spending followed a period of exceptionally strong auto sales.

Chart 2

CUMULATIVE CHANGE IN REAL OUTPUT IN CYCLICAL RECESSIONS



Consumption spending holds up in a recession because the so-called automatic stabilizers—such as unemployment insurance and reduced tax liabilities—cushion the decline in disposable income. But consumption spending, although not declining, does slow down, and the effect is seen in an accumulation of business inventories in excess of their desired levels. In consequence, businessmen do not re-order goods until stocks are reduced and brought into line with their current expectations of sales. This effect is pervasive, for inventories must be reduced at all levels from retailers' shelves to manufacturers' warehouses. As new orders are reduced, production falls and unemployment rises.

This response of inventory investment to changes in consumer spending—the "acceleration principle"—is expressed in functional terms as

$$\triangle I_t = f(S_t - S_{t-1})$$

where current inventory investment ($\triangle I_t$) is governed by sales in the current period (S_t) relative to sales in the previous period (S_{t-1}). Even when consumption spending is growing, if it grows more slowly than in the past, the change in inventories ($\triangle I_t$) will decline.[3] And it is important to remember, it is the *change* (not the level) of inventories which enters the GNP accounts. The acceleration principle is symmetrical; in the typical recovery, inventory investment is second only to consumption in contributing to the overall expansion of output (Table 1), and as noted above it accounts for the bulk of recession declines. In recessions, as businessmen's anticipations of rising sales become disappointed, inventory accumulation becomes involuntary, and forces businessmen to reduce stocks.

In the typical recession, a decline in business fixed investment ranks second only to inventory liquidation as a contributor to declining output. The acceleration principle applies to business capital spending as it does to inventory investment, though the time horizon of anticipated sales must be extended. Inventory adjustment is a function of current sales, while capacity-expanding investment in plant and equipment is a function of expected future sales. The expansion of capacity takes time, perhaps as long as a year after funds have been appropriated.[4] However, when excess capacity exists (or increases), expansion plans will be shelved or projects stretched out until the sales outlook improves. The result is a significant reduction in business capital spending.

Largely because of differences in reaction time, consumption spending—not investment—tends to be the leader in each recovery. Consumption decisions may be constrained by income, but investment decisions are conditioned by businessmen's assessment of future demand and the facilities required to meet that demand. Thus, businessmen may not react as quickly as consumers to recovery prospects at the bottom of a recession.

Table 2
Cumulative Changes in Major GNP Sectors in Five Recession Periods
(Percent of Change in Real GNP)

	Recession Period					
	1953.2-1954.2	1957.3-1958.1	1960.1-1960.4	1969.3-1970.4	1973.4-1975.1	Average Share
Cumulative change Real GNP	-100.0	-100.0	-100.0	-100.0	-100.0	-100.0
Personal Consumption	+ 8.7	- 18.8	+ 57.6	+ 93.3	- 13.9	+ 25.4
Residential Construction	+ 4.4	- 2.7	- 56.5	+ 4.2	- 22.8	- 14.7
Business Fixed Invest.	- 4.9	- 26.5	- 17.6	- 76.7	- 22.1	- 29.5
Inventory Invest.	- 45.1	- 47.1	-202.3	- 83.3	- 56.3	- 86.8
Net Exports	+ 13.6	- 21.1	+ 45.9	+ 7.5	+ 8.8	+ 10.9
Government	- 76.7	+ 16.2	+ 72.9	- 45.0	+ 6.3	- 5.3
Addendum:						
Change in Real GNP (Billions of 1972 dollars)	- 20.6	- 22.3	- 8.5	- 12.0	- 81.5	- 29.0

III. The Different Recession

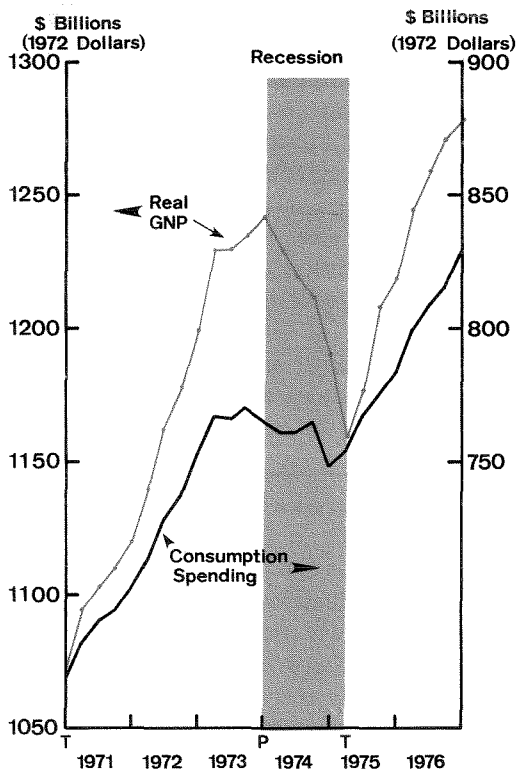
Business cycles vary because of contemporary forces which determine the length and vigor of expansion and the severity of recessions. Nonetheless, all of the cycles before the 1973-75 recession had certain common elements. Inventory liquidation occurred early in each recession and increased most in each recovery. But the 1973-75 recession was different; inventory liquidation came late in the downturn and consumption spending declined even before the 1973 peak was reached.

This recession was not only the most severe of the post-World War II period, but the inflation which accompanied (and preceded) it was unparalleled since the price upsurge of 1946-47, caused by the unleashing of pent-up wartime demand and the easing of price controls. Prices generally remained stable through most of the next two decades, and then the inflation rate edged up to the range of 4½-5 percent from 1968-1972. In 1973, the U.S. experienced the world-wide inflation that was raging and which peaked domestically at nearly 14 percent late in 1974. As a result, consumers were doubly punished during the recession, by an inflation-caused reduction in real income and then by increasing unemployment.

Consumption spending, which had been a firm source of support in the expansion that began in 1971, faltered in mid-1973 (Chart 3). It levelled off in the late stages of the expansion, and peaked in the third quarter of the year—one quarter ahead of real output. It was not until

Chart 3

REAL GNP AND CONSUMPTION SPENDING



1975.3, eight quarters later, that the 1973.3 level of real consumer spending was again reached and surpassed. As in the 1953-54 and 1957-58 cycles, consumer spending for goods (not services) bore the brunt of the decline in spending.[5]

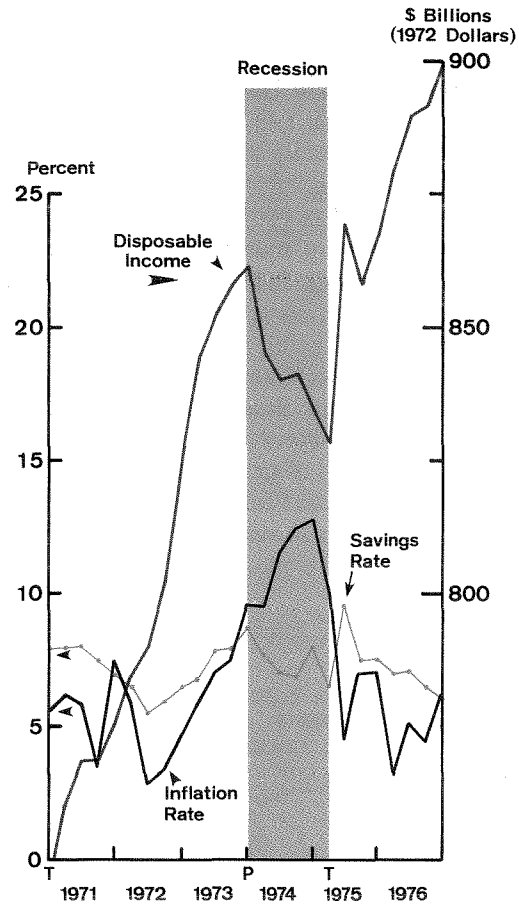
IV. Consumption: Inflation and Savings

In making their consumption and saving decisions, consumers were at least as sensitive to the inflation rate as they were to changes in real income during the 1971-76 period (Chart 4). In reviewing this period, Joseph Bisignano has noted that individuals tend to react to unanticipated inflation by increasing their rate of saving.[6] Savings generally declined in 1971-72 as inflation decelerated, and then rose in 1972-73 as inflation accelerated. The parallel was not exact; in fact, the savings rate dipped in 1974 when the inflation rate peaked, as the decline in real disposable income indicated that there are limits to the displacement of consumption by saving. But then the relationship was re-established in 1975, as the inflation rate and the savings rate declined together.

The general consumer response to inflation of the unanticipated magnitude of 1973-75 was an evident decision to reduce spending and increase saving. Even in 1973, despite rising employment and disposable income, real consumption recorded a slight decline. Moreover, consumers responded, then and later, to the differential impact of inflation on different sectors of consumption. From peak to trough, real purchases

Chart 4

INCOME, INFLATION and the SAVINGS RATE

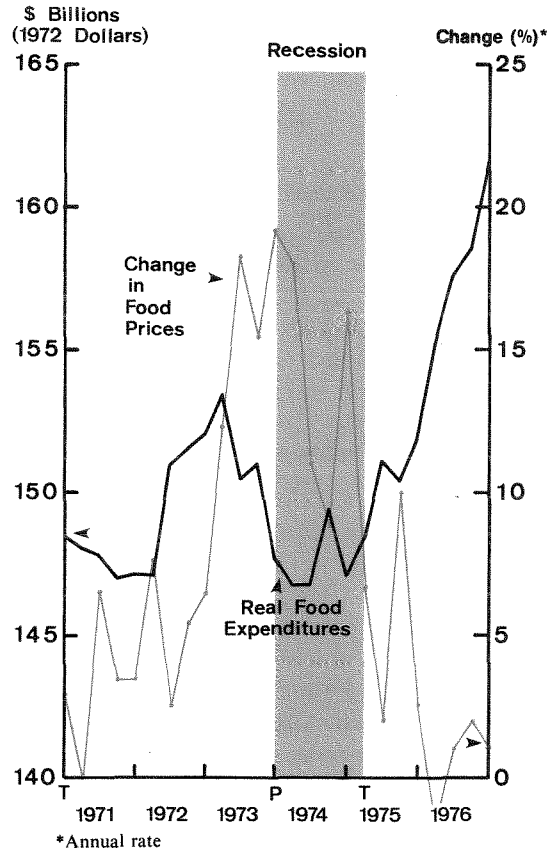


of durable goods declined by more than 15 percent, while purchases of nondurable goods fell more than 3 percent. At the same time, despite sharply rising prices of services, expenditures in that category rose 4½ percent, with housing services rising by 9½ percent.

This pattern reflects the ability of consumers to seek and respond to possible substitutes. Durable goods by their nature are deferrable. In addition, there is a high degree of substitutability in food expenditures. The demand for food as such is highly inelastic at some point, since it is necessary to sustain life. Yet real expenditures for food declined early in 1973 in the face of a 12 percent (annual rate) rise in food prices, and spending remained depressed for three years (Chart 5). Consumers were quick to adjust the contents of their market baskets on the basis of relative prices, reducing their consumption of meat and processed foods and increasing their consumption of fresh fruits and vegetables.[7] In contrast, there was less possibility for substitution in housing, because of market rigidities and transaction costs, such as leases and costs of search and moving.

Chart 5

REAL FOOD EXPENDITURES
AND
CHANGES IN FOOD PRICES



*Annual rate

V. Inventories: Inflation Factor

Unlike consumers, businessmen in the 1973-75 period generally did not restrict their expenditures and increase their savings in the face of inflation. Inventory investment, which typically turns down early in each recession, did not do so in this case until real output bottomed out, and liquidation of stocks continued through the first three quarters of the recovery (Chart 6). Quite atypically, the inventory sector eased the rate of decline in real output in 1974, and then held down the rate of growth in the early stages of recovery. The continued inventory build-up of 1974, in the face of declining consumption and real output, might be explained in terms of such factors as involuntary accumulation of stocks. However, special mention should be made of the inflation expectations of businessmen engendered by a rapid run-up in materials prices.

The sharp rise in wholesale prices in 1974 helps explain much of the behavior of inventories at that time, reflecting the fact that changes in stocks of materials and work in progress are three times as volatile as changes in stocks of finished durable goods.[8] Durable goods producers responded to the inflationary rise in the wholesale prices of materials—which reached rates of 30-40 percent in late 1974—by increasing their inventories of materials relative to stocks of finished goods, possibly in anticipation of further price increases (Chart 7). This took place a year after consumer demand had softened and while total real output was already declining. Thus, expectations of price inflation apparently had a more significant impact than business sales expectations upon inventory investment policy in the most recent cycle.

Chart 6

REAL GNP AND
CHANGES IN INVENTORY INVESTMENT

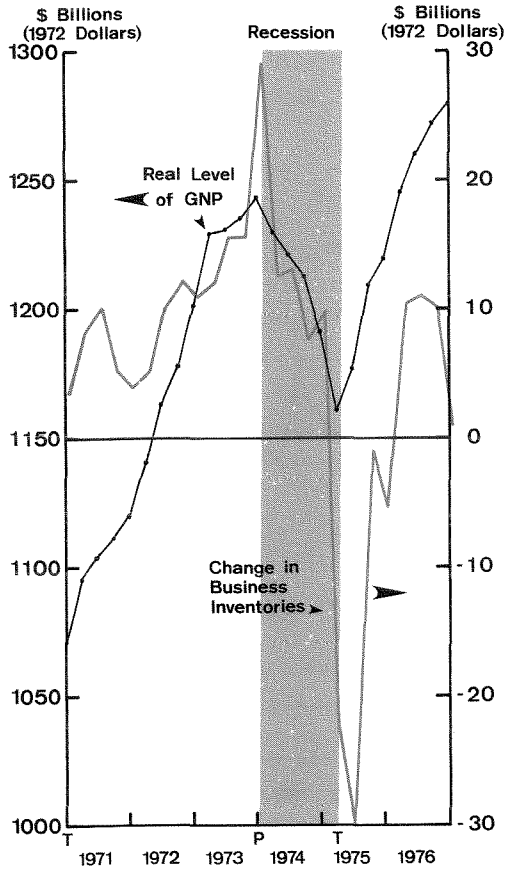
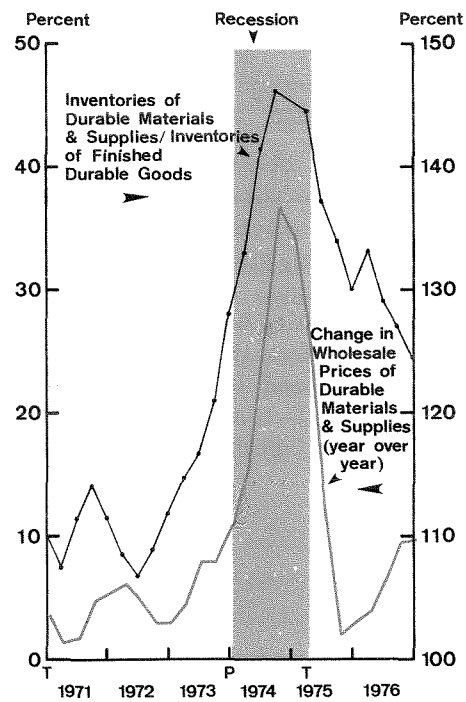


Chart 7

CHANGES IN MATERIALS PRICES
AND RELATIONSHIP OF INVENTORIES
TO FINISHED GOODS INVENTORIES



VI. Summary and Conclusions

A high and unanticipated rate of inflation significantly altered the profile of the most recent business cycle, causing it to differ from the average of other recent cycles. This is clearly apparent from an examination of consumption spending, which normally dominates most recession movements.

The recent behavior of consumers suggests that they may exert a considerable amount of autonomous control over their aggregate level of spending in the short run. This is not inconsistent with the view that consumption in the long run is endogenous to the system and is a stable function of income. However, the mood of the consumer—whether optimistic, cautious, or just plain uncertain—can generate major changes in the savings rate.

