Henry Kissinger at the oil-consuming nations conference in February 1974, to share scarce energy supplies with other consuming countries, provided these countries reciprocate. From a long-range point of view, such objections are unwise, despite the unfortunate short-run impact of energy exports during periods of shortage.

The United States exports substantial volumes of foodstuffs, industrial materials, and equipment to the Arab oil-producing countries. Because these countries resorted to a boycott on oil exports to the United States, there is widespread support for an embargo of U.S. exports of goods vital to these countries' economies.

There is little reason for objecting to the Congress granting the Executive Branch the power to deny American products to countries interfering with the shipment of goods to us. Implementing such a provision should be limited to the most dire of circumstances, however. An American embargo could easily be evaded or circumvented in the absence of full support from U.S. trading partners. Items could be rerouted through third countries, or alternative sources outside the United States (including the Soviet Union) could replace American exports. Quick resort to retaliatory trade measures would foster the already dangerous tendency toward economic warfare, which, if widely pursued, can only endanger world prosperity. The remedy lies in a removal of the sources of friction, not in aggravating the pitch of battle.

Conclusions

Five policy elements should be combined in assuring adequate energy supplies at acceptable costs: moving toward a more balanced distribution of power between producing and consuming countries; developing a technological readiness for national energy independence; establishing desirable stocks and reserve productive capacity; relying on a flexible tariff system for linking domestic and world energy markets; and adopting an export strategy that supports the basic objective.

Two conditions are sine qua non's to any import-export strategy regarding energy materials. Policies must be clearly laid out and pursued with a steady hand in order that investors can afford to commit the vast sums necessary and expect recovery and adequate returns, typically spread over long periods of times. The policy package must be internally consistent, avoiding the conflicts and contradictions that so often have marred U.S. energy policy in the past.

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Oil Money and World Money: Conflict or Confluence?

Thomas R. Stauffer

I attempt to analyze here the impact of escalating oil prices upon the international money markets and the balance of payments positions of the major powers. Since oil is by far the most important item moving in world trade —and since effective export prices have roughly quadrupled since October 1973 —it is germane to ask whether such convulsive price increases might touch off seismic repercussions throughout the international economy.

This question is all the more relevant because current assessments of the impact of higher oil prices differ diametrically. Some observers, like Walter Levy, foresee recession and global relapse. Others, equally astute, invoke the inherent resiliency of the marketplace—the invisible, but supple, hand—and argue that some new equilibrium condition is near at hand and not unacceptable. Somewhere between the Scylla of hysteria and the Charybdis of insouciance must lie reality.

I shall identify only the bounds of the problem and illustrate the several issues using approximate, order-of-magnitude calculations. The analysis will be broken down into the following parts: (i) parameters of the oil price increase; (ii) prior role of Middle Eastern oil in the international balance of payments; (iii) contribution of oil price increases to inflation; (iv) impact of price increases upon trade balances; (v) their implications for financial markets; and (vi) interpretations and tentative conclusions.

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Oil Prices—the Quantum Jump

Between early October 1973 and January 1974, the tax reference, or posted, prices of Middle Eastern crude oils rose from \$3.01 to \$11.65 per barrel (1 barrel $= 1.59 \times 10^2$ liters). The oil-producing states unilaterally decreed these two upward revisions. These "prices" are used to determine exporting governments' revenues, which, in turn, are by far the largest component of the effective price of crude oil on world markets, as illustrated in Table 1. Government revenues rose from \$1.76 to \$7, and consequently the tax-paid costs for crude oil in the Persian–Arabian Gulf area rose from \$1.88 to \$7.13 per barrel.

The effect upon actual prices was somewhat greater, since the average prices are the sum of costs, taxes and royalties, producing-company profits, and a margin for the governments' equity—crude oil that the companies are obligated to buy back at higher prices under recent participation agreements. Omitting all intricacies, one can estimate that the typical f.o.b. price of oil in the Gulf rose \$5.50 to \$6 per barrel in 4 months.

