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THE OIL-POOR DEVELOPING COUNTRIES AND U.S. ENERGY POLICY: A PRELIMINARY ASSESSMENT

By

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Introduction

The world follows, with more than casual interest, the tortuous path the United States had taken in its efforts to develop a comprehensive energy policy. Given the interdependence of world economies, the impact of any major policy in a country as economically important as the U.S. is felt worldwide, directly and indirectly. And U.S. energy policy is no exception. Although a U.S. energy plan must necessarily be designed to "solve" the U.S. problem, including its dependence on foreign sources, such a plan has multi-faceted international implications. The size of the U.S. purchases in the world oil export market makes the outcome of its energy program crucial to the future direction of world energy prices.

The most vocal critics of the failure of the U.S. to adopt a comprehensive energy policy have been its industrially developed, major trading partners — Japan and Western Europe. But probably more critically endangered over both the short-term and the long-term are the oil-poor or net-oil-importing less developed countries (NOI-LDCs). The oil imports of these countries, while crucial to their individual development programs, constitute an insignificant share of the world oil market, thus making them virtual "price-takers." As such, they can only watch and react. They cannot influence the world market price.

This paper will comment not on the kind of energy policy the

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U.S. should adopt, but rather on the relevance of the U.S. policy to NOILDCs. The goal of U.S. energy policy is to attain self-sufficiency in its energy market over the long-term. A domestic demand/supply gap can be narrowed or closed by (1) reducing demand, (2) increasing supply, or (3) simultaneously doing both. If the ultimate goal is to reduce dependence on foreign supplies, the strategy would logically focus on increasing domestic supply and reducing demand. The target sizes of the demand reductions and supply increases would be constrained, within given time frames, by technical problems and socioeconomic /political objectives.

The first part of this paper will elaborate on why and how closing the demand/supply gap in the U.S. can influence world prices. The second part will show how the outcome affects development planning and resource allocation in developing countries, in the light of the gap's direct and indirect inflationary effects. The Philippine case is used to illustrate the arguments presented in this paper. The choice of a Southeast Asian country is based on the observation that the focal point of the world economy in the next 10 to 15 years will shift to the region which includes Japan, South Korea, Southeast Asia, and Australia. Moreover, the region will be growing relatively faster than the rest of the world.

It should be emphasized that the arguments presented must be viewed in the context of the preliminary nature of the assessment made here. A broader study is scheduled shortly, incorporating the comments made during this conference.

Impact of U.S. Net Demand on World Oil Market

U.S. Import Demand

U.S. oil demand constitutes about 30 per cent of total world demand and 35 per cent of the oil marketed outside the Centrally Planned Economies (CPEs). Since 1967, this amount has been increasingly supplied by non-U.S. oil (Table 1).

The U.S. produces about 16 per cent of the world's supply, and over 14 per cent of non-U.S. production goes to the U.S. market. Since almost all of production in the U.S. and in Western Europe are consumed domestically, their output may be effectively excluded

TABLE I

Oil Consumption: U.S. vs. World, 1967-1976 (Selected Years) (million metric tons except where otherwise noted).

	1967	1970	1973	1976
World	1,769.3	2,274.8	2,773.2	2,878.8
U.S.	595.8	694.6	818.0	822.4
Per cent of World	33.7	30.5	29.5	28.6
Per cent of World less CPEs	39.5	35.6	34.9	35.1
Per cent Imported (net)	19.4	22.7	35.4	41.4
NOILDCs as a percentage of World less CPEs	NA	8.9	9.4	9.8

Source: *BP Statistical Review of the World Oil Industry, 1976* for consumption, Independent Petroleum Association of America, "Supply and Demand Outlook," January 1979, and the World Bank for NOILDC consumption.
NA = not available

from world traded oil. Besides, the output relevant to the discussion is exported oil. About 88 per cent of the production of the Organization of Petroleum Exporting Countries (OPEC) in 1976 was exported (Table 2). In 1976, about 20 per cent of such production (or 23 per cent of its exports) went to the U.S. About 15 per cent went to Japan, and about 35 per cent to Europe (Table 3). A World Bank study (34) showed both recent historical and projected NOILDC consumption to be only 10 per cent of total demand. Assuming that NOILDC imports all come from OPEC countries, the relationship may be shown symbolically as follows:

$$\text{OPEC output } (X) = .20X \text{ (US)} + .15X \text{ (Japan)} + .35X \text{ (W. Europe)} + .10X \text{ (NOILDC)} + 0.20X \text{ (Misc.)}$$

