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Chapter Author: Jean-Thomas Bernard, Robert Weiner

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4 Multinational Corporations, Transfer Prices, and Taxes: Evidence from the U.S. Petroleum Industry

Jean-Thomas Bernard and Robert J. Weiner

Whenever goods cross national borders within the channels of a multinational corporation (MNC), a transfer price must be calculated for tax purposes. When corporate tax rates differ on the two sides of the border, the MNC has an incentive to set its transfer prices in a way that reduces its tax burden by reporting higher profits in the country where corporate profits are taxed more lightly.

The ability of MNCs to set transfer prices to minimize taxes, however, is circumscribed by the tax regulations of the home and host countries. In the United States, Section 482 of the Internal Revenue Code requires that transfer prices for imports and exports of goods and services be set equal to "arm's length prices."

Defining *arm's length prices* is often nontrivial. Unless the good transferred is perfectly homogeneous and has a well-functioning arm's length market, determination of "arm's length" prices will involve some arbitrariness. The process of determining arm's length prices in practice is one of negotiation with the U.S. Internal Revenue Service (IRS). The numerous court cases involving arm's length pricing (LaMont 1975) are an indication that the process is not cut and dried.

Jean-Thomas Bernard is professor of economics and director of GREEN at Université Laval, Québec. Robert J. Weiner is assistant professor of economics at Brandeis University and adjunct research fellow at the EEPC, Kennedy School of Government, Harvard University.

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Allegations of "abuses" of transfer pricing are widespread, where *abuse* is loosely defined as a divergence between transfer prices and some notion of arm's length prices. These allegations are supported by some indirect evidence (Lall 1973; Vaitsos 1974; Jenkins and Wright 1975; Roumeliotis 1977; Bertrand 1981), but there have been no direct comparisons of interaffiliate and arm's length prices. This paper carries out such a study for the U.S. petroleum industry.

The main reason for choosing the petroleum industry is data availability. The main limitation in examining this industry is that its tax history in the United States, for both purely domestic companies and multinationals, has been quite different from that of manufacturing. Thus, one should be extremely cautious in generalizing results from petroleum to other industries.

Nevertheless, there is much to be said for examining petroleum, quite apart from data availability. As seen in table 4.1, in the last decade for which tax data are available, the oil and gas industry has accounted for between one-third and two-thirds of U.S. taxable income from abroad, paid well over half of foreign taxes, and earned a similar fraction of foreign tax credits. Roughly speaking, the petroleum industry from this standpoint is about as large as all other industries combined.

Table 4.1 is also useful for obtaining a rough idea of the tax position of the industry. From column 5, the average foreign tax rate is very high, more than double that for other industries. From column 6, the ratio of the foreign tax credit to U.S. taxable income from abroad is close to the U.S. statutory corporate tax rate, suggesting that there was little tax left to be paid at home. From column 7, whereas other industries were able to offset almost every dollar of foreign tax paid against U.S. tax liabilities, the petroleum industry was able to offset only half to three-quarters of the foreign taxes it paid. These figures are averages across all countries; as discussed below, situations vary from one country to another.

The U.S. petroleum industry has been alleged to be a notorious abuser of transfer pricing (see, e.g., U.S. Congress 1977; Bertrand 1981). In addition to purely political considerations, there are at least three reasons for this. First, until the mid-1970s, U.S. MNCs were permitted by the IRS to treat virtually all payments to governments for oil abroad as foreign income taxes, enabling the companies to deduct these costs directly from their U.S. tax liabilities rather than from their taxable income.[1] The incentive was thus very strong for them to make these payments appear as large as possible.

The second reason is the nature of the petroleum market. Crude oil, a raw material, accounts for most of the petroleum moving in international trade. Until the 1980s, there was virtually no spot-auction market in crude oil (see Hubbard and Weiner 1989). The arm's length market was one of long-term contracts. Crude oil is not a homogeneous product, and contract terms depend inter alia on its sulfur and gravity, size of ship transporting the cargo, and terms of credit. In addition, as Hines (1988b) points out, the contractual

relation itself can have value by, for example, mitigating moral hazard problems (referred to in the contracting literature as "opportunism"; see Williamson 1975). Moreover, the market for crude oil is not competitive; rather, it has been dominated by OPEC, a cartel whose power has waxed and waned over time. Oligopolistic interaction among sellers is likely to lead to varying degrees of freight absorption in markets with geographically dispersed production, so that the arm's length price will depend on the exporting country and point of destination. In the case of petroleum, the Atlantic and Pacific markets are particularly likely to differ because moving the product between them is costly.

The final reason is the sheer size of the industry. While crude oil is not perfectly homogeneous, it is more homogeneous than other products often cited for transfer-price abuse such as pharmaceuticals. Although the scope for transfer-price manipulation may be substantially smaller as a percentage of arm's length price, when multiplied by the enormous volume of petroleum moving in international trade, the revenue transferred, and tax avoided, is potentially great.

Suspicions of tax evasion through transfer pricing by the industy have not been limited to researchers and politicians. In 1978, the IRS created a special unit, the Petroleum Industry Program, to monitor the industry and, inter alia, make determinations regarding arm's length prices. The U.S. Department of Energy (DOE) monitored transfer prices in the course of administering the regulatory program imposed on the domestic petroleum industry in the 1970s. This monitoring process is the source of the data used in this study, which were required to be submitted to the U.S. Energy Information Administration (EIA), the data-collection branch of DOE, by American companies that import crude oil.

The approach in this paper is as follows. First, we use regression methods to isolate systematic differences between third-party and interaffiliate prices, controlling for the factors discussed above. One hypothesis we examine is whether the rise of the spot market and centralization of IRS petroleum expertise at the end of the 1970s resulted in a reduced scope for creative transfer pricing. We then go on to relate these differences to the tax regimes of exporting countries.