The widely quoted and awesome prices of \$17 to \$22 per barrel represented only a minor fraction of the total market, and were largely the re-

Table 1. Components of effective price of crude oil on world markets, for three dates.

Component	1 Oct. 1973 ($)	16 Oct. 1973 ($)	1 Jan. 1974 ($)
Posted price	3.01	5.12	11.65
Royalty	0.38	0.64	1.46
Production cost	0.12	0.12	0.12
Income tax	1.38	2.40	5.54
Government revenue	1.76	3.04	7.00

sult of panic purchases of nonembargoed crude oil by U.S. utilities or smaller firms exempt from price controls. The increased burden on the world economy for 1974 may be estimated as $55 billion, based upon the increase in host government "take," plus a transient additional profit to the companies of perhaps as much as $0.40 per barrel.

Based upon 1973 production and prices, the economic rent collected by the Organization of Petroleum Exporting Countries (OPEC) amounted to about $25 billion per year, growing at 11 percent or more yearly. The recent price increases, however, almost quadruple that flow and imply the transfer of a further $50 to $60 billion annually to the oil-exporting countries. This incremental transfer in purchasing power amounts to 10 percent of the total value of world trade.

Oil and Dollar Flows before 1973

Even before the dramatic increase in oil prices in October 1973, the Middle Eastern oil industry played a very important, but quite discrete, role in international money flow. By the mid-1960's, the presence of U.S.-owned oil companies in the Middle East and the marked preference of most oil-exporting countries for U.S.-produced goods and services combined to generate large net flows of dollars into the United States.

This relationship paralleled that of India and the British Empire in the 19th century. The United Kingdom maintained a trade surplus vis-à-vis India and ran a deficit with the rest of the world, while India consistently showed a balance of payments surplus with all other countries except England. Trade among the United States, the Middle East, and the rest of the world yielded net flows of some $3 billion per year into the United States through 1967. The U.S. advantage eroded subsequent to 1967, and now we will show a net deficit vis-à-vis the Middle East, quite apart from any aid transfers to Israel.

Oil Prices and Inflation

The first measure of the aggregate impact of higher prices for imported oil is obtained by comparing those increased costs to the gross national product (GNP) of each of the major oil-consuming nations. The ratio of incremental oil import costs to GNP is a revealing measure for two reasons: it shows the direct impact of such increases upon domestic prices (that is, it provides a workable estimate for the inflationary impact) and it places the problem of accommodating higher oil import costs in the perspective of the entire national economy.

These effects are displayed in Table 2, where the extra import costs due to the October 1973 and January 1974 price increases are shown in the first two columns. Thus, for Japan, the first increase added $2.8 billion to its annual import bill, while the January increase added a further $6.5 billion—for a total of almost $10 billion per year, based upon projected import levels for 1974. Those two increases together contribute 1.7 percentage points directly to domestic inflation, or 1.8 points if one includes indirect effects as well.

The contribution to inflation in the Netherlands is 2.5 points, while that for Canada is only 0.4 percentage points. In the case of the United States, the proximate effect of higher import prices—assuming that Middle Eastern oil were actually to flow in needed volume—is an increase of 0.7 percent in the price level. However, the price for U.S. domestic oil, which comprises some two-thirds of national consumption, has been dragged up as well, and the full inflationary contribution approaches 2.0 percentage points.

The inflationary impacts upon the six or seven largest industrial economies are thus essentially the same—an addition of 2.0 percentage points to the price level. Since inflation rates range between 6 percent for Germany and 10 to 12 percent for Japan, it appears that the Shah's bold thrust has added between one-sixth and one-third to this year's inflationary trend—unless, of course, still more costly surprises are in the offing. It is hoped that this is a

Table 2. Direct impacts of 1973–74 OPEC price increases; N.A., not applicable. [Source: *Economic Outlook* (Organisation for Economic Cooperation and Development, Washington, D.C., 1973)]

Country	Impact on 1974 import bill ($ billion)		Impact on aggregate price levels (percentage points)	
	October increase	October and January increases	Direct	Total
Canada	0.3	0.9	0.4*	0.6
United States	2.8	9.3	0.7*	0.8
Japan	2.8	9.3	1.7	1.8
France	1.5	5.1	1.4	1.7
Germany	1.8	6.0	1.4	1.7
Italy	1.3	4.2	2.0	2.3
United Kingdom	1.3	4.2	2.0	2.4
Netherlands	0.5	1.7	1.7	2.5
Total OECD	15.0	51.0	1.4	1.8
Non-OECD	2.5	8.5	N.A.	N.A.