Consumers, faced with much greater than expected inflation in the early 1970's, became uncertain and reacted by spending less and saving more, even before real output and employment had started to decline. Businessmen, on the other hand, continued to add to their inventories after output and consumption had turned down, accumulating stocks in anticipation of continued materials price increases. To some extent, then, the inflation that caused the consumer to pull in his horns and restrict his spending also induced the businessman to spend more, in response to inflation rather than demonstrated final demand.

The principal lesson for the future is that inflation cannot be lightly regarded as a factor in the business cycle, particularly when that inflation is unanticipated. Because of inflation, the profile of the last cycle was substantially altered from the typical cycle sequence. Reduced consumer spending reduced the rate of growth prior to the cyclical peak. Conversely, continued inventory investment during most of the recession cushioned the decline in real output. However, when the inventory adjustment came, it was swift and severe. In the ensuing recovery, inventory policy has been fairly conservative while the consumer savings rate has receded, reflecting the reduced rate of inflation. Yet, since the severe and unexpected inflation of the 1973-74 period apparently contributed to the distortions evident in the most recent cycle, future episodes of this type should not be ruled out.

FOOTNOTES

1. The reference cycle turning points are determined by the National Bureau on the basis of the behavior of economic indicators representing all sectors of the economy, such as employment, prices, costs and profits and other measures that range beyond production and income as represented by real gross national product. Many of these series are monthly series, and the reference turning points are designated on a monthly basis. Suppose that a series which coincides with cyclical movements, such as the index of industrial production, bottoms out in April and then starts to rise. April may then be the reference trough date, but since output will be rising in May and June, real GNP may rise in the second quarter, making the first quarter the trough for real GNP.

See Victor Zarnowitz and Charlotte Boschan, "Cyclical Indicators: An Evaluation and New Leading Indexes," **Business Cycle Digest,** U.S. Department of Commerce, May 1975, pp. v-xiv; **Cyclical Analysis of Time Series; Selected Procedures in Computer Programs,** Gerhard Bry and Charlotte Boschan, Technical Paper 20, National Bureau of Economic Research, New York: 1971, Chapter 3.

2. Albert Ando and Franco Modigliani, "The Life Cycle Hypothesis of Saving: Aggregate Implications and Tests," **American Economic Review,** LIII, March 1963, pp. 79-80. The authors state that when income declines, the savings rate will also fall. This happened in recessions prior to 1969-70 and 1973-75; in which the savings rate rose in the recession. See also Bert G. Hickman, **Growth and Stability in the Postwar Economy,** Brookings Institution, Washington: 1960, pp. 259-261.

3. Michael K. Evans, **Macroeconomic Activity,** Harper & Row, New York: 1969, pp. 373-375.

4. Shirley Almon, "Lags Between Investment Decisions and their Causes," **Review of Economics and Statistics,** vol. 50, 1968, pp. 193-206.

5. **Economic Report of the President,** 1955, p. 15; 1959, p. 12.

6. J.R. Bisignano, "The Effect of Inflation on Savings Behavior," **Economic Review,** Federal Reserve Bank of San Francisco, December 1975, pp. 25-26.

7. **Agricultural Statistics 1976.** U.S. Department of Agriculture, U.S. Government Printing Office, Washington: 1976, p. 561.

8. Feldstein and Auerbach have recently taken issue with the "conventional wisdom" regarding inventory policy. Heretofore, inventory changes—especially in durable-goods manufacturing—have been considered to be a lagged response to corporate sales expectations, as expressed in new orders or unfilled orders. According to this reasoning, if sales expectations are disappointed, the increase in finished-goods inventories reflects both the shortfall in sales and the original intended increase in inventories. Feldstein and Auerbach question this theory of lagged response; they contend that the adjustment process is much more immediate, taking place largely within the current quarter, but also incorporating a longer-term period of adjustment to a "desired" level of inventories. The short lags in this model would lead us to expect a prompt response to inflation of the 1973-74 type. Martin Feldstein and Alan Auerbach, "Inventory Behavior in Durable-Goods Manufacturing: The Target-Adjustment Model," **Brookings Papers on Economic Activity,** 1976, pp. 351-392. D.A. Belsley, **Industrial Production Behavior: The Order-Stock Distinction,** North-Holland Publishing Company, Amsterdam, 1969, pp. 18-27, pp. 43-47.

The Outlook for Inflation Based on Cost-Push and Capacity Factors

Yvonne Levy*

Cost-push influences frequently have been cited as the cause of short-term increases in the overall price level. But there is general agreement among economists that, over the long run, inflation is a demand-related rather than a supply-related phenomenon. Neither strong unions nor oligopolistic manufacturing firms, through their market power, can independently generate a sustained upward movement in prices. Unless wage increases are validated or supported by increased demand for labor, rising unemployment eventually will halt the wage-push. Similarly, the efforts of sellers to widen their profit margins, without regard to the strength of demand, eventually will be frustrated by heavy discounting from list prices.

The monetarists go a step further and argue that inflation is always a purely monetary phenomenon, that apparent cost-push influences (even in the short run) are lagged reactions to past excesses in monetary growth. But even the monetarists agree that a short-run acceleration in the rate of money growth initially stimulates the demand not only for goods and services but also for factor inputs. It is in this sense, with regard to their role in transmitting inflation, that it is useful to study the underlying "cost-push" elements at work in the inflationary process.

This article attempts to study the role of costs and capacity-utilization rates in the industrial pricing process, and to formulate an inflation forecast for 1977 based on a consideration of those factors as well as the expected behavior of farm and food prices. The first section describes the cost-plus pricing methods most manufacturing firms follow in setting their prices, and the variables that affect the various elements of cost. The second and third sections compare the behavior of the various cost elements during the current recovery in U.S. economic activity with that of previous post-war economic recoveries. The fourth section examines the behavior of costs and prices during 1976 in more detail, as a prelude toward developing an inflation forecast. Finally, in the last section we analyze what all these considerations imply for the overall rate of inflation in 1977.

I. Cost-Price Determination Process

Most manufacturing firms in the United States operate in imperfectly competitive markets, where individual producers have some control over the price of their output in the short-run. They do not passively accept as a "given" the price established by the freely operating forces of supply and demand. Rather, empirical studies have shown that most firms set their product prices in accordance with some version of the cost-plus principle. The central tenet of this doctrine—also known as mark-up pricing—is that prices per unit of output are set primarily on the basis of average costs of production (for labor, materials, energy and capital) plus a margin of profit based on some predetermined target rate of return on investment.[1] Prices per unit therefore change primarily in response to changes in unit costs, or profit margins, rather than in response to short-term shifts in the demand for goods. Of course, demand influences may be felt through variations in the profit margin, since firms frequently increase their markups during booms and shade their list prices during recessions and other periods of demand-supply imbalance.

Unit labor costs, the largest cost factor, de-

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pend upon the hourly compensation paid workers and their productivity, i.e., output per hour. Wage-rate changes in turn depend primarily upon the unemployment rate and the past rate of inflation in consumer prices.[2] Under the traditional Phillips Curve concept, the rate of increase in wages bears an inverse relationship to the rate of unemployment, which serves as a measure of tightness in labor markets.[3] For the recovery stage of the business cycle, with unemployment declining, the Phillips analysis thus implies an accelerated rate of increase in compensation.

Past inflation influences wages in two ways: 1) automatically, through the operation of cost-of-living adjustment (COLA) clauses in labor contracts and 2) through the collective-bargaining process, as organized workers seek also to increase their real wages. Because labor contracts normally extend over several years' time, wages are affected not only by past price behavior but also by the expected behavior of prices during the term of new contracts.

The second major determinant of unit labor costs is productivity.[4] Changes in labor productivity reflect two distinct forces: 1) the long-term trend in technology as reflected in the capital/output ratio and 2) short-term cyclical fluctuations in output and the capacity-utilization rate.[5]

Other direct costs of production include the costs of materials and energy. The costs of industrial raw materials—such as cotton, hides, natural rubber, and metal scrap—depend largely upon prices determined in highly competitive markets, where changes in demand lead to quick adjustments. Consequently, their prices tend to show a higher degree of cyclical volatility than prices for products at later stages of the production process. Highly processed materials, such as steel and aluminum, in contrast are priced in oligopolistic markets in accordance with the cost-plus principles outlined here. Higher prices for these products affect the costs incurred by manufacturers of finished products such as automobiles and appliances, encouraging them to raise their product prices. The costs of energy, which have risen sharply (both absolutely and relatively) in recent years, are determined primarily by OPEC cartel's actions in setting the world price of oil and by the Federal Power Commission's actions in regulating interstate natural-gas prices.

II. Cost Behavior During Previous Recoveries

How do these cost elements behave during the recovery phase of the typical business cycle? A review of five cyclical recoveries (prior to the 1973-75 period) shows that hourly-compensation growth typically increases gradually as the recovery progresses, presumably in response to both a decline in the rate of unemployment and a speed-up in the rate of inflation (Chart 1-A). Output per labor-hour typically rises sharply during the early stages of the recovery, when capital and labor are both underutilized and output can be expanded without commensurate growth in aggregate hours by fuller resource utilization (Chart 1-B).[6] In contrast, output per labor-hour normally slows during the more advanced stages of the business recovery, as plant capacity becomes more fully utilized and output expansion becomes difficult even with increased inputs of labor.

The rapid rise of productivity early in the expansion, combined with a relatively moderate rate of increase in compensation, typically causes unit labor costs to stabilize or even decline (Chart 1-C). Later in the recovery, with slowing productivity and accelerating compensation, unit labor costs tend to rise at a more rapid rate.

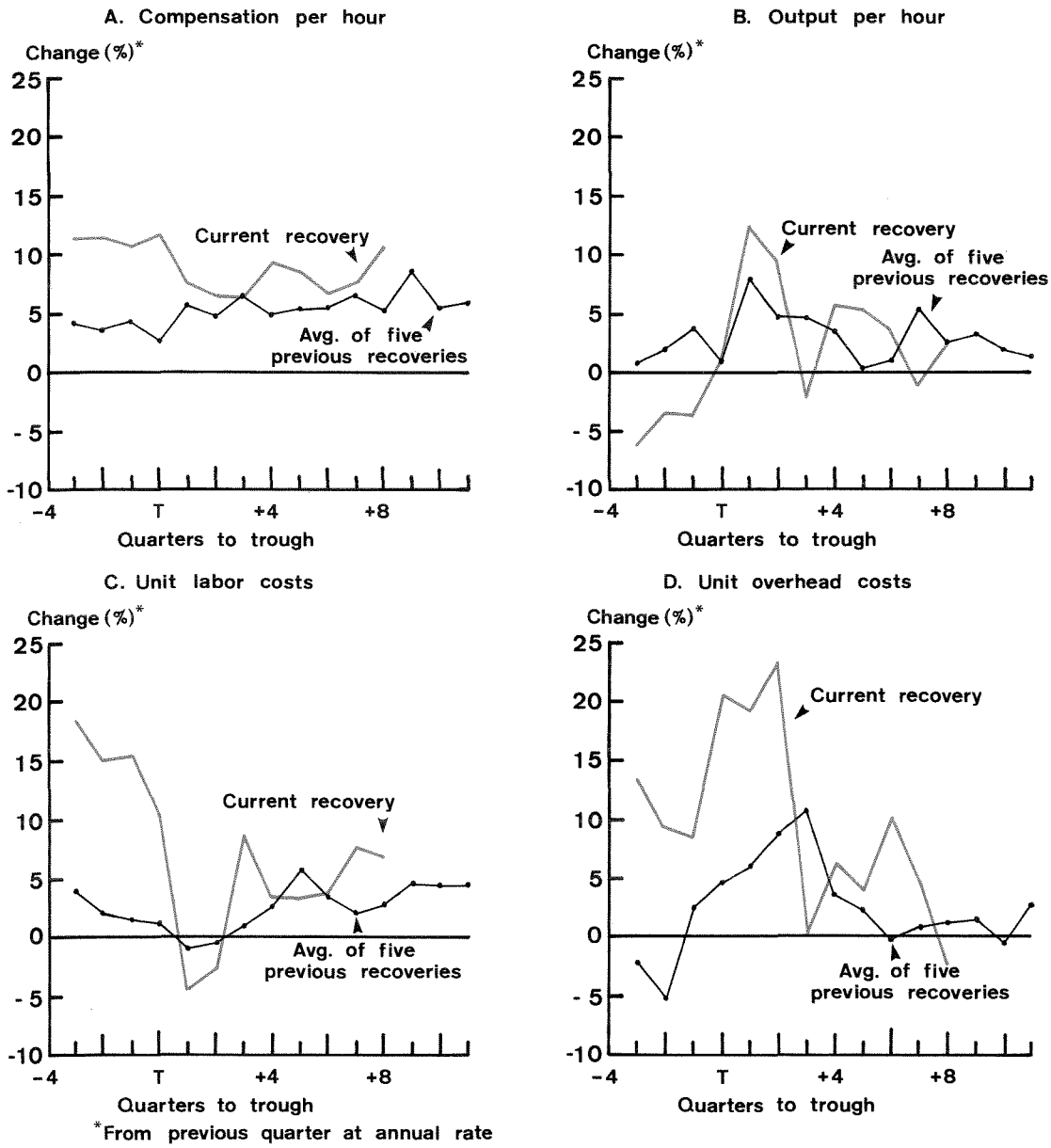
On the raw material side, industrial raw-material prices typically begin to turn upward about a quarter before the cyclical low in general business activity, as manufacturers begin to rebuild their materials inventories in preparation for increased production. These prices tend to rise slowly, then more rapidly, and then more slowly again in response to a slower growth of production and inventory accumulation. Finally, late in the expansion period, the rate of increase in prices begins to accelerate again as buyers begin to react to expectations of shortages (Chart 2-A).[7] Reflecting these price movements, raw material costs per unit of output tend to fluctuate in the same manner over the course of each cyclical expansion. Energy prices (and

energy unit costs) in contrast remain relatively stable until the later stages of the typical recovery (Chart 2-B)—although not of course in the most recent recovery.

Those manufacturing industries producing industrial materials—particularly highly-processed materials such as steel, aluminum, and paper—tend to be the first to experience capacity bottlenecks as the recovery matures. Demand for these materials is bolstered not only by increased consumption but also by inventory accumulation (as a hedge against possible shortages and

Chart 1

CYCLICAL BEHAVIOR OF LABOR AND OVERHEAD COSTS



*From previous quarter at annual rate

higher prices), so that their output typically tends to rise faster than the production of finished products such as automobiles. Thus, at any given stage of the expansion, the capacity-utilization rate in the basic material (primary processing) industries tends to be higher than for the manufacturing sector as a whole (Chart 3).[8]

This survey of pre-1973 business cycles indicates that total costs per unit of production generally rise at a relatively slow rate early in the recovery, when output is rising relatively rapidly, and at a faster rate as the recovery matures. But at that advanced stage of the expansion, excess demand pressures relative to available supply cause widespread capacity bottlenecks in the basic material industries, exerting strong upward pressure on industrial prices.