4.1 Data

The data were obtained from EIA, which deleted any information that would allow identification of individual firms. The data are described in some detail in Weiner (1986) and Anderson (1988);[2] the discussion here is limited to attributes salient to this paper. The data cover the period October 1973–October 1984,[3] a period that encompasses tremendous variations in oil prices, changes in the structure of the petroleum industry, and tax rates. The data base contains information on dates of loading and importation,

Table 4.1 **U.S. Foreign Income, Tax, and Tax Credit, Oil and Gas Industry versus all Industries ($ million)**

	(1) U.S. Taxable Income from Foreign Sources	(2) Foreign Tax Paid or Accrued	(3) Foreign Tax Carryover	(4) Foreign Tax Credit Computed	(5) Foreign Tax as % of U.S. Taxable Income (2)/(1)	(6) Foreign Tax Credit as % of U.S. Income (4)/(1)	(7) Foreign Tax Credit as % of Foreign Tax (4)/(2)	(8) Foreign Tax Carryover as % of Credit (3)/(4)
1972:								
Oil and gas	6,760	5,415	1,429	3,252	.801	.481	.601	.439
Other industries	9,720	3,514	323	3,365	.361	.346	.958	.096
All industries	16,486	8,929	1,752	6,617	.542	.401	.741	.265
Oil and gas/all industries	.410	.607	.816	.492				
1974:								
Oil and gas	32,186	26,668	4,366	15,516	.829	.482	.582	.281
Other industries	14,584	5,040	363	4,740	.346	.325	.940	.077
All industries	46,770	31,708	4,729	20,256	.678	.433	.639	.233
Oil and gas/all industries	.688	.841	.923	.766				
1976:								
Oil and gas	37,459	33,368	3,999	17,820	.891	.476	.534	.224
Other industries	17,955	5,841	655	5,760	.325	.321	.986	.114

All industries	55,414	39,209	4,654	23,580	.708	.426	.601	.197
Oil and gas/all industries	.676	.851	.859	.756				
1978:								
Oil and gas	36,148	31,148	18,270	17,111	.862	.473	.549	1.068
Other industries	29,002	9,504	990	9,235	.328	.318	.972	.107
All industries	65,150	40,652	19,260	26,346	.624	.404	.648	.731
Oil and gas/all industries	.555	.766	.949	.649				
1980:								
Oil and gas	31,515	18,859	3,175	14,080	.598	.447	.747	.225
Other industries	39,026	11,137	1,036	10,801	.285	.277	.970	.096
All industries	70,541	29,996	4,211	24,881	.425	.353	.829	.169
Oil and gas/all industries	.447	.629	.754	.566				
1982:								
Oil and gas	20,670	12,430	15,872	9,022	.601	.436	.726	1.759
Other industries	38,812	10,365	1,598	9,922	.267	.256	.957	.161
All industries	59,482	22,795	17,470	18,944	.383	.318	.831	.922
Oil and gas/all industries	.348	.545	.909	.476				

Sources: U.S. Dept. of the Treasury, Internal Revenue Service, *Statistics of Income,* various publications.

exporting country, port of landing, f.o.b. and landed prices, sulfur and gravity, credit terms, volume, and transaction type for cargoes of crude oil imported into the United States during this period.[4] While some previous analysts have concluded that the absence of a "market price" precludes assessment of transfer-price manipulation (Rugman 1985), we are able to take advantage of this information in the regression analysis, thereby correcting for much of the heterogeneity discussed above.

For our purposes, the most interesting aspect of the data base is the breakdown of imports by type of transaction, whether interaffiliate transfers (designated type A below) or arm's length purchases. The latter is further broken down into purchases directly from host governments (type H), "third-party" purchases (purchases from other firms, designated type T), and arm's length purchases with type of seller unreported (type U). The decline of the major multinational oil companies and the rise of state enterprises in oil-exporting countries is reflected in the falling share over time of interaffiliate transfers relative to arm's length transactions. The breakdown of transaction types for purchases from each oil-exporting country is provided for an illustrative year in table 4.2.

4.2 Hypotheses Regarding Transfer Pricing

The hypotheses about transfer-price behavior are straightforward. Multinational petroleum companies set transfer prices that differ from their arm's length prices when they have the incentive and the ability to do so. Ceteris paribus, firms that produce crude oil in countries with effective marginal corporate tax rates (t_f) that exceed the rate in the United States (t_{US}) will reduce their tax obligations by reporting transfer prices as low as possible. At the margin, the dollar in profit "lost" in the host country will reduce firms' tax obligations by t_f, while increasing their U.S. tax obligation by an amount $t_{US} < t_f$. Similarly, when $t_{US} > t_f$, firms have an incentive to report greater profits in the host country, in order for as much of their revenue as possible to be taxed at the lower rate abroad.

In practice, calculations of tax obligations are complicated by the fact that U.S. MNCs must pay U.S. corporate tax on income earned by their foreign subsidiaries. In order to avoid double taxation, the IRS allows U.S. MNCs to credit foreign taxes paid against their U.S. tax obligations. In terms of this very simple model, the U.S. MNC would owe U.S. tax of $t_{US} - t_f$ on the marginal dollar of profit if $t_{US} > t_f$. If the foreign rate exceeds the U.S. rate, the U.S. MNC owes no tax to the United States at the margin.