* Exclusive of effect of increased prices for domestic petroleum.

Table 3. Effect of oil prices on balance of trade. [1974 trade (T) in dollars estimated as $T(1971)^2 \div T(1968)$—that is, extrapolation of growth rate from 1968 to 1971. No devaluation-revaluation corrections.]

Country	Exports of goods and services		Approximate relative burden of "extra" oil costs
	1971 ($ billion)	1974* ($ billion)	Percent
Canada	21.0	29	0
United States	56.2	72	13
Japan	27.0	49	19
Belgium	12.7	20	
France	27.4	43	12
Germany	47.0	74	8
Italy	19.8	29	14
Netherlands	17.7	29	6
United Kingdom	30.7	44	10
Total OECD	312.4	464	11

* Estimated.

one-shot effect. Even the inflationary impacts estimated above will be reduced insofar as higher prices curb consumption or induce fuel-economizing investments.

Effect upon Trade Balances

Although the effect of oil prices upon inflation rates—the internal effect—is seen to be small and nonrecurrent, the impact upon trade balances—the external effect—is both relatively larger and clearly recurrent. The relevant measure here is the ratio of the extra oil import bill to total exports of goods and services. This is equivalent to the amount by which the country's exports must be increased—or its nonoil imports decreased—in order to neutralize the effect of costlier oil imports.

Canada is obviously the most favored (see Table 3): Its additional costs for imported oil are offset by its surtax on oil exported to the United States. Otherwise, the burden of higher oil prices ranges between 6 percent of trade earnings for the Netherlands to a high of 19 percent for Japan.

Increased deficits of such magnitude in the balance of trade can, in principle, be accommodated by means of currency devaluation or export promotional devices—if each country views its plight in complete isolation. To restore equilibrium, any individual country would need to devalue its currency by a percentage equal at most to its trade imbalance. Thus, Japan might devalue by between 10 and 20 percent, while the United States would need to devalue by 13 percent at most. Devaluations of this magnitude have not been infrequent.

However, the conventional, mercantilist reaction—relative exchange rate depreciations—involves a zero-sum game. Only one country can succeed with this gambit, since the industrial states are each others' principal customers. If any one gains in trade under these circumstances, it is largely at the expense of the others. Since retaliation is certain, the usual trade competition via exchange rate adjustments offers no solution whatsoever to the problem of "oil deficits." Indeed, the conventional reaction ensures disruption and disequilibriums.

The oil-exporting countries cannot absorb enough exports from the consuming countries to balance trade accounts. Even Iran, with the largest population and the greatest ultimate import needs, has managed to consume more modest oil revenues only by virtue of massive expenditures on weaponry. Thus, for some years, all of the major oil exporters will show a cash surplus. Saudi Arabia, for one, may generate surplus revenues well into the 1980's. The overhang of "petromoney" is endemic, therefore, unless prices collapse. Barring a price collapse, then, chronic balance of trade deficits are an inevitable part of the world economic order for the next 5 to 8 years, and overall "balance" in the balance of payments is possible solely via capital flows.

Table 4. Foreign exchange reserves and oil import burden.