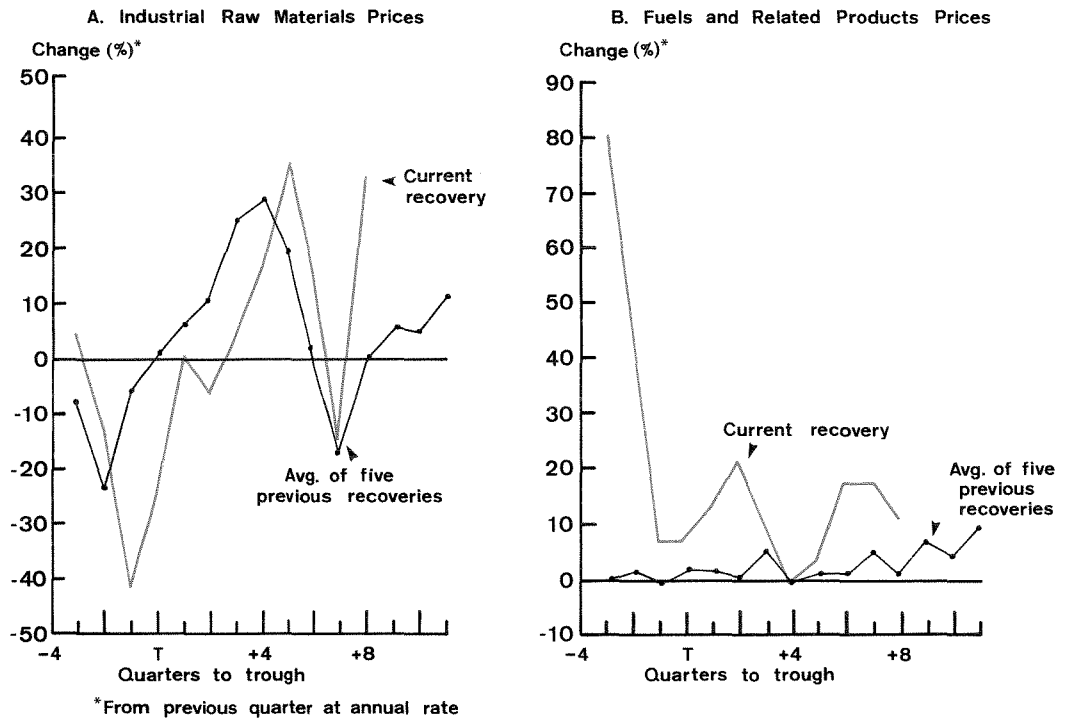
III. Cost Behavior During the Current Recovery

Unit labor costs, the dominant cost element, have followed the typical pattern during the recovery from the severe 1973-75 recession (Chart 1-A). During the first two quarters of the recovery, unit labor costs in the nonfarm business sector actually declined sharply, and thus offset much of the increase in costs that has since occurred. Meanwhile, the rate of increase in hourly compensation slowed during the first two quarters of the recovery, accelerated in early 1976 and then settled back again. This suggests that the rising unemployment rate during the first half of 1975 and the latter half of 1976 acted to moderate the rate of increase in wages during those periods.

Productivity also has followed the expected cyclical pattern (Chart 1-B), growing fastest during the early stages of the recovery and then

Chart 2

CYCLICAL BEHAVIOR OF RAW MATERIAL AND ENERGY COSTS



*From previous quarter at annual rate

rising at a more moderate rate. But throughout most of the current recovery, the growth of productivity has been above average for comparable stages of the business cycle, due to the comparatively low capacity-utilization rates prevailing during this business upswing. Gains in productivity thus have provided a larger than normal offset to rises in compensation, moderating the upward pressure on industrial prices stemming from rising unit labor costs. In fact, the exceptional growth of productivity during the first two quarters of the recovery actually acted, along with the deceleration in the growth of hourly compensation, to reduce unit labor costs.

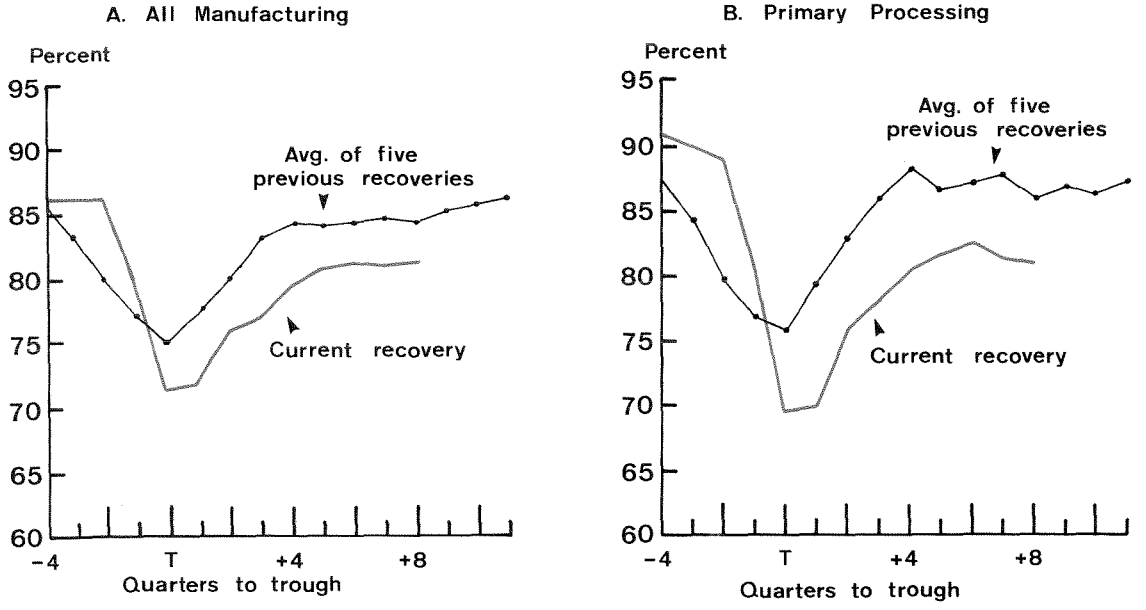
Raw material prices also have tended to follow the expected pattern—rising relatively slowly and then more rapidly until the "pause" of mid-1976, which reduced the demand for industrial raw materials and moderated their prices (Chart 2-A). Energy prices, on the other hand, failed to follow the typical pattern, since OPEC actions caused a greater rate of increase during the recession than during the recovery (Chart 2-B). This rise in energy prices undoubtedly acted to offset some of the benefits of the early-recovery decline in unit labor costs.

Total unit costs consequently rose at a relatively modest rate during the early stages of the recovery, when labor costs were declining. Total costs then followed roughly the same pattern during the first half of 1976, before accelerating because of rapidly rising labor and energy costs. Despite this gradual acceleration, costs still rose far less on an annual basis in 1976 than in 1975, due to the very large increase recorded during the late-recession period of early 1975.

Industrial prices have generally paralleled the cyclical movements in costs during this recovery, but the overall increase in prices has been greater than the rise in unit labor costs (Charts 1-C and 4). This pattern suggests that manufacturing firms have been attempting to restore their profit margins to more acceptable levels after seeing those margins narrow during the preceding recession.

Chart 3

CYCLICAL BEHAVIOR OF CAPACITY UTILIZATION RATE

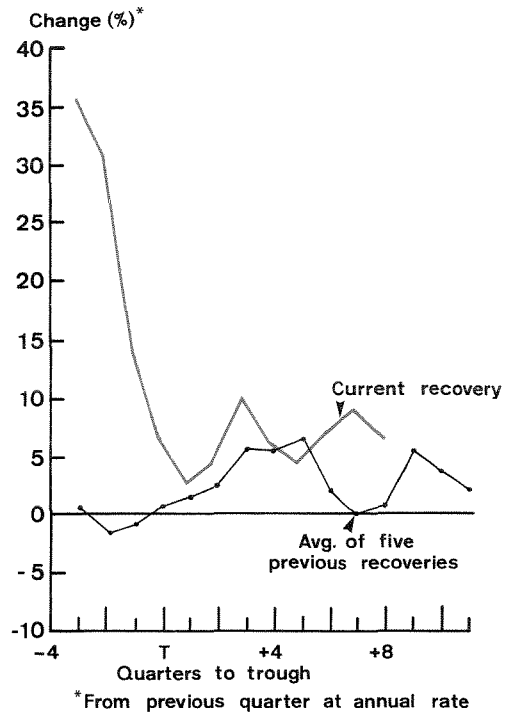


Prices rose at a slower pace in 1976 than at any time since 1972, when wage and price controls hid the actual cost pressures underlying the economy. The GNP deflator, the broadest measure of price change, rose at an average annual rate of 5.1 percent—about one-half the rate reached during the peak inflationary period of 1974 (Table 1). Actually, the inflation rate accelerated during the course of the year, but the late-year increase was at least partly due to the impact of a Federal pay increase.

Food and energy were largely responsible for the 1976 price improvement, but prices for manufactured products also rose at a more moderate pace. The food component of the consumer price index rose by only 3.3 percent—the smallest gain since 1971. Energy prices at first declined as a result of a legislated rollback of domestic oil prices, but they later accelerated again; still, the 7.1-percent annual increase in household energy prices was only a fraction of the 1974 peak figure.

Chart 4

CYCLICAL BEHAVIOR OF INDUSTRIAL PRICES



The wholesale price index also decelerated in 1976 (Table 1). The farm and processed-food component actually declined slightly, acting to moderate the upward pressure on retail food prices. Industrial commodities, which account for more than three-fourths of the total index, rose 6.3 percent for the year—again, only a fraction of the earlier peak rate. Slower rates of increase were widespread among most major categories, including not only fuels but also metals, chemicals, and paper. Inflation speeded up again in late 1976, but slack demand conditions, especially for highly processed basic materials, led to widespread discounting from published list prices. Thus, the acceleration in realized prices was less than for the posted prices which make up the industrial price index.

Moderate labor pressures

Reductions in labor cost pressures helped account for the deceleration in industrial prices. In 1976, unit labor costs in the private nonfarm business sector rose by only 3.6 percent—again only a fraction of the earlier peak (Table 2). When 1976 opened, it was expected that hourly compensation would rise by at least 10 percent, or slightly more than in 1975, as organized labor sought to compensate for the prior decline in its real wages attributable to sharply rising living costs. Most of the contracts expiring had been negotiated in 1973, when wage and price controls were still in effect.

Although the settlements in the automobile, electrical equipment, trucking and rubber industries turned out to be relatively high, the average first-year increase in compensation amounted to a relatively low 8.3 percent for all new major contracts with COLA provisions. Moreover, the wages of nonunion workers rose at an even slower rate, so that the increase in hourly compensation for all workers in the nonfarm business sector (including cost-of-living adjustments) averaged 7.4 percent.

Even more important in moderating labor cost pressures was the solid growth in productivity. Output per labor-hour increased in the nonfarm business sector by a healthy 3.7 percent after declining in 1974 and rising only slowly in 1975,

Table 1
Behavior of Major Price Indices, 1970-77
(Percent change, at seasonally adjusted annual rates)

	GNP Deflator	Consumer Price Index	Wholesale Price Index		
		All Items	All Items	Farm Products & Processed Foods	Industrial Commodities
1970	5.4	5.9	3.7	3.4	3.8
1971	5.1	4.3	3.2	2.0	3.6
1972	4.3	3.3	4.6	7.6	3.4
1973	5.8	6.2	13.1	30.0	6.8
1974	10.0	11.0	18.9	11.5	22.2
1975	9.3	9.1	9.2	3.8	11.5
1976	5.1	5.8	4.6	-0.6	6.3
1975					
I	8.5	8.3	-2.1	-19.3	5.8
II	4.3	6.2	3.3	7.6	1.7
III	7.0	8.3	7.9	14.1	5.3
IV	7.1	6.5	9.2	3.9	11.5
1976					
I	3.2	4.7	-0.7	-16.2	4.9
II	5.2	4.5	4.5	11.6	3.3
III	4.4	3.6	3.6	-7.7	7.5
IV	5.8	4.4	7.6	-0.7	10.2
1977					
I	5.8	8.6	8.5	16.5	6.6

Source: GNP deflator: U.S. Department of Commerce, Bureau of Economic Analysis; consumer and wholesale price indexes: U.S. Department of Labor, Bureau of Labor Statistics.

Table 2
Changes in Productivity, Labor Costs and Industrial Prices, 1974-77
(Percent change, at seasonally adjusted annual rate)

	Compensation per hour*	Output per hour*	Unit Labor costs*	Industrial Prices**
1974	9.3	-3.5	13.2	22.2
1975	9.5	1.6	7.7	11.5
1976	7.4	3.7	3.6	6.3
1975				
I	11.6	1.1	10.4	5.8
II	7.1	11.8	-4.2	1.7
III	6.4	8.9	-2.3	5.3
IV	5.8	-2.8	8.9	11.5
1976				
I	9.0	5.4	3.4	4.9
II	7.7	4.4	3.2	3.3
III	7.1	2.7	4.3	7.5
IV	7.0	-1.2	8.3	10.2
1977				
I	10.2	2.6	7.3	6.6

*Private nonfarm business sector.
**Industrial commodity component, wholesale price index.
Source: U.S. Department of Labor, Bureau of Labor Statistics.

and thus helped account for the modest 3.6-percent increase in unit labor costs. Productivity growth weakened as the recovery progressed in 1976, and actually declined slightly during the final quarter, but that sluggishness was attributable not to capacity restraint but to a temporary slowdown in industrial production.

In retrospect, it is clear that wage increases in 1976 were moderated by the 1975 slowdown in inflation, which held down newly negotiated wage demands—and by the further price slowdown that occurred in 1976, which held down the increases granted all workers under contracts with COLA provisions. Slower wage increases, in combination with above-average productivity gains, then helped dampen the increase in unit labor costs in a way that helped cool the inflation rate even more. Similarly, the slower rate of increase in energy prices and unit energy costs helped to moderate the increase in industrial prices.

Moderate capacity pressures

Capacity restraints posed little threat to the overall price level in 1976. According to newly revised Federal Reserve statistics, the rate of capacity utilization in manufacturing reached 81 percent by the final quarter of 1976. This figure, although substantially above the cyclical low of 71 percent, was still about 7 percentage points below the 1973 peak, when shortages and production delays generated intense upward price measures.[9] In the materials industries, where shortages had been most intense, the 80-percent operating rate of late 1976 was a full 13 percentage points below the 1973 peak. Only the chemical, energy and paper industries—with capacity utilization rates ranging from 83 to 88 percent—were operating at above-average rates.

In raising prices last year, manufacturers attempted not only to recover increased costs but also to achieve the higher rate of return required to finance necessary expansion in plant and

Table 3
Profits Per Dollar of Sales, by Industry, 1974-76
(Cents)

	1974	1975	1976	1976 I	1976 II	1976 III	1976 IV
				(After taxes)			
All Manufacturing Corporations	5.5	4.6	5.3	5.2	5.9	5.3	5.0
Durable Manufacturing Corporations	4.7	4.1	5.2	4.8	5.8	5.0	5.0
Basic Material Industries	5.5	4.2	4.4	3.4	5.2	4.7	3.9
Primary metal industries	6.6	4.3	3.9	3.5	4.8	3.9	3.5
Iron & steel	6.4	5.0	4.1	3.8	4.8	3.9	3.8
Nonferrous metals	7.0	3.1	3.6	3.1	4.7	3.7	2.9
Fabricated metal products	4.6	4.2	4.8	4.8	5.3	4.9	4.1
Stone, clay & glass products	4.5	3.7	5.0	2.3	6.2	6.2	4.6
Other Durable Manufacturing	4.3	4.1	5.5	5.2	6.1	5.1	5.5
Nondurable Manufacturing Corporations	6.4	5.1	5.5	5.6	5.9	5.6	5.0
Petroleum & Coal Products	12.8	7.7	8.5	8.7	9.0	8.3	8.0
Basic Material Industries	5.9	4.2	5.0	5.6	5.7	4.7	4.1
Industrial chemicals	8.4	6.9	6.9	7.8	7.6	6.7	5.5
Textile mill products	2.5	1.5	2.4	3.0	2.9	2.0	1.6
Paper & allied products	7.0	5.6	5.8	6.1	6.7	5.7	4.7
Rubber & plastic products	5.0	3.1	3.8	3.9	4.5	2.8	4.0
Other Nondurable Manufacturing	4.1	4.4	4.5	3.9	4.8	5.2	4.1

Source: Federal Trade Commission, "Quarterly Financial Report for Manufacturing, Mining and Trade Corporations."

equipment. Many firms were still trying to overcome financial problems generated by the recession. Metals and other basic materials industries had been especially hard hit, because the demand for their products was adversely affected not only by the consumption slowdown but also by the inventory liquidation which continued to depress orders even after consuming industries had begun to recover. For example, steel-mill product shipments dropped 28 percent during 1975, and nonferrous metals experienced similar declines.