When $t_{US} > t_f$, U.S. MNCs nonetheless have an incentive to report profits abroad because the U.S. tax owed is payable only when the profit is repatriated to the United States. By investing their profits abroad, U.S. MNCs can thus defer their U.S. tax obligations. When t_f exceeds t_{US}, the difference is an excess foreign tax credit, which the U.S. MNC can carry

Table 4.2 Number of Transactions by Type, 1981

Country	Type of Transaction				
	H	T	A	Other	Total
Abu Dhabi	2	7	60	0	69
Algeria	18	73	150	1	242
Angola	0	10	20	0	30
Brunei	0	11	0	0	11
Cameroon	0	12	14	0	26
Canada	0	13	145	0	158
China	0	2	0	0	2
Congo	0	23	0	0	23
Dubai	5	0	4	0	9
Ecuador	6	5	19	0	30
Egypt	2	1	11	0	14
Gabon	0	5	26	0	31
Indonesia	24	94	196	0	314
Iraq	4	0	0	0	4
Libya	32	55	125	3	215
Malaysia	0	4	15	0	19
Mexico	232	38	342	2	614
Neutral Zone	0	0	25	0	25
Nigeria	26	181	218	4	429
Norway	8	75	60	1	144
Oman	0	13	7	0	20
Peru	3	6	12	0	21
Qatar	3	3	0	0	6
Saudi Arabia	0	162	592	4	758
Sharjah	0	0	6	0	6
Syria	2	1	0	0	3
Trinidad	3	27	97	0	127
United Kingdom	17	56	92	2	167
Venezuela	100	83	117	2	302
Zaire	0	0	23	0	23
Undefined	12	52	66	0	130
Total	499	1,012	2,442	19	3,972
(%)	(13)	(25)	(61)	(1)	(100)

Note: H = host government, T = third party, A = affiliate.

forward against future U.S. tax obligations. Thus, the incentives for transfer-price manipulation described above are present even when foreign taxes are creditable against U.S. taxes.[5]

Because the comparison we undertake is so straightforward, we do not present a formal theoretical model of transfer pricing in this paper. A model that integrates some features of the theoretical literature in this area can be found in Eden (1985), where it is demonstrated that tariff rates, as well as corporate tax rates, can influence transfer-price decisions. Although the

United States has imposed a tariff on crude oil imports since 1973 (when it switched from a quota), the tariff is very small ($0.20/barrel, corresponding to a rate of roughly 1 percent) and is neglected in our analysis.

Transfer prices can also serve purposes other than reduction of tax obligations (e.g., providing signals for managerial incentives within the firm; see Eccles 1985). These other considerations will confound efforts to examine hypotheses regarding tax factors only if they vary systematically with tax rates, which appears unlikely.

The scope for multinational firms to set transfer prices to minimize their tax obligations is constrained by the tax regulations of their home and host countries and by the ability of the tax authorities to enforce these regulations. In the United States, the relevant regulation is Section 482 of the Internal Revenue Code, which requires that transfer prices be set at arm's length prices. The regulations acknowledge the difficulty often involved in the establishment of arm's length prices. Section 482 specifies that, if "comparable" third-party transactions exist, then they must be used in determining arm's length prices. Firms have considerable discretion in deciding what constitutes "comparable," however. In the event that no comparable transaction exist, firms are instructed to choose, in descending hierarchy, the "resale price" method (which uses downstream arm's length prices to impute upstream transfer prices), the "cost-plus" method, or any other pricing method that can be justified to the IRS.[6] Using FTC line-of-business data for 1975, Benvignati (1985) estimated that 24 percent of transfer prices set for goods exported from the United States to affiliates abroad were established using the comparable-third-party and resale-price methods, 57 percent using the cost-plus method, and 19 percent using other methods. Unfortunately, the FTC data do not cover interaffiliate imports into the United States. In contrast, the breakdown for interaffiliate transfers within the United States (where tax considerations do not enter) in 1975 was 49 percent comparable-third-party and resale-price methods, 29 percent cost-plus method, and 22 percent other methods.

The null hypothesis here is that the U.S. tax authorities are sufficiently knowledgeable about the arm's length market in crude oil and sufficiently capable at enforcing transfer-price regulations that MNCs are obliged to set the prices for their interaffiliate transactions equal to prices prevailing for third-party transactions. As noted above, the heterogeneity of the product and third-party contract terms will tend to complicate efforts to establish arm's length prices with which to compare a firm's transfer prices. However, IRS enforcement of the arm's length yardstick need not be perfect to deter the practice of using transfer prices to avoid taxes. As detailed in Robbins and Stobaugh (1973), there are many channels through which MNCs can shift funds between affiliates besides trade transactions, including dividend payments, loans, service fees and overhead charges, and royalties. Depending on the costs of doing so, MNCs may choose one or

more of these other channels as a means of shifting profits among tax jurisdictions.

In addition to testing for differences between arm's length and transfer prices, we examine below the hypothesis that MNCs transfer funds between tax jurisdictions by charging themselves above- or below-market rates of interest on their credit transactions. The effective interest rates charged are imputed from the sensitivity of f.o.b. prices to credit terms. The higher the effective interest rate, the more an increase in the number of days credit should raise the purchase price. In other words, the effective interest rate rises with $d(\text{price})/d(\text{credit days})$.

The hypothesis here is that U.S. multinationals would like their affiliates in countries with relatively low marginal corporate tax rates to "charge" high interest rates on their transfers to affiliates in countries where such rates are relatively high, thereby tranferring income to jurisdictions where it is taxed more lightly. Effective interest rates are of course unobservable, but this hypothesis can nonetheless be tested using a two-step procedure similar to the one mentioned above for prices. The first step is a comparison of regression coefficients for $d(\text{price})/d(\text{credit days})$ for arm's length and interaffiliate transactions, in order to locate significant differences. The second is to relate any such differences to tax rates abroad. If MNCs are transferring funds in this manner, the correlation between foreign tax rates and "excess" effective interest rates, as measured by: $d(\text{price})/d(\text{credit days})_{\text{interaffiliate}} - d(\text{price})/d(\text{credit days})_{\text{third-party}}$, should be negative.

The statistical work below constitutes the first systematic test of the effectiveness of transfer-price regulations. Scattered indirect evidence suggests that the IRS is active in attempting to enforce Section 482. Plasschaert (1979) reports that, in 1968–69, the IRS investigated 871 cases of international interaffiliate transactions. The largest number (roughly a third of the total) of potential adjustments concerned transfer prices in trade transactions. Only 26.9 percent of the adjustments were actually implemented, but those that were involved fairly large dollar figures. According to Plasschaert, two-thirds of the firms surveyed by the Conference Board in 1970 and 1971 have been subject to adjustments under Section 482.