This equation may give rise to the argument that Western Europe consumes more than the U.S. and that the latter is, therefore, not as important as it is made to appear here. It may be pointed out, however, that Western Europe is composed of several independent states with independent energy policies. To expect it to act as a bloc and treat it as one buyer is beyond the time frame under discussion,

TABLE 2

Output Excluding Centrally Planned Economies ('000 b/d)

	1973	1974	1975	1976
OPEC	31,310	31,060	27,545	31,025
Non-OPEC, non-CPE	17,665	17,505	17,425	17,755
Total non-CPE	48,975	48,565	44,970	48,780
OPEC as a percentage of non-CPE	63.9	64.0	61.3	63.6
Per Cent of OPEC exported	—	—	—	88

Source: U.S. Central Intelligence Agency, Report No. ER IOD 77-021, 19 October 1977, and *International Energy Biweekly Statistical Review.*

TABLE 3

Imports of Selected Developed Countries, 1976 ('000 b/d)

	Total	U.S.	Japan	Western Europe	Canada
Total from OAPEC	13,610	2,796	2,909	7,687	218
Total from OPEC	22,133	6,114	4,486	10,803	730
Total from non-OPEC producers	4,646	1,160	716	2,746	24
Total imports	26,984	7,295	5,235	13,698	756
% OAPEC[a]	50.4	38.3	55.6	56.1	28.8
% OPEC[a]	82.0	83.8	85.7	78.9	96.6
Breakdown of sources:					
OPEC (OAPEC) Saudi Arabia		1,371	1,719	3,200	
OPEC (OAPEC) Libya		532	41	1,072	
OPEC Nigeria		1,124	17	698	
OPEC Indonesia		573	613	6	
OPEC Iran		548	974	2,273	

Source: U.S. Central Intelligence Agency, Report No. ER IODSS 77-021, 19 October 1977.

[a] May not add up because of rounding.

given its success record (or lack of it) in similarly important but politically difficult areas like the plan for a European Monetary System (3, pp. 1, 7). The U.S., on the other hand, has the opportunity to benefit from an integrated national energy policy.

Around 64 per cent of world production excluding those from CPE countries (Table 2) and around 80 per cent of exported oil originate from OPEC countries (Table 4). World export can thus be conceptually divided into the OPEC and non-OPEC groups: a duopoly with a dominant seller, or even a monopoly if the non-OPEC exporters are considered to have minimal or zero impact on price.

TABLE 4
Total Exports and Production, 1976
('000b/d)

Region	Exports	Production
Middle East	20,855	22,175
Africa	5,330	5,850
Southeast Asia	1,765	1,865
Latin America	3,310	4,575
Subtotal	31,260	34,465
World Total	34,300	59,555
Exports as % of output	90.7	—
Subtotal as % of Total	91.1	57.9

Source: *BP Statistical Review of the World Oil Industry*, 1976.

The influence of NOILDCs on price may be considered nil because of their negligible demand, hence, an oligopsony—a few big buyers of oil.

Theoretical and Policy Implications

The situation may be likened to bilateral oligopoly where several sellers are faced by several buyers.[1]

[1] See discussion in Bilas (8, p. 301). The relevance of the market structure in the world oil market and the energy crisis has been repeatedly stressed by Morris Adelman (1). His arguments however, differ from those presented in this paper.

For practical purposes, however, the situation is more likely typified by a "dominant seller" facing "a dominant buyer."[2] In this situation the parties may bargain, and the better bargainer (whether this is because of astuteness or greater leverage) theoretically obtains the more favorable terms. This, in effect, is what is happening today. It has been argued that the Saudi position of moderation has been pursued in return for an expected settlement of the Middle East political situation in which the U.S. is playing a key role (2). What is disclosed here is that the relative powers of the buyers and sellers (as determined by several factors) determine the final outcome and that visible economic factors affecting this leverage exist.[3] Joint maximization of benefits is possible in this type of economic relation; the outcome however is indeterminate. Yet, while it is difficult to predict the outcome, it is possible to envision sources of bargaining strengths.

The purpose of this section, therefore, is to point out that the size of the U.S. demand for oil alone, ignoring the political factors, puts it in a good position to influence price movements on the selling side. Given this position then, the final framework of U.S. energy policy and its impact on energy demand and supply may be considered significant determining factors in OPEC prices in particular and petroleum prices in general.