These industries thus were unable to pass on all of their higher costs in 1975, and as a result, profit margins and rates of return on investment dropped sharply. For some, the slippage even continued into 1976 (Tables 3 and 4). During the first quarter of 1976, after-tax profits per dollar of sales in the primary metals industries amounted to only 3.5 cents—less than one-half the mid-1974 level and less than the 5.2-percent average return earned currently by all manufacturing firms. Similarly, their return on stockholders' equity was only 7.1 percent—about one-third of the mid-1974 figure and far below the 13.3-percent average return earned currently by all manufacturing firms. Their rates of return rose sharply during the second quarter when demand conditions improved, but margins eroded somewhat again during the last half of the year, despite a spate of published price increases, as weak demand conditions reduced sales and undermined list prices.

Table 4
Annual Rates of Return on Stockholders' Equity, by Industry, 1974-76
(Percent)

	1974	1975	1976	1976 I	1976 II	1976 III	1976 IV
				(After taxes)			
All Manufacturing Corporations	14.9	11.6	13.9	13.3	15.7	13.7	13.1
Durable Manufacturing Corporations	12.6	10.3	13.6	12.3	16.0	12.9	13.3
Basic Material Industries	15.2	9.9	11.0	7.1	13.6	11.8	9.5
Primary metal industries	16.5	8.6	8.2	7.1	10.7	8.1	7.1
Iron & steel	17.0	10.9	9.0	8.1	11.3	8.7	7.9
Nonferrous metals	15.7	4.9	6.8	5.3	9.5	7.0	5.5
Fabricated metal products	16.0	13.2	15.3	15.0	17.7	15.8	12.9
Stone, clay & glass products	10.6	8.5	12.0	4.8	15.5	16.1	11.1
Other Durable Manufacturing	11.4	10.5	14.8	13.7	17.1	13.4	14.9
Nondurable Manufacturing Corporations	17.1	12.9	14.2	14.3	15.5	14.4	12.9
Petroleum & Coal Products	21.1	12.5	14.3	14.7	14.8	14.0	13.9
Basic Material Industries	15.0	9.7	12.5	13.7	14.7	11.4	9.0
Industrial chemicals	17.6	11.0	14.2	16.2	16.3	13.5	11.0
Textile mill products	7.9	4.3	8.0	10.0	10.1	6.6	5.3
Paper & allied products	17.7	12.6	13.7	14.5	16.3	13.6	10.9
Rubber & plastic products	14.4	8.0	10.8	10.6	13.4	7.6	11.4
Other Nondurable Manufacturing	15.0	15.2	15.3	14.3	16.4	16.6	13.8

Source: Federal Trade Commission, "Quarterly Financial Report for Manufacturing, Mining and Trade Corporations."

V. Higher Inflation in 1977?

In 1977, as demand conditions improve sufficiently to support higher prices, producers of some basic materials such as steel undoubtedly will raise their posted prices in a further effort to offset rising costs and improve profit margins. The higher cost of these products in turn will lead to higher prices for many manufactured goods in which those materials are utilized. This does not mean, however, that wholesale industrial prices will rise significantly above the 6.3-percent figure registered in 1976. Based on the expected growth of demand, bottleneck pressures are likely to develop in only a few manufacturing industries over the course of the year, while near-term prospects for unit labor costs and energy costs do not appear as worrisome as they did during the weather-caused supply problems of early 1977. Similarly, the prospect of ample supplies of most farm products points to only about a one percentage-point increase in food-price inflation, despite recent problems caused by the Eastern freeze and the Western drought. Altogether, these factors suggest a moderate acceleration in the overall inflation rate in 1977 as a whole.

Moderate increase in labor pressures

Unit labor costs in the private nonfarm business sector may rise about 4 or 5 percent this year, compared to the 3.6-percent increase of 1976. An increase of that magnitude seems likely on the basis of a modest 2-to-3 percent increase in labor productivity, along with a 7-percent rise in hourly compensation. Normally, labor compensation would rise at a faster rate at this stage of a mature expansion, but the increase could be dampened by the improvement in the inflation rate that already occurred in 1976.

This year, as in 1976, the collective bargaining calendar is extremely heavy.[10] Major contracts covering nearly 5 million workers are expiring in a number of important industries—including coal, petroleum refining, steel, aluminum and construction. On the basis of the agreement recently reached in the first of those industries—steel—it seems likely that the overall increase in compensation for all workers in nonfarm business will be close to the 7.4-percent increase recorded in 1976.

The early-1977 price upsurge would suggest upward pressure on wage negotiations from the recent price escalation, but little of this was evident in the steel agreement, which was settled about as expected with an 8.3-percent first-year increase and an average 5-percent annual increase over the life of the contract. Again, the significant improvement in the unemployment rate would suggest further upward pressure on labor compensation—except for the fact that the jobless rate, presently hovering around 7.3 percent, is still abnormally high for this stage of the recovery. In 1977 also, fewer workers will be involved in negotiations who are not already covered by cost-of-living adjustment provisions. In fact, two-thirds of the workers covered by expiring contracts have been protected by COLA provisions, and thus from at least some of the effects of inflation, during the past three years.

Productivity growth in the nonfarm business sector probably will drop below the 1975 figure of 3.7 percent, reflecting the tendency for plant-utilization rates to increase in the later stages of a business recovery. However, productivity growth may remain above normal, because there is still less pressure on capacity-utilization rates than at the same point of previous recoveries. The relatively strong first quarter performance—a 2.6-percent rate of increase in output per labor-hour in the nonfarm business sector—in the face of severe weather problems suggests grounds for optimism in this regard. In any event, if productivity grows by 2 to 3 percent and labor compensation rises at a 7-percent rate, the increase in unit labor costs could be held to 4 or 5 percent.

Shortages posed by capacity restraints do not appear to be a major threat. If industrial production rises (as expected) by 6 percent this year, and if manufacturing capacity increases by 3 percent (in line with past plant-equipment spending trends), the capacity-utilization rate in manufacturing will rise only gradually from 81 to 84 percent—still quite low in comparison with the peak operating rates reached in 1973. Thus the supply situation generally should be quite easy, with only a few exceptions such as paper. In fact, with the continuation of present trends in pro-

duction and capacity growth, bottlenecks would not be likely to hamper production until well into 1978.

Energy and raw material inputs

Energy prices are likely to rise at a somewhat faster rate than had been expected before severe weather conditions abnormally increased the winter demand for heating fuels. Prior to the onset of the freeze, energy experts were predicting a 6- to 7-percent rise in prices of fuels and related products—about the same rate as in 1976.[11] These estimates took into account the OPEC-imposed increase in the price of imported crude oil at the beginning of the year.

These forecasts are now considered to be a little low. To help alleviate the natural-gas shortage in freeze-affected areas, Congress passed legislation calling for the removal of price controls (through July) on emergency sales of natural gas in interstate markets. However, the amount of gas involved in these "emergency" sales is only a small percentage of the total market, so that little additional price pressure should result. Altogether, energy prices may not rise more than 7½ percent this year, assuming some pressure from that source and from the initial implementation of the Administration's energy program. Still, an increase of that magnitude would raise energy costs per unit of output in manufacturing—and the overall rate of inflation—by rather modest amounts.

Industrial raw-material prices accelerated during the first quarter of 1977, reaching a point 15 percent higher than a year earlier. Some increase in prices is normal for this stage of the recovery, but the recent upsurge has been aggravated by this spring's "snap back" in industrial production, which followed the late 1976 pause and subsequent weather-induced slowdown. As production returns to its normal growth trend, industrial raw-material prices should rise at a slower rate, and, as a result, the rise in unit raw-material costs may parallel last year's increase.

Farm and food prices

The overall rate of inflation this year will of course reflect changes in farm and food prices as well as the changes in industrial prices discussed above. Prior to the advent of the recent drought and freeze, food prices were not expected to be a major source of inflationary pressure. Indeed, the U.S. Department of Agriculture early this year was predicting a 3- to 4-percent rise in the food component of the CPI, not much more than in 1976.[12] But the USDA later raised the forecast to the 4- to 6-percent range, as a result of the sharp increase in fruit and vegetables prices caused by California's drought and Florida's freeze.[13] Yet with only few exceptions, the supply prospects for most major products remain quite favorable.

In the case of meat (particularly beef), the supply conditions that led to lower prices last year are unlikely to persist throughout 1977. Favorable ratios of livestock to feed prices in 1975 resulted in large increases in meat production in 1976. The resulting addition to supplies helped depress prices, but the ensuing reduction in cattle numbers then set the stage for higher beef prices in the latter part of this year. But continued large supplies of pork and poultry are expected to dampen the overall increase in retail meat prices.

Most observers predict significantly higher prices for fresh fruits and vegetables—and of course sharply higher prices for coffee. Indeed, most of the acceleration in the inflation in farm and food prices during the first quarter was attributable to these products. But prices for fresh vegetables already have begun to decline, so that the annual increase in fresh fruit and vegetable prices should be less than in the first quarter. Moreover, prices of cereal products should remain relatively stable on an annual basis because of ample supplies of the principal food grains, wheat and rice. Indeed, heavy U.S. output of these crops in 1976 allowed substantial rebuilding of stocks. Similarly, milk production is expected to continue at high levels, creating the possibility of some weakness in prices.

VI. Summary and Conclusions

In this article, we examined the typical cyclical behavior of industrial prices, and presented projections of future price behavior based on cost-push and capacity factors. Industrial commodities not only account for three-quarters of the weight of the wholesale-price index, but their prices are also the major determinant of prices for nonfood items sold at the retail level. To round out the inflation outlook, we also analyzed the expected behavior of farm and food prices at the wholesale and retail levels.

Our analysis suggests that the increase in industrial prices will not be much higher than last year's 6.3-percent figure, judging from the expected behavior of labor, material and energy costs, and the expected level of capacity-utilization rates in manufacturing. Meanwhile, the favorable supply outlook for most agricultural products, in conjunction with the effects of recent weather problems, suggests a one-percentage point greater increase than last year in farm and food prices. Our overall analysis of the expected behavior of manufacturing costs and farm and food prices, together with its implications for the expected behavior of the wholesale and consumer price indexes, suggests that the GNP deflator will increase about 5.5-6.0 percent in 1977, only moderately faster than the 5.1-percent rate recorded last year.

FOOTNOTES

1. Actual costs per unit usually vary greatly with the rate of operation. To overcome this variability in cost, most manufacturing firms use a "standard" rate of operation for estimating unit costs rather than the actual operating rate. The standard rate may be the actual average rate of operation experienced over a period of years, e.g., 75 or 80 percent of plant capacity. The use of a standard operating rate makes for less frequent price changes than would actual unit cost pricing, because it makes prices respond to changes in labor, material and energy prices rather than operating rates (unless the standard rate is changed). Standard unit labor costs typically are calculated on the basis of the trend rate of growth in productivity. Similarly, under target return pricing, profit margins are determined not on the basis of actual operating rates but on an assumed or long-run average rate of plant utilization. In effect, this procedure is designed to prevent short-run changes in volume from unduly affecting prices, with the expectation that the averaging of fluctuations in cost and demand over the business cycle will produce the desired rate of return on investment. Under standard cost procedures, prices at any given time may not necessarily reflect actual unit costs of production, although over longer periods prices must reflect actual unit costs for firms to remain in business.

For a description of the pricing practices of large industrial corporations in the United States, see A.D.H. Caplan, Joel B. Dirlam and Robert F. Lanzillotti, **Pricing in Big Business: A Case Approach** (Washington, D.C.: The Brookings Institution, 1958). An example of the target pricing calculus and its implications also appears in Gardner G. Means, **Pricing Power and the Public Interest** (New York: Harper and Brothers Publishing Company, 1962), pp. 232-248. For an analysis of the properties of various econometric price determination models incorporating these micro-economic pricing practices, see William D. Nordhaus, "Recent Developments in Price Dynamics," **The Econometrics of Price Determination,** Conference sponsored by the Board of Governors of the Federal Reserve System and Social Science Research Council, October 30-31, 1970, Washington, D.C., pp. 16-49.

2. There have been numerous empirical studies utilizing these two variables as determinants of changes in money wages. See for example, Otto Eckstein and Thomas A. Wilson, "The Determination of Money Wages in American Industry," **Quarterly Journal of Economics,** LXXVI, Number 3 (August 1962), pp. 379-414. For a more recent version of that approach, see Otto Eckstein and Roger Brinner, **The Inflation Process in the United States,** Congressional Joint Economic Committee, 92nd Congress, 2nd Session (Washington, D.C.: U.S. Government Printing Office, 1976), pp. 3-46. Also, Paul A. Samuelson and Robert M. Solow, "Analytical Aspects of Anti-Inflation Policy," **American Economic Review, Papers and Proceedings,** L, Number 2 (May 1960), pp. 177-194. This article also contains an excellent discussion of the difficulties of disentangling "demand-pull" and "cost-push" sources of inflation from ex-post statistical data.

3. A.W. Phillips, "The Relation Between Unemployment and the Rate of Change in Money Wage Rates in the United Kingdom, 1951-1957," **Economica,** N.S., XXV, Number 100 (November 1958), pp. 283-299. For an analysis of later modifications in the original Phillips Curve concept, see Thomas M. Humphrey, "Changing Views of the Phillips Curve," **Monthly Review,** Federal Reserve Bank of Richmond, LIX, Number 7 (July 1973), pp. 3-13.

4. Unit labor cost is computed as the ratio of compensation per hour/output per hour. In determining the increase in unit labor costs during any given period, increases in output per hour, i.e., productivity, provide a direct offset to increases in compensation per hour. For example, in 1976, unit labor costs in the private nonfarm business sector rose by 3.6 percent, reflecting a 7.4-percent increase in compensation per hour and a 3.7-percent increase in productivity. For a more complete explanation of the manner in which unit labor cost is measured, as well as the inverse relationship between unit labor cost and productivity, see J. Randolph Norsworthy and Lawrence J. Fulco, "Productivity and Costs in the Third Quarter," **Monthly Labor Review,** XLVI, Number 2 (February 1976), pp. 38-39.

5. See, for example, Thor Hultgren, **Changes in Labor Cost During Cycles in Production and Business,** National Bureau of Economic Research, Occasional Paper No. 74, 1960; Edwin Kuh, "Profits, Profit Markups and Productivity," Study Paper No. 15, Congressional Joint Economic Committee, **Study of Employment, Growth and Price Levels** (Washington, D.C.: U.S. Government Printing Office, 1959). Also, Thomas A. Wilson and Otto Eckstein, "Short-Run Productivity Behavior in U.S. Manufacturing," **Review of Economics and Statistics,** XLVI, Number 1

(February 1964), pp. 41-54.

6. These results, which were developed independently, conform with the findings of the authors mentioned in footnote 5 above.

7. The upsurge in industrial raw material prices during the Korean War period helped to push up this average during the first several quarters after the trough, but this had little effect on the typical cyclical pattern. The Bureau of Economic Analysis, U.S. Department of Commerce, classifies the Bureau of Labor Statistics' spot market price index for 13 industrial raw materials as a leading indicator of cyclical troughs—but not of cyclical peaks, because of its inconsistent behavior near the peak.

8. In June 1976, the Federal Reserve Board introduced a new capacity utilization series for the industrial materials industries as a replacement for the old series for "major materials." The new series is much broader in scope than the old series, since it includes all the materials industries contained in the industrial production index. But unlike the old series, it extends only back to 1967. For the cyclical comparisons used in Chart III-B, it therefore was necessary to use the FRB capacity utilization series for primary-processing industries as a proxy for capacity utilization in the materials industries. The primary-processing index incorporates many of the same manufacturing industries that are represented in the industrial-materials index—including textiles, lumber, paper, industrial chemicals, petroleum refining, rubber and plastics, stone, clay and glass and primary and fabricated metals—and has moved in close correspondence with the materials index during the 1967-76 period. For a discussion of the methodology involved, and of the relationship between the primary-processing and industrial-materials series, see "New Estimates of Capacity Utilization: Manufacturing and Materials," **Federal Reserve Bulletin,** LXII, Number II (November 1976), pp. 892-905.