4.3 Empirical Tests

Our objectives for the empirical work are three. First, we want to determine whether interaffiliate prices and third-party prices differ significantly, in both an economic and a statistical sense, and whether any such differences vary systematically over time. Second, we wish to identify the exporting countries, if any, that exhibit such differences. Our final desire is to relate any country-specific differences we find to tax rates in oil-exporting countries.

The approach that we adopt is as follows. We conduct OLS regressions with the purchase price as the dependent variable. Crude oil transactions have traditionally been conducted on an f.o.b. basis, and, with a few exceptions, our purchase price data are quoted f.o.b. point of export.[7] To control for any systematic differences in prices caused by factors other than the relation between parties in the transaction, the following explanatory variables are included: gravity, sulfur content, size of shipment, and dummy variables for spot transactions, port of entry into the United States (East and Gulf Coasts, West Coast, Hawaii, Guam, and unknown), and credit terms.

Separate regressions were run for each year, both because the effect of the control variables on price is likely to vary with changing conditions in the oil market over time and because we are interested in changes over time in differences between third-party and transfer prices, for the reasons discussed above.[8] A dummy variable is used for each loading month to control for intrayear fluctuations in oil prices.

To conduct hypothesis tests, we include separate dummy variables for each transaction type (interaffiliate transfer, third-party purchase, host-government purchase) for each country that exported crude oil to the United States in a given year.[9] We test whether the regression coefficients for third-party transactions and interaffiliate transfers are equal for each exporting country. In equation form, the null hypothesis is $t_{ij} - a_{ij} = 0$, $i = 1, \ldots, q_j$, where t_{ij} and a_{ij} are the regression coefficients on the third-party and interaffiliate dummy variables for country i in the regression for year j, and q_j is the number of countries that exported crude oil to the United States in year j through both these transaction types.[10]

The standard technique for testing the null hypothesis that the q_j length vector $\mathbf{t_j} - \mathbf{a_j} = 0$ is to construct an F-ratio based on the squared errors from the constrained (the constraints being the equality of all the $\mathbf{t_j}$ and $\mathbf{a_j}$ coefficients) and the unconstrained regressions. Here, we use instead the Bonferroni t-test (as described in Savin 1980), which rejects the null hypothesis at the α-level if any of the q_j t-values for the difference in coefficients exceeds the t_α critical point in absolute value. The reasons for using the Bonferroni t-test are two. First, the standard F-test can reject the null hypothesis at the α-level even when none of the $\mathbf{t_j}$ - $\mathbf{a_j}$ coefficients differ significantly from zero at the α-level, a result that is not meaningful here because we are primarily interested not in whether the restrictions are accepted universally but rather in where the violations of these restrictions arise. The second reason is that the Bonferroni t-test indicates which of the coefficients in the vector $\mathbf{t_j}$ - $\mathbf{a_j}$ cause the rejection of the null hypothesis when it is rejected, whereas the F-test does not.

The difficulty with the Bonferroni t-test is that the distribution of the test statistic $B = \max_i |t_{ij}|$ is not easily calculated because the t_{ij}'s are not independent. It should be intuitively clear, however, that rejection of the null hypothesis at the α-level entails using a critical t-value at a level smaller than

α if more than one t-value is being calculated. Although the exact distribution of B will not in general be known, Savin (1980) shows that using a critical level of α/q_j for the q_j individual t_{ij}'s will result in the test's rejecting the null hypothesis at a level $\leq \alpha$.[11] In this paper, we use the levels $\alpha = .05$ and $\alpha = .10$; our q_j's vary from year to year but are around twenty exporters, so that the individual t-statistics must exceed the critical value (for the two-tailed test with a large number of degrees of freedom, so that we use the standard normal distribution to approximate) $t_{.0025} = 3.03$, $t_{.005} = 2.81$.

Canada is treated separately on the grounds that Canadian crude oil shipments enter the United States via pipeline, primarily in the North Central region (Indiana to Montana), where there is relatively little immediate competition with other foreign sources of crude oil, which are shipped by tanker to the U.S. East, West, and Gulf coasts.[12] Otherwise, the same regression model is applied to Canadian data.

An illustrative example for 1981 of the overall regression results appears in table 4.3. The dummy variables have been chosen so that the constant represents the average price paid to the Venezuelan government for crude oil shipped to the East Coast during the month of January with zero credit days. American Petroleum Institute (API) gravity and sulfur content have the expected positive and negative signs, respectively. This result is quite robust over time. Volume or size of shipment displays an expected negative sign owing to size discount; however, this result is far from robust as the coefficients turn out to be significantly positive for a number of years. As expected, the spot transaction variable yields a mixture of positive and negative signs over the sample period. Although this is not the case in 1981, oil delivered to the West Coast is usually significantly cheaper than oil delivered to the East Coast owing to the added cost of moving oil south of Africa or through the Panama Canal. The dummy variables for loading month display a pattern of falling prices in 1981.

The variable for credit days was introduced in the years for which data are available (1979–84) with the intent of measuring an implicit interest rate across transaction types, as explained above. Unfortunately, no coherent inference can be made, as can be seen from the 1981 result. It was expected that the average purchase price increases with the number of credit days owing to the implicit loan. Furthermore, affiliates may want to charge implicit interest rates different from market interest rates in order to realize money transfers. Unfortunately, the data reveal no definite pattern in this respect, although some coefficients of the variables for credit days are statistically significant.