Country	Official reserves ($ billion)	Extra oil bill (1974) ($ billion)	Coverage (years)
United States	14.6	9.3	1.6
Japan	11.6	9.3	1.2
France	8.3	5.1	1.6
Germany	32.2	6.0	5.4
Italy	6.0	4.2	1.4
United Kingdom	6.2	4.2	1.5
Netherlands	5.9	1.7	3.5
World total (excluding oil exporters)	163	51.0	

Dollar Reserves and Capital Flows: Size of Flows and Markets

The projected deficits in oil account for the industrialized, oil-consuming countries cannot be offset by drawing down their existing foreign exchange reserves. As shown in Table 4, official reserves are far too small to meet the recurrent, projected oil deficits.

Germany might need to draw but little upon its reserves of some $30 billion, since its basic trade balance is now strongly in surplus. In the case of Italy and the United Kingdom, however, the extra oil drain adds directly to net dollar outflows, so they have no cushion at all (*1*).

"Recycling" of the surplus funds is the ony foreseeable equilibrating mechanism for the next several years, unless prices drop or the oil-exporting countries increase their own imports of goods and services. The oil importers' trade deficits become the OPEC countries' financial surpluses—money is conserved, not lost, in this process—and the key question is whether these extraordinarily large flows can find their way back into portfolio investments by the oil exporters without disrupting or saturating financial markets.

It must be emphasized that the flows of "petromoney" are both large *and* recurrent, possibly even growing each year. Forecasts of $100 billion, rising to $200 billion, per year have been made by combining the new, high prices for oil and the older projections of oil demand, which were derived from the older—and much lower—oil prices. These cost forecasts are clearly inconsistent and extravagantly high.

One might project the OPEC surpluses at, roughly, an average of $40 billion per year through 1980, with about one-third accruing to Saudi Arabia. This assumes that higher prices dampen the growth of oil demand from 11 or 12 percent per year to, say, 4 percent, while OPEC's own imports grow by some 15 percent per year. The emergence of supplementary sources of supply might further reduce demand for Middle Eastern oil after 1980, or even lead to a decline in production, but an estimate of $240 billion of accumulated portfolio reserves appears plausible by 1980. Accumulated interest and dividends, plus existing balances of $15 billion, could bring the total to about $300 billion.

This magnitude can be tested against

Table 5. Financial market flotations and issues, 1971. [Source: *OECD Financial Statistics*]

Country	Bonds ($ billion)	Shares ($ billion)	Long-term loans ($ billion)	Government short-term ($ billion)	Other short-term ($ billion)	Total ($ billion)
Canada	7.4	0.5	4.6	0.4	0.7	13.5
United States	49.5	14.8	48.9	22.3	9.9	145.4
France	3.3	3.1	12.4	1.2	5.9	25.9
Italy	8.1	3.2	9.6	2.7	9.8	33.4
Japan	11.9	4.0	50.0	e.c.*	e.c.*	65.9
United Kingdom	9.5	0.9	14.0	1.3	1.7	27.4
Germany	5.6	2.2	15.1	e.c.*	4.5	27.3
Totals	95.3	28.7	154.6	27.9	32.5	338.8

* "e.c." denotes "elsewhere classified."

Table 6. Estimated national financial markets, 1971. The definition of "market" is approximate; N.A., not applicable. [Source: *International Financial Statistics*]

Country	Shares ($ billion)	Bonds ($ billion)	Loans ($ billion)	Total ($ billion)
United States	1030	600	1100	2730
Germany	N.A.	N.A.	190	190*
Japan	35	80	350	465
France	25	25	125	175
Italy	20	60	150	230
Canada	N.A.	60	60	120*
Subtotal (with United States)	1110*	825*	1975	3910*
Subtotal (without United States)	75*	225*	875	1180*
Euroloans/Eurocurrencies			100	100
Eurobonds		15		15

* Partial totals, excluding unavailable items.

both the total size of the world's financial markets and the annual increase in demand for loan capital of all types, in order to test tightness of fit. The capital markets of the seven major industrial countries absorbed almost $350 billion in new money in 1971 (see Table 5); the figure for 1974 should be close to $450 billion in current dollars. Thus, the investable surplus of some $40 billion in 1974 (after deducting about $10 billion for increased OPEC imports and a high level of regional aid disbursements by the Arab states) amounts to one-tenth of the growth of flotations of new debt or stocks in the countries in the Organisation for Economic Cooperation and Development (OECD).

