COMMENTS ON RASCHE AND TATOM, "THE EFFECTS OF THE NEW ENERGY REGIME...." AND "ENERGY RESOURCES AND POTENTIAL GNP"

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These two studies have performed a timely service in reminding us that a major rise in natural resource costs can have a sizable negative impact on potential GNP. The purpose of this note is not to question that central proposition. Rather, it is to argue that (1) the impact on potential GNP takes place only gradually as production techniques and consumption patterns change, not all at once as these studies imply, and (2) that the ultimate impact may not be as large as the 4 or 5 percent estimated in these studies.

At the present time, the note will conclude, production techniques and consumption patterns do not seem to have altered substantially in response to higher energy prices. Potential GNP has therefore not yet declined appreciably; rather, what has happened is that a larger fraction of GNP (or claims against GNP reflected in balance-of-trade deficits) must be paid to the owners of energy resources. Potential consumption after subtracting out this fraction has been reduced, but potential production has not. It is, however, important to

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watch for signs that production techniques are beginning to respond to high energy prices and to take any such response into account in formulating economic policy.

The Rasche-Tatom Assumptions and Their Implications

The reasoning used in these studies to translate higher energy prices into reduced potential GNP can be explained in a few sentences. Since output requires labor, capital, and energy, potential output depends on available supplies of these three inputs. For labor and for capital, it is possible to measure at least approximately maximum available inputs, determined by population and expected labor force participation rates in the case of labor and by the initial capital stock, its rate of depreciation, and the expected fraction of new output devoted to fixed investment in the case of capital.

Since energy is traded internationally in huge amounts, it does not make sense to think of a fixed quantity of potential energy consumption by any one country, analogous to potential labor and potential capital. Rather, it makes sense to think of producers and consumers choosing a ratio of energy to output on the basis of relative prices, technological developments, and perhaps other influences. The higher this ratio is --the more energy-intensive production is--the more output can be produced with given amounts of labor and capital. A sizable increase in the relative price of energy should lead producers to conserve energy and consumers to shift purchases away from energy-intensive goods and services--should, in other words, reduce the ratio of energy to output. High energy prices should therefore mean that available supplies of

labor and capital will not yield as much output as they would have if the cheap-energy years of the past had continued.

A major increase in energy prices should, in this view, cause (1) energy conservation, or a fall in energy consumption per unit of output; (2) a rise in both labor consumption per unit of output (equivalent to a fall in productivity as usually measured) and capital consumption per unit of output; and (3) a reduction in productive capacity or potential output, properly measured. The specific relationships used by Rasche and Tatom, furthermore, imply that these reactions occur at once when relative energy prices go up.

The Evidence Since 1973

Have these consequences actually taken place since the OPEC price rise of 1973-1974? The evidence is, at best, mixed. The first consequence, a fall in the energy-output ratio, is a central one. Only as this ratio falls do producers need to use more capital and/or labor per unit of output and hence reduce potential GNP. But there is no evidence of a drop below trend in the energy-output ratio since 1973. Table 1 shows two measures of energy per unit of output from 1970 through 1976. They both display a trend toward conservation over these years amounting to a reduction of 1 to 3 percent in energy per unit of output each year. But they show this trend before the dramatic increase in energy prices as well as afterwards and there is no sign of any acceleration after the energy price increase took place. Examination of a longer period than 1970-1976 suggests that some movement toward conservation may have taken place in recent years, but nothing like the 33 percent drop in the ratio

TABLE 1

ENERGY CONSUMPTION AND GNP

(CONSTANT DOLLARS)

	Energy Consumption (thousand trillion BTUs)		GNP, 1972 Prices (billions of dollars)		Ratio of Energy to Output (indexes, 1973 = 100)	
	Total	Industrial	Total	"Industrial"[1/]	Total	Industrial
1970	68.3	23.3	1075.3	370.2	104.5	107.8
1971	69.5	23.0	1107.5	374.9	103.2	105.1
1972	73.3	23.8	1171.1	399.7	102.9	102.0
1973	75.1	24.9	1235.0	426.4	100.0	100.0
1974	73.2	24.2	1217.8	402.6	98.8	102.9
1975	71.5	21.6	1202.1	379.9	97.8	97.4
1976 est.	75.0	22.9	1274.7	416.2	96.8	94.2

Source: Energy Consumption--FEA, by telephone, through 1975-1976, CBO estimates based on data in FEA's Monthly Energy Review

GNP--Commerce Department

Rasche and Tatom would expect in response to the roughly 50 percent increase in the relative price of energy in 1973-1974.

With respect to labor and capital, the evidence is not quite so negative. Output per unit of labor did fall in 1974 and has not yet caught up to its earlier trend, even after correction for cyclical influences. After cyclical correction, however, output per unit of capital does not appear to have fallen. Output per unit of combined labor-capital did fall, and the Rasche-Tatom regression results reflect the fact that this shift in the relation of output to labor and capital inputs occurred at the same time as the rise in oil prices. But it is hard to interpret these labor and capital changes as responses to energy developments when there is no evidence of a shift in the energy-output ratio.