The last group of explanatory variables is based on transaction type by country. It yields the annual average price differential associated with the type of transaction. Table 4.3 shows that, with two exceptions, crude oil sold by the Venezuelan government was the cheapest crude oil imported into the United States.[13] Using the estimated coefficients reported in table 4.3 and

Table 4.3 OLS Regression Results for 1981

	Estimated Coefficients and Standard Errors[a]		
Explanatory Variable	Estimated Coefficient	Standard Error	*t*-statistic
Constant	29.738	.462	64.331
Gravity	.152	.011	13.606
Sulfur	-1.610	.076	-21.225
Volume	-.326	.129	-2.533
Spot	-.791	.331	-2.390
Transaction type T:			
Abu Dhabi	6.710	.813	8.252
Algeria	3.298	.468	7.047
Angola	1.198	.714	1.679
Brunei	3.404	.750	4.536
Cameroon	4.547	.654	6.953
China	-2.384	1.551	-1.537
Congo	2.204	.631	3.494
Ecuador	2.627	.948	2.772
Egypt	6.638	2.032	3.267
Gabon	2.648	.990	2.676
Indonesia	1.551	.431	3.601
Libya	3.454	.444	7.780
Malaysia	2.406	1.098	2.192
Mexico	3.736	.514	7.269
Nigeria	4.048	.367	11.020
Norway	3.710	.424	8.759
Oman	4.723	.677	6.980
Peru	4.440	.896	4.955
Qatar	2.994	1.209	2.477
Saudi Arabia	3.657	.331	11.034
Syria	8.557	2.030	4.216
Trinidad	3.240	.480	6.753
United Kingdom	3.060	.437	6.995
Venezuela	2.391	.324	7.370
Transaction type A:			
Abu Dhabi	3.313	.441	7.504
Algeria	3.859	.406	9.496
Angola	3.274	.568	5.763
Cameroon	4.357	.742	5.873
Dubai	5.501	1.059	5.195
Ecuador	2.294	.553	4.146
Egypt	3.095	.693	4.464
Gabon	2.812	.502	5.598
Indonesia	2.262	.378	5.985
Libya	5.481	.374	14.640
Malaysia	5.564	.629	8.852
Mexico	5.047	.286	17.642
Neutral Zone	5.856	.482	12.159
Nigeria	4.894	.348	14.059
Norway	3.718	.534	6.962

Table 4.3 (continued)

Explanatory Variable	Estimated Coefficients and Standard Errors[a]		
	Estimated Coefficient	Standard Error	*t*-statistic
Oman	4.825	1.452	3.323
Peru	3.806	.651	5.844
Saudi Arabia	2.350	.316	7.448
Sharjah	1.604	1.209	1.326
Trinidad	6.641	.373	17.784
United Kingdom	3.312	.393	8.436
Venezuela	-.316	.444	-.712
Zaire	2.710	.626	4.328
Transaction type H:			
Abu Dhabi	3.272	1.461	2.239
Algeria	3.875	.679	5.707
Dubai	6.576	1.042	6.313
Ecuador	2.342	.867	2.700
Egypt	4.111	1.454	2.827
Indonesia	2.069	.648	3.194
Iraq	8.644	1.057	8.175
Libya	6.850	.508	13.476
Mexico	5.206	.294	17.729
Nigeria	4.753	.575	8.262
Norway	5.160	.962	5.365
Peru	.857	1.199	.715
Qatar	9.943	2.034	4.889
Trinidad	3.179	1.455	2.185
United Kingdom	4.135	.599	6.906
Transaction type U:			
All Countries	4.226	.975	4.333
Port of entry:			
Hawaii	1.358	.381	3.564
Guam	2.206	.401	5.507
United States	.392	.171	2.297
West	-.109	.236	-.461
Unknown	-.773	.471	-1.639
Number of credit days:			
0–9	.504	.598	.842
10	-.191	.229	-.833
11–29	-.936	.272	-3.443
30	-.105	.101	-1.042
31–59	2.575	.407	6.324
60	.773	.583	1.327
61–179	3.060	.467	6.547
180 or more	-.168	.196	-.856
Loading month:			
February	.219	.188	1.170
March	.036	.178	.202
April	-.372	.181	-2.054
May	-.546	.184	-2.969

(continued)

Table 4.3 (continued)

Explanatory Variable	Estimated Coefficients and Standard Errors[a]		
	Estimated Coefficient	Standard Error	*t*-statistic
June	-1.680	.185	-9.098
July	-1.992	.187	-10.634
August	-2.305	.179	-12.864
September	-2.555	.188	-13.593
October	-2.606	.190	-13.716
November	-2.373	.195	-12.162
December	-2.195	.188	-11.675
	Test for Differences between Third-Party and Affiliate Prices		
Countries:			
Abu Dhabi	3.397	.821	4.135[b]
Algeria	-.561	.361	-1.554
Angola	-2.077	.800	-2.596
Cameroon	.190	.895	.212
Ecuador	.334	1.024	.326
Egypt	3.543	2.112	1.678
Gabon	-.164	1.026	-.159
Indonesia	-.711	.294	-2.416
Libya	-2.027	.362	-5.594[b]
Malaysia	-3.158	1.171	-2.697
Mexico	-1.311	.468	-2.803[c]
Nigeria	-.846	.249	-3.404[b]
Norway	-.008	.485	-.016
Oman	-.102	1.547	-.066
Peru	.634	1.028	.616
Saudi Arabia	1.307	.229	5.715[b]
Trinidad	-3.401	.463	-7.348[b]
United Kingdom	-.252	.396	-.638
Venezuela	2.708	.443	6.117[b]

[a] The dependent variable is purchase price. The number of observations is 2,942. The adjusted R^2 is .787.

