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CONTENTS

The Effects of the New Energy Regime on Economic Capacity, Production, and Prices 2

The Growing Link Between the Federal Government and State and Local Government Financing 13

So What, It's Only a Five Percent Inflation 21

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The Effects of the New Energy Regime on Economic Capacity, Production, and Prices

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THE quadrupling of OPEC oil prices in late 1973 and early 1974 had a profound and permanent impact on the U.S. economy. The initial impact was an explosion in the prices of most goods and services, as well as the longest and most severe decline in national output since the 1930s. The recession trough occurred over two years ago and the rate of inflation has fallen substantially since 1974. While the inflation rate remains quite high by historical standards, the primary focus of concern, at least in official circles, seems to have shifted toward the persistence of an unacceptably high unemployment rate and the associated loss of national output. More importantly, the mounting concern over the immediate problem posed by unemployment seems to have obscured the permanent effect of the energy price revision.

The large increase in the price of energy in 1974 permanently reduced economic capacity, or the potential output of the U.S. economy, by four to five percent. The productivity of existing capital and labor resources was sharply reduced. Policy discussions which fail to account for the permanence of these changes, especially in the face of persistent unemployment, contribute to an overstatement of the benefits to be obtained from a conventional policy of aggregate demand stimulus.

In order to clarify the gains which may be expected from a stimulative economic policy and the accompanying inflation risks, it is useful to examine the impact of the energy price revision on prices, production and employment.[1] To facilitate this discussion, we will first develop the concept of a firm's capacity output. This concept allows for analysis of the effects of a change in the price of energy on a firm's cost structure, capacity output, employment, and product price using a standard microeconomic model of the firm. Such an analysis is basic to an understanding of potential output and the transitional and permanent impacts of the OPEC price actions since 1973.

Microeconomics and Capacity Output

The notion of economic capacity is fundamentally a short-run concept. There is no limit to the output a firm could produce efficiently if it could command sufficient amounts of each of the resources it employs. From a long-run perspective, an efficient firm would tend to use more of each of the resources it employs to produce at a higher output rate. However, some resources are, as a practical matter, fixed or given for some period into the future. This fixed nature of some resources characterizes the short run. For any amount of fixed resources only one output rate can be produced using an efficient long-run method. This output rate is the economic capacity of the firm. Firms have a cost-saving incentive to produce at capacity output or to have an amount of fixed resources that allow the production of their desired output at the lowest cost possible.

The concept of a firm's capacity may be seen more clearly by looking at the cost structure of the hypothetical firm of economic theory.[2] The cost structure is derived from the "production function" of the firm and the prices of resources used by the firm, such as labor, capital and energy. A production function defines the maximum output attainable given the

[1]Most of the discussion of the economic impact of the OPEC action has focused upon its effects upon aggregate demand. However, several recent studies have indicated that the nation's excess capacity may not be as large as some data shows. Among these studies are: Denis S. Karnosky, "The Link Between Money and Prices — 1971-76," this *Review* (June 1976), pp. 17-23; A. Nicholas Filipello, "A Question of Capacity," *Business and Government Outlook* (Fall 1976), pp. 1-3; and Barry Bosworth, "Capacity Creation in Basic-Materials Industries," *Brookings Papers on Economic Activity* (2:1976), pp. 297-341. A contrary view is presented by Albert J. Eckstein and Dale M. Heien, "Estimating Potential Output for the U. S. Economy In a Model Framework," *Achieving The Goals of the Employment Act of 1946 — Thirtieth Anniversary Review*, U.S. Congress, Joint Economic Committee, 94th Cong., 2nd sess., December 3, 1976, pp. 1-25.

[2]Such a cost structure is more fully discussed in the microeconomic section of most principles of economics texts. A thorough development of the cost structure of the firm may also be found in C. E. Ferguson and S. Charles Maurice, *Economic Analysis*, rev. ed. (Homewood, Illinois: Richard D. Irwin, Inc., 1974), Chapters 6 and 7, pp. 161-232. The best discussion and argument for the concept of economic capacity used here is that by George Stigler, *The Theory of Price*, 3rd ed. (New York: The Macmillan Company, 1966), pp. 156-58.

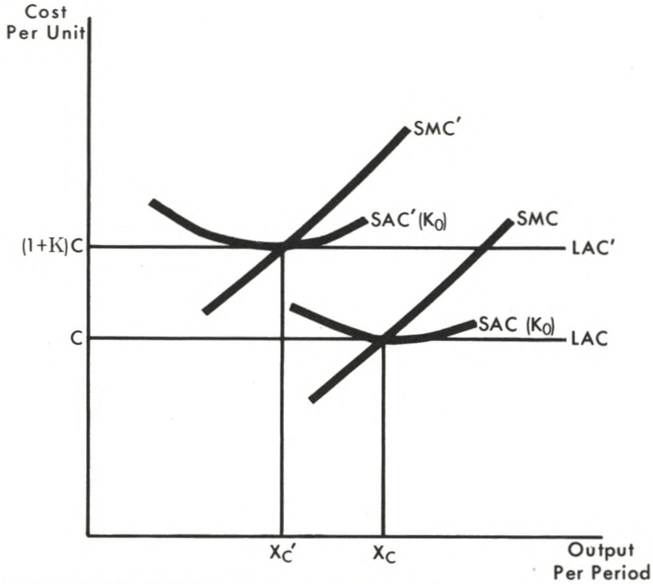
state of technology, for any set of resources.[3] For each rate of output, technology and the prices of resources dictate the lowest cost method or combination of resources required.

Figure I shows the relevant long-run and short-run cost structure of the firm. In the long run, when the firm is free to change the employment of *all* resources, the unit cost or long-run average cost (LAC) of any output rate is constant.[4] Given the price of each resource, the firm can choose the method of producing any output rate at the lowest total resource cost or unit cost (C in Figure I). Any other output rate could be produced by varying proportionately each of the resources used with the lowest cost method. Since total resources cost is also proportionate to resource employment, unit cost (C) is independent of output. In the long run, the cost of producing an additional unit of output, the marginal cost, is the same as the average cost of a unit of output.

For any amount of fixed resources, the output rate which can be produced with the minimum long-run cost method is capacity output. In the short run, any output, other than capacity, will require a higher cost method of production than that indicated by the long-run average cost. Thus, for any level of capital which is fixed in the short run, the short-run average cost of output, SAC, is above the long-run average cost curve, except at the capacity output level.[5] Of course, the larger is the amount of capital the firm has, the larger is its capacity output. In the short-run, higher cost methods are required to obtain additional output since only variable resources may be increased. As output expands, each unit of a variable resource has less of the fixed resource with which to work so the productivity of variable resources declines. Correspondingly, the cost of additional output, the short-run marginal cost (SMC), rises as the output rate expands. This cost is only the same as the long-run marginal cost at the output which uses the optimal long-run method of production, or capacity output.

Figure I

A Firm's Cost Structure and the Effect of a Higher Variable Resource Price



The cost structure is a major factor in the output decision of a firm. For example, consider the profit maximizing competitive firm which is a "price-taker," able to sell as much as it chooses at a given market price. For such a firm, the relevant short-run supply curve is the SMC curve in Figure I. For any given market price, the firm maximizes profit by producing the output rate where marginal cost, SMC, equals price.[6] The cost structure is important in the long-run as well. The firm will not continue operating in an industry where losses (the inability to cover the cost of using capital, labor, and energy resources) are incurred. The minimum long-run supply price is (C) in Figure I. Moreover, if the firm earns economic profit in the short run, it has an incentive to expand its capital and capacity output. In addition, the existence of economic profit attracts new firms into the industry. As output expands, the product price tends to fall to induce customers to buy the larger output.

[3]The production function is based upon technical efficiency. The more popular notion of capacity, the maximum output attainable for a given set of resources is, by definition, included in the production function and does not depend upon resource prices.

[4]The production process, for simplicity, is assumed to be characterized by "constant returns to scale," or proportionate changes in the use of each resource (change in scale) will allow output to be changed proportionately.

[5]The SAC curve is U-shaped. At low rates of output, the major component of cost is the cost of the fixed resources. As output expands, the firm "spreads its overhead" over more units producing a larger output at a lower unit cost. As output is expanded beyond the capacity level, the unit cost of variable resources becomes an increasing share of unit cost and the cost effect of using higher cost (lower productivity) methods of production is dominant and raises the unit cost.

[6]Technically, the short-run supply curve is only defined above the minimum level of unit expenditures on variable resources. If the market price were below this level, there would be no output at which the firm could cover the cost of its variable resources. The profit-seeking firm would shut down, restricting losses to the cost of the fixed resources. Note also that if the market price equals (C) in Figure I, the firm maximizes profit by producing the capacity output rate. While the firm "breaks even" there, it earns a competitive rate of return on its capital since this return is included in the unit fixed cost and SAC.

The product price will tend to fall to (C) where the long-run incentive to expand capital and capacity output is eliminated.[7]

The Determinants of Capacity Output

Capacity output is determined by the stock of capital which a firm has, and its long-run average cost. The latter, in turn, depends upon the market price of each resource employed and technology. Changes in either resource prices or technology will change the economically efficient means or production in the long run and shifts the long-run average cost curve. Moreover, such changes, except for a change in the price of the fixed resource, will shift the firm's short-run supply.[8]

The effect of a one percent increase in the price of a variable resource on the cost structure and capacity output of a firm is also shown in Figure I. An increase in the price of a resource raises the long-run average cost and supply price of output. The extent of the rise in long-run average cost depends upon the share in total cost of the resource whose price has increased. A change in the price of a resource whose cost is a very minor proportion of total output cost will have very little impact on unit cost, as compared to a resource whose cost is a major share of unit cost.

In particular, each one percentage point rise in the price of a resource will add K percent to the long-run average cost, where K is the share of this resource in total cost.[9] For example, a one percent increase in the market wage rate of workers in a firm where labor costs account for half of total costs will tend to raise the long-run unit cost by one-half of one percent.