The total size of the financial markets of six OECD countries is estimated in Table 6. The U.S. market alone comprised $2.7 trillion, and the partial total for the six countries was $4 trillion in 1971. The total for all OECD countries in 1974 should be closer to $6 trillion, against which projected OPEC surpluses amount to three-quarters of 1 percent. Extrapolating forward, one might estimate that oil exporters' financial assets would reach 2 to 3 percent of the total financial markets by 1980.

Constraints on Financial Markets

Neither the annual flows of "petromoney" nor the accumulation of financial surpluses appears to be untowardly large in comparison with the financial markets of the industrial countries.

Therefore, the central issue is the elasticity of the money markets themselves. Potential difficulties do exist with respect to structural rigidities or possible imbalances in international financial markets. Hitherto, most oil payments have been denominated in dollars, and the OPEC countries have tended to concentrate their financial holdings in the short-term Eurocurrency markets. Currency and maturity preferences thus could create market tensions. Also, since a half-dozen countries (but principally Saudi Arabia) will predominate as the new holders of financial claims, concentration among lenders could portend instability.

This issue will be joined this month, once the first sizable oil payments under the new price regime begin. Will the abrupt reordering of international money flows upset the market? There is some cause for optimism:

1) The Eurocurrency markets already exist as a vehicle for recycling balance of payments surpluses back to deficit countries.

2) The Eurocurrency market has proved extraordinarily resilient, growing as much as 25 percent per annum. Both oil debtors and creditors are well acquainted with the market.

3) The Eurocurrency market is shifting steadily toward longer maturities; placements with terms of 5 years or more appear now with increasing frequency.

4) "Oil deficit" countries are moving into this market to recapture funds; France and the United Kingdom have both borrowed officially in recent months, and Japanese companies are borrowing, while their banks are liquidating asset positions.

5) Heretofore, with the sole exception of Libya's unprofitable bolt out of sterling in 1971, oil exporters' portfolios have been managed most cautiously, thereby incurring unwelcome devaluation losses on both sterling and the dollar. Their increasing asset positions argue continued conservation.

The short-term prospects appear favorable, even without recourse to bilateral clearing agreements, which automatically reduce the possibilities for "slosh" in money markets.

For the long-term, multilateral instruments have been discussed—"oil money unit trusts" or special roles for the International Monetary Fund and the Bank for International Settlements as depositories. These may prove redundant, if the Kuwait model for investing oil surpluses is contagious. With a longer history of surplus funds, Kuwait early found long-term investment outlets, including some equities and real estate in the United States. The proliferation of multilateral investment banks —joint ventures between Arab state and consuming country banks—and the queues of investment bankers in airline terminals around the Middle East betoken ample opportunity for funneling new funds into equities or real estate. The conduits for recycling are multiplying, and the financial reservoir at the end of the pipes is comfortingly large.

Summary and Conclusions

High oil prices will have a relatively minor impact upon the industrialized countries, since these can borrow to finance their oil imports until broader adjustments ensue. The underdeveloped countries have no such option, yet, because their economic duress is not fundamental to the global economic order, this article is focused on the industrialized nations.

Some effort at perspective is useful, however. First, some of the underdeveloped countries can compensate by virtue of newly buoyant export prices for other commodities. For the remaining, hard-core cases, a rearrangement of foreign aid priorities may be needed. For example, India, with a per capita income of about $90, receives about $1 per person in aid; Israel, with a per capita income of some $2000, now receives more than $1000 per head in total aid, an amount equivalent to one-half or more of U.S. expenditures on foreign aid. The readjustments to assist the neediest of the less developed countries are manageable if there is serious concern, even without price concessions or aid disbursements by the oil exporters themselves.

With respect to the industrialized countries, the general issues may be summarized as follows:

1) The one-time inflationary contribution of higher oil prices is about 2 percentage points.