[b] and [c] indicate significance levels of 5 percent and 10 percent, respectively, according to the Bonferroni test, i.e., greater than 3.00 and 2.79, respectively, in absolute value.

the estimated variance-covariance matrix, the average price "differential" (defined as the difference, corrected for the control variables) between third-party and affiliate transactions is calculated for each country along with the pertinent standard error and *t*-statistic. The results are reproduced at the bottom of table 4.3. A positive value implies that prices for transactions through affiliates were lower than those for transactions through third parties. A negative value implies the reverse. Recalling the discussion above, differentials motivated by tax considerations should be positive. Table 4.3 shows that the two prices were statistically different at the 5

percent significance level for Abu Dhabi, Libya, Nigeria, Saudi Arabia, Trinidad, and Venezuela and at the 10 percent level for Mexico but that only three of the significant differentials have the sign predicted by the tax motivation hypothesis.[14]

Table 4.4 provides a summary of the results from the annual regressions. Only the price differentials that are statistically significant at the 10 percent level are shown.[15] No price differential is statistically significant in 1983, so the null hypothesis of no difference is not rejected for that year according to the Bonferroni procedure. The null hypothesis is rejected for all other years. Countries are separated into two groups, with the first including major exporting countries, which contributed 5 percent or more of all U.S. crude oil imports in a particular year and the second, all other smaller oil-exporting countries.

If attention is centered on the major oil-exporting countries only, it is possible to observe specific patterns over time and for individual countries. From 1973 to 1975, when major oil-exporting countries had yet to nationalize completely their oil production, all average price differentials were negative, with one exception, Algeria in 1973. From 1982 to 1984, all price differentials are positive, with Indonesia in 1984 being the single exception. Between these two periods, the results are mixed. At the individual country level, Indonesia shows negative price differentials for all years except 1978. Saudi Arabia has only positive price differentials, while Venezuela has negative price differentials before nationalization, in 1973 and 1974, and positive price differentials from 1979 to 1984 after nationalization. It should be pointed out that average price differentials were unusually large in favor of interaffiliate transactions in 1979.[16] This can be explained by the 1979 oil price surge, with interaffiliate prices being adjusted slowly.

When prices are higher for transactions through affiliates than prices through third parties (assumed to represent market prices), or, in other words, when price differentials are negative, money is transferred from the United States to other countries. The converse occurs with positive price differentials. To get an idea of the relative importance of these money transfers within affiliated parties, the statistically significant differences in prices reported in table 4.4 were multiplied by the number of barrels imported by affiliated parties. The results appear in table 4.5, which also shows the total value of oil imported by affiliated parties, and of all oil imports. With the exception of the first two years and the last one, more money was flowing into the United States than out. The gross money transfer represents less than 2 percent of the value of crude oil imported into the United States by affiliated parties, with 1979 being an exception, and an even smaller percentage of all crude oil imports.

The data base includes information on both the purchase price and the price of oil at the port of entry, the difference being transportation costs. There is no information on the ownership of tankers (or pipelines) carrying crude oil to the American port of entry, nor is there information about which

Table 4.4 **Differences between Third-Party and Affiliate Prices**

	1984	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973
Major countries exporting oil to the United States:												
Algeria	1.08[a,b]	—	—	—	—	—	—	—	—	−.37[a]	—	5.12[a]
Canada	.27[b]	—	4.09[a]	−1.02	—	.98[a]		−1.38[a]	−1.04[a]	—	—	—
Indonesia	−1.13[a,b]	—	—	—	—	—	.13[b]	−.15[a,b]	−.35[a,b]	−.59[a,b]	—	−1.60[a,b]
Iran	—	—	—		—	2.22[a,b]	—	.12[a,b]	—	—	—	—
Libya			—	−2.03[a,b]	—	—	—	—	.29[a,b]	—	—	—
Mexico	—	—	—	−1.31[b]	—	—	—	—	—	—	—	
Nigeria	—	—	—	−.85[a,b]	.91[a,b]	—	—	−.10[a,b]	.22[a,b]	—	−.62[a,b]	−1.42[a,b]
Saudi Arabia	—	—	—	1.31[a,b]		—	.24[a,b]	.51[a,b]	.37[a,b]	—	—	—
United Kingdom	—	—	—	—	—	—	—	—	—			
Venezuela	.87[b]		1.69[a]	2.71[a]	—	2.23[a]	—	—	—	—	−1.13[a,b]	−.70[a,b]
Other countries exporting oil to the United States:												
Abu Dhabi	—	—	—	3.40[a]	—	6.68[a]	—	—	.23[a,b]	—	—	—
Angola	—	—	—	—	−4.04[a]	—	—	—	—	—	5.56[a]	
Bolivia							—	—	—		—	
Brunei			—		—		—					
Cameroon	—	—	—	—	—	—						
China	—		—			—						
Congo	—	—			—	—			−1.50[a]			
Dubai			—		2.92	—			—	—		

Ecuador	—	—	—	—	—	—	—	—	—	—	2.42[a]	2.46[a]
Egypt	—	—	−2.03[a]	—	−3.51[a]	10.24[a]		1.62[a]				
Gabon	.90[a]	—	—	—		—	—	—	—	—	—	
Iraq					—	9.33[a]	−.63	.36[a]	.73[a]			—
Ivory Coast	—											
Kuwait										—		—
Malaysia				—	—	−8.47[a]	—	—	.68[a]			
Neutral Zone	—	—	−7.39[a]		—				—		—	
Norway	−.71	—	—	—	—	—	—	—	—	—		
Oman		—		—	−6.62		—	—	—	—		
Peru	—		—	—	−3.35[a]	7.81[a]						
Qatar					—	—	—	—	—	—	—	
Sharjah							—	—	—	—	—	
Syria						—						
Trinidad	−1.82[a]	—		−3.40[a]	—		−.76[a]	—	—			
Tunisia			—									
Soviet Union									—			
Zaire	—	—	—									
R^2	.85	.85	.88	.79	.80	.74	.81	.85	.83	.73	.47	.71
N	1816	2228	2238	2942	3979	4480	4729	5039	4573	3412	3266	659

Note: A dash indicates that the differential between T and A is not significant at the 10 percent level (according to the Bonferroni test, except for Canada, to which the usual *t*-test is applied); a blank space indicates insufficient data to estimate coefficients for both T and A. [a] indicates a difference significant at the 5 percent level. [b] indicates a country that accounts for at least 5 percent of U.S. imports in the given year.