The short-run supply decision also is affected by an increase in the price of a variable resource. An increase in the price of a variable resource raises the cost of the resources necessary to produce more output. Thus, the short-run marginal cost of output also increases. Moreover, it increases more than short-run average cost.[10] If there is more than one variable resource, changes in the mix of variable resources affect the size of the upward shift in each cost and the result is more difficult to specify. However, when the resource whose price increases is a "substitute" for capital in the production process the analysis of the simple case and the results depicted in Figure I hold.[11] The percentage reduction in a firm's capacity output is identical to the percentage rise in its long-run average cost. At the new capacity output, the firm possesses its optimal amount of capital, given the new set of resource prices, and it employs exactly the capital and labor which were efficient before the rise in the price of energy. Only energy employment declines as capacity output declines.[12]

The effect of a rise in the price of a variable resource such as energy is to reduce capacity output and raise the long-run supply price, the changes being greater, the greater is the share of energy in the total cost of each product. Products which rely more heavily upon energy have larger losses in capacity output and their long-run price is increased relatively more than that of other goods.

Estimates of the Change in Manufacturing Capacity as a Result of the 1973-74 Change in Energy Prices

The discussion above suggests that an estimate of the capacity loss in U.S. manufacturing due to the

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[7]The concept of capacity is not restricted in its relevance to the cases of competitive firms having constant-returns-to-scale production processes. For any market structure and regardless of returns to scale, any firm has a cost-saving incentive to manage capital resources so that production of any desired output occurs at capacity.

[8]Since we are primarily concerned with the effect of changes in resource prices on capacity, the analysis of technological change is not pursued here.

[9]A rise in the price of capital increases capacity output. Fixed costs do not affect the marginal cost of output in the short run. Since average cost, both short- and long-run, rise, capacity rises to the output level where long-run average cost intersects the initial short-run marginal cost curve.

[10]A simple example illustrates why this is the case. Suppose labor is the only variable resource in the short run. A given percentage increase in the wage rate will proportionately increase the cost of both the labor currently employed per unit of output, and the labor necessary to produce an additional unit of output, the marginal cost. Since the fixed cost of output is unchanged, the unit cost of any level of output rises less than the percentage increase in labor costs. If each firm initially operated at capacity output, the marginal cost rises more than short-run average cost at that output, and capacity output declines.

[11]A resource is a "substitute" for capital, if efficient production of some output requires that a rise in the price of the resource lowers the optimal employment ratio of the resource to capital. For example, energy and capital are substitutes if a rise in the price of energy relative to that of capital services causes the efficient firm to lower its employment of energy per unit of capital services to produce a given rate of output.

[12]The results in this paragraph are derived in our unpublished paper, "Firm Capacity and Factor Price Changes." The conclusions require that production is characterized by a "partial elasticity of substitution" between energy and capital and between energy and labor equal to one. This means an X percent rise in the price of energy relative to the price of capital (or labor) causes least-cost production of any output to require X percent less energy relative to capital (or labor) employment. This appears to be an accurate characterization for production in nine industrial nations, including the United States. See J. M. Griffin and P. R. Gregory, "An Intercountry Translog Model of Energy Substitution Responses," *The American Economic Review* (December 1976), pp. 845-57.

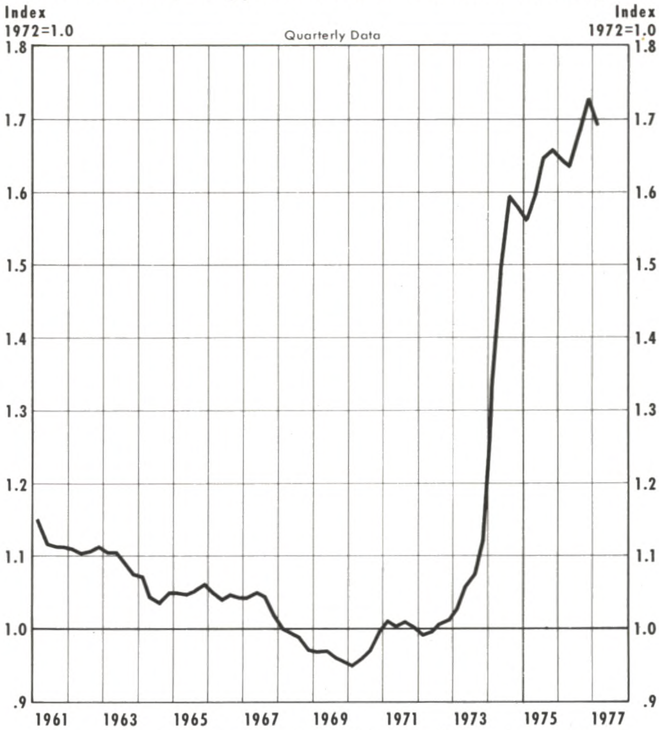
sharp increase in the price of energy could be obtained if measures were available on the change in capacity by industries. The discussion of the microeconomics of capacity indicates that information would be required on parameters of the production functions of these industries, and on the size of expenditures on energy by industry, as well as a measure of the increase in energy prices over the period. Unfortunately, no complete set of estimates of the relevant production function parameters by industry exists.

An alternative is to consider estimates of the production function parameters for the aggregate of all manufacturing. A recently published study, which overcomes a number of statistical problems inherent in previously published estimates, provides estimates of the required information concerning the aggregate production function for manufacturing in nine industrial countries, including the United States.[13] This study supports the conclusion above that the percentage response of capacity output to a one percent change in the price of energy is just equal to the share of energy costs in total factor costs. The study suggests that this cost share was quite stable throughout the 1960s at around twelve percent of total factor costs. Thus, an unexpected ten percent increase in energy costs, given wages and the capital stock, should produce approximately a 1.2 percent decrease in capacity of the U.S. manufacturing sector.

The behavior of the price of energy relative to the price of output is presented in Chart I, where a relative price index has been constructed by dividing the wholesale price index for fuels, related products, and power by the deflator for private business output, adjusted to a basis of 1972 = 1.0. As can be seen from the Chart, this relative price series trends downward through the 1960s, is fairly stable from 1968 through 1972, rises sharply from the fourth quarter of 1973 through the third quarter of 1974, and then becomes relatively stable around a value of 1.6 until mid-1976. The wholesale price of energy increased 45.3 percent from the fourth quarter of 1973 through October 1974. This increase, multiplied by a cost share of 0.12 suggests a loss in manufacturing capacity of about 5.4 percent.

Chart I

The Price of Energy Relative to the Price of Output*



Sources: U.S. Department of Labor and U.S. Department of Commerce

*The Wholesale Price Index of fuels, power and related products divided by the Implicit Price Deflator for the private sector.

Latest data plotted: 1st quarter 1977 preliminary

Energy prices were not the only factor prices which were observed to rise during this period. Over the period (IV/1973 through III/1974), actual hourly compensation rose by 7.9 percent. According to the Griffin and Gregory estimates, an increase of labor costs of this magnitude in the manufacturing sector of the U.S. economy should have reduced capacity by an additional 0.4 percent. In total, the change in economic capacity as a result of changes in factor prices over this period of time can be estimated to be on the order of five percent.[14]

It is generally accepted that the U.S. economy was operating at effective capacity during the latter half of 1973. The important question is where did the economy operate relative to its new, lower, economic capacity in the latter part of 1974. Employment in

[13]See J. M. Griffin and P. R. Gregory, "An Intercountry Translog Model of Energy Substitution Responses." They conclude that production can be considered to be of the Cobb-Douglas form in the energy resource. Their estimates are constructed under the assumption of constant returns to scale. Under these conditions, the partial elasticities of substitution between capital and energy and between labor and energy are both equal to one, as required in the analysis in the previous section.

[14]The sum of the effects from energy price changes and wage changes is 5.8 percent. This estimate implicitly assumes that the price of capital services remained unchanged over this period. Alternatively, it could be assumed that the price of capital services rose proportionally to the increase in wages. Such an increase would offset (see footnote 9) the computed reduction in capacity by 1.4 percent, for a net reduction of 4.5 percent. The five percent reduction chosen above represents a midpoint of this range.

manufacturing declined by 1.8 percent from the fourth quarter of 1973 through October 1974. Over the same period, the average work week (of production workers) in manufacturing declined by 1.5 percent for a reduction in total hours per week of about three percent. The Griffin-Gregory estimates suggest that the reduction in capacity of the order of magnitude suggested above should have been accompanied by a zero to 1.5 percent reduction in employment. Given the statistical error associated with the production function estimates, the data on the behavior of employment over this period appear to be roughly consistent with a movement from one point of full capacity utilization to a second point of full capacity utilization.

The Federal Reserve Board's Index of Manufacturing Capacity Utilization was 87.8 and 87.7 percent in the last two quarters of 1973, respectively. By October 1974, the month immediately prior to the sharp drop in industrial production and the sharp rise in unemployment which characterized the rest of the 1973-75 recession, this index had fallen to 83.4 percent. If this index does not capture the impact of changes in relative factor prices, and if the economy was operating at full economic capacity in October 1974, then the index should understate capacity utilization by the amount of the capacity loss. The decline of the index to this point in time is 5.1 percent which is the same order of magnitude as suggested by the Griffin-Gregory production function estimates.

The Effect of Energy Price Changes on Measures of Capacity Utilization

A crucial question is whether or not the conventional capacity utilization indices measure the impact of a change in relative factor prices. There is no question that the Wharton Index fails to measure such effects, since it measures capacity by extrapolating peak-output to peak-output trends.[15] The Federal Reserve Board Index is constructed by utilizing data from periodic surveys on capacity utilization such as the McGraw Hill capacity survey and interpolating using the behavior of the Federal Reserve Industrial Production index for manufacturing. As a result the Federal Reserve capacity utilization index has two general properties: (1) the cyclical movements approximate those of the industrial production index, with the growth trend removed; and (2) the average utilization rates over time and the long-term movement in such rates are determined by the estimates of utilization rates as reported in the various surveys.[16] The important question is, therefore, whether the survey data would pick up the change in the utilization of economic capacity.

The concept of capacity which the surveys attempt to measure has been labeled "maximum practical capacity."[17] This approach seems to ask how much *could* be produced with existing facilities if they were run under normal "full-time" operating conditions. It does not seem to ask whether such a level of operations would be efficient given existing factor prices. This interpretation is reinforced by the testimony of Mr. Douglas Greenwald of McGraw Hill before the Joint Economic Committee. In discussing the notion of capacity in the McGraw Hill Surveys he stated:

> Thus it was decided to let companies set their own definitions of capacity, and we only asked that the respondents stick to their definitions. This, of course, leaves open such questions as number of shifts of operations, treatment of low grade, standby capacity, and final assembly versus intermediate capacity. But, in general, companies follow a commonsense definition of capacity, *such as maximum output under normal work conditions*.[18]

The authors of the description of the recent revision of the Federal Reserve Board (FRB) capacity utilization index appear to agree that the concept of capacity measured by the survey data does not capture the effects of changes in relative factor prices: "This version of capacity (maximum practical capacity) is similar to our prior notion of engineering capacity in that no explicit recognition is given to the effects of changing price relation over the cycle."[19] Thus, it would appear that the measured indices would not capture the impact of changes in economic capacity as defined above, and that the measured utilization indices would underestimate utilization by the amount

[15]A description of this series may be found in F. Gerard Adams and Robert Summers, "The Wharton Indexes of Capacity Utilization: A Ten Year Perspective," *Proceedings of the Business and Economic Statistics Section*, 1973 (Washington, D.C.: American Statistical Association, 1974), pp. 67-72.