The current U.S. energy policy is to reduce foreign dependence significantly. But it is not clear that the current framework will sufficiently enhance total energy supply over the medium term (to 2000?) to attain this, even though it conceivably could. Concentrating on petroleum, for example, elasticity studies have shown that U.S. petroleum output is relatively price elastic in the long run (20). If oil prices are decontrolled and output rises with the incentives—given the U.S. market structure—there is no *a priori* reason to expect U.S. crude prices to rise to OPEC levels (21, 11).

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[2]The "dominant firm price leader" situation occurs when an industry consisting of one firm is dominant in the usual sense of the word (i.e., it controls at least 50 per cent of total industry output), but has several competitive "fringe" firms, each too small to exert a perceptible influence on price through its output decisions (27). Although the demand proportions from the major developed countries do not perfectly fit this description on the demand side, one could still safely call the U.S. a "dominant buyer" because of its ability to influence price by the size of its purchases.

[3]Economic power cannot, after all, be clearly separated from political power.

On the demand side, price elasticity in the U.S. has been shown in several studies to be relatively inelastic in the short and medium term, but nontrivial (6, 30). At the same time, OPEC pricing generally responds to demand-supply conditions, as the post-1974 price growth rates show.

There is no *a priori* reason, therefore, to believe that OPEC prices would rise faster than the inflation rate if it competed in the U.S. market with U.S. output. The Kennedy study (19), simulating a low (.33) and a high (.67) elasticity of supply for the U.S., showed that U.S. energy policy affecting domestic production could have influenced OPEC's optimal behavior. Statements by OPEC leaders on the prudence of Saudi pricing moderation in 1978, as they foresaw a well-supplied market with the production of the Alaskan and North Sea fields, also bear out the balancing influence of non-OPEC supply on world prices (3).

U.S. demand for foreign oil imports can become more elastic than it is now if, coupled with demand reduction and sufficient domestic energy production to supply its basic needs, the marginal supply of foreign oil can be dispensed with. It can, under such a situation, either bargain more effectively with the OPEC countries on the price level of its oil imports or by having a more elastic demand provide the necessary stabilizing influence on such prices. However, an inelastic U.S. oil import demand under favorable economic growth conditions provides no such influence. A policy that reduces demand without increasing supply is no guarantee that the U.S. import market will diminish. Thus, a U.S. energy policy failing to narrow the domestic demand-supply gap to one that makes it less critically dependent on oil imports leaves it in a very poor bargaining relationship with the oil cartel and provides no downward pull on oil prices.

Externalities of U.S. Policy on NOILDC Development

The foregoing has several resource allocation effects on net-oil-importing developing countries. One of them has to do with oil consumption. By helping prevent the world oil market from going "soft," U.S. energy policy guarantees that a major portion of the world's supposedly dwindling oil supply would be consumed by the United States. A second has to do with prices. By assuring that the OPEC price will hold, it keeps prices up for all other users as well. These categories are by no means exhaustive, and we limit ourselves to the second implication, which is dealt with in this section and the next.

There has been a growing concern over the international aspects of U.S. energy policy (17, 36). This, however, focuses on energy supply development strategies in NOILDCs. Various treatises have also suggested analytical frameworks for studying the implications of oil price increases (26, 23). The areas that have been considered were: (1) the domestic and external monetary sectors, (2) employment, (3) wealth transfers, (4) patterns of consumption and production. Other treatises have dwelt on the impact on the developmental efforts of developing countries (14, 29, 33, 35). Any study linking the serious dependence of the development efforts of NOILDCs on how the U.S. manages its energy problems however, is not known.[4]

Given the importance of the U.S. in an interdependent economy, its failure to implement a policy slowing down the rise in world oil prices has serious implications for the economic development of NOILDCs, which are expected to fuel their future economic development programs largely with petroleum imports. On the whole, NOILDCs have fewer opportunities for reducing petroleum demand, either because substitution opportunities are lower or marginal uses which can be sacrificed to conserve energy are fewer compared to those in developed countries like the U.S., Japan, or Western Europe. In particular, the ability of NOILDCs to find substitutes for imported oil is limited by shortages of capital and the appropriate technology for using alternative sources.

It may appear unfair to attach this much importance to the U.S. role. Yet criticisms by U.S. allies of the U.S. failure to devise a meaningful energy policy during the 1977 and 1978 devaluation of the U.S. dollar suggest that, realistically, U.S. energy policy is more important than what the U.S. cares to accept. After all, the U.S. is what might be called the "swing country" in world oil demand. It is not only the best endowed with a variety of energy resources, including coal and petroleum, and therefore has the best potential supply for utilization, but it is also the country where conservation measures yielded relatively less significant results given its capacity for effecting such savings.