2) Benighted bilateralism—that is, currency devaluations or trade promo-

tion programs—invites retaliation and is not fruitful.

3) "Oil deficits" can be offset over the next several years only through compensatory capital flows, *not* on trade account.

4) The "oil surpluses" will constitute about 7 to 10 percent of new debt issuance in the OECD countries and by 1980 might accumulate to 2 to 4 percent of global financial markets (excluding real estate).

These higher prices do entail real transfers of real resources of purchasing power from oil consumers to oil exporters, but the global economy does not appear to be untowardly burdened. The relatively small magnitudes facilitate adjustment. The key question, therefore, is not one of magnitudes, but of whether the surpluses can be rechanneled back to the debtor countries with minimum friction.

International financial markets are both deep enough and deft enough to absorb the volumes of recycled funds that are projected. It remains to be seen whether national governments will foster or impede these adjustments, but it is clear that the adjustment process will be minimally painful for those economies that prove best able to respond quickly.

Notes

1. The new extra oil import bill would have to be subtracted from the pre-October 1973 basic trade balance to estimate the rate at which reserves would actually be drawn down, but the "coverage" figures do illustrate the precariousness of the present situation.

Applications of Input-Output Analysis to Energy Problems

Anne P. Carter

This year there is rising interest in the application of input-output analysis to energy problems. Input-output computations have been used by government and private agencies to assist in forecasting shortages of fuels and other industrial inputs during the oil embargo. They are also being used to assess how various changes in energy technology might affect the economy in the long run. These problems require a detailed systems approach because they involve many interdependent industries and consumers. Studies of new technologies must bridge the gap between technical specifications that call for particular inputs—steel, construction, computers, and instruments—and production and employment in all sectors.

Input-output analysis is the only method now available for dealing with these large-scale multisectoral problems empirically. However, there is a danger that the elegance and convenience of the approach will blind users to its limitations. Input-output analysis does not supply instant economic planning. The U.S. data base is substantial and rapidly improving but still modest as compared with those of countries where the system has been used more in energy and other applications (*1*). Some of the information needed to solve current problems is not yet available. Those who take input-output seriously will continue to emphasize the importance of additional information, judgment, ingenuity, and luck.

In this article I present a brief outline of the U.S. input-output system and data base and discuss two kinds of applications: (i) estimating the impact of this year's petroleum shortages on output, employment, and prices; and (ii) analyzing the long-term economic effects of prospective changes in energy technology. The coverage is illustrative rather than exhaustive. I regret that I cannot discuss the many regional input-output studies now under way.

Framework and Data

An input-output table gives a detailed picture of the flow of goods and services that individual industries buy from and sell to each other in a particular year. Table 1 is a 1958 input-output table for the United States, aggregated to only eight sectors for illustrative purposes. Each horizontal row gives the amounts that a particular industry sold to all sectors, including itself, and to the "final demand" or final users categories: households, government, foreign trade, net inventory change, and gross private capital formation. Transactions are measured in dollars, although they occasionally are measured in physical units (kilowatt-hours, tons, number of automobiles, and so on). The materials industry, for example, sold $276 million of its output to the mining industry, $8565 million to itself, and $3994 million to final demand. Individual vertical columns indicate how much each sector purchased as inputs from other sectors. Column 1 shows that the materials industry purchased $8565 million of materials, $1505 million of metalworking products, and $506 million of agricultural products to produce 1958 output. The next to the bottom row of Table 1 gives the "value added" for each sector, which is the sum of its payment to labor and of its capital charges, profits, direct taxes, and miscellaneous disbursements.

Input-output coefficients are obtained by dividing the entries in a column, which are an industry's inputs, by that industry's output. In other words, coefficients show the amounts that an industry purchased from all other industries and from value added per unit of its own output.

A column of coefficients thus gives a detailed quantitative description of the technique of production used by a sector, a sort of recipe for its output with specifically enumerated inputs as ingredients. Because an input-output coefficient table includes a column of input-output coefficients for every sector, it gives a comprehensive structural description of the entire economy for a particular year.

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