9. In late 1976, the Federal Reserve Board introduced a major revision in its manufacturing capacity-utilization series dating back to 1946. The revised figures showed that the capacity utilization rate in recent periods tended to be much higher than earlier estimates. The overall capacity-utilization rate in manufacturing during the third quarter of 1976, for example, was estimated to be 80.8 percent, in contrast to the figure of 73.6 percent reported earlier. The differential between current operating rates and the peak rates attained in 1973 thus was considerably smaller than originally calculated—although substantial nonetheless. For a discussion of the methodology, refer to **Ibid.**

10. For a discussion of 1977 labor negotiations and the collective bargaining environment, see Lena W. Bolton, "Bargaining Calendar to be Heavy in 1977," **Monthly Labor Review,** LXLIX, Number 12 (December 1976), pages 14-24. Also, Douglas LeRoy, Schedule Wage Increases and Escalator Provisions in 1977," **Monthly Labor Review,** C, Number 1 (January 1977), pp. 20-26.

11. **Economic Report of the President,** 1977 (Washington, D.C.: U.S. Government Printing Office, January 1977), page 44.

12. U.S. Department of Agriculture, Economic Research Service, **Agricultural Outlook,** AO-16 (Washington, D.C.: U.S. Government Printing Office, November 1976), pp. 1-11. Also, "Food Prices Expected to Rise Little in 1977; Boon to the Economy?" **Wall Street Journal,** December 28, 1976, page 1.

13. _____ **Agricultural Outlook,** AO-19 (Washington, D.C.: U.S. Government Printing Office, March 1977), page 7.

Labor Force Participation and Unemployment Insurance

Rose McElhattan*

The need to ask for unemployment-insurance benefits is an unhappy prospect for some unemployed Americans, yet it is a necessity for many and may be a way of life for others who (deliberately or not) have a long wait between jobs. Benefit payments, aside from providing income maintenance for the unemployed, may also have helped increase the supply of labor over time. Some individuals who lose their jobs might otherwise leave the labor force, were it not for benefit payments which reduce the cost of searching for another suitable job. Certain unemployed persons, on the other hand, may report job search in order to receive jobless benefits (and be counted in the labor force) although no attempt is made to secure employment. Other individuals might search for seasonal or intermittent employment in order to be eligible for benefits, when the income from such employment alone would not be sufficient to warrant labor-force participation.

This article analyzes the economic factors which have contributed to cyclical variations in labor-force participation rates since 1950. Our primary purpose is to measure the impact, if any, of the unemployment-insurance (UI) program upon the aggregate labor-force participation rate. Certain simplifying assumptions are made about the growth of population and labor-force participation. For example, we estimate the supply of labor from given population measures, and account for the secular behavior in labor force participation with a simple time trend and with a series which measures the number of young children (5 and under) as a percentage of the adult population. The increase in the latter factor has helped account for the increasing participation rate of females, which in turn has been the major reason for the rising trend in the aggregate labor-force participation rate in the postwar period.

Our analysis indicates that UI payments to individuals have acted to increase the supply of labor over time and to weaken the familiar "discouraged worker" effect. According to the latter hypothesis, an increase in unemployment signals an increase in the difficulty and cost of finding a suitable job, causing some unemployed workers to become discouraged and withdraw from the labor force—and to await a time when jobs are more plentiful and the cost of finding work is reduced. However, the payment of unemployment-insurance benefits may actually keep unemployed workers in the labor force. Our analysis suggests that, considering both the cost of finding a job and the payments of jobless benefits, there is far less responsiveness of labor as a group to changes in unemployment rates than previous estimates of the discouraged-worker effect have suggested.

In addition, the statistical results indicate that since the late 1960's there has been a change in the net response of labor to cyclical changes in the average real wage rate. From the late 1940's and into the 1960's, labor-force participation generally declined whenever current real wage rates were perceived as temporarily high, implying a diminished need for additional family members to supplement income as the pay of the main earner rose. However, this negative labor-supply response to transitory wage changes has diminished over time, and has even become slightly positive since 1967. Some labor market observers have suggested that the growth in

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labor supply will slow down as real wages rise in the current recovery, since the increased family income implied by the higher wage rate will permit supplementary household workers to return to nonmarket pursuits. Our results indicate that this is not likely to happen. The tendency of some individuals to leave the labor force as real wages rise appears to have been offset since 1967 by the behavior of others who want to take advantage of the higher real wages. Section I provides the conceptual framework for our labor-force participation model, and Section II provides the estimated results of that model.

I. A Model of Labor Force Participation—Conceptual Framework

The underlying notions of the labor-supply model in this paper come from the established economic theory of consumer behavior.[1] According to this theory, individual choices with regard to labor supply concern the division of time between market activity and nonmarket activity—the former including both working and looking for a job, and the latter including all other activities, such as child care, cooking, eating, housework and leisure time in general. The individual's allocation of time will be influenced by the net real income (that is, dollars of constant purchasing power) which his or her services can command in the marketplace. Three elements are considered in this paper to enter into the calculation of that net income: the real wage rate, the cost of finding a suitable job, and the payment of unemployment insurance benefits.

Real wages

In the first instance, an increase in the real wage rate which an individual expects to receive in the market increases the cost to him of spending time in nonmarket pursuits. Normally, a change in the real wage rate will alter the allocation of an individual's time, so that different quantities of labor services will be offered on the market at different real wage rates.

The individual's reaction to a change in real wages, however, will depend upon how permanent the change is expected to be. Put differently, any change in real wage rates may be considered as made up of "permanent" and short-lived, "transitory" components. Two separate hypotheses can be used to explain labor's reaction to wage changes. The first is the permanent wage effect, analyzed in the work of Milton Friedman.[2] According to this effect, workers will plan their labor activity to coincide with periods when the current actual wage is high relative to their perception of some "normal" or "permanent" wage. This hypothesis implies that if current wages (W) are rising relative to normal real wages (W*)—that is, if the ratio W/W^* is increasing—more labor will be supplied.

An alternative hypothesis is the relative wage effect, described in the works of Richard Easterlin and Michael Wachter.[3] According to this hypothesis, the ratio (W/W^*) represents a relative standard-of-living variable; that is, it measures today's standard of living, which is represented by current wages (W), in relation to the expected standard (W*). When current standards of living are rising relative to those expected on the basis of past experience—that is, when W/W^* is increasing—workers may choose more nonmarket activity rather than work in the market. This choice may show up, for example, in the withdrawal of supplementary family workers from the labor market when the wage of the main family earner increases. Conversely, when the current standard of living falls relative to the expected standard, secondary workers may be induced to sacrifice nonmarket activity to enter the labor market to supplement the family income. The impact of an increase in the ratio of current to permanent wages upon the labor-force participation rate thus may be either positive or negative, depending on whichever is the dominant influence—the permanent-wage effect or the standard-of-living effect.

Cost of search and unemployment benefits

Ordinarily, an individual making a labor-force decision will have to spend some time and effort searching for a suitable job. We may infer that the individual, in offering labor services, has

considered both the cost of looking for a job and the expected market wage from a prospective job. We may also infer that the net benefits of market activity to the individual are at least equal to the benefits he would obtain by staying at home—or, more precisely, engaging in nonmarket activity. An increase in the cost of searching for a job reduces the expected net benefits from market activity, and could thus lead to a decline in labor-force participation.

The availability of unemployment-insurance (UI) benefits also enters into the calculations of an individual's expected cost of job search. Unemployed workers may consider UI benefits as an offsetting payment to the direct cost of job search. By reducing the individual's search costs, UI payments increase the net benefits expected from market activity. An increase in UI payments, therefore, tends to offset the discouraged-worker effect and to strengthen labor-force participation.[4]

Some individuals also may be attracted into the labor force by the prospect of receiving benefits after a short period of employment. UI payments may encourage seasonal or other intermittent employment when the wages available from employment alone are not sufficient to warrant labor-force participation. For this reason too, we may expect the labor-force participation rate to increase when jobless benefits are increased.[5]

We could reason that, to the extent the program is self-financing, UI payments should not impact upon the labor supply. According to this argument, the payments have already been incorporated into the individual's expected wages. Although benefits are paid by the employer, they are considered the same as other employee benefits which are deducted from the employee's total wage. At least in the short run, however, individuals may not consider their contribution to the insurance program as being a self-financing matter. Although the program was intended to be self-financing, it has not been so for the past several years of high unemployment.[6]

In addition, most state laws create a rather loose relationship between the benefits received by an unemployed worker and the payments made on his behalf. Consequently, as the average covered wage increases, the maximum weekly benefit also increases. In such a case, however, revenues to finance the system do not increase proportionately, because the taxable wage base increases much more slowly than average wages. For these reasons, benefit payments in their own right tend to affect labor-force participation decisions.

Our argument thus suggests that changes in the aggregate labor-force participation rate depend upon changes (both permanent and temporary) in real wage rates, the cost of job search, and unemployment-insurance benefits. An increase in the cost of job search would tend to reduce the participation rate, while an increase in UI payments would tend to increase the labor supply. The wage effect upon labor supply is less certain, depending upon the relative importance of the permanent or relative wage effect. If the latter is dominant, changes in the supply of labor—in response to temporary changes in wages—may be the result of supplementary family members moving in and out of the labor force in an effort to maintain the family's accustomed standard of living. On the other hand, the growing importance of women in the labor force—particularly married women whose work experience indicates an increased attachment to full-year participation[8]—detracts from the importance of the relative wage hypothesis. Since the two hypotheses we have considered imply different signs on the wage coefficients, we can test in our model to see which effect is dominant.

II. Estimation of Labor Supply Model

It is seldom an easy matter to proceed from a general theoretical framework to a specific regression which can be estimated from available historical data. The model described above needs several adjustments before empirical estimation can proceed. The discussion of those refinements is followed by the estimation results (including forecast results) and a summary of their implications.

From theory to testing

There are no historical data which directly measure the cost of job search. In general,

changes in the unemployment rate have been used in labor supply studies to signal changes in the number of jobs available, with an increase in unemployment, for example, indicating an increase in the cost and difficulty of finding a job. In this paper, the unemployment rate of prime age males (25-54) is used to represent the cost of finding a job since this rate, more than any other, reflects cyclical changes in job opportunities and in the overall demand for labor. This is because the supply of prime age males (from a given population) is relatively insensitive to cyclical economic conditions so that changes in their unemployment rate basically reflect changes in job opportunities and in the demand for labor in general.[9]

Our model attempts to explain the aggregate behavior of different population groups. Demographic changes in the population, in particular changes in the age/sex distribution, may well affect labor participation behavior over time in ways not captured by the model. To handle this aggregation problem we have used the share of prime age males (25-54) in the population (MIX) to measure the impact of changes in population composition upon participation decisions in the estimation period, 1950.1 to 1974.4. In particular, we have permitted the variable MIX to affect both the relative-wage and unemployment-rate effects on the labor-force participation rate, entering those two explanatory variables with coefficients of the form (a + b MIX) where a and b are estimated constants.[10]

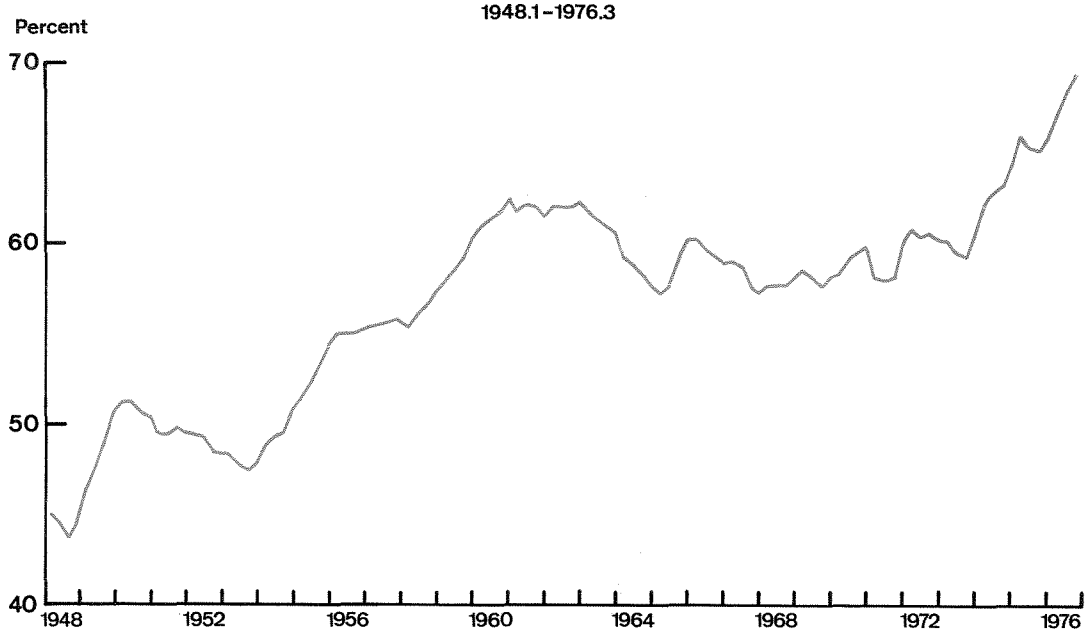
In addition, we have entered the unemployment-insurance benefits variable (UIB) in the labor-supply equation as a measure affecting the unemployment rate's impact upon the labor supply. We would expect a rise in UIB to keep more people in the labor force to the extent the unemployment rate increases; that is, the greater are the number of individuals faced with the work-nonmarket activity decision. Thus, to account for the effects of both MIX and UIB, the unemployment rate (RU) is written in the form $RU' = (a + bMIX + cUIB)RU$, where a, b and c are estimated constant coefficients. In other words, the unemployment impact upon the labor-force participation rate will vary over time

Chart 1

UNEMPLOYMENT INSURANCE BENEFITS

(Maximum weekly UIB payments as a percentage of weekly spendable wages)

1948.1-1976.3



with changes in the population (MIX) and changes in unemployment benefits (UIB).

The actual value of UI payments in the estimated regression is an index of the relative size of benefits. Specifically, the variable UIB is the maximum average weekly benefit, stated as a percentage of the average weekly spendable wages of a worker with three dependents in the nonfarm private business sector (Chart 1).[11] Unemployment benefits have increased from about 50.5 percent of spendable earnings in 1950 to 69.4 percent in 1976.3, but the rise has accelerated in recent years. The increase from 1973.1 to 1976.3 was by far the greatest for any four-year period since 1948.[12]

To estimate permanent wages (W*), we have assumed that the permanent real wage rate in a given period is equal to a percentage of the trend level of labor productivity. That percentage is equal to labor's share in total output produced—a relatively constant measure over time. The details of the procedure used to calculate W* are given in the appendix.

Although we are concerned with short-term or business cycle variations in the labor-force participation rate, the labor-supply data incorporate both trend and short-term movements, which means we must devise some way of adjusting for trend. The rise in the aggregate labor-force participation rate in the postwar period reflects the dramatic increase in the female participation rate.[13] Women's labor-force participation tends to be associated with the number of small children in the family, so to pick up that factor, we have included in the regression model the number of children 5 years old and under as a percentage of the adult population. That percentage, which began to decline sharply in the mid-1960's, apparently accounts for a significant amount of change in the aggregate participation rate. Also, that percentage apparently serves as a useful proxy for several other related influences which have had an important influence upon female labor supply—such as the trend toward later marriages and the rise in female-education levels—but which we have not attempted to estimate separately.

To capture additional secular forces influencing the aggregate participation rate, we have chosen a nonlinear time trend (1/time, where time = 13 in 1950.1 and 119 in 1976.3). This time trend was the most statistically significant of the several considered, and it has the desirable long-run property of approaching a value of zero as time progresses. This is a desirable property; the participation rate has a maximum value of one and a time trend without a limitation on the values it can assume would imply a participation rate with possible values greater than one.