The NOILDCs, on the other hand, can only formulate national energy policies aimed at developing indigenous resources. Because they are dependent on the world oil market for most of their energy

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[4]We do not suggest here that the plight of NOILDCs is the result of U.S. energy policy. To do so would be ridiculous. As stated in the introduction and throughout the discussion, we hold that the U.S. is such an economically important nation that, as some have put it, "when it sneezes, its neighbors catch colds," and I might add, "the NOILDCs catch pneumonia."

supplies, they can only react and readjust their priorities in response to policy developments in developed countries. To a large extent, then, their energy and related costs are largely determined by developments in the U.S. market. The analysis in this paper is limited to a description of the impact on the balance of payments accounts and capital allocation in NOILDCs.

Balance of Payments Impact on NOILDCs

As Table 5 shows, NOILDCs are expected to continue their reliance on oil for over 40 per cent of their energy requirements, most of which are imported. In Southeast Asia, this reliance has been projected to be a higher 75 per cent (Table 6). Most of this will be imported from OPEC countries.

The impact of world oil price increases on an NOILDC's balance of payments (BOP) may be grouped into those that are direct and those that are indirect. The direct impact is the foreign exchange losses from the higher oil prices, i.e., the effect on a country's current account. The indirect BOP impact is felt by a country suffering from higher costs of energy-intensive producer goods.

TABLE 5

NOILDC Energy Balance, 1960-85
(million b/d of oil equivalent)

Year	Inland Consumption			Net Imports
	Oil	Non-Oil	Total	(energy)
1960	1.5	1.3	2.8	1.2
1970	3.3	2.2	5.5	2.6
1973	4.2	2.6	6.8	3.5
1974	4.3	2.7	7.0	3.5
1975	4.3	2.9	7.2	3.5
1976	4.4	3.4	7.8	3.5
1977	4.5	3.9	8.4	3.5
1980	4.8	5.0	9.8	3.5
1985	5.4	7.1	12.5	3.5

Source: United Nations for 1960-74 data. World Bank estimates for 1975-1985 data (Annex IV, p. 10, of Report 814/77).

Note: *World Bank projections assume medium rate (4.6 per cent for 1976-80 and 4.4 per cent for 1980) of GNP growth and US$11.50/bbl. Oil price (in 1975 $).

TABLE 6

Southeast Asia's Primary Energy Requirements, 1975, 1985 (thousand barrels per day, oil equivalent)

	1975		1985	
	Total	Oil	Total	Oil
Brunei	18	2	31	4
Burma	27	23	38	31
Cambodia	2	2	5	3
Hong Kong	79	79	145	145
Indonesia	296	248	669	489
Laos	4	3	7	5
Malaysia	119	101	213	186
Papua New Guinea	13	12	27	23
Philippines	216	201	479	357
Singapore	78	78	156	156
Taiwan	271	179	599	366
Thailand	200	184	409	350
Viet Nam	122	75	172	93
Total	1,445	1,187	2,950	2208

Source: F. W. Zingaro, "Energy and Development in S.E. Asia," supplement to the August 1977 issue of *Caltex New York*.

Table 7 shows the current account deficits of NOILDCs between 1973 and 1977. In addition, the World Bank found a 15 per cent decline in the average terms of trade of 40 NOILDCs between 1973 and 1975. The world trade prices of oil and manufactured goods from developed countries increased faster than those of NOILDC commodities. In 1974, NOILDC commodity export price increases were 50 per cent of oil price hikes, and 67 per cent of price increases in the manufactured goods of developed countries (23, p. 153).

The effective demand of NOILDCs for oil imports (M_o) is constrained by its supply of foreign exchange.[5] NOILDCs' ability to purchase oil may, therefore, be seen as a function of its total foreign exchange supply (FX_t) and its import demand for capital goods (M_k), fertilizers (M_f) and other goods (M_n). Inasmuch as its

5/At this point we will resort to a freer use of symbols to simplify exposition.

TABLE 7

Current Account Deficits Net-Oil-Importing Developing Countries, 1973-1977 ($ billions)

Year	94 NOILDC*[a]	All NOILDC[b]
1973	−10.8	− 9.4
1974	−30.−	−39
1975	−38.−	−49
1976	−28.−	−41
1977	−29	NA

Source: Smith [1977], Tables 7, 8.

[a] International Monetary Fund.

[b] Development Advisory Committee, Organization for Economic Cooperation and Development.