Preferred Rates of Capacity Utilization

The third implication of a rise in relative energy prices is a decline in capacity and potential GNP. As Rasche and Tatom point out, manufacturing capacity as measured by the Federal Reserve Board did not fall when energy prices went up. Capacity, as Rasche and Tatom define it--namely, the cost-minimizing or profit-maximizing level of output--should have fallen by 4 or 5 percent, according to their calculations. They interpret the failure of the actual indexes to fall as due to a difference in definition. Published capacity statistics, they believe, refer to maximum output feasible under customary operating conditions, not to the concept of cost-minimizing output which they prefer.

I believe they are probably right in their interpretation of published capacity statistics. In the short run at least, the failure of published capacity indexes to fall is not a serious argument against their view of the impact of energy prices. Neither, however, is it a confirmation of their view. It is simply not relevant to evaluating their hypotheses.

The Bureau of Economic Analysis does, however, collect another set of statistics in its capacity survey which are more relevant to testing the Rasche-Tatom views. These are manufacturers' views of the percent of capacity at which they would prefer to operate. The exact question is: "At what percentage of manufacturing capacity would your company have preferred to operate in order to achieve maximum profits or other objectives?"[2/] Now if high energy prices do not change rated capacity but do have an immediate impact on production techniques and input proportions as Rasche and Tatom maintain, then the minimum-average-cost rate of operation should decline when energy becomes much more expensive.[3/] A reduction in preferred operating rates looks like a promising candidate for an empirical counterpart to this theoretical concept. Manufacturers might be expected to prefer not to operate equipment which was extremely energy-intensive, and to prefer to operate other equipment in ways which conserve energy and hence sacrifice some output.

In fact, however, nothing much has happened to manufacturers' view of their preferred rate of operation. For all manufacturers taken together, preferred utilization was 95 percent of rated capacity from 1970 through 1974 and 94 percent in 1975 and 1976. There is no sign of a 4 to 5 percent drop after the run-up of energy prices in 1973-1974.

Unpublished detail supplied by the Bureau of Economic Analysis, furthermore, does not suggest that the aggregate conceals any shifts at industry levels that would bear out the Rasche-Tatom view. For example, there does not appear to have been a drop in preferred rates in energy-intensive industries offset by a rise elsewhere. Thus, statistics on preferred operating rates, like statistics on energy per unit of output, suggest that so far there has not yet been a significant restructuring of production techniques in response to higher energy prices.

What Has Been Happening?

There is no doubt that higher energy prices have created incentives to change production processes. So far, however, the evidence indicates that these incentives have not yet led to significant energy conservation and substitution of labor and/or capital for energy. Probably one reason for the delay is that many of the possibilities for energy conservation require new plant and equipment. Frequently it will pay to continue to operate existing capital goods for a time even if they utilize uneconomic processes because they have already been paid for and because conversion to a more energy-conserving process is extremely costly. Another possibility is that large-scale energy conservation is awaiting more certainty about future technological change. and about government actions affecting energy costs.

While it is tempting to associate the recent productivity slowdown with the rise in energy prices, the facts about energy per unit of output do not bear out this connection. The most likely explanation for the productivity slowdown appears to lie elsewhere--lower rates of

capital investment in relation to GNP, shifts in the experience-mix of the labor force and the industry-mix of output, lower growth in research and development spending, and the severity of the 1974-1975 recession.

With respect to potential GNP, the short run conclusion is that until production techniques begin to react significantly to the change in energy prices, it would be a mistake to translate higher energy prices into reduced potential and lower output targets. So far, high energy prices have not altered production techniques but have caused this country to pay sizable amounts to oil producers in order to produce GNP by old production techniques. In paying for oil, we have incurred large balance-of-trade deficits which represent growing foreign claims against domestic output. While potential output has not yet been reduced substantially, these foreign claims mean that potential consumption by U.S. citizens has been reduced by high energy prices.

The conclusion about potential GNP in the long-run is more conjectural. Eventually high energy prices should lead to energy conservation, substitution of other inputs for energy, and hence less potential GNP from given supplies of labor and capital. Qualitatively, the Rasche-Tatom results seem quite plausible as a long-run proposition.

I suspect, however, that quantitatively the long-run effect may not be as large as 4 or 5 percent. The 4 to 5 percent estimate assumes no response of labor or technology to changing productivity and real income. In actuality, low real wages due to high fuel costs could cause the supply of secondary workers or other dimensions of labor supply to increase. Recent labor market statistics and analyses seem to be consistent with behavior of this kind, in which lower productivity is

partly offset (as it affects potential GNP) by higher labor force participation. Furthermore, future technological advances could on balance be energy-saving rather than neutral (as Rasche and Tatom assume) with respect to input proportions.

These offsets are no more than possibilities, however. It would be a mistake to ignore the danger of a substantial eventual impact of high energy prices on potential GNP. The Rasche and Tatom studies will have served a highly useful purpose if they remind us to monitor closely trends in energy conservation and productivity and be prepared to adjust our estimates of potential GNP when U.S. production techniques show signs of significant reaction to the new energy regime.

Footnotes

1/ "Industrial" sector covers manufacturing, mining, agriculture, and construction for comparability with energy consumption data.

2/ See Marie P. Hertzberg, Alfred I. Jacobs, and Jon E. Trerathan, "The Utilization of Manufacturing Capacity, 1965-73," Survey of Current Business, July 1974, p. 49.

3/ Rasche and Tatom, "The Effects of the New Energy Regime," pp. 3-4.