Finally, we have assumed that the supply of labor from a given population responds to both current and past changes in the economic determinants included in the equation. The time adjustment model which proved most statistically significant was one in which the supply of labor responds to past changes in the different economic determinants with the same distributed lag pattern. In the conventional way, we have incorporated this behavior by entering the lagged dependent variable on the righthand side of the equation.[14]

Empirical Results

The following least-squares equation, estimated over the 1950.1-1974.4 period, appears to explain the movements in the labor-force participation rate quite well. The adjusted coefficient of determination ($\bar{R}^2$) of .95 means that about 95 percent of the variation in the aggregate labor-force participation rate can be accounted for by the model. The standard error of .24 percentage points indicates a very close fit between actual and estimated values, since this error represents only .3 percent of the mean labor-force participation rate (69.9 percent) over the sample period.

$$LFPR_t = \underset{(5.27)}{28.1644} - \underset{(-2.30)}{9.70906}TT - (\underset{(-3.15)}{2.34380} - \underset{(3.16)}{6.61831}\,MIX_t - \underset{(2.40)}{.00969}\,UIB_t)\,RU_t + (\underset{(2.82)}{.996122} - \underset{(-2.87)}{4.08348}MIX_t)\left(\frac{W}{W^*}\right)_t - \underset{(-4.34)}{.204513}N5_t + \underset{(9.52)}{.648341}LFPR_{t-1}$$

Adjusted $\bar{R}^2$ = .95

Durbin Watson = 2.11

Standard Error = .24

Mean LFPR = 69.9

Estimation Period 1950.1-1974.4

Numbers in parentheses are t statistics

where

LFPR = labor force participation rate of all persons between the ages of 16 and 64, in percent

MIX = numbers of males in the population between the ages of 25 and 54 divided by the total population 16 years and over, in percent

UIB = maximum weekly benefits payable under the unemployment-insurance system, divided by spendable average weekly earnings of production worker with 3 dependents, in percent

RU = rate of unemployment of males between the ages of 25 and 54, in percent.

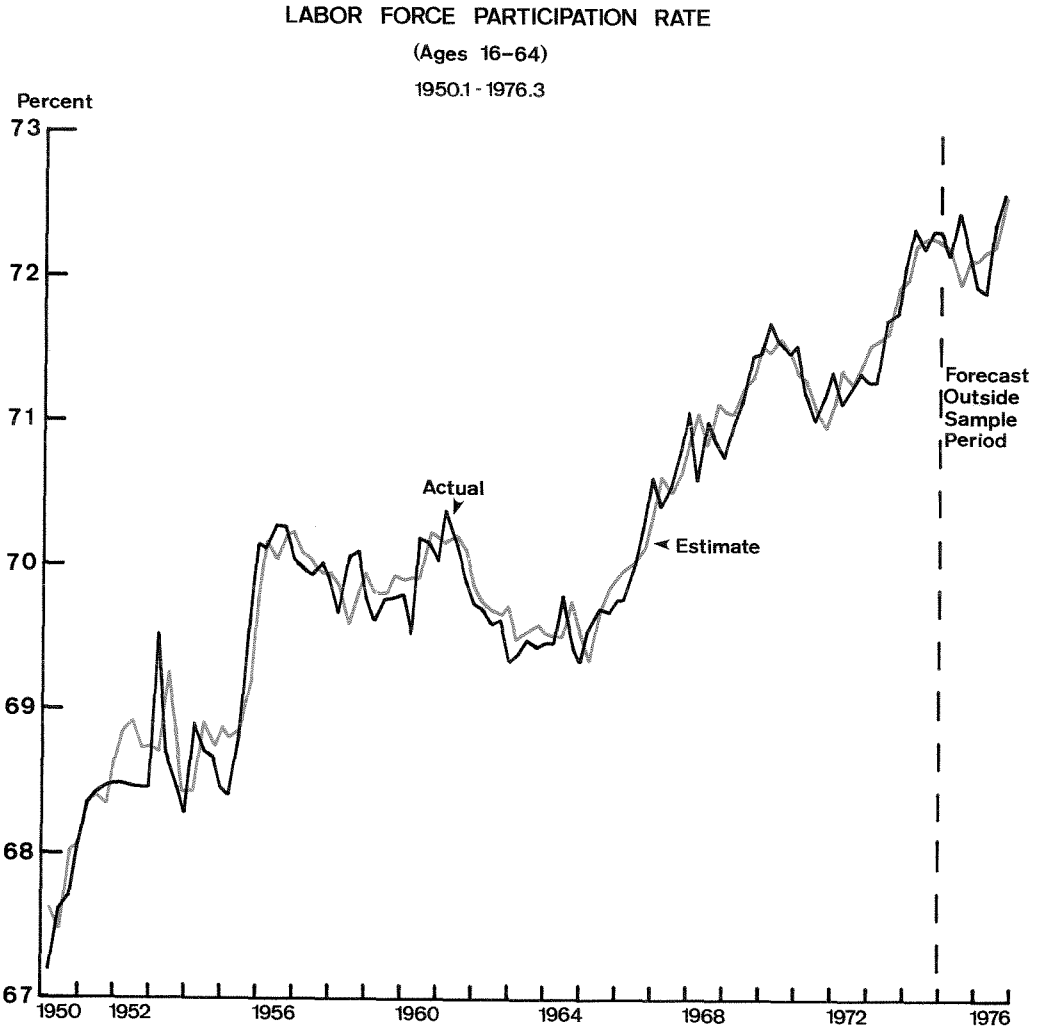
W/W* = current real wages of employees in nonfarm private domestic business sector, divided by normal wage, in percent

TT = 1/Time - Time is equal to 13 in 1950.1 and 112 in 1974.4

N5 = number of children 5 years old and under in the population, divided by number of people 16 years old and over in this population, in percent

The more pertinent test for a model, however, is how well it can forecast movements in the

Chart 2



dependent variable after the estimation period. The years 1975 and 1976 provide a particularly good test, since that period incorporated a considerable amount of variation in labor behavior, including (in 1976) the highest labor-force participation rate on record (Chart 2).

The model performed very well over the post-sample period, especially by capturing the unusual 1976 increases in labor supply (Table 1). The mean absolute forecast error for the seven quarters (1975.1-1976.3) is .17 percentage points, while the average error is only –.07 percentage points; both are well within the .24 standard error of the equation over the estimation period.

The movement over time in the supply of labor has been dominated by population growth, along with other long-run changes which have produced a shift in preferences between work and nonmarket activity. The strong trend-like movement in the labor-force participation rate is captured in the model by the time trend, the constant term, N5 (the children/adult ratio), and the lagged dependent variable. To determine the statistical significance of the cyclical economic variables, we re-estimated the model with only the time trend, constant, N5 and lagged dependent variables, and then compared the unexplained variation in the participation rate from this abbreviated model with that of the full model (equation 1). The additional variables included in the full model were found to reduce the unexplained variance in the participation rate by 20 percent. In addition, a statistical test indicated that this reduction represented a statistically significant decrease in the unknown variance in the labor-force participation rate.[15] We can thus conclude that the wage, unemployment and unemployment-insurance variables account for a significant amount of cyclical variation in labor-supply behavior.

Table 1
Labor Force Participation Rate of Population aged 16-64
Forecasts Outside the Estimation Period
1975.1—1976.3

	Labor Force Participation Rate		
	Forecasted*	Actual	Forecast Error
1975.1	72.170	72.155	.015
.2	71.933	72.449	–.516
.3	72.115	72.203	–.088
.4	72.012	71.932	.081
1976.1	72.146	71.896	.250
.2	72.185	72.369	–.184
.3	72.528	72.585	–.058

Mean Absolute Error, 1975.1—1976.3 = .170

*Forecasts are outside the estimation period (1950.1—1974.4) and have been calculated with all variables on the right hand side of the equation equal to actual values. In a dynamic ex-post simulation in which estimated values of the lagged-dependent variable replace actual values, the mean absolute error is .23 percentage points.

Table 2
Short-term Unemployment Coefficients for Selected Periods
Unemployment Rate—Prime Age Males:
Total Coefficient = -2.34380 + 6.61831MIX + .00969UIB

	(1) Coefficient excluding Unemp. Insurance Benefits (-2.34380 + 6.61831MIX)	(2) Coefficient including only Unemp. Insurance Benefits (.00969 UIB)	(3) Total Size of Coefficient (1) + (2)
1950.4	–.524	.485	–.039
1955.4	–.524	.524	.0
1960.4	–.596	.601	.005
1965.4	–.709	.581	–.128
1970.4	–.762	.579	–.183
1975.4	–.769	.636	–.133
1976.1	–.769	.651	–.118
1976.2	–.769	.662	–.107
1976.3	–.769	.672	–.097

The coefficients of the unemployment rate (RU) and the wage term (W/W*) vary over time (Tables 2 and 3), and these coefficients are associated with the current-quarter independent variable. The lagged dependent variable in our equation means that some time is required for labor to adjust fully to a change in an independent variable; ultimately, the long-run response will be about 2.8 times larger—1/(1–.648)—than the current coefficient estimate. Henceforth, we will focus upon current-quarter coefficient values, since this provides the essence of labor-supply behavior. The longer-run reaction can be derived easily, by multiplying the reported results by 2.8.

Our estimates indicate that the impact of labor-market conditions—represented by the prime-age male unemployment rate (RU)—on the labor-force participation rate has varied significantly over time. In particular, the supply of labor has become more sensitive to changes in labor-market conditions in the 1970's than was evident twenty years ago (column 1). Those estimates measure the unemployment coefficient, excluding the effect of unemployment insurance but including the response to demographic changes. The MIX variable (the proportion of prime age males in the population) has shown a secular decline since the early 1950's, and this has increased the labor-supply reaction to changes in the unemployment rate. This should be expected, since prime-age males are less likely than others to move in and out of the labor force in response to changes in the cost and difficulty of finding a job. The values in column 1 indicate that a 1-percentage point increase in adult male unemployment would lead to a decline in the average labor-force participation rate of .524 percentage points in 1950.4, .709 percentage points in 1965.4, and .769 percentage points in 1976.

Table 3
Wage Coefficient for Selected Periods
Coefficient = .996122 -4.08348MIX

	Total Size of Coefficient
1950.4	–.127
1955.4	–.127
1960.4	–.082
1965.4	–.012
1970.4	+.020
1975.4	+.024
1976.1	+.024
1976.2	+.024
1976.3	+.024

However, the negative response of labor supply to unemployment-rate changes has been considerably reduced (in absolute terms) by the payment of unemployment-insurance benefits. As the positive values in column 2 indicate, for any given unemployment rate, an increase in UI payments leads to an increase in labor supply. For example, in 1950.4, when the unemployment rate of prime-age males was equal to 3.0 percent, UI payments added 1.46 percentage points to the participation rate (.485x3.0). If unemployment conditions had remained unchanged, UIB would have increased the participation rate by 1.74 percentage points in 1965.4 (.581x3.0); 1.91 percentage points in 1975.4; and 2.02 percentage points in 1976.3.

Considering the opposing forces at work—the cost of finding a job and the payment to unemployed workers—the total size of the unemployment coefficient (column 3) is considerably smaller than it would be with no benefit payments (column 1). Thus, previous estimates of the discouraged-worker effect may have overestimated the response of labor supply to unemployment-rate changes by not considering the positive labor response to increases in UI payments. Some labor studies have used an employment rate rather than an unemployment rate to represent job opportunities and the cost of job search. Our results suggest that these studies also may exaggerate the discouraged-worker effect when the importance of UI payments is ignored.[17]

The MIX variable also has affected the size of the wage coefficient over time. The signs of the coefficients indicate that the relative wage effect had been dominant until the late 1960's. Until 1967, whenever wages fell relative to expected income, the labor force increased as additional entrants attempted to supplement the family's desired standard of living. Conversely, whenever wages rose relative to expected income, supplementary family workers left the labor force. Subsequently, however, the relationships have been reversed. Even more strikingly, the impact of wages upon labor supply has diminished

considerably over time. The negative value of .127 in the early 1950's has even turned to a small positive .024 in 1976.

The growing weakness in the relative wage effect may be due to offsetting behavior by different groups in the labor force. Since the early 1950's, married women (with husbands present) have accounted for a growing percentage of the labor force. This group of workers has shown an increasing attachment to the labor force and has traditionally displayed a strong positive response to changes in their wages.[18] The increasing importance of married women in the labor force may have offset the negative response of other workers to temporary increases in the average wage.

III. Summary and Conclusions

This paper has analyzed the economic variables which determine cyclical behavior in labor supply, with emphasis upon the influence of unemployment-insurance benefits in the period since 1950. The findings indicate that the payment of UI benefits has weakened the discouraged-worker effect, so that when jobs become difficult to find, less workers leave the labor force (or are discouraged from entering) than would be the case if no payments were provided to the unemployed. Some individuals might view an increase in UI payments as a reduction in the cost of searching for a job and, hence, as an inducement to remain in the labor force as an unemployed worker rather than to leave for nonmarket pursuits. Other individuals might be encouraged to enter short-term employment when the wages alone from such work would not be sufficient inducement to do so. Our model does not distinguish between these or other motivations. It simply suggests that the impact of changes in labor-market conditions should be considered a net response—one allowing for the cost of finding a job on the one hand and payment of UI benefits on the other. Otherwise, the unemployment/labor-supply relationship will be overstated.

These findings have implications for the interpretation of the official unemployment data published by the Bureau of Labor Statistics. Many observers question the use of the aggregate unemployment rate as an indicator of the strength of the economy. Understanding the economic picture requires understanding the causes of fluctuations in the jobless rate, such as the labor-supply factors estimated here.

If the discouraged-worker effect is weaker than originally thought, the unemployment rate should have greater amplitude and conform more closely with cyclical changes in aggregate output. Fewer workers would leave the labor force during the recession and fewer would enter during the recovery, so that changes in the jobless rate would more likely reflect changes in aggregate demand.

However, other economic conditions could stimulate changes in the supply of labor and thus interfere with this conformity. Increases in unemployment-insurance benefits have tended to add to the labor-force participation rate. For example, an increase in UI benefits during an economic downturn acts to increase the labor supply, and thereby to increase the unemployment rate more than would be justified by aggregate-demand conditions alone. This behavior helps to explain the unusual and largely unexpected increases in the labor-force participation rate observed during last year's "pause." The slowdown in final demand for goods and services which began early in 1976 acted to moderate growth in labor supply. At the same time, the maximum weekly UI payment increased substantially, and thus acted to stimulate increased labor-force participation. The increase in the ratio between UI benefits and weekly spendable earnings was unusually large, and the increase between 1976.1 and 1976.3 may have added about 145,000 workers to the labor force and about .14 percentage points to the unemployment rate in 1976.3.

In addition, the aggregate labor force has shown little response to temporary changes in the relationship between current and expected real wages. However, this response may represent the offsetting behavior of different groups. Indeed, it could become a stronger positive factor in labor-supply growth if married women continue to increase their representation in the labor force.

APPENDIX I

For normal wages (W*), we assume that the permanent real-wage rate in a given period of time is equal to a percentage of the trend level of labor productivity. The percentage is equal to labor's share in total income produced (gross business domestic product)—a ratio which has been relatively constant over time. We rely upon the relative constancy of this ratio to derive a measure of normal wages.

This constancy can be represented as:

k = (Total Labor Income/Gross Business Domestic Product).

Total labor income can be written as the average wage per worker times the number of workers (WxN); and Gross Business Domestic Product can be written as a measure of the average price level times a measure of the real quantity of output produced (PxQ). Or, rewriting the above, $k = (WxN)/(PxQ)$. This equation can be rewritten so that real wages (W/P) are expressed as a constant percentage (k) of the average output of labor (Q/N):

$$W/P = k\,x\,(Q/N).$$

To derive an estimate of normal or expected real wages (W*), we substitute the trend level of labor productivity for the average output of labor, which we designate as $(Q/N)'$. Then $W^* = k\,x\,(Q/N)'$.