[16]Federal Reserve *Bulletin* (November 1976), p. 894.

[17]See *Survey of Current Business* (July 1974), pp. 54-5. This measure is defined as the maximum output which could be produced using existing facilities while at the same time "following the company's usual operating practices with respect to the use of productive facilities, overtime, work shifts, holidays, etc.," and assuming "product mix at capacity which is most nearly similar to the composition of your actual output." Ibid, p. 50.

[18]U.S. Congress, Joint Economic Committee, Subcommittee on Economic Statistics, *Measures of Productive Capacity,* 79th Cong., 2nd sess., May 14, 1962, p. 4.

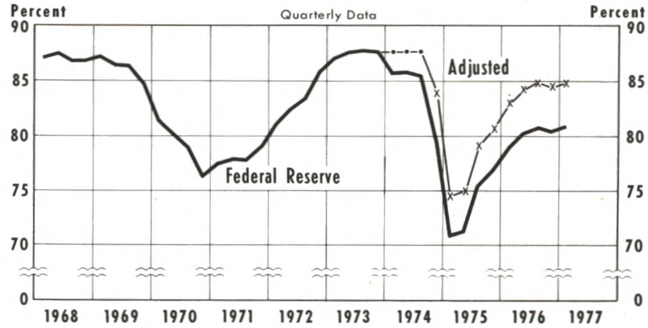
[19]L. Forest and R. Raddock, "Federal Reserve Measures of Capacity Utilization," unpublished memorandum, (Washington, D.C.: Division of Research and Statistics, Board of Governors of the Federal Reserve System, 1977), p. 13.

of the factor price effect.[20] Adjusting the Federal Reserve Board index for October 1974 up by five percent gives an estimated utilization rate of 87.6 percent, essentially the same as in the fourth quarter of 1973.

Two strategies could be adopted for adjusting the published figures since the end of 1974. It could be assumed that the survey respondents gradually adjust their concept of "normal operating conditions" over time. In the near term it seems unlikely that this would happen. First, the emphasis in the survey construction is on historical conditions in the particular industry. Second, the emphasis is on inertia: respondents should choose whatever definition of normal operating conditions they wish, but then they should "stick to that definition." Over a longer period of time, some reduction in the bias of the measured index will take place as the capital which suffered the capacity loss depreciates, and is replaced by new capital. Chart II is constructed assuming a constant downward adjustment in capacity as measured by the Federal Reserve Board equal to five percent of the capacity measure for October 1974. The revised capacity measure is divided into the industrial production index to give the adjusted index of capacity utilization plotted in the figure. It is difficult to know how to handle the first three quarters of 1974, since the relative price of energy was changing rapidly during this period of time, and since the published index of capacity utilization is based on interpolations between the survey dates. For lack of a better alternative, we show the utilization rate as constant over these quarters.

Chart II

Capacity Utilization Rate



Latest data plotted: 1st quarter 1977 preliminary

firms and, hence, would alter capacity. The computation of aggregate capacity requires the summation of the capacity estimates of all individual firms based on the factor prices which would actually be realized if all of the firms operated at their capacity level.[21]

Aggregate Capacity, Potential Output, and Supply

Construction of an aggregate or economy-wide measure of capacity is not, in general, a straightforward adding of the capacity measures of the individual firms. The attempt by all firms to move to operations at their computed capacity levels, may cause changes in factor prices. Such changes in factor prices would shift all of the cost curves of the individual

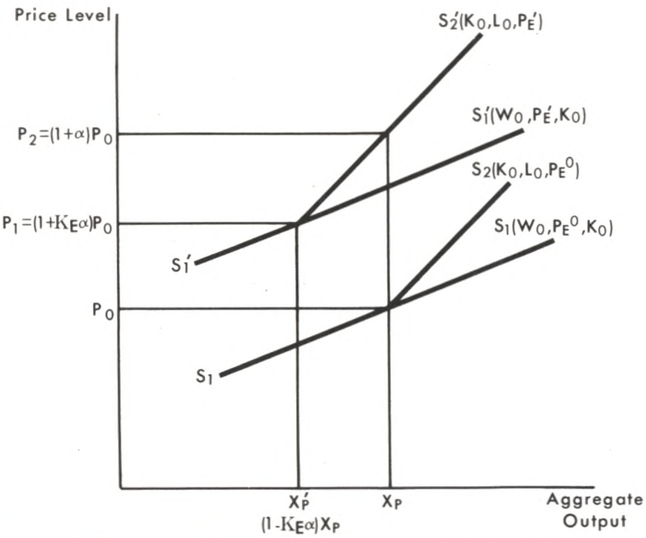
Nevertheless, the aggregative problems may be partially avoided and the effects of an energy price change on United States production can be analyzed, by proceeding in stepwise fashion. Assume that aggregate output is produced by firms like the hypothetical firm described above. Energy prices are, since late 1973, determined on a world market, so it can be assumed that the United States faces a perfectly elastic supply curve for this resource.[22] Finally, assume the labor supply curve of the traditional textbook Keynesian model, namely that the aggregate labor supply is perfectly elastic at a given nominal wage rate, at least up to some "full-employment" quantity. Under these circumstances the aggregation problem discussed above is avoided, and the appropriate measure of aggregate economic capacity in the model is the summation of the economic capacity of the individual firms. Aggregate capacity is only one point of the short-run aggregate supply curve of the economy. Under the assumed conditions regarding factor markets, it is possible to construct an aggregate supply curve such as S_1S_1 in Figure II, for the entire economy by summing the relevant portions of the

[20]The recent revisions in the FRB index might be cited as evidence that this index captures some or most of the permanent loss in capacity because of the change in the relative price structure. An examination of the relationship between the FRB index and the Wharton index before and since 1974 fails to provide any strong support for such a hypothesis. The annual FRB capacity utilization index was regressed on the annual Wharton capacity utilization index from 1951 through 1973. Linear and log-linear specifications were constructed in level and first difference forms. When any of these specifications is used to simulate the FRB index from 1974 through 1976, the prediction errors are less than one standard error from the actual value of the index in all three years.

[21]This problem is discussed by Lawrence R. Klein, "Some Theoretical Issues in the Measurement of Capacity," *Econometrica* (April 1960), pp. 272-86.

[22]This is the traditional small-country assumption frequently found in the international trade literature. In this particular market, it appears to be an appropriate description of behavior over the past few years. Initially we shall assume that the *nominal price* of energy is given; in the next section this assumption is altered to more accurately reflect the recent situation where the *relative price* of energy is determined abroad.

Figure II
Aggregate Supply Under Alternative Nominal Energy Prices
$[P_E' = (1+\alpha)P_E^0]$



short-run marginal cost curves across all firms.[23] Thus, along S_1S_1, nominal wages, W_o, the nominal energy price, P_E^o, and the stock of capital, K_o, are held constant.

An important constraint, for the aggregate economy, remains to be taken into account. The economy is only a price taker in the labor market up to the existing supply of labor or "full employment." Attempts to expand output beyond that produced with full utilization of capital and labor, result in higher wages and prices with little or no impact on aggregate production. This level of output is generally referred to as "potential output." It has become common to consider the aggregate supply curve being vertical at potential output. Such a vertical segment would occur along S_1S_1 in Figure II at the output X_p.

In the context of the discussion here, the appropriate supply curve, once full utilization of labor is reached, is not vertical. While attempts to expand output beyond X_p result in higher wages and prices, with no additional labor or capital entering production, the economy is free to expand its employment of energy. Given a nominal market price of energy, higher output prices can lead to increased output through the use of more energy intensive operations. The aggregate supply curve beyond X_p will be steep but not vertical, as along S_2 in Figure II.

Suppose that initially every firm is producing its capacity output and the economy fully utilizes capital and labor, producing output X_p in Figure II at its corresponding price level at the kink in the supply curve S_1S_2. An α percent rise in the nominal price of energy, P_E, will shift the aggregate supply curve. The shift in the S_1 segment of the aggregate supply curve may be found by the same reasoning as applied to the firm supply curve. The relevant parameter is the share of energy, K_E, in the total factor cost of aggregate output. Capacity output falls initially by K_E percent for each percentage point increase in P_E, to X_p' in Figure II. Moreover, as in the case of the firm, capital and labor employment will be the same at X_p' as at X_p, and the price level of this output will rise by a percentage equal to the factor share, K_E, for each percentage point rise in P_E. The reduction in output is associated with a reduction in energy usage. Since both capital and labor would be fully utilized at output X_p', the kink in the new aggregate supply, $S_1'S_2'$, occurs at that output.

It should be noted that output X_p could still be produced and would be, if the price of output were sufficiently higher, at P_2. If the output price and other resource prices rise by precisely the percentage increase in the nominal price of energy, firms would be willing and able to produce exactly their original output, X_p, utilizing the original methods of production.

An analysis of how this may come about is shown in Figure III. As the supply curve shifts and the price level rises above P_o, less output will be demanded. Policymakers may take actions such as monetary expansion to maintain real output at X_p, by shifting aggregate demand. While full employment would exist at output X_p', policymakers might face pressures to expand demand since output and the real return to capital and labor owners will have fallen at price level P_1.

As the level of prices rises to P_2, increased competition for fixed capital and labor resources raises their nominal prices and shifts the S_1' curve to S_1''. The higher price of output and other resources reduces the relative price of energy, providing an incentive to adjust energy employment back toward its original

[23]Changes in one of the two variable factor prices still pose aggregation problems. The results for the firm indicate that an increase in the price of energy would reduce capacity output and raise the long-run supply price of a product more, the more important (as measured by the cost share) energy is to production. Hence, relative commodity prices will be affected in both the short run and long run due to the higher energy price. We may abstract from the interindustry changes in relative prices and focus on potential output and capacity changes by considering the aggregate production function implicit in discussions of potential output.