*Note: Smith uses the abbreviation NOEDC rather than NOILDC.

demand for oil is closely related to the use of capital goods for development, the priority assigned to oil imports would not be significantly, if at all, higher than the import of capital goods. The same might be said for fertilizer imports. The NOILDC's import optimization problem may thus be expressed symbolically as:

$M_o = M_o (FX_t, M_k, M_f, M_n)$, subject to $FX_t - M_o - M_k - M_f - M_n = O$

FX_t is the sum of foreign exchange receipts (FX_r) from exports (FX_x) and invisibles (FX_i) plus proceeds from loans or external debt (ED) and aids or grants (AG). That is:

$$FX_t = FX_r + ED + AG$$

Some NOILDCs may have minimal access to ED if they are not "commercial developing countries" but are "aid-dependent" countries. Even for the "commercial" NOILDC, however, the brunt of oil import payments must be borne by FX_r over the longer-term. The price of its traditional exports (P_x) may rise by a factor p ($p \gtrless O$), while volume changes by p + a ($a \gtrless O$). At the same time, oil import requirements may rise by p + b ($b > O$) and oil import costs may rise by p + c ($c \gtrless b$). Should the situation $p(p + a) < (p + b)(p + c)$ exist, i.e., should the proportionate increase in export earnings be

less than the proportionate change in the costs of oil imports, an NOILDC will have to seek payment of the difference by augmenting ED or AG or reducing M_k, M_f, or M_n, or by reducing M_o itself. Should the prices of capital (P_k) and of fertilizers (P_f) also change upward, then further adjustments are needed.

A rigorous and empirically conclusive attempt to show the importance of U.S. energy policy to the developmental goals of NOILDCs is not a simple task, and is not attempted at this stage. This paper tries to show qualitatively the direct and indirect BOP effects of the oil price increases on one NOILDC, the Philippines, for which the U.S. is a major supplier of capital goods and fertilizers. The Philippines is about 95 per cent dependent on oil — all of which are imported. With the operation of its geothermal and nuclear plants in the offing, dependence on oil is expected to decline to 75 per cent by 1987 (37, 4). This forecast still stands even with the commercial production of its offshore oil discovery in 1979. Table 8 shows the magnitude of oil import cost increases between 1970 and 1976, while volume remained virtually unchanged until 1975.

TABLE 8

Philippines: Changes in Oil Import Volumes and Costs, 1970-1976

Year	Total Mineral Fuel Imports	Crude & Partly Refined Petroleum		
	(f.o.b.) US$10^6	(f.o.b.) US$10^6	(c.i.f.) US$10^6	(m.t.) X10^6
1970	118.95	101.2	123.8	9.1
1971	141.23	125.6	154.4	9.0
1972	148.82	137.8	NA	9.2
1973	187.60	167.0	209.3	9.3
1974	653.4	573.2	619.4	8.5
1975	769.9	709.8	751.3	9.1
1976	881.5	801.2	842.7	9.6
1977	890.7	NA	NA	NA
Compounded Growth Rates 1970-1976 (Per Cent)	39.7	41.5	38.7	0.9

Source: Central Bank of the Philippines, *Statistical Bulletin* and *Foreign Trade Statistics.*

Table 9 shows the international accounts relevant to the discussion of the cost of oil imports. The last three columns show the ratio of mineral fuel imports to foreign exchange receipts, merchandise exports, and external debt. Between 1967 and 1973 the amount of external debt beginning in 1967 closely approximated the size of export earnings. The ratios of mineral fuel imports to merchandise exports and to external debt were also very close. In 1975, these ratios were at 35 per cent. This suggests that the payment for oil imports (which means sacrifice of other goods) either takes a sizable cut off export earning or must be paid for by a sizable amount of borrowed money.[6]

How does U.S. energy policy relate to this? As stated earlier, the relationship is via the impact of the U.S. demand/supply gap on world oil prices. The Philippine case is only one example of the development costs of higher oil prices, and the picture is not at all heartening for this middle-income, "commercial" developing country.

Capital Allocation Impact on NOILDCs

A specific example of energy-related costs would be NOILDC imports of capital goods. Developing countries are dependent on developed countries including the U.S. for capital goods. Therefore, the inflationary effects of a "high-price" policy (such as the crude oil tax) on the high-energy consuming manufactures would somehow be transferred to the developing countries via their imports.[7] This has serious implications considering that developing countries, in general, would not have the degree of elasticity of substitution between energy and capital inputs in the production process that developed countries enjoy (18, 7, 15). In fact, in LDCs, capital and energy may be complementary inputs, suggesting that

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[6]A statistical analysis of the data showed a high correlation between external debt and mineral fuel imports. Partial correlation was 0.66 in a three variable test, where external debt was regressed against mineral fuel imports and export receipts ($R^2 = 0.7858$). The coefficients were statistically significant at 0.1 and 0.025.