FOOTNOTES

1. For examples of a formal derivation of a labor supply model see W.G. Bowen and T. Aldrich Finegan, "The Economics of Labor Force Participation," pages 569-570; Robert E. Lucas, Jr., and Leonard A. Rapping, "Real Wages, Employment, and Inflation," **Journal of Political Economy,** 1969, pages 721-754.
2. Friedman, Milton, **Price Theory,** Aldine Publishing Co., Chicago, Ill., 1962, page 205.
3. Wachter, Michael, "A Labor Supply Model for Secondary Workers," **Review of Economics and Statistics,** 1972, pages 141-151, "A New Approach to the Equilibrium Labour Force," **Economica,** February, 1974, pages 35-51.
4. For a review of how unemployment insurance benefit payments are incorporated in general theories of search as well as a comprehensive review of search theory see "Theories of Search in a Labor Market," Kenneth Burdett, Technical Analysis Paper No. 13, Office of Evaluation, Office of the Assistant Secretary for Policy, Evaluation and Research, Department of Labor, October 1973.
5. Feldstein, Martin, "The Economics of the New Unemployment," **The Public Interest,** No. 33, Fall 1973.
6. There has been a particularly large drain on the UI system caused by the recent recession. "As of October 1, 1976, the 21 states that have depleted their trust funds have borrowed $3.1 billion from the Federal Unemployment Account. In turn, this account, as well as the Federal Extended Unemployment Compensation Account (which finances the Federal share of extended benefits and all supplemental benefits) have both been depleted and are borrowing from Federal general revenue funds. Even with proposed tax increases to be effective January 1, 1978, it is estimated that the deficit in the Federal accounts will be over $5 billion by the end of 1981." See Steven Zell, "Unemployment Insurance: Programs, Procedures, and Problems," **Monthly Review,** Federal Reserve Bank of Kansas City, February, 1977, especially pages 41-42.
7. Zell, Steven P., "Unemployment Compensation," Background Paper No. 15, Congressional Budget Office, Congress of the U.S., Washington, D.C., December 8, 1976, especially Chapter 2, page 13.
8. Regarding the increasing attachment to the labor force of many secondary workers, see Joseph L. Gastwirth, "Estimating the Number of 'Hidden Unemployed,'" **Monthly Labor Review,** U.S. Department of Labor, Bureau of Labor Statistics, March 1973, pp. 17-26.
9. For a review of the use of unemployment rates in labor force participation rate models, see Jacob Mincer, "Labor Force Participation and Unemployment: A Review of Recent Evidence," in **Prosperity and Unemployment,** Robert A. Gordon and Margaret S. Gordon, editors, John Wiley and Sons, Inc., New York, 1966. Mincer points out that the unemployment rate of the primary labor force is a better cyclical index than the rates of other sex-age components. It is therefore also likely to be superior, in this respect, to the aggregate unemployment rate. The unemployment rate of prime age males may not be a perfect proxy for overall labor market tightness and therefore for the general cost of finding a job if, as Mincer points out, "as a result of minimum wages, employers tend to substitute experienced for inexperienced workers, the unemployment rate in the primary group may have decreased, in part, at the expense of higher rates in other groups," page 107. Of the various employment and unemployment rates that may proxy for labor market tightness, the prime age male unemployment rate appears the best indicator and is the reason for its use in this paper. This does not preclude the possibility, however, of finding another perhaps better indicator of labor market tightness in future research. For a discussion of the results of several labor market indicators see Bowen and Finegan referenced in footnote 1, especially pages 516-522.
10. For a similar treatment of the aggregation problem, see Wachter, Michael, "A New Approach to the Equilibrium Labour Force," **Economica,** February, 1974.
11. Actually, I estimated the regression model in two ways. The first used the maximum average weekly benefits payable to individuals divided by the consumer price index as a measure of the real value of UIB payments. The second estimation used the ratio of real UIB payments divided by real weekly spendable earnings as described in the text above. The first measure should serve as a useful proxy for the effect of unemployment insurance since increases in its value indicate an increase in the cost of remaining out of the labor force. The ratio measure, however, represents the relative value of an individual's time; that is, people may value their time at least as high as current wage rates and UIB payments relative to the current wage rate may be the relevant value in the trade-off decision between market and nonmarket activity for individuals. In practice, the

estimation results indicated that there was little to choose between the two measures since they are highly correlated in time. The close relationship between the two measures may be the result of state laws which generally increase UIB payments whenever covered wages increase. The ratio measure was chosen for the regression results presented in this paper since the ratio estimate has the most likely property of a limiting value of one, as does the dependent variable, the labor force participation rate. For a paper with somewhat similar results regarding the use of real UIB payments and the ratio of payments to weekly earnings see Thomas W. Wallace, "The Effect of Unemployment Insurance on the Measured Unemployment Rate," Discussion Paper No. 155, July 1974, Queen's University, Kingston, Ontario.

12. The series used in the denominator of the ratio, weekly spendable earnings of a worker with three dependents, has been questioned by Geoffrey H. Moore as being an underestimate of what an average family of this type actually earns. "Workers' Earnings: Higher Than They Look," **The Morgan Guaranty Survey,** October, 1976. Nevertheless, the close relationship between the ratio measure and real UIB payments, as well as other features referenced in footnote 11, led me to use the ratio measure in the regression estimates of the aggregate labor force participation.

13. See for example, three articles on women in the labor force in the **Monthly Labor Review,** November 1975, U.S. Department of Labor, Bureau of Labor Statistics.

14. There has been some controversy in the literature as to whether labor supply responds contemporaneously or with a distributed lag to the determinants in the supply function. Labor supply functions which assume the former have a high degree of auto-correlation in the error terms and the Cochrane Orcutt procedure has been applied to correct for this factor. My tests indicate, however, that this representation and estimation of the labor supply function may be a misspecification of the labor supply behavior. If first-order serial correlation of the error terms is an appropriate specification of a model, we can write this model in general terms as:

$$y_t = \alpha X_t + \rho u_{t-1} + e_t, \text{ or}$$

$$y_t = \alpha X_t + \rho Y_{t-1} - \rho\alpha X_{t-1} + e_t$$

where $u_{t-1} = Y_{t-1} - \alpha X_{t-1}$, and e_t is a normally distributed, zero mean, finite variance random variable uncorrelated over time and ρ is the estimated auto-correlation coefficient.

If the Cochrane Orcutt estimation procedure is the correct specification, we should find that the lagged variables, X_{t-1} and Y_{t-1} are statistically significant and the estimated coefficients bear the relationship expressed in the above equations. I found that the labor supply function, specified as the second above equation, did not result in statistically significant estimated coefficients for the lagged values of the equation's determinants, although the lagged dependent variable was statistically significant. Therefore the adjustment model appears to be the more meaningful interpretation of labor supply behavior than models which have assumed no distributed lag in the response of labor to the model's determinants. The results suggest that labor supply models which do not take into account a delay in the response of labor to changes in economic variables may represent a misspecification of the supply function. For a detailed discussion of choosing between a Cochrane Orcutt estimation technique and a distributed lag such as chosen in this paper, see Mike Salant and Nick Sargen, "The Supply of Wheat: A Study in Cereal Correlation," May 25, 1968, unpublished paper. Dr. Sargen is an Economist at the Federal Reserve Bank of San Francisco.

15. The calculated F-value was 5.33; the critical values at the 5 percent point for F(5,91) is 2.30 and at the 1 percent point is 3.20.

16. Griliches, Zvi, "Distributed Lags: A Survey," **Econometrica,** Vol. 35. No. 1 January, 1967.

17. The two best-known studies which find a negative relationship between changes in the supply of labor and a measure of labor market tightness (i.e., an employment rate) are by Alfred Tella ("Labor Force Sensitivity to Employment by Age, Sex," **Industrial Relations,** Vol. 4, No. 2, February 1965, pp. 69-83) and Thomas Dernburg and Kenneth Strand ("Hidden Unemployment 1953-63," **American Economic Review,** Vol. 56, March 1966, pp. 71-95). More recent studies which find a discouraged worker effect between unemployment and labor force participation are those of Bowen and Finegan, **The Economics of Labor Force Participation,** Princeton University Press, 1969; Wachter, Michael L., "A New Approach to the Equilibrium Labour Force," **Economica,** February, 1974. A recent cross section study by Arlene Holen and Stanley A. Horowitz, "The Effect of Unemployment Insurance and Eligibility Enforcement on Unemployment," **The Journal of Law and Economics,** October, 1974, especially pages 410-11, finds a strong discouraged worker effect and a positive impact upon participation rates of a change in an unemployment insurance benefits index.

18. Mincer, Jacob, "Labor Force Participation of Married Women," **Aspects of Labor Economics,** National Bureau of Economic Research, Princeton University Press, 1962. Cain, Glen G., **Married Women in the Labor Force,** The University of Chicago Press, 1966.

Unemployment, Unused Capacity and the Business Cycle

Larry Butler*

The unemployment and capacity-utilization rates measure the labor and capital market pressures in the nation's economy. The two measures have much in common, and between them provide a reasonably clear picture of how much slack is present in the economy, and how much real growth we may expect before the economy encounters serious bottlenecks.

This article examines relative movements in the two series throughout the postwar period. Until 1974, unemployment and unused capacity bore a stable relationship to one another. Since 1974, however, unemployment has been increasingly higher than one would have predicted on the basis of its relation to unused capacity[1] in previous cycles. Unused capacity, however, has behaved in the recent recession and in the present recovery just as it has in previous cycles. This observation leads to the conclusion that unused capacity is still a good measure of overall factor-market tightness while unemployment is not. The economy is thus likely to enter a period with available capacity constraining output but with the unemployment rate still well above 6 percent.

The remaining sections document these conclusions. Section I points out the potential noncomparability of the two series, but shows that, until 1974, they provided similar indications of factor-market tightness except during a few strike- or war-affected periods. Section II discusses the normal cyclical pattern of unused capacity and unemployment. The concluding Section III turns to the present discrepancy—unmatched in the postwar period—between unused capacity and unemployment. Basically, we find that unused capacity in the current recovery has generally matched its earlier pattern, as has the amount of *decline* (though not the *level*) of unemployment. This suggests that unused capacity is as much as ever a relevant measure of factor market tightness. Further, the elements which have produced the present very high unemployment, it will be argued, will not disappear quickly. High unemployment, both absolutely and relative to its past relation to unused capacity, is likely to remain a feature of the economy for at least three to five years.

I. Unemployment-Capacity Relationship Over Time

Both the unemployment and unused capacity data rest on sample surveys—the first, of the civilian population, and the second, of manufacturers. Both are proximate measures of the degree of tightness in the markets for the two main factors of production. There is a strong reason why the two measures should track closely over time: capital is reproducible, and thus over long periods of time, the capital-labor ratio can be altered substantially. For example, an influx of labor could lower the wage rate as compared with the return to capital. In this case, the demand for labor by employers would rise, the demand for capital would decline, and after an adjustment period, there would be no important effect on the usage of either capital or labor (Chart 1).

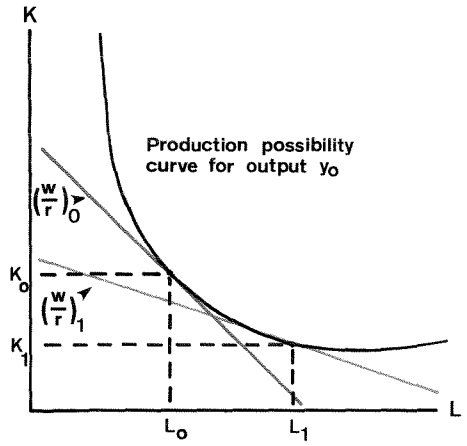
Suppose the wage rate relative to the return of the capital is $\left(\frac{w}{r}\right)_0$ with the constant-expenditure line in Chart 1 showing how a constant total cost can purchase various combinations of labor and capital. The production process itself implies a technological trade-off between added units of capital and labor, which

is labelled as the "production possibility curve" for the fixed output y_0. The point of minimum cost of production is reached where the marginal contribution of capital and labor to cost are the same: where the $(\frac{w}{r})_0$ line is tangent to the possibility curve. The least costly way of producing the output y_0 is to use an amount K_0 of capital and L_0 of labor. Now suppose the labor supply increases, initially driving unemployment up and wages down, with the cost line now at $(\frac{w}{r})_1$. Capital is now relatively less attractive than before, so manufacturers will tend to cut back on investment plans and hire more labor. Eventually we reach the new point of minimum cost, with all of the new labor absorbed (at L_1) and with less capital in use (at K_1). The result is a lower real wage, and a capital-labor ratio changed from $(\frac{K}{L})_0$ to $(\frac{K}{L})_1$, but with little effect on the long-run unemployment and unused capacity rates.

This argument applies only over substantial periods of time, both to allow for enough change in investment to alter the capital-labor ratio and to make the assumption of a flexible wage-to-profit ratio reasonable. This type of adjustment will not affect periods as short as a business cycle, for it does not pay to adjust production methods in periods as short as the typical recession. Thus both unemployment and unused capacity rise substantially in recessions, and remain high for some time after recessions end. Historically, however, the two measures have remained in close alignment despite three elements which could have changed their relationship to each other.

Chart 1

LONG-TERM CAPITAL-LABOR TRADE-OFF



First, labor force composition has changed over time, reflecting mostly an increase in female participation.[2] To the extent that different groups of workers are not good substitutes for each other in terms of skill, the composition shift may imply an increase in the observed unemployment rate associated with any given state of aggregate demand. However, we can analyze such compositional changes just as we did the relationship between capital and labor.

If one group enters the labor force in large numbers, that group's relative wage should fall, leading employers to increase hiring in that group. This should create some tendency for subgroup unemployment rates to equalize over time. We should note that subgroups of the labor force are not reproducible in the same sense that capital assets are, and that the labor market contains elements which prevent adequate short-term wage adjustment—among others, the minimum-wage law and its relationship to high unemployment among the young. These factors suggest that market adjustments among labor-force groups will be slower than between aggregate labor and capital, although market pressure should remain an important long-term force in equalizing unemployment between groups.

The second problem is that any sample survey—such as those used to develop our unemployment and unused-capacity measures—is open to some subjectivity on the part of respondents. For instance, someone who has been laid off but has stopped seeking work may perceive himself as unemployed, but may not be counted as such according to the official definition. In similar fashion, a manufacturer facing strong demand pressures may perceive his capacity as increasing because he has adopted more costly processes (like added shifts) that he would normally regard as uneconomic.

The Federal Reserve Board's capacity-utilization series—like the Bureau of Labor Statistics' unemployment series—must be regarded as an excellent example of the survey art.

Capacity utilization is a relatively ambiguous concept, and thus the Board uses two independent surveys in constructing its estimates of manufacturing capacity. One source provides data on real investment over the cycle (the Commerce Department's Bureau of Economic Analysis), and the second source provides capacity-utilization data (McGraw-Hill). The use of investment data avoids much of the subjectivity inherent in the utilization survey. For example, there is some tendency for manufacturers to report plant shutdowns during recessions as losses in capacity, when the closings are in fact temporary. The reported loss must be confirmed by a reduction in investment or increased scrappage before the Board will lower its capacity estimates and adjust the utilization data.

The BLS unemployment data are based on a monthly survey of 47,000 households, designed to measure the overall unemployment rate to within 0.2 percent. The survey includes questions to insure that respondents understand the exact meaning of the very precise BLS definitions of unemployment and labor-force participation. Consequently, any error in the survey must arise from a difference between the BLS intent—measuring the labor force—and the respondent's intent (aside from the pure sampling error in using 47,000 households to represent a labor force of nearly 100 million).