Figure III
Demand Management and a Higher Nominal Energy Price

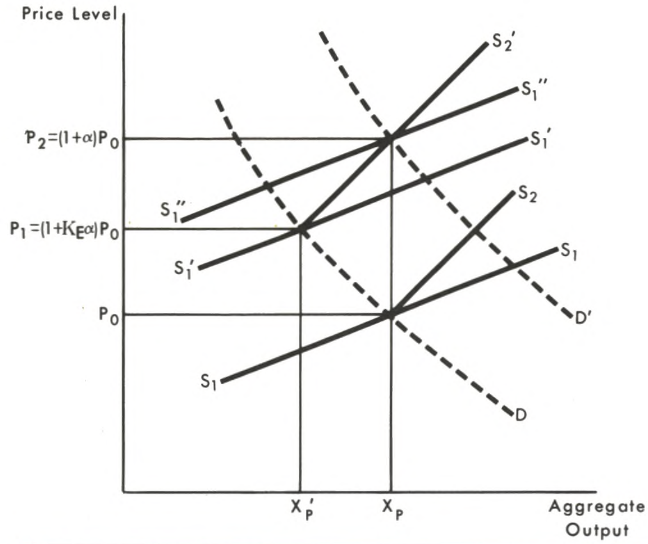
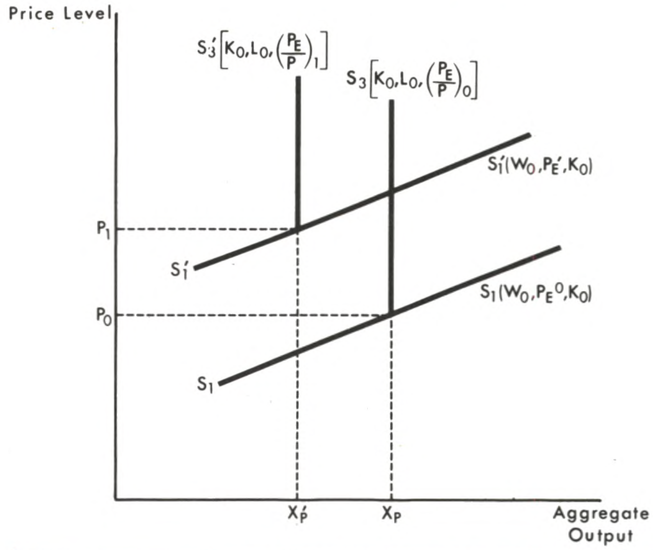


Figure IV
Aggregate Supply and the Effect of a Higher Relative Price of Energy



rate of usage. Thus, to maintain real output at its original level, commodity and factor prices must rise by the same percentage as the increased energy cost to restore all relative prices to their original values. The two essential ingredients of this result are the accommodative expansive demand management policy and the fixed and higher *nominal* price of energy in world markets.

OPEC and Aggregate Output in the United States

The relative price of energy presented in Chart I indicates a large jump in late 1973 and 1974 which has not been eroded by demand growth and increases in the price level. In the analysis above, the relative price of energy initially rises, but the accommodative demand management policy is able to effectively erode the gain to energy producers through inflation. The *relative* price of energy is restored to its original level.

The pricing actions of OPEC apparently were not intended to be so easily frustrated. The relevant price which OPEC is able to dictate as the dominant energy producer is the price of energy relative to that of output. Attempts by U.S. firms to move along the S_2' curve in Figure III are frustrated by further increases in the nominal price of energy. The appropriate aggregate restriction on the supply curve S_1 (or S_1') is not that indicated by S_2 (or S_2'). Instead, after the institutional change imposed on the world energy market, the appropriate restriction is a given *relative* price of energy. Given this relative price and an existing amount of capital, full utilization of labor occurs at a price level where labor costs relative to output prices warrant hiring all the labor available. Increases in output prices, beyond this point, result in no incentive to expand energy employment and merely bid up the nominal prices of the fully employed labor, capital, and energy. Such a supply restriction implies the vertical segment of the aggregate supply curve discussed earlier. In Figure IV, this supply restriction is depicted as S_3 at the capacity output level, X_p. The aggregate supply curve is S_1S_3.

An increase in the nominal price of energy raises the S_1S_1 segment of aggregate supply in precisely the same manner and amount as in Figure II. Again, at output X_p' and price level P_1, there is the same utilization of capital and labor as at X_p. However, in this case, the new relative price of energy shifts the vertical segment of the aggregate curve to S_3'. *Thus, there is no price level at which the economy may produce its original level of potential output.* Both capacity output and potential output fall to X_p'. If excess demand exists at P_1, or if policymakers create an excess demand at price P_1 through expansionary policy, nothing happens to aggregate output. In such situations, the price level will simply rise inducing employers to bid up nominal resource prices for the fully-employed capital and labor resources as well as the dollar prices of energy.

The increased relative price of energy, according to this analysis, caused a *permanently* higher level of prices and *permanent* reduction in potential output, as well as reducing firms' capacity output and altering relative commodity prices. These effects occur independently of changes in the level of employment of labor and capital and may not be offset by demand management policies. The only way to recover the loss in potential output and capacity would be the restoration of the prior relative price of energy.[24]

The Loss of Potential Output in 1974 and the Economic Outlook

Data on potential output, recently constructed by the Council of Economic Advisers (CEA), indicate that the economy was operating essentially at its potential in late 1973. Table I shows potential output and actual real GNP (1972 dollars) since IV/1973. From IV/1973 to IV/1974, real output fell 4.1 percent (about $51 billion) while potential GNP was estimated to rise 3.5 percent or about $44 billion. Thus, in the fourth quarter of 1974, there is an estimated "gap" of $96.7 billion.

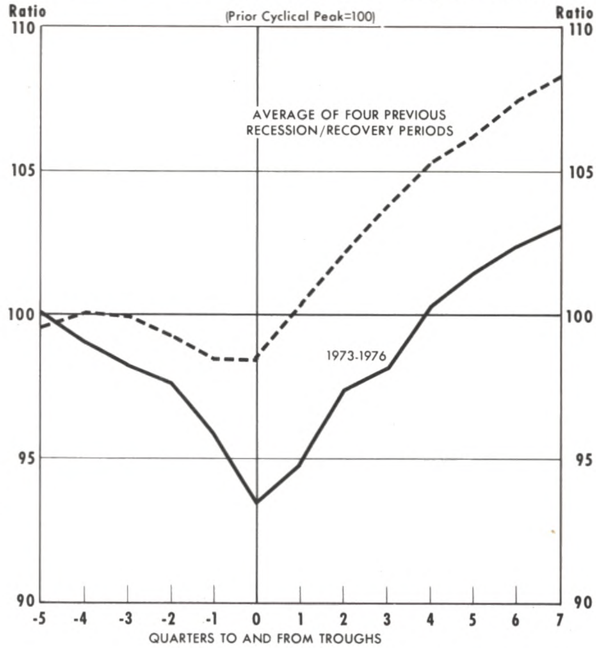
Table I

	Official Potential GNP* (1972 dollars)	Actual GNP (1972 dollars)
1973 IV	1244.3	1242.6
1974 I	1255.2	1230.4
II	1266.2	1220.8
III	1277.2	1212.9
IV	1288.4	1191.7
1975 I	1299.7	1161.1
II	1311.1	1177.1
III	1322.6	1209.3
IV	1334.1	1219.2
1976 I	1345.8	1246.3
II	1357.6	1260.0
III	1369.5	1272.2
IV	1381.5	1280.4

*Source: Unpublished data supplied by the Council of Economic Advisers.

Chart III

Real GNP in Recession/Recovery Periods*



Source: U.S. Department of Commerce

*Prior Peak Quarters: III/1953 III/1957 II/1960 IV/1969 IV/1973
Trough Quarters: II/1954 II/1958 I/1961 IV/1970 I/1975

Latest data plotted: 4th quarter 1976

The growth in potential output reflects growth in the labor force, adjusted for its age-sex composition, and growth in the capital stock over the year. In particular, the estimate assumes constant or trend growth in productivity of resources. Thus, the potential estimates do not include changes in potential output due to a change in the relative price of energy and the consequent decline in the productivity of capital and labor described above.[25]

Since some growth in the capital stock occurred in 1974, it may be inferred that the effect of the OPEC mandated energy price change (IV/1973 to IV/1974) reduced U.S. capacity and potential output by more than the actual 4.1 percent decline in real output. An estimate of five percent is roughly the order of magnitude indicated by a monetarist model of 1974 price and output developments.[26]

A five percent estimate of the loss in potential output or reduction in the productivity of capital and labor resources is also the correct size to explain an "output

[24]Of course, over time labor force growth and capital accumulation would increase potential output so that eventually the old level of potential output is restored. The conclusion above is that the labor and capital existing at any time could produce a larger potential output, in the absence of the energy price increase.

[25]The Council of Economic Advisers, *Economic Report of the President*, 1977, pp. 52-5, indicates an awareness of this permanent decline in productivity, and even suggests the magnitude of the decline in potential output to be about $30 billion (1972 dollars) by 1976. The CEA indicates that over the near term, productivity data should demonstrate whether or not the productivity decline is permanent, and that such proof will determine the need for a revision of its estimates of potential GNP.

[26]See Karnosky, "The Link Between Money and Prices."

gap" recently noted by the Congressional Budget Office (CBO).[27] The CBO pointed out that, after six quarters of recovery, real GNP was about five percentage points below the rate indicated by the experience in prior recoveries. Furthermore, the CBO attributes two percentage points of the unusually high unemployment rate to this output gap.[28]

Chart III shows the pattern of previous recessions and recoveries discussed by the CBO. Real GNP is measured relative to its rate at the prior cyclical peak and an average of this index of output is given for the four prior recession-recovery periods. The chart shows that on average, after six quarters of recovery, real GNP was 7.5 percent above its rate at the cyclical peak. In contrast, output was only 2.4 percent higher than the prior cyclical peak after six quarters of the most recent recovery. The difference of about five percent in this pattern since the recession trough (I/1975) is called the "persisting output gap" by the CBO.