[7]The inflationary impact of increased energy prices in the U.S. has been studied and reported by several authors. One of the most recent was done by K. A. Mork (22) who estimated the contribution of energy prices to be one-third of above-trend inflation during the 1973-75 period. For the first three quarters of 1974, Mork estimated the impact to be 5 percentage points of inflation at an annual rate. Other estimates of this impact range from below to above Mork's estimate. An extreme on the high side is that of R. C. Fair (13) who puts this impact at 8 percentage points.

TABLE 9

Philippines: Foreign Exchange Status, 1966-1977
(million U.S. dollars, except where indicated otherwise)

Year	Balance of Payments (1)	Foreign Exchange Receipts[a/] (2)	% Change (3)	Merchandise Exports (4)	% Change (5)	External Debt (6)	% Change (7)	Mineral Fuel Imports As % of (2)	Mineral Fuel Imports As % of (4)	Mineral Fuel Imports As % of (6)
1966	65	1810.5	—	787.3	—	515.9	—	4.6	10.7	16.3
1967	—64	1987.7	9.8	771.8	—2.0	679.6	31.7	4.7	12.1	13.8
1968	—48	1812.5	—8.8	860.0	11.4	736.8	8.4	5.8	12.3	14.4
1969	—137	1638.7	—9.6	840.8	—2.2	840.2	14.0	6.5	12.7	12.7
1970	23	1836.3	12.1	1049.8	24.9	956.3	13.8	6.5	11.3	12.4
1971	6	2053.6	11.8	1118.2	6.5	1009.4	5.5	6.9	12.6	14.0
1972	94	2258.3	10.0	1086.6	—2.8	1171.4	16.1	6.6	13.7	12.7
1973	664	3213.1	42.3	1709.2	57.3	1225.0	4.6	5.8	11.0	15.3
1974	110	4709.5	46.6	2519.3	47.4	1562.6	27.6	13.9	25.9	41.8
1975	—521	5100.3	8.3	2181.9	—13.4	2233.7	42.9	15.1	35.3	34.5
1976	—161	5413.5	6.1	2194.9	0.6	5517.0	147.0	16.5	40.6	16.1
1977	164	5048.7	—6.7	2556.4	16.5	6573.0	19.0	19.7	38.9	15.1
Compounded Growth) Rates 1966-77	) 10.9			10.75		26.0				

Source: Basic data from Central Bank, *StatisticalBulletin* and *Annual Report*, various years.

[a/] Defined as merchandise exports, gold, U.S. government expenditures, and other invisibles (transportation investment income, travel insurance, pensions, and other remittances.

financial constraints on one may reduce demand for the other. Such a reduction magnifies the impact of lowered energy use (16).

Griffen (15) shows substitution elasticities of capital/energy and labor/energy at 1.0 + and 0.8 ±, respectively, for manufacturing in certain European countries and the U.S. We cannot, however, assume that the same substitution elasticities will hold at least for manufacturing industries in NOILDCs, because such capital substitution would normally tend to be non-process related (i.e., related to conservation measures). But if we can assume the same for NOILDCs, the latter have no choice that would reduce costs. If they try to substitute more capital, which is imported rather than locally produced, either way they will be affected by (1) the shortage of foreign exchange, or (2) the inflationary effects of oil prices on manufactured goods.

Again, we take the Philippines as an example. Table 10 shows the values of capital equipment and fertilizer imports of the Philippines over the period 1966-1977, and how much of these comes from the U.S. Table 11 also shows how much prices have risen for these classes of imports as well as for mineral fuels. Although these indexes are for total imports of the specified items, given the share of imports from the U.S., the price changes may indicate the direction and magnitude of price changes in the U.S. import portions. The increases are quite evident for chemicals. Allowing for a 2-3 year lag between oil price increases and machinery imports, one can also see some of the partial inflationary impact of the oil price increases on these imports.

Of course, other cost-push factors must be taken into account, and it is inappropriate to tag oil price increases as the sole cause for the rise in machinery prices. Still, given the importance of energy costs in manufacturing and related activities, the impact of U.S. energy demand/supply gaps on oil prices and consequently on prices of producer goods may inevitably help to thwart NOILDC efforts to achieve their developmental goals on schedule. Insofar as the U.S. aid is a partial source of funding for such development programs, the gaps also short-circuit its well-intentioned development assistance policies.