Table 4.5 **Value of Differences between Third-Party and Affiliate Prices (million $)**

	1984	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973
Major countries exporting oil to the United States:												
Algeria	11.8									−15.4		1.6
Canada	10.0		182.7	−35.0		25.3		−41.7	−29.1			
Indonesia	−80.0						19.0	−21.1	−56.7	−52.1		−16.6
Iran						119.1		16.4				
Libya				−138.3					26.9			
Mexico				−115.6								
Nigeria				−106.2	170.7			−17.7	50.0		−99.8	−35.7
Saudi Arabia				526.8			87.1	209.1	131.2			
United Kingdom												
Venezuela	1.7		10.3	45.9		73.9					−121.2	−18.2
Other countries exporting oil to the United States:												
Abu Dhabi				119.8		479.1			16.5			
Angola					−51.7						154.8	
Congo									−1.5			
Dubai					12.6							

Ecuador											31.9	1.5
Egypt			−18.4		−37.3	150.3		16.4				
Gabon	11.0											
Iraq						244.7	−12.0	5.8	4.4			
Malaysia						−75.0			4.6			
Neutral Zone			−25.7									
Norway	−8.1											
Oman					−22.3							
Peru					−27.8	55.2						
Trinidad	−48.4			−120.2			−26.8					
Total	−102.0		149.0	177.2	44.3	1,072.5	67.3	167.1	146.3	−67.5	−34.3	−67.5
Summation (+)	34.6		193.1	692.6	183.4	1,147.5	106.1	247.7	233.6		186.7	3.1
% total type A	.3		.8	1.7	.4	3.6	.5	1.2	1.4		2.0	.4
% total imports	.1		.5	1.2	.3	2.4	.3	.7	.9		1.2	.2
Summation (−)	−136.5		−44.1	−515.4	−139.1	−75.0	−38.8	−80.5	−87.3	−67.5	−221.0	−70.6
% total type A	1.2		.2	1.3	.3	.2	.2	.4	.5	.6	2.3	8.1
% total imports	.5		.1	.9	.2	.2	.1	.2	.3	.4	1.5	5.3
Total type A	11,073.4	14,003.8	23,769.3	41,198.6	46,180.9	31,870.2	21,214.3	20,360.3	17,142.5	11,446.2	9,490.6	869.1
Total imports	29,395.5	33,758.6	38,733.1	57,126.7	62,039.2	48,806.9	32,451.2	34,769.9	26,623.1	17,302.7	14,948.8	1,343.6

Note: + and − indicate the sum of all the positive and negative numbers that are significant at the 10 percent level.

countries ultimately received the money spent on transportation. Nevertheless, transportation fees form another channel that could be used to transfer money into or out of the United States. In spite of the incomplete information, an analysis similar to that described above for crude oil prices was applied to transportation costs in order to test whether the latter differ between third-party and affiliate transactions.[17]

Table 4.6 displays the summary results with respect to differences between transportation costs of third-party and affiliate transactions. No systematic differences over the years seem evident, but some individual countries display definite patterns: Algeria (positive), Iran (negative), Libya (positive), Mexico (positive), Saudi Arabia (negative), Angola (positive), Egypt (negative), and Norway (positive). Table 4.7 shows the money transfers that result from affiliates paying significantly different transportation costs than third parties. These transfers represent less than 1 percent of the value of oil imported into the United States by affiliated parties.[18]

4.4 Tax Effects

As shown in tables 4.4 and 4.6, third-party and interaffiliate purchase price and transportation cost differentials display specific patterns for some countries. What are the relations between these estimated patterns and the host country tax regimes? Oil taxation in each country of interest and its evolution over time are highly complex and cannot easily be summarized in a few general statements (see Kemp 1987). Furthermore, it is difficult to put together a set of statistical information on this matter that displays consistency over time. Since our interest lies in transfer pricing between affiliated parties, our objective is to find an indicator of the fiscal treatment granted to an additional dollar of oil production income by host countries. The higher the marginal oil income tax rate, the greater is the incentive to reduce reported taxable income in a particular country, regardless of whether the marginal tax rate is higher than the home country (U.S.) tax rate.[19] Since marginal tax rates are not readily available, we have to rely on average effective tax rates prevailing abroad. The average effective income tax rate is defined as the ratio of income tax paid or accrued to taxable income based on measures that would normally be acceptable to the IRS. The average effective income tax rate may be a poor indicator of the marginal rate when the latter is increasing (understatement) or decreasing (overstatement). It is possible to have a situation where the average tax rate is high and the marginal rate is nil, as was the case when the income tax paid was based on the posted prices (see U.S. Congress 1977).

Average effective income tax rates are displayed in table 4.8 but should be interpreted with great care. The main statistical sources are as follows. The tax and income data for even years up to 1982 are taken from various issues of *Statistics of Income* put out by the IRS; the data for 1977 and 1982 come

from the benchmark survey of the U.S. Department of Commerce on U.S. direct investment abroad. Smith (1987) presents a few figures for 1983, and, finally, some judgment was applied to make interpolations or extrapolations. We are left with a number of missing observations. The salient feature of the average effective tax rates as shown in table 4.8 is that they are high, both in absolute terms and relative to U.S. statutory income tax rates over the same period.[20] Furthermore, the effective income tax rate of U.S. parents of foreign oil affiliates, computed in a similar fashion, was 0.30 in 1982 (U.S. Department of Commerce 1985, table iii.M.1); only Mexico was characterized by a lower figure. No overall time trends are evident; some countries, such as Canada, Egypt, and Nigeria, display upward trends, while others, such as Ecuador, Indonesia and Kuwait, show downward trends.

What is the relation between third-party and interaffiliate purchase price and transportation cost differentials, on the one hand, and the average effective income tax rates, on the other? For purchase price, the transfer-pricing hypothesis states that interaffiliates would like to set a lower price in high-tax host countries relative to third-party transactions, hence generating high positive price differentials. As for transportation cost, a high effective tax rate should induce integrated companies to take income out of the oil-producing host country, possibly into the home country, or more likely into a tax-haven country through a flag-of-convenience shipping affiliate. This would result in more of the oil acquisition cost being in the form of transportation cost and hence increase transportation cost relative to third parties.

