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The Resources Crisis

by Louis W. Stern, Tayeb Zahzah, New York *

This article utilizes a new concept of supply and demand for raw materials. It emphasizes the need for the use of long run economics rather than short run analysis in the determination of a fair price for raw commodities.

The October War and the oil embargo which followed could have brought us to a new era of military occupation of oil producing countries and possibly to World War III. Will we again experience the same anguish when another raw material is in short supply?

The future will pay tribute to the present world leaders for having kept a low tone during the recent energy crisis. Conflicts, although serious, were low keyed by both the heads of oil producing countries and those of consuming countries. The growth of Japan, Germany and the European world was brought to a halt because one raw material, petroleum, lacked. Balances of trade shifted from red to black for some countries, from black to red for others and from red to even redder for some less developed countries. Suggestions ranging from invading the Middle East to using the Jews as a scapegoat were made in private as well as in public.

"Artificial or real shortage?", was the topic of much speculation a few months ago. However, questions, suggestions and propositions led to one conclusive warning: the world resources of petroleum are depleting. The price of petroleum moved from approximately \$ 2.55/barrel in May 1971 to \$ 9.06/barrel in November 1973, an average increase of 120 p.c. a year¹.

Why did the price of petroleum rise by 400 p.c. in three years, thus allowing oil exporting countries to increase their income per barrel of oil by 600 p.c.²? What has brought the Arabs to the

successful use of oil as a weapon? Has the Law of Supply and Demand failed to regulate?

The answers to these questions go far beyond the present situation in the Middle East. They lie in the concept of fair prices for raw materials, rather than the prices imposed only by the present artificial equilibrium of demand versus supply. The present price of raw materials does not take into consideration future supply and demand but deals instead with present supply and demand.

Let us examine the two extremes of the continuum of production and process of raw materials, one at the mine or well and the other at the retail outlet.

Causes of Falling Raw Material Prices

"Instead of following the trend of international prices for other commodities, the prices of oil started to fall in 1948. They continued in their decline until the oil producing countries joined together and formed the Organization of Petroleum Exporting Countries (O.P.E.C.). Oil prices stopped declining after August 1960, but they remained frozen at the level they reached at that time until the end of 1970. After that, they rose a little to a level that was still lower than their level in 1948."³

The explanation of this adverse trend in the price of any raw commodity is found in the concept of supply and demand. In the short run analysis, supply means production which, because of the fantastic technological progress, increases at a higher rate than demand, and therefore generates

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¹ Petroleum Press Service, May 1971, pp. 162, December 1973, pp. 448.

² US Congress Senate Committee on Finance (93:2), Hearing on Profitability of Domestic Energy Company Operation.

³ Sheik Ahmed Zaki Yamani, United Nations A/PV 2217, April 1974, pp. 32.

a lower price. But in the long run analysis, supply, meaning total available known and limited resources, is depleting at an increasing rate.

At the other extreme of the continuum, the consumer side, only the short term effect is reflected. Production increases; price decreases. The decrease in price may not be passed on directly to the consumer but may be reflected in an improved product at the same price.

Since the average per capita income increases at about \$ 58.00 a year⁴ in industrial countries the consumption of products, steel for example, increases proportionally and is balanced by increases in production rather than by increases in price. Here the law of supply and demand does not act as a regulator. In short term analysis, resources are not scarce.

Misled Consumers

It is true that for the present, resources are not scarce but the Club of Rome in "Limits to Growth"⁵ lists twenty vital minerals which, with the most conservative index of depletion and the most optimistic factor for reserves not yet discovered, will be entirely consumed by the year 2050. Obviously the energy crisis should be called the resources crisis and may in the next decade or two repeat itself for every mineral resource.

Optimists may hope that by 1990 we will have found substitutes for most raw materials. Such hope would certainly not be that of scholars who have understood the Principle of Conservation, i.e. "only nothing comes from nothing", and who have understood that natural resources are the only inputs to our whole life system. Any substitute for one resource is nothing more than an increase in the rate of depletion of another, e.g. increases in the use of coal as a substitute for petroleum.