Conclusions

This paper has attempted to show in a preliminary way the critical dependence of NOILDCs' energy costs for future development efforts on the energy policies of the more developed countries,

TABLE 10

Philippines: Imports of Chemicals and Machinery, Total and From U.S., 1966-1977
(F.O.B. value in thousand U.S. dollars, except where indicated)

	Total Imports (Mt)	% from U.S. (Mtu)	Total Imports of Chemicals (Mc)	% from U.S. (Mcu)	Mcu as % of Mtu (Mtcu)	Total Imports of Machinery (Mk)	% from U.S. (Mku)	Mku as % of Mtu (Mtku)
1966	852.8	33.4	22.3	32.9	2.6	151.3	39.6	21.1
1967	1062.2	34.1	26.2	31.1	2.3	229.0	39.1	24.7
1968	1150.2	32.4	33.9	34.7	3.2	238.5	38.2	24.5
1969	1131.5	28.3	34.5	32.6	3.5	258.4	30.5	24.6
1970	1090.1	28.9	36.7	30.7	3.6	235.2	31.8	23.7
1971	1186.0	24.6	39.9	22.2	3.0	255.1	29.6	25.9
1972	1229.6	25.4	48.2	17.5	2.7	239.9	32.8	25.2
1973	1596.6	28.2	75.4	25.6	4.3	296.0	34.5	22.7
1974	3143.3	23.3	216.1	21.6	6.4	424.0	35.5	20.5
1975	3459.2	21.8	153.6	25.6	5.4	654.9	30.3	26.3
1976	3633.5	22.1	141.8	26.9	4.8	625.3	27.8	21.7
1977	3914.8	20.4	160.0	27.2	5.5	589.0	30.5	22.5

Source: Basic data from the Central Bank of the Philippines

TABLE 11

Wholesale Price Indexes, Philippines
(1965 = 100)

Year	WPI — Imported Commodities in Manila			
	Mineral Fuels	Chemicals	Machinery and Equipment	All Items
1966	101.0	100.7	99.7	100.7
1967	101.1	102.4	99.9	100.8
1968	101.1	101.1	101.6	100.5
1969	102.1	101.9	105.7	100.3
1970	132.5	144.4	128.4	136.3
1971	170.3	160.4	151.3	155.0
1972	181.3	172.3	161.5	166.4
1973	204.1	240.4	175.9	212.9
1974	294.3	431.4	204.0	300.4
1975	352.9	504.8	269.8	354.6
1976	411.1	523.5	283.7	374.6
1977	435.4	538.0	295.4	384.4
Compounded Growth Rates 1965-77 (%)	13.0	15.0	9.4	15.8

Source: Central Bank of the Philippines

particularly the U.S. Insofar as the NOILDCs are "price takers" in the world oil market where the situation is characterized by a "dominant seller" (the OPEC cartel) and a "dominant buyer" (the U.S.), the world price level of oil is highly dependent on the elasticity of import demand for oil in the U.S. The inflationary impact of such price levels is first transferred through the NOILDCs' balance of payments but the repercussions are felt in the resource allocation impact of their relatively inelastic demand for oil and capital.

REFERENCES

(1) Adelman, M. A., "Is the Oil Shortage Real? Oil Companies as OPEC Tax Collectors," *Foreign Policy,* Vol. 9 (Winter), 1972.

(2) Akins, James, Opening talk, Offshore Southeast Asia Conference, Excerpts quoted in *Asian Wall Street Journal,* "U.S. oil diplomat says oil views are shortsighted," 23 February 1978.

(3) *Asian Wall Street Journal,* "OPEC Fails to Reach Accord on 1978 Oil Prices," 22 December 1977.

(4) _____, "Philippines' Energy Chief Says Key Goal is to Rely on Foreign Firms' Exploration," 15 February 1978.

(5) _____, "European Currency Plans Stymied," 23 January 1979.

(6) Bennett, J. T. and C. M. Siddayao, "The Efficacy of Price Mechanisms to Reduce Domestic Oil Consumption," *Akron Business and Economic Review,* Vol. 7, No. 1 (Spring), 1976.

(7) Berndt, E. R. and David O. Wood, "Technology, Prices, and the Derived Demand for Energy," *Review of Economics and Statistics,* Vol. 7, No. 3 (August), 1975.

(8) Bilas, R. A., *Microeconomic Theory,* Second Edition, McGraw Hill Book Company, 1971.

(9) British Petroleum Company Ltd., *BP Statistical Review of the World Oil Industry 1976,* 1976.