The main source of error concerning intent is probably the unemployment-insurance laws, which provide that a person who has been laid off must be looking for work (that is, must be in the labor force) to receive unemployment benefits. The law thus creates an incentive for some to *say* they are in the labor force when in fact they are not actively seeking work. Recent increases in unemployment benefits, and in the length of time benefits are paid, have probably increased the number of people in this position. (See companion article by Rose McElhattan.)

Finally, the capacity-usage figures apply by definition only to manufacturers. Manufacturing has declined fairly steadily relative to GNP over the postwar generation, reflecting the rise in government spending and in the consumption of services from 34.5 percent of GNP in 1950 to 50.1 percent in 1976. This shift may distort any relationship between unused capacity and unemployment, because the cyclicity of the shrinking portion of employment in manufacturing may differ from that of total employment.

II. Cyclical Pattern of Unemployment and Unused Capacity

To analyze the importance of these considerations in determining movements in unemployment and unused capacity, we may compare the time series of the two (Chart 2). To make the series directly comparable, the actual unused capacity series has been re-scaled with the aid of the information in Table 1.

Table 1
Unemployment and Unused Capacity in Five Post-Korea Recessions
(Percent)

	1 Mean Level 1950-76	2 Average at recession peak	3 Average at pre-recession trough	4=2-3 Average increase in recession
Unused capacity	18.1	25.2	11.4	13.8
Unemployment	5.3	7.0	4.1	2.9

The re-scaling of the data makes the unused-capacity series into a series with the same average recession run-up of 2.9 percent as the unemployment rate, as well as the same 1950-76 mean of 5.3 percent. In the chart, the average levels of unemployment and unused capacity serve as measures of normal factor usage, and their average recession increases serve as measures of the normal amount of fluctuation in the two series. It should be kept in mind that the unused-capacity series normally increases 5 percentage points—equal to (13.8/2.9)—for each 1-point increase in unemployment.

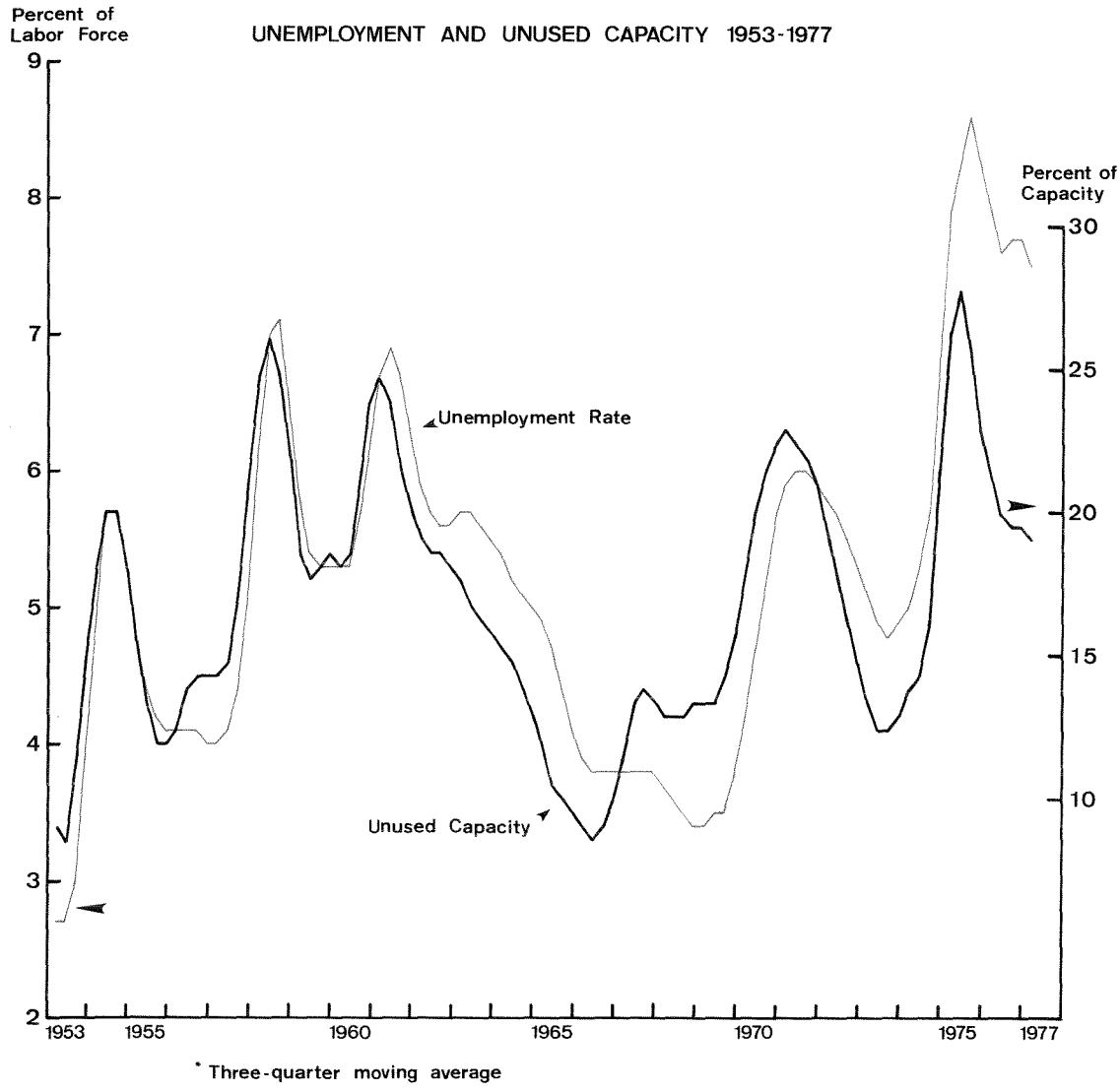
The chart data indicate, first, that the two factor-usage series told the same basic story until 1974. The two series peaked together in each recession through 1970, generally within one quarter of each other. Further, unemployment declined much more slowly than unused capacity in each post-war recovery (including the present

one), with the unused-capacity measure dropping well below unemployment by the third quarter of recovery. There is no evidence of any shift in the observed relationship between the factor markets until the 1974-76 recession-and-recovery.

A second observation is that unused capacity rises in periods of very tight labor markets (i.e., below about 4-percent unemployment). Increases occurred in 1955-56, and in 1966-67, at times of quite low unemployment. Increases in unused capacity did not occur at the recovery lows in unemployment in 1958-59 and 1972-73 when unemployment remained well above 4 percent.[3] This apparent anomaly is explained by induced investment in these periods of high demand for goods. A relatively low level of unused capacity coupled with a flat level of unemployment thus appears to be a reliable measure of great supply pressure in the economy.

A third useful observation is that a steadily growing gap has appeared between the two rates

Chart 2



* Three-quarter moving average

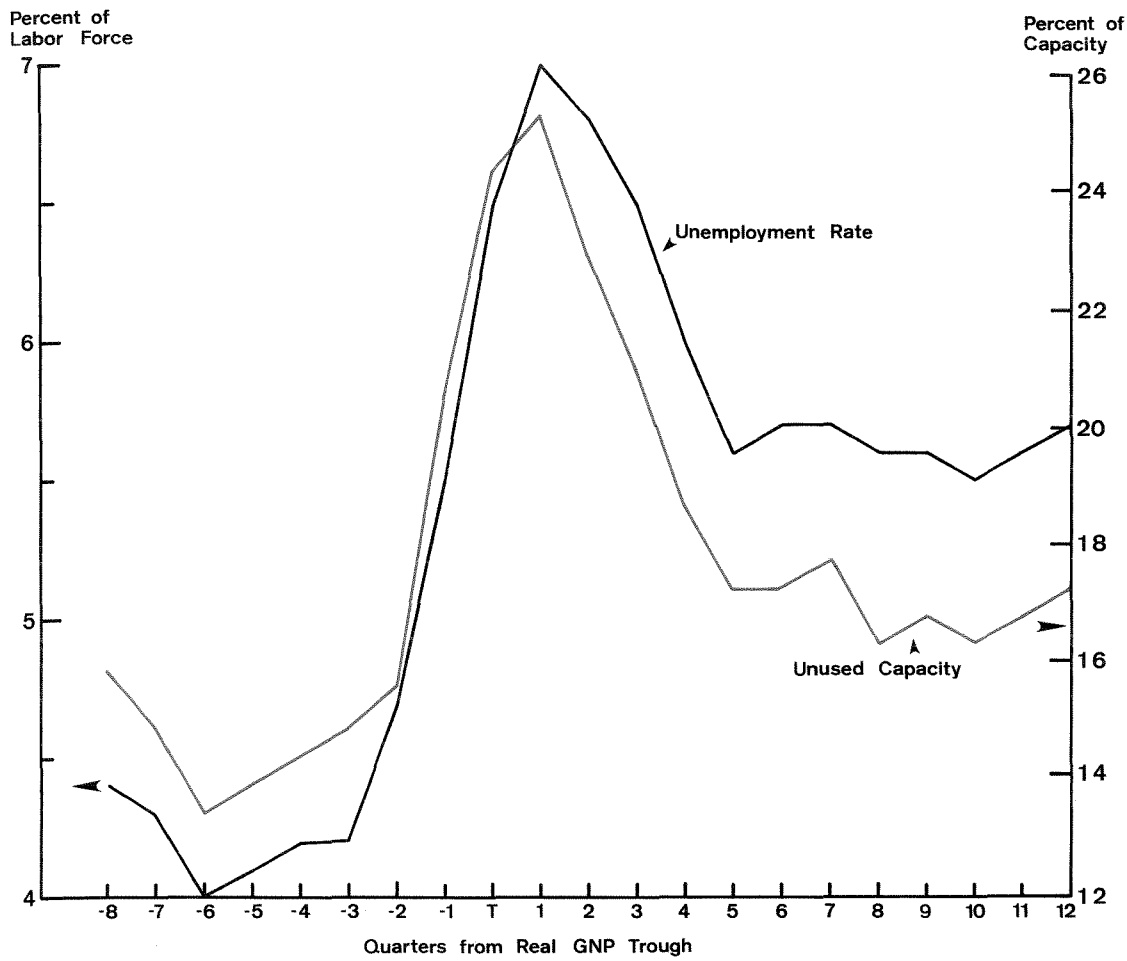
since the start of the 1974-75 recession. Only part of this can be attributed to the normally more rapid decline in unused capacity than in unemployment. This point will be discussed later in this article.

The cyclical behavior of unemployment and unused capacity in the past five cycles (Chart 3) also deserves analysis. First, unemployment and unused capacity have on average declined until the cyclical peaks were reached. Thus, the factor markets have generally failed to provide a systematic warning of the onset of recession. In effect, there is no "incipient recession" phase of the cycle, when income growth decelerates to the point of sluggish unemployment and unused capacity, but not to the point of qualifying as a recession. The unused-capacity rate provided evidence of tight supply conditions on two occasions—1955 and 1965—but recession did not follow for over two years following 1955, and for over four years following 1965.

Secondly, unused capacity tends to rise less rapidly than unemployment in recessions, but also tends to recover much more quickly, falling

Chart 3

UNEMPLOYMENT AND UNUSED CAPACITY—CYCLICAL AVERAGE*



*Five-cycle average, with troughs dated 1953.5, 1958.4, 1961.2, 1970.1, and 1975.3

to moderately low pre-recession levels by the fifth to seventh quarter after the recession trough. This suggests that unused capacity behaves very asymmetrically with respect to unemployment/unused capacity relationship probably usual recession-recovery pattern in GNP is for a sharp fall during recession (relative to its growth trend) followed by a long recovery period of growth above trend. But unused capacity falls in recovery almost as fast as it rises in recession, suggesting that early recovery consists for manufacturers of putting machines back to work before making new hires. This pattern is understandable; most machinery costs must be paid whether the machine is used or not, while most wage costs depend on the amount of labor hired.

Thirdly, and in contrast, unemployment follows the pattern set by GNP, with a rapid rise in recession and a prolonged period of slow decline thereafter. This pattern helps account for the perception many workers have of recession as lasting much longer than the official definition suggests. These workers define recession as a period of high unemployment, while statisticians define it as the preceding, much shorter, period of negative income growth.

III. Outlook for Unused Capacity and Unemployment

Since 1974, there has been a substantial increase in the unemployment rate relative to unused capacity. Because unused capacity has shown no tendency to increase over time, we may ask whether this increment in unemployment will persist for any length of time.

In Section I, we argued that reproducibility of capital helps keep the average level of unused capacity stable over time, as manufacturers adjust their investment demand to keep their capital stock in line with the long-run demand they expect for their output. A portion of any needed adjustment can be accomplished fairly quickly by cutting investment sharply. The fall in fixed investment in 1974-75 was in fact quite sharp, and investment has remained sluggish since, thus accounting for the "normal" behavior of unused capacity despite the continuing low level of income relative to past trends.

The labor force does not have the same kind of self-adjusting capacity, so the severity of the 1974-75 recession has left us with substantial unemployment two full years after the recession trough. However, the amount of *decline* in unemployment we have experienced—from a high of 8.8 percent in 1975.2 to 7.4 percent in 1977.1—is closely in line with the decline in earlier recessions.[4] With unused capacity showing normal cyclical behavior, we may expect that with a continuing recovery, unused capacity by mid-1978 will reach a low level while unemployment is still in the neighborhood of 6½ percent.

There are two scenarios as to what may happen after mid-1978. The first is a period of long-term adjustment of the capital-labor ratio, as illustrated in Chart 1, and thus a return to a more typical unemployment/unused capacity relation. In the past, this scenario has required a shift to an investment-led recovery in output, so the appearance of strong investment growth would be a key that this scenario is being followed. The alternative possibility would be a recession after mid-1978, and a postponement of the adjustment until the succeeding recovery. There would be no reduction in unemployment relative to unused capacity.

The first scenario has been typical of recoveries with low unused capacity, as we expect in mid-1978. We may examine the two earlier periods when quite low levels of unused capacity were reached well before the trough in unemployment. These periods were in 1955 and 1965.[5] Both periods were part of long recoveries (1954-57 and 1961-69) and the low points in unused capacity were accompanied by substantial increases in investment. In both cases, unused capacity rose significantly (about 2 percent) in the year following the low point and remained at that new plateau until the cyclical peak in real income was reached. Also in both cases, unemployment continued to decline, though rather slowly, right up to the income peaks, which were marked by unemployment rates below 4 percent. Thus both periods marked long-run adjustments in the capital-labor ratio.

In the past, then, low unused capacity in mid-

recovery has not been a barrier to further expansion of output or to further reductions in unemployment. Should these events recur—especially the shift to an investment-led recovery—the more typical relationship of unemployment to unused capacity could be restored for the period after mid-1978.

It should be emphasized that this scenario is not inevitable, because it relies on a continuation of the economic recovery through 1978, and especially on greater investment growth. The shorter two of the four most recent recoveries (1958-60 and 1971-73) each ended without a long period of low unused capacity, and thus without a long period of high investment. Both ended with unemployment quite high by the standards of the other two recoveries. Should this kind of truncated recovery occur, the "normal" unemployment/unused capacity relationship probably would not be restored until well into the following recovery, that is, some time after 1980. Neither scenario, in any event, suggests the possibility of a return to historically low levels of unemployment for some time.

FOOTNOTES

1. To measure unused capacity, we subtract the published capacity-utilization rate from 100. Thus, a rise in unused capacity accompanies a **rise** in unemployment.
2. This aspect of the labor data is examined by Rose McElhattan elsewhere in this **Review.**
3. Strikes generally appear as one-quarter "blips" in both unemployment and capacity, and so barely affect the moving averages in Chart 1. The largest single post-Korea strike—the 1959 steel strike—affects our conclusion only moderately.
4. Okun's Law, the econometric rule-of-thumb relating changes in unemployment to growth in income, exactly predicts the 1.4-percentage point decline which has actually occurred. This indicates that changes in unemployment are still closely tied to changes in real income.
5. The war in Vietnam tended to limit the number of new entrants into the labor force in the 1965 period. However, the relatively small size of that war (as compared with Korea) makes it hard to adjust for that data.