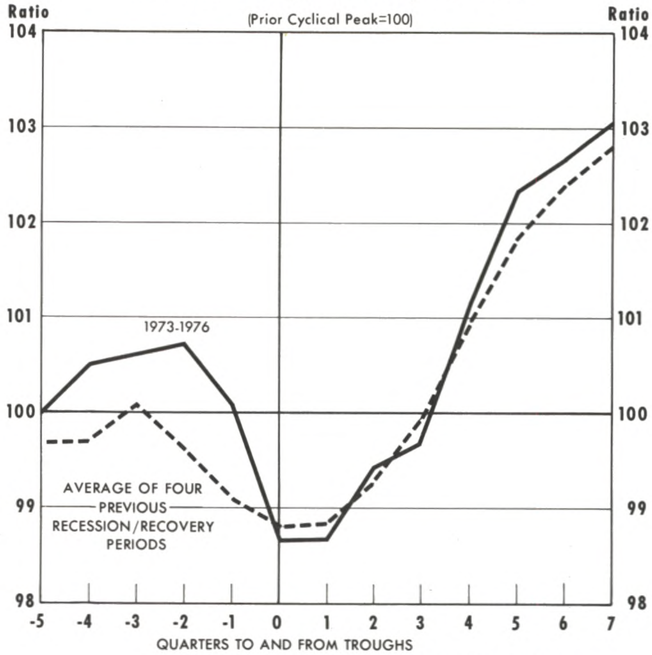
Chart IV shows the corresponding developments for civilian employment. The employment pattern in the recent recovery is not different from that of prior recoveries. The shortfall of output is not associated with a shortfall of employment. Recent unemployment experience is not explained by unusual employment developments but rather is apparently due to unusual labor force behavior. Thus, it appears that the "output gap" might better be termed a "productivity gap." The decline in labor productivity of about five percent would be expected due to the impact on actual and potential output of the higher relative price of energy.

A more conservative estimate of the loss in potential output may be found using the earlier evidence on the loss of economic capacity in manufacturing. About 20 percent of real GNP is comprised of compensation of government employees, output originating in the rest of the world, and output produced by the residential housing stock. There is little reason to expect that these components of output are as severely limited by the change in the energy price as the output of the rest of the economy. Assuming the manufacturing result is representative for the remainder of the private economy, a conservative estimate of the loss in potential output is four percent.

The theory above indicates that the rise in the relative price of energy would cause a percentage rise in the minimum price level associated with potential

Chart IV

Civilian Employment in Recession/Recovery Periods*



Source: U.S. Department of Labor

*Prior Peak Quarters: III/1953 III/1957 II/1960 IV/1969 IV/1973
Trough Quarters: II/1954 II/1958 I/1961 IV/1970 I/1975

Latest data plotted: 4th quarter 1976

output, equal in size to the percentage loss in potential output. Thus, a minimum four percent and perhaps a five percent rise in the price level over 1974 would be expected based upon supply considerations alone. The actual rate of price increase, as measured by the GNP deflator, was 11.5 percent. If roughly four percentage points of this increase is accounted for by the one-time price level effect of the increase in the relative price of energy, the remainder, 7.5 percent, must be accounted for by other factors, such as growth in aggregate demand.

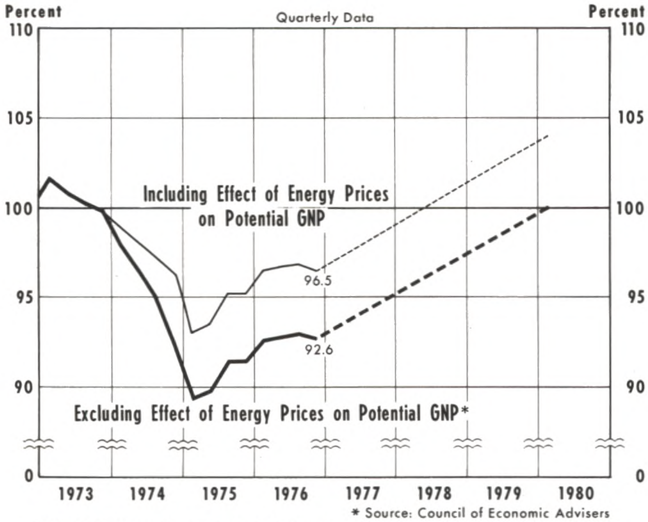
The impact of a four percent reduction in potential GNP may be seen in Chart V, which measures actual real GNP relative to potential output with and without the four percent reduction. The Chart indicates that in the fourth quarter of last year the economy was producing 92.6 percent of the CEA's measure of potential output. To account for the effect of the energy price change, the CEA estimate of potential output is lowered after the fourth quarter of 1973 so that, by the fourth quarter of 1974, potential output is four percent lower. The CEA estimate of the growth rate of potential output (3.5 percent) is maintained in the adjusted curve after the fourth quarter of 1974. As the Chart indicates, by the end of 1976 the economy

[27]U.S. Congress, Congressional Budget Office, *The Disappointing Recovery*, January 11, 1977, pp. 1-3.

[28]Ibid., p. 3.

Chart V

Ratio of Actual to Potential GNP(1972 Prices)



* Source: Council of Economic Advisers

Note: Output growth is projected at a 6 percent annual rate from IV/1976. The effect of energy prices is to reduce Potential GNP by 4 percent beginning in the fourth quarter of 1974.

Latest data plotted: 4th quarter 1976

was producing 96.5 percent of potential output or the gap is less than half as large as the official measures indicate.

Recent policy discussions seem to assume that demand management policies can close the official gap. Obviously, policy measures which are sufficient for this size task would be far too great for the resources at hand. The biggest output gain achievable through stabilization policy is about $46 billion in the fourth quarter of 1976. Attempts to close the official gap of over $100 billion reflect a failure to recognize that the implied production rate is unattainable and that such efforts will add to the rate of price increase.

More importantly, Chart V illustrates the importance of accounting for the loss in potential output in assessing both the prospects for closing the gap, and the desirability of policy stimulus. How quickly the gap closes depends upon the rate of growth of actual output. In Chart V each measure of potential output grows at 3.5 percent and actual real GNP is allowed to grow at a six percent annual rate, a growth goal which has been the subject of considerable recent discussion. When account is taken of the effect of the energy price increase on potential output, the Chart indicates that six percent growth closes the gap early next year. Of course, beyond that point real output growth would be limited to the 3.5 percent growth in potential output. If the official estimates of potential output are correct, achieving the growth goal would not close the gap until 1980. Thus, much of the current debate over the need for fiscal stimulus rests upon an awareness of the permanent loss in potential output since 1973.[29]

[29]Even if real output grows at about a five percent annual rate, less than the average annual rate of growth of real output achieved during the recovery (I/1975 to IV/1976), the gap would be eliminated by the end of next year, rather than in 1982, as the official gap would indicate.

The Growing Link Between the Federal Government and State and Local Government Financing

NANCY AMMON JIANAKOPLOS

THE growth of the state and local government sector and its increasing reliance on Federal revenues warrant consideration in discussions of stabilization policy. State and local government expenditures and taxes have been growing rapidly in recent decades, both absolutely and relative to that at the Federal level. In addition, grants-in-aid from the Federal Government have become an increasingly important source of funds for state and local governments.

Concern about stabilization policy has been focused primarily on monetary and fiscal policies of the Federal Government. Many analysts would agree that this focus on Federal policy is not misplaced since stabilization policy is not a major responsibility of state and local governments.[1] Whether or not one believes that state and local governments can or should *actively* pursue policies to affect national income, state and local government spending and taxing decisions do in fact constitute a part of total government fiscal policy. State and local fiscal activities do influence economic activity, although there remains some controversy over the nature, degree, and duration of these effects.

A full evaluation of government stabilization policy requires consideration of the impact of the state and local sector on aggregate economic activity. Do state and local policies reinforce or compete with Federal policies? Is the financing of state and local government spending carried out under different constraints than at the Federal level? Has the increasing reliance on Federal aid altered the character of state and local government financing?

STATE AND LOCAL FINANCE IN PERSPECTIVE

Expenditures

A more detailed examination of the data on government expenditures gives a perspective on the relative size of and functions performed by the different levels of government. Since 1960, state and local expenditures on a national income accounts (NIA basis have increased at an average annual rate of 10.5 percent, compared to a 9.3 percent rate of increase in Federal expenditures. Purchases of goods and services accounted for 94 percent of state and local expenditures in 1976, compared to 34 percent at the Federal level (Table I). These expenditures represent the purchase of goods and services by the public sector and are the government component of GNP. Currently, state and local purchases represent 14 percent of GNP, compared to 8 percent represented by Federal purchases.

Other expenditures by government determine not so much *what* goods will be produced, but rather *who* will decide what goods to produce. In particular,

[1]The rationale behind this distribution of government functions among levels of government is discussed by Richard A. Musgrave and Peggy B. Musgrave, *Public Finance in Theory and Practice* (New York: McGraw-Hill Book Company, 1973), Chapter 26, pp. 595-621.

Table I

Government Expenditures[1]

(Billions of Dollars)

	1960		1976p		
Federal	Amount	Percent of Total Expenditures	Amount	Percent of Total Expenditures	Annual Rate of Change 1960-1976
Purchases of Goods and Services	$ 53.7	57.7%	$133.4	34.3%	5.9%
Transfer Payments	23.4	25.2	162.2	41.7	12.9
Grants-in-Aid	6.5	7.0	60.2	15.5	14.9
Net Interest Paid	6.8	7.3	27.5	7.1	9.1
Subsidies Less Current Surplus of Government Enterprises	2.6	2.8	5.6	1.4	4.9
TOTAL EXPENDITURES	$ 93.1	100.0%	$388.9	100.0%	9.3%
State and Local					
Purchases of Goods and Services	$ 46.5	93.4%	$232.2	94.3%	10.6%
Transfer Payments	5.4	10.8	25.2	10.2	10.1
Net Interest Paid	0.1	0.2	−6.6	−2.7	−6.6
Subsidies Less Current Surplus of Government Enterprises	−2.2	−4.4	−4.4	−1.8	−2.0
TOTAL EXPENDITURES	$ 49.8	100.0%	$246.4	100.0%	10.5%

[1]National income accounts basis

p — preliminary

Source: Department of Commerce, Bureau of Economic Analysis.

NOTE: Data may not add due to rounding.

transfer payments represent government actions to redistribute income, and thereby spending decisions, from one sector of the economy to another. The Federal sector plays a more important role in these types of expenditures than do state and local governments. Transfer payments to individuals represent 10 percent of state and local expenditures, but account for 42 percent of Federal expenditures and currently are the largest category of Federal expenditure.

Grants-in-aid, which are counted as Federal expenditures but are receipts of state and local governments, transfer resource-use decisions from the private sector to state and local governments by way of the Federal Government. Federal grants accounted for only 7 percent of Federal expenditures in 1960, compared to the current 16 percent. Of course, both of these types of transfers (to individuals and to other levels of government) frequently are accompanied by stipulations as to how these resources are to be used.