(10) Duchesneau, Thomas D., *Competition in the U.S. Energy Industry,* Ballinger Publishing Co., Cambridge, Massachusetts, 1975.

(11) Erickson, E. W. and R. M. Spann, "Supply Response in a Regulated Industry: the Case of Natural Gas," *The Bell Journal of Economics and Management Science,* Vol. 2, No. 1 (Spring), 1971.

(12) _____, "Vertical Integration and Cross-Subsidization in the U.S. Petroleum Industry: A Critical Review," Paper presented at the 1977 Annual Meeting, American Economic Association, New York, 1977.

(13) Fair, R. C., "Inflation and Unemployment in a Macroeconomic Model," Paper presented at the Federal Reserve Bank of Boston Conference, Martha's Vineyard, 1971.

(14) Fried, E. R. and C. L. Schultz (eds.), *Higher Oil Prices and the World Economy: the Adjustment Problem,* The Brookings Institution, Washington, D.C., 1975.

(15) Griffen, J. M. and P. R. Gregory, "An Intercountry Translog Model of Energy Substitution Responses," *American Economic Review,* Vol. 66, No. 5 (December), 1976.

(16) Hogan, William, W., "Capital Energy Complementarity in Aggregate Energy-Economic Analysis," Energy Modelling Forum Paper EMF 1.10, Stanford University, 1978.

(17) Howe, James and William Knowland, "Energy and Development: an International Approach," Overseas Development Council, Washington, D.C., 1976.

(18) Hudson, E. A. and D. W. Jorgenson, "U.S. Energy Policy and Economic Growth, 1975-2000," *The Bell Journal of Economics and Management Science,* Vol. 5, No. 2 (Autumn), 1974.

(19) Kennedy, Michael, "An Economic Model of the World Oil Market," *The Bell Journal of Economics and Management Science,* Vol. 5, No. 2 (Autumn), 1974.

(20) Mancke, R. B. "The Long-run Supply Curve of Crude Oil Produced in the United States," *Antitrust Bulletin,* Vol. 15 (Winter), 1970.

(21) Mead, Walter J., "Competition in the Energy Industry," Unpublished report for the Energy Policy Project, Ford Foundation, 1974.

(22) Mork, K. A., "The Inflationary Impact of Higher Energy Prices 1973-1975," Energy Laboratory Working Paper No. MIT-EL 78-014WP, Massachusetts Institute of Technology, Cambridge, Massachusetts, 1978.

(23) Park, Y. S., *Oil Money and the World Economy,* Westview Press, Boulder, Colorado, 1976.

(24) Philippines, Central Bank, *Statistical Bulletin,* Annual.

(25) _____, Energy Development Board, *Towards a National Energy Policy: An Intermediate Program of Action*. Office of the President, Manila, 1977.

(26) Rybzynski, T. M. (ed.), *The Economics of the Oil Crisis,* Trade Policy Research Centre, London, 1976.

(27) Scherer, F. M., *Industrial Market Structure and Economic Performance,* Rand McNally and Company, Chicago, 1971.

(28) Shapiro, Margaret, "A Master Plan for the Poor Nations' Energy," *Petroleum News Southeast Asia,* November 1977.

(29) Smith, Gordon, W., *The External Debt Prospects of the Non-Oil Exporting Developing Countries: An Econometric Analysis,* Overseas Development Council, Washington, D.C., 1977.

(30) Taylor, Lester D., "The Demand for Energy: A Survey of Price and Income Elasticities," in W. D. Nordhaus (ed.), *International Studies of Energy Demand,* North Holland Publishing Co., 1978.

(31) U.S. Cabinet Task Force on the Oil Import Quota Question, Government Printing Office, Washington, D.C., 1971.

(32) U.S. Central Intelligence Agency, *International Energy Biweekly Statistical Review,* ER IOD SSS 77-021, 19 October 1977.

(33) World Bank, "Some Implications of Rising Trend in Petroleum Prices for Developing Countries," Document Sec M73-769, Washington, D.C., 1973.

(34) _____, *Energy and Petroleum in Non-OPEC Developing Countries,* 1974-1980, Washington, D.C., 1977.

(35) _____, *Price Prospects for Major Primary Commodities.* Report No. 814/77, Washington, D.C., 1977.

(36) Yergin, Daniel, ". . . and Project Interdependence," *Asian Wall Street Journal,* 15 December 1977.

(37) Zingaro, Frank W., "Energy and Development in S.E. Asia," Supplement to *Caltex New York,* August 1977.