Along with these two transfer-pricing hypotheses, our objective is to check whether significant structural breaks occurred between the early part of the sampling period and the latter part, when a number of oil-producing countries had taken over oil production and when the IRS improved its ability to monitor U.S. oil companies operating abroad.

To test for the influence of effective income tax rates on affiliate pricing behavior and for possible structural changes, regressions were run, with average effective tax rate as the explanatory variable and differentials between third-party and affiliate prices (as shown, e.g., at the end of table 4.3) as the dependent variable, for two subperiods, 1975–78 and 1980–84.[21] Each observation is weighted by the inverse of the standard error of the estimated third-party/affiliate differential to take into account the precision of the information. Only observations for which tax rates and estimated price differentials are both available are used.

Table 4.9 presents the summary regression results. The relation between the two sets of variables is at best tenuous. There appears to be no significant relation between third-party and affiliate estimated purchase price differentials and average effective income tax rates in both subperiods. Estimated transportation cost differentials, on the other hand, show the predicted negative relation with tax rates, significantly so in the first subperiod and a

Table 4.6 **Differences between Third-Party and Affiliate Transportation Costs**

	1984	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973
Major countries exporting oil to the United States:												
Algeria	—	—	—	−.41[a,b]	.32[a,b]	.22[a,b]	.25[a,b]	.26[a,b]	.20[a,b]	—	—	—
Canada	−.15[a,b]	—	.48[a]	.13[a]	—	.48[a]		−1.40	−.94[a]	−3.04[a]	—	—
Indonesia	−.44[a,b]	—	.50[a,b]	.45[a,b]	.27[a,b]	—	−20[a,b]	.15[a,b]	—	—	—	—
Iran	−1.10[a]	−.80[a]	−1.58[a]		—	−.88[a,b]	.31[a,b]	—	−.15[b]	−.33[a,b]	—	—
Libya			—	—	.64[a,b]	.38[a,b]	.23[a,b]	.19[a,b]	—	.37[a,b]	—	—
Mexico	—	.41[a,b]	—	.44[a,b]	.84[a,b]	—	—	—	—	1.11[a]	—	
Nigeria	−.29[b]	—	—	−.23[a,b]	—	.26[a,b]	.35[a,b]	.25[a,b]	—	.29[a,b]	—	—
Saudi Arabia	−.37[a,b]	−.29[a,b]	—	−.88[a,b]		—	—	−.46[a,b]	−.34[a,b]	−.33[a,b]	−.48[a,b]	—
United Kingdom	—	—	—	—	—	—	.44[a]	.45[a]	—			
Venezuela	—		—	.39[a]	1.00[a]	—	—	−.17[a]	−.15[a,b]	−.73[a,b]	−.31[a,b]	—
Other countries exporting oil to the United States:												
Abu Dhabi	—	—	−1.64[a]	−.78[a]	—	—	.45[a,b]	—	.23[a,b]	−.56[a]	—	—
Angola	—	—	—	—	.77[a]	.46[a]	—	—	—	.95[a]	—	
Bolivia							—	—	—		—	
Brunei			—		−3.17[a]		—					
Cameroon	—	—	—	—	—	—						
China	—		—			—						
Congo	—	—			—	—			—			
Dubai			—		—	—			−1.34	—		

Ecuador	.40[a]	—	—	—	—	—	−.82[a]	—	—	—	—	—
Egypt	—	−1.12[a]	−1.41[a]	−2.61[a]	−1.53[a]	—		−1.93[a]				
Gabon	—	—	—	—		—	—	—	—	—	—	
Iraq					—	—	—	−.50[a]	−1.08[a]			—
Ivory Coast	—											
Kuwait										—		—
Malaysia				—	—	—	—	—	−.89[a]			
Neutral Zone	—	—	—		—				—		—	
Norway	—	—	—	—	—	—	.34[a]	.49[a]	.53[a]	—		
Oman		—		—	—		.51[a]	—	—	—		
Peru	—		—	—	—	—						
Qatar					—	—	—	.54[a]	—	—	—	
Sharjah							—	—	—	—	—	
Syria						−1.43[a]						
Trinidad	—	—		—	—		—	—	—			
Tunisia			—									
Soviet Union									—			
Zaire	—	—	—									
R^2	.51	.46	.49	.47	.49	.44	.50	.42	.47	.29	.54	.49
N	1816	2228	2238	2942	3979	4480	4729	5039	4573	3412	3266	659

Note: A dash indicates that the difference between T and A is not significant at the 10 percent level (according to the Bonferroni test, except for Canada, to which the usual *t*-test is applied); a blank space indicates insufficient data to estimate coefficients for both T and A. [a] indicates a difference significant at the 5 percent level. [b] indicates a country that accounts for at least 5 percent of U.S. imports in the given year.

Table 4.7 **Value of Differences between Third-Party and Affiliate Transportation Costs (million $)**

	1984	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973
Major countries exporting oil to the United States:												
Algeria				−25.7	21.2	23.0	25.5	19.2	12.6			
Canada	−5.6		21.4	4.5		12.4		−42.3	−26.3	−76.5		
Indonesia	−31.1		41.7	−41.8	28.3		−29.3	21.1				
Iran	−7.8	−17.1	−6.5			−47.2	28.3		−13.5	−30.2		
Libya					83.2	56.0	33.8	24.7		23.9		
Mexico		16.9		38.8	97.1					4.9		
Nigeria	−6.6			−28.7		54.9	69.5	44.4		41.4		
Saudi Arabia	−10.3	−23.0		−353.9				−188.6	−120.5	−54.1	−74.9	
United Kingdom							8.8	5.7				
Venezuela				6.6	16.3			−11.8	−10.4	−87.2	−33.3	
Other countries exporting oil to the United