Receipts

State and local receipts increased at an average annual rate of 10.9 percent from 1960 to 1976, while Federal receipts have increased at an 8 percent average rate (Table II). Major sources of tax receipts for state and local governments currently include sales taxes (22.1 percent) and property taxes (22 percent). Personal income taxes account for 10.2 percent of state and local receipts, while corporate income taxes produce 3.3 percent of total receipts. Contributions for social insurance, which include various employee retirement funds and contributions to workmen's compensation, represent another 6.5 percent of state and local receipts. The greatest change in the composition of state and local tax receipts from 1960 to 1976 has been the relative decline in receipts from property taxes (32.5 percent of total receipts in 1960 versus 22 percent in 1976) and an increase in income tax receipts (5 percent in 1960 versus 10.2 percent in 1976).

While these five taxes produce 64 percent of state and local receipts, approximately 91 percent of total Federal receipts are derived from only three sources: individual income taxes (42.3 percent), corporate income taxes (16.8 percent) and contributions for social insurance (32 percent). Thus, in general, state and local governments derive their revenues from a different group and a greater variety of taxes than does the Federal Government.

Since 1960 Federal grants to state and local governments have grown faster than every source of tax receipts except personal income taxes. Federal grants currently constitute 23.1 percent of total receipts at the state and local level, compared to 13 percent in 1960. Table III shows the current composition of

Table II

Government Receipts[1]
(Billions of Dollars)

	1960		1976		
Federal	Amount	Percent of Total Receipts	Amount	Percent of Total Receipts	Annual Rate of Change 1960-1976
Personal Income Tax	$41.8	43.5%	$139.8	42.3%	7.8%
Corporate Profits Tax	21.4	22.3	55.6	16.8	6.1
Contributions for Social Insurance	17.6	18.3	105.8	32.0	11.9
Other Personal Tax and Non-tax	1.8	1.9	5.5	1.7	7.2
Indirect Business Tax and Non-tax Accruals	13.4	14.0	23.5	7.1	3.6
TOTAL RECEIPTS	$96.1	100.0%	$330.3	100.0%	8.0%
State and Local					
Personal Income Tax	$ 2.5	5.0%	$ 26.7	10.2%	16.0%
Corporate Profits Tax	1.2	2.4	8.7	3.3	13.2
Contributions for Social Insurance	3.4	6.8	17.0	6.5	10.6
Sales Tax	12.2	24.4	57.6	22.1	10.2
Property Tax	16.2	32.5	57.2	22.0	8.2
Other Personal Tax and Non-tax	4.2	8.4	21.6	8.3	10.8
Other Indirect Business Tax	3.6	7.2	11.4	4.4	7.5
Grants-in-Aid	6.5	13.0	60.2	23.1	14.9
TOTAL RECEIPTS	$49.9	100.0%	$260.5	100.0%	10.9%

[1]National income accounts basis

Source: Department of Commerce, Bureau of Economic Analysis.

NOTE: Data may not add due to rounding.

Federal grants, which include funds earmarked both for special purposes, such as highways and education, and general purpose funds, such as revenue sharing. Some grants require matching funds from the receiving government.

STATE AND LOCAL FINANCE AS A COMPONENT OF STABILIZATION POLICY

Direction of Fiscal Policy

Given the differences in the growth and composition of state and local receipts and expenditures relative to those at the Federal level, the behavior of these items over the course of economic cycles is a factor which should be considered in discussions of government stabilization efforts. A useful measure of this behavior is the net change in state and local expenditures and receipts — that is, changes in budget surpluses and deficits.[2] Appropriate fiscal policy, in the view of analysts, requires movement away from surplus during recession (expenditure growth exceeding

[2]Studies using this approach include Robert W. Rafuse, Jr., "Cyclical Behavior of State-Local Finances" in *Essays in Fiscal Federalism,* Richard A. Musgrave, ed. (Washington: The Brookings Institution, 1965), pp. 63-121 and Ansel M. Sharp, "The Behavior of Selected State and Local Government Fiscal Variables During the Phases of the Cycles 1949-1961," *Proceedings,* National Tax Association, 1965, pp. 599-613.

Table III

Composition of Federal Aid to State and Local Governments, Fiscal 1976 est.
(Millions of Dollars)

Function	Amount	Percent of Total
Natural resources, environment and energy	$ 3,088	5.2%
Agriculture	499	0.8
Commerce and transportation	8,277	13.8
Community and regional development	4,008	6.7
Education, employment training and social services	14,422	24.1
Health	10,032	16.8
Income Security (Public assistance, food stamps)	11,212	18.8
Law enforcement and justice	838	1.4
Revenue sharing and general fiscal assistance	7,166	12.0
Other	295	0.5
	$59,787	100.0%

Source: U.S. Office of Management and Budget "Special Analysis of Federal Aid to State and Local Governments" derived from "The Budget of the United States Government."

NOTE: Data may differ from original due to rounding.

growth of receipts).[3] Likewise, appropriate government fiscal policy during expansion would require movement toward surplus (growth of receipts in excess of expenditure growth).

In postwar business cycles, state and local expenditures have tended to increase relative to receipts during recessions (Table IV). On average, expenditures grew at a 12.7 percent rate during the five previous recessions, while receipts increased at an average 8.5 percent rate. In the most recent recession expenditures increased at a 12.9 percent rate, while receipts increased at a 10 percent rate. The net effect of these relative growth rates was to move state and local budgets away from surplus positions during recessions. This is the appropriate policy (fiscal stimulus espoused by fiscal activists, and such stimulus reinforces similar movements at the Federal level.

Table IV

CYCLICAL CHANGES IN GOVERNMENT EXPENDITURES AND RECEIPTS

	Annual Rates of Change			
	Federal		State and Local	
	Expenditures	Receipts	Expenditures	Receipts
IV/48 - IV/49 (R)	6.2%	−11.6%	15.3%	8.7%
IV/49 - III/53 (E)	17.8	18.6	7.3	9.1
III/53 - III/54 (R)	−10.3	−10.3	11.6	5.8
III/54 - III/57 (E)	5.1	9.2	9.4	9.8
III/57 - II/58 (R)	13.6	−10.7	11.8	8.7
II/58 - II/60 (E)	2.5	12.8	6.4	9.6
II/60 - I/61 (R)	9.4	− 2.8	10.1	7.9
I/61 - IV/69 (E)	8.0	8.8	9.9	10.5
IV/69 - IV/70 (R)	8.7	− 3.9	14.5	11.2
IV/70 - IV/73 (E)	9.0	12.0	10.4	12.2
AVERAGE (R)	5.5	− 7.9	12.7	8.5
AVERAGE (E)	8.5	12.3	8.7	10.2
IV/73 - I/75 (R)	18.9	6.3	12.9	10.0
I/75 - III/76 (E)	10.4	10.5	9.5	11.6

R — recession
E — expansionary phase

Over expansionary phases, state and local receipts have increased at a faster pace than expenditures, moving state and local budgets towards surplus positions. On average, receipts have increased over the course of previous economic expansions at a 10.2 percent rate, while expenditures have grown at an 8.7 percent rate. Since the first quarter of 1975, the beginning of the current recovery, state and local receipts have increased at an 11.6 percent rate, compared to a 9.5 percent rate of increase of expenditures. Thus, in the current as well as in past expansions, state and local budgets have moved toward surplus, the movement prescribed by many fiscal policy proponents.

Magnitude of Fiscal Policy

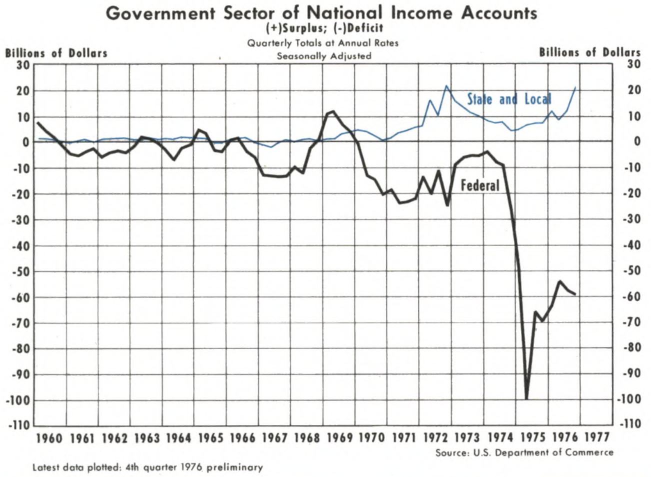
Although there remains some controversy concerning the nature of the effects, the impact of government stimulus or restraint on the level of economic activity depends not only on the direction of budget changes, but also on the magnitude of these changes. It is important to remember, however, that while changes in the Federal budget position may reflect *deliberate* actions to influence economic activity, the state and local budget position is aggregated over 80,000 governmental budgets. Changes in state and local budgets constitute an *implicit* fiscal policy which can be taken into account, but which would be difficult to coordinate with actions at the Federal level, especially given the different character of expenditures and receipts which was discussed above.

One method of measuring the degree of fiscal stimulus or restraint produced by governmental finances is by changes in the NIA budget surplus or deficit (see Chart).[4] Table V presents the dollar change from the previous year in the Federal and state and local budgets on an NIA basis. For example, changes in the Federal NIA budget between 1975 and 1976 produced about $13 billion of fiscal restraint. State and local budgets accounted for an additional $7 billion of restraint, or about a third of total government fiscal restraint.

Changes in the full employment budget can also be used to assess the degree of government fiscal impact on economic activity. The full employment budget concept was developed in an attempt to eliminate the automatic influences of economic fluctuations on the

[3]For example, see Otto Eckstein, *Public Finance,* 3rd ed. (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1973), p. 121.

[4]For a discussion of various methods of calculating the impact of budgets on GNP, see Saul H. Hymans and J. Philip Wernette, "The Impact of the Federal Budget on Total Spending," *Business Economics* (September 1970), pp. 29-34.



budget. For example, tax receipts generally decrease during an economic downturn, while expenditures for unemployment benefits at the Federal level increase. By eliminating these "passive" elements of the budget, more attention is focused on "active," or discretionary, changes in the budget.[5] Realizing the implicit fiscal policies of state and local budgetary policies, the Council of Economic Advisers has attempted since 1974 to measure the full employment budget position of both the Federal and state and local governments.[6] The combined impact of both budgets gives a more complete picture of the extent of government fiscal activity. Based on changes from the previous year, the 1976 Federal Government budget on a full employment basis exercised $2.2 billion in restraint, while state and local full employment budgets contributed an even greater $3.1 billion of restraint.[7] As the examples illustrate, whatever the ultimate impact of fiscal policy on the economy and however it is measured, an assessment of the degree of fiscal stimulus or restraint is incomplete without consideration of the state and local sector.