The consumer, an economic animal, when he has the purchasing power which he has in the United

States, Canada and Sweden, will try to maximize his welfare. But as Abraham Maslow⁶ has demonstrated, the needs of man are not static and even the concept of the basic needs varies. The type and definition of basic needs change with the increase of per capita income. A television and a car, for instance, are necessities in the US (GNP per capita \$ 5072 in 1971)⁷, but they are luxuries in Algeria (\$ 304 GNP per capita in 1971)⁸.

Long-term Determination of Prices

President Haouari Boumedienne of Algeria advocates austerity for the developed countries. Speaking to the United Nations he stated, "In particular, it is necessary to eliminate the phenomena of overconsumption and gadgetization and, more generally, the waste, which runs rampant throughout the developed economies"⁹.

Is this realistic? Can gadgetization be eliminated? Of course not. "Gadgetization" is the logical consequence of abundance. "Gadgetization" and overconsumption cannot be stopped by rules and laws but they can be slowed down by a new definition of supply when raw materials are involved. Supply, demand, price and their interrelationships are the only tools that developed countries, in the non-socialist and non-communist world, can use to shape consumer's behavior and moderate his needs. But in order to be effective, price must be determined by the long run analysis.

When the per capita income increases there is a corresponding increase in the demand for certain products, gasoline for example. In the long-run economics, there are two ways to slow down this change in demand: One way would be to maintain a constant supply of the raw material. However, this is not advisable because of its negative byproduct, namely rationing and black marketing. Another method is to increase both

⁶ A. H. Maslow, Motivation and Personality. Second Edition, New York, 1970, pp. 24.

⁷ US Bureau of Census, Statistical Abstract of US 1973.

⁸ Background notes by US Department of State, August 1972, pp. 3.

⁹ Discours du Président Haouari Boumedienne, Session Extraordinaire de l'Assemblée Générale des Nations Unies, April 1974, p. 41.

Real Price Computation Model

Resource	No. of Years of Available Supply	Base Price (Hypothetical)	Incremental Factor Z	Real Price Reflecting Depletion Factor	Known Global Reserve
Aluminium	31	\$ 10/ton	3.22	\$ 32.20/ton	1.77 x 10 ⁹ tons
Copper	21	\$ 10/ton	4.76	\$ 47.60/ton	308 x 10 ⁶ tons
Iron	93	\$ 10/ton	1.08	\$ 10.80/ton	1 x 10 ¹¹ tons
Petroleum	20	\$ 10/bbl	5.00	\$ 50.00/bbl	455 x 10 ⁹ bbls

Source: Data taken from Meadows et al., The Limits to Growth, page 57.

the supply and the price. The increase in price should reflect both changes in demand and a change in the rate of depletion of the raw material, here petroleum. This increase in the price will serve as feedback to the consumer who will of course reduce his demand.

Conclusion and Recommendations

As stated earlier, the present prices of most raw materials do not consider an important factor: the rate of the world resources depletion. The price of raw materials must not be left to a short-sighted application of demand and production but must be tied to the "depletion factor".

An example of the depletion factor can be seen by considering all known world resources of all minerals that may be depleted within the next one hundred years. We must determine a reasonable base price, either the actual price or a negotiated price. Then determine the depletion factor which has an inverse relationship to the number of years of available resources.

Compute the real price which is the minimum price that must be paid for the raw material:

$P_r = P_b Z$, where P_r = Real Price, P_b = base price, Z = depletion factor.

The table on p. 180 is an example of the computation of the real price for four raw materials.

Of course, more elaborate and dynamic models could be developed by a panel of experts in Statistics, Economics and Management Science. An international body such as the World Bank with a team of experts representative of producers of raw materials from developed and developing countries is in our opinion the best choice for introducing what is called *Management of World Resources*.

A realistic and early approach to the mineral resource problem will avoid some sporadic and possibly fatal crises, will force conservation, stimulate efficient use of raw materials, stimulate research for new resources, contribute to cooperative rather than competitive international relationships, prevent the otherwise inevitable formation of OPEC-like cartels, and may even help to leave our children, if not a heavenly and peaceful world, at least not an empty one. After all, what is heaven to a hungry man?

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