Table V

Changes in NIA Budgets Towards Stimulus (+) and Restraint (—)
($ billions)

Calendar Year	Federal	State and Local
1970	$ +20.6	$ — 0.7
1971	+ 9.9	— 0.9
1972	— 4.7	—10.0
1973	—10.6	+ 0.7
1974	+ 4.8	+ 5.7
1975	+59.7	+ 0.4
1976p	—12.9	— 7.0

Changes in Full Employment Budgets Towards Stimulus (+) and Restraint (—)
($ billions)

Calendar Year	Federal	State and Local
1970	$ + 6.3	**
1971	+ 6.6	$ — 2.3
1972	+12.3	— 7.4
1973	—13.6	+ 3.3
1974	—22.0	— 4.0
1975	+26.5	—11.7
1976p	— 2.2	— 3.1

**Data unavailable.
Source: *Economic Report of the President,* 1977.
p — preliminary

FINANCING GOVERNMENT SPENDING

The way in which government spending is financed affects both the impact of the spending on aggregate economic activity and the perception of taxpayers concerning the costs of government programs. If the costs of government are affected by the method of financing, this can ultimately influence the size of government and, hence, the magnitude of fiscal effects on the economy.

Methods of Financing

Both Federal and state and local government spending can be financed directly by taxes or by borrowing from the public. In addition, Federal Government spending can be financed by borrowing indirectly from the Federal Reserve. The Federal Reserve buys Federal Government securities with newly created money. Thus, the Federal Reserve can, in fact, finance expenditures by printing new money or, more formally, "monetizing the debt." While the Federal Reserve does not operate in the market for state and local debt, these governments have the Federal Government, through grants-in-aid, as an additional source of revenue and thus, in an indirect manner, have ac-

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[5] See Keith M. Carlson, "Large Federal Budget Deficits: Perspective and Prospects," this *Review* (October 1976), pp. 2-7.

[6] *Economic Report of the President 1974,* pp. 80-81. Recognition of the significance of state and local budget positions in the assessment of fiscal policy can be found in Donald L. Raiff and Richard M. Young, "Budget Surpluses for State and Local Governments: Undercutting Uncle Sam's Fiscal Stance?" *Business Review,* Federal Reserve Bank of Philadelphia (March 1973), pp. 19-28; Nancy H. Teeters, "Current Problems in the Full Employment Concept" and Robert C. Vogel, "The Responsiveness of State and Local Receipts to Changes in Economic Activity: Extending the Concept of the Full Employment Budget" in *Studies in Price Stability and Economic Growth,* Paper Nos. 6 and 7, Joint Economic Committee, June 30, 1975, 94th Cong. 1st Sess.

[7] *Economic Report of the President,* 1977, p. 76.

cess to all the methods of financing available to the Federal Government including debt monetization.

Taxes — Spending financed by tax revenue, whether at the Federal or state and local level, results in a direct transfer of resources from the private sector to the public sector. The costs of government spending financed by taxes are explicitly known to taxpayers. The imposition of taxes alters private consumption and investment decisions, and this will ultimately affect the composition, if not the level, of output and employment.

Borrowing from the Public — When government spending is financed by borrowing from the public, control over resources is also transferred from the private sector to the public sector. The costs of government spending financed by borrowing from the public are less directly known to taxpayers than if the spending were financed by taxes. However, taxpayers will eventually become aware of the costs if the principal and interest are repaid through tax revenue.

Government borrowing represents an increased demand for credit. If there is no increase in the public's desire to supply credit (savings) or no offsetting decrease in private credit demand, the effect of the government borrowing will be to put upward pressure on interest rates. At higher interest rates some private borrowers will be crowded out of the market.[8] Some state and local governments, which have restrictions as to the maximum interest rate at which they can borrow, will also be forced out of the market. Higher interest rates increase the cost of mortgages, consumer loans, and loans for capital investment. Again, private consumption and investment decisions will be altered. This will change the composition, if not the level, of output and employment.

Borrowing from the Federal Reserve — When there is an upward movement in interest rates, there can be pressure on the Federal Reserve to resist such movements given current operating procedures. In the short run the Federal Reserve can ease pressure on interest rates by purchasing Federal debt. The Federal Reserve generally does not purchase Federal debt directly from the Treasury, but rather in the open market. By purchasing the debt the Federal Reserve increases reserves in the banking system and mitigates the initial upward pressures on interest rates. At the same time, this action increases the rate of monetary expansion which, over an extended period, leads to higher rates of inflation and eventually higher interest rates. Of course, the decision to monetize the debt has been at the discretion of the Federal Reserve.

The costs of financing government spending through monetary expansion are even less clearly discernable than financing through taxes and borrowing. While the costs of inflation are less apparent, they are no less real than the imposition of taxes or the costs of borrowing.

The ultimate monetary authority is at the Federal level. State and local governments do not have direct authority to create money and the Federal Reserve does not purchase state and local debt. Nevertheless, the initial source of upward pressure on interest rates may have been increased credit demands by either the Federal Government to finance Federal spending, by state and local governments to finance their spending, or by the private sector to finance its spending. Thus, while state and local debt is not directly purchased by the Federal Reserve, it can be indirectly accommodated by Federal Reserve actions to hold down interest rates in the short run.

The combination of the more indirect access to money creating powers and certain legal restrictions on borrowing tend to make state and local governments operate under a tighter budget constraint than the Federal Government. This is evidenced by the fact that state and local government budgets in the aggregate have been in surplus on an NIA basis in 14 of the last 17 years, compared to only 4 surpluses incurred by the Federal Government over this period. Since expenditures are more likely to be financed by available receipts than by monetary expansion at the state and local level, taxpayers are more aware of the costs of state and local spending than the costs of Federal spending.

Implications of Federal Grants-in-Aid

When state and local government spending is financed by Federal aid, the impact on economic activity depends on how this *Federal* spending is financed. The fact that spending in this instance is one step removed from paying for the programs makes the net benefit of the state and local government expenditures more difficult to assess. In particular it is more likely that the real costs of spending will be underestimated.

To the extent that Federal aid is financed by Federal taxes, resources are transferred from the private sector to the public sector. In this case it becomes a

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[8]See Roger W. Spencer and William P. Yohe, "The 'Crowding Out' of Private Expenditures by Fiscal Policy Actions," this *Review* (October 1970), pp. 12-24 and Keith M. Carlson and Roger W. Spencer, "Crowding Out and Its Critics," this *Review* (December 1975), pp. 2-17.

Table VI

FEDERAL AID IN PROPORTION TO FEDERAL TAX BURDENS BY STATE
Fiscal 1974

	Federal Aid Per Dollar of Federal Tax Burden[1]		Federal Aid Per Dollar of Federal Tax Burden[1]		Federal Aid Per Dollar of Federal Tax Burden[1]
Alabama	$ 0.28	Kentucky	$ .29	North Dakota	$ .28
Alaska	.53	Louisiana	.29	Ohio	.14
Arizona	.20	Maine	.30	Oklahoma	.24
Arkansas	.30	Maryland	.14	Oregon	.23
California	.18	Massachusetts	.17	Pennsylvania	.17
Colorado	.18	Michigan	.16	Rhode Island	.22
Connecticut	.14	Minnesota	.21	South Carolina	.25
Delaware	.14	Mississippi	.44	South Dakota	.39
Dist. of Columbia	.51	Missouri	.16	Tennessee	.22
Florida	.14	Montana	.30	Texas	.18
Georgia	.24	Nebraska	.17	Utah	.27
Hawaii	.23	Nevada	.16	Vermont	.34
Idaho	.27	New Hampshire	.17	Virginia	.16
Illinois	.15	New Jersey	.12	Washington	.20
Indiana	.12	New Mexico	.36	West Virginia	.36
Iowa	.15	New York	.20	Wisconsin	.17
Kansas	.16	North Carolina	.20	Wyoming	.29

U.S. Average $ 0.19

1Federal aid comprises Federal funds, trust funds, and general revenue sharing funds transferred to state and local governments. Federal tax burden by state was estimated by the Tax Foundation on the basis of a formula designed to show where tax dollars originate, rather than where they are collected. For further explanation see Tax Foundation, "Allocating the Federal Tax Burden Among the States," Research Aid No. 3, 1957.

Sources: U.S. Dept. of the Treasury, *Federal Aid to States*, annual and Tax Foundation, *Facts and Figures on Government Finance*, 1975.

two-stage process; resources are first transferred to the Federal Government and then to state and local governments. The costs of any particular state and local program are borne across the economy in proportion to taxpayers' Federal tax liabilities, rather than their state and local tax liabilities. Private spending and investment decisions will be altered, but in a manner corresponding to the impact of Federal taxes, rather than in a manner resulting from the same expenditures being financed by taxes at the state and local level. As Table VI indicates, rough estimates suggest that the Federal aid received by states does not correspond closely with the Federal tax burden of the people in the respective states. The *average* amount of Federal aid per dollar of Federal tax burden nationally is 19 cents. However, Federal aid ranges from 12 cents per dollar of Federal tax burden in Indiana and New Jersey to 53 cents per tax dollar in Alaska.

To the extent that Federal aid is financed by Federal borrowing from the public, resources are also transferred from the private sector to the public sector. Without compensating changes in the supply or other demands for credit, the Federal borrowing will put upward pressure on interest rates and alter private investment and consumption decisions.

If Federal aid is financed by borrowing from the Federal Reserve (monetization of the debt), then Federal aid to state and local governments is ultimately financed by increased monetary expansion and a faster rate of inflation in the future. Federal aid, in effect, gives state and local governments greater access to Federal powers of money creation. The costs of spending financed in this manner are not obvious. However, these costs take the form of a higher rate of inflation distributed over the entire economy.

CONCLUSION

Although there is much concern about the increasing size of government, attention is usually focused on the Federal Government, whereas the state and local sector represents a larger portion of GNP and is growing more rapidly. Likewise, the impact of fiscal policy on economic activity is generally centered on explicit Federal Government decisions. However, the spending and taxing decisions of state and local governments, although operating under somewhat different circumstances than the Federal Government, do constitute an implicit fiscal policy.

The influence of state and local governments on economic activity depends both on the size of the stimulus or restraint reflected in budget changes and on the method in which spending is financed. The amount of fiscal restraint or stimulus reflected in state and local budgets in recent years has been of sufficient magnitude to merit consideration in conjunction with Federal fiscal policies. Likewise, examination of the ways in which state and local spending is financed shows that it can influence economic activity in much the same way as Federal spending. In particular, state and local spending can be financed by monetary expansion, even though the ultimate monetary authority is at the Federal level. Although the Federal Reserve does not purchase state and local debt, upward pressure on interest rates resulting from increases in state and local credit demands can lead to accommodation by the Federal Reserve.

The increasing importance of Federal aid as a source of state and local revenue means that state and local governments have access to Federal sources of financing. The ability to spend at the state and local level with funds raised at the Federal level makes it more difficult to correctly determine the desired level of state and local government spending. The complete costs of state and local spending are not readily apparent and, therefore, more spending may take place than taxpayers would be willing to pay for if they were fully informed of the costs. To correctly assess the net benefit of state and local spending financed by Federal aid, it is important to be aware of the possible costs: higher taxes, higher interest rates, and/or a higher future rate of inflation.

So What, It's Only a Five Percent Inflation

LEONALL C. ANDERSEN

IN recent years there has been an apparent willingness on the part of many individuals to accept the present five percent rate of inflation as a more or less permanent feature of our economy. This view may be exemplified by the expression "So what, it's only a five percent inflation."

Some individuals argue that a five percent rate of inflation is relatively satisfactory when compared with the recent double-digit rate or with the higher rates of inflation in most other countries. Others argue that, if inflation is stabilized at this rate, individuals would take actions in the market place such that their money income would also rise at a five percent annual rate. Consequently, a permanent five percent rate of inflation would have little effect over time on the ability of individuals to buy goods and services.

But such is not the case. Even if an individual's money income rises as fast as the rate of inflation and his real income received (actual purchasing power) thus remains unchanged, his after tax real income decreases. The reason for this result is the progressive nature of the existing personal income tax structure which causes an individual's tax payments to rise faster than money income.

Indexation of the Federal personal income tax structure — altering the structure each year according to the rate of inflation that has been experienced — is a prominently mentioned method for preventing such a decrease in after tax real income. Indexation for inflation would maintain the degree of progression provided in the existing personal income tax structure, but progression would be based on *real income* received instead of *money income*. With such a program, tax payments as percent of income would increase only when a worker receives a real wage rate increase (purchasing power of money wage rate) for a given job, or moves into a job paying a higher real wage rate. Effective tax rates would not rise as in the case where wages were rising because of the pernicious effects of inflation.

This article illustrates the impact of the 1976 personal income tax structure on after tax real income during a prolonged period of five percent inflation. The example used is that of a worker currently holding a job paying $3.00 an hour and a worker holding the same job at a later date. Income taxes are calculated for a married couple who have two dependent children, take the standard deduction, and file a joint return. The article also presents the changes in the parts of the 1976 personal income tax structure applicable to this worker if there were indexation for the rate of inflation.[1]

IMPACT OF THE 1976 PERSONAL INCOME TAX STRUCTURE

The effect of inflation on after tax real income can be illustrated by three simple examples — a 5 percent rate of inflation and no growth in real income, a 3.5 percent rate of growth in real income and no inflation, and both a 5 percent inflation and a 3.5 percent rate of growth in real income. The time period considered is the next 45 years, the expected number of remaining years of work for a twenty year old worker.

Five Percent Inflation

In this case, it is assumed that the money wage rate for this job increases over the next 45 years at the same rate as inflation; thus, there is no increase in the real wage rate. Table I presents the implications for

[1]Other provisions would also be indexed, but they are not considered in this article.

Table I

Influence of 1976 Federal Personal Income Tax on Earnings From a Job Currently Paying $3 Per Hour

	Beginning Level	Level After 45 Years: 5 Percent Inflation	3.5 Percent Growth in Real Income	Inflation & Growth in Real Income
Hourly Money Wage	$ 3.00	$ 26.96	$ 14.11	$ 117.89
Annual Income[1]	6,240	56,077	29,349	245,211[2]
Tax	(155)[3]	17,019	5,336	111,586
After tax income:				
Current Year Dollars	6,395	38,058	24,013	133,625
Constant Dollars (1977)	6,395	4,346	24,013	14,869
Tax as a Percent of Income	(—2.5)[3]	30%	18%	46%

[1]Based on 2080 hours annually of work and paid vacations and holidays.
[2]Subject to 50 percent marginal rate on earned income.
[3]Refund as a result of earned income credit.

after tax real income and for taxes as a percent of income.

The money wage rate would increase from $3 to $27 per hour (Table I), and annual money income received would increase from $6,240 to $56,077.[2] Nevertheless, as a result of inflation the higher money income received 45 years from now would purchase only the same amount of goods and services as in 1977. On average, the prices of most items purchased would rise as much as money income. Exhibit I presents the prices of selected items at the end of the period, assuming that all prices increase at the same rate as inflation.

Although real income received by a person holding this job remains unchanged, after tax real income decreases from $6,395 to $4,346. The reason for this result is the progressive nature of the existing personal income tax structure in which taxes as a percent of income received rises from —2.5 percent to 30 percent.[3]

Three and One-Half Percent Growth in Real Income

This case assumes that the money wage rate of a worker holding this job and, hence, the real wage rate, increases at a 3.5 percent annual rate. Table I indicates that, while money income would increase from $6,240 to $29,349, the increase in after tax real income would be considerably less. This result is accounted for by the rise in taxes as a percent of income shown in the table, but this is the normal result of the progression provided in the existing personal income tax structure.

Inflation and Growth in Real Income

A more realistic assumption is that the money wage rate for this job rises at a rate reflecting both the rate of inflation and the increase in productivity (the real wage rate). In this case it is assumed that the money wage rate increases at an 8.5 percent annual rate — the sum of the assumed 5 percent rate of inflation and a 3.5 percent rate of growth in productivity (that is, the real wage rate).

According to Table I, the level of after tax real income of a worker holding this job would be $14,869 compared with $24,013 in the previous case, even though the real wage rate rose the same in each case. Also, taxes as a percent of income are 46 percent com-

Table II

Indexation of 1976 Federal Personal Income Tax Structure for a Five Percent Rate of Inflation Over the Next Forty-Five Years

	Present	After 45 Years
Exemption Per Dependent	$ 750	$ 6,739
Standard Deduction 16% of Adjusted Gross Income:		
Minimum	2,100	18,869
Maximum	2,800	25,158
Tax Credit:		
Per Dependent	35	315
or		
2% of Taxable Income With a Maximum of	180	1,617
Earned Income Credit:		
Starting Income	4,000	35,940
Cut-off Income	8,000	71,880

Marginal Tax Rate	Present Taxable Income: More Than:	Less Than:	Taxable Income After 45 Years: More Than:	Less Than:
14	$ 0	1,000	$ 0	8,985
15	1,000	2,000	8,985	17,970
16	2,000	3,000	17,970	26,955
17	3,000	4,000	26,955	35,940
19	4,000	8,000	35,940	71,880

[2]Based on pay for 2080 hours of work, paid vacation, and holidays.

[3]The —2.5 percent figure results from the 1976 provision for an earned income credit for low income families with dependent children.

pared with 18 percent. The increase in tax burden reflects the effect of inflation transferring resources from the taxpayer to the government under the existing personal income tax structure.

INDEXATION REQUIRED FOR FIVE PERCENT INFLATION

Table II presents the provisions of the 1976 personal income tax structure applicable to the worker at the beginning of the period and these same provisions at the end of 45 years if they were indexed for a 5 percent rate of inflation. Such indexation would maintain the tax payment of a worker holding the assumed job as a percent of income received at the same level as in 1977 in the case of inflation and no growth in real income, and at the level implied at the end of 45 years in the case of growth in real income without inflation.

The table indicates that substantial changes in the tax provisions would be required to accomplish these results. For example, the exemption per dependent would be $6,739 and the minimum standard deduction $18,869. The lowest marginal tax rate would apply to taxable income up to $8,985.

CONCLUSIONS

The simple examples considered here give results that may appear to be extreme. But that is the point. Acceptance of the view — "So what, its only a five percent rate of inflation " — because it is believed that individuals can take actions in the market place to protect their real income fails to take into consideration the existing personal income tax structure. Even if increases in an individual's money income reflect fully the rate of inflation, the gap between real income and after tax real income tends to widen. The reason for this result is that taxes as a percent of income increases as money income incorporates the rate of inflation.

Indexation of the existing personal income tax structure for the rate of inflation would eliminate the widening of the gap between real income received and after tax real income. There is also another method available for accomplishing the same objective. That method is the elimination of inflation by reducing the present excessive rate of monetary expansion.

Exhibit I

Influence of Permanent Five Percent Rate of Inflation on Selected Prices[1]

	Beginning Level	After 45 Years
Grocery Items		
Bread (1 lb. loaf)	$ .25	$ 2.25
2% milk (1 gallon)	1.39	12.49
A-Large eggs (1 dozen)	.85	7.64
Ground beef (1 lb.)	.99	8.90
Chuck roast (1 lb.)	.69	6.20
Whole fryer (1 lb.)	.49	4.40
Round steak (1 lb.)	1.49	13.39
Cabbage (1 lb.)	.33	2.97
Potatoes (1 lb.)	.13	1.17
Canned tomatoes (16 oz.)	.35	3.14
Peanut butter (28 oz.)	1.35	12.13
Butter (1 lb.)	1.25	11.23
Toilet Paper (4 rolls)	.79	7.10
Clothing		
Work pants	$ 8.98	$ 80.69
Work shirt	7.98	71.70
Work shoes	26.00	233.61
Work jacket (light)	9.98	89.67
Work jacket (heavy)	13.98	125.61
Man's suit	85.00	763.73
Man's coat (all weather)	60.00	539.10
Man's dress shoes	25.00	224.63
Woman's slacks	14.00	125.79
Woman's dress	30.00	269.55
Woman's coat (all weather)	39.00	350.42
Woman's dress shoes	16.99	152.66
Housing		
New House	$ 34,980	$314,296
1 Bedroom Apartment	135/ month	1,213/ month
Automobile		
Pinto	$ 3,175	$ 28,527
Malibu coupe	4,588	41,223
Regular gas (1 gallon)	.599	5.38

[1] St. Louis prices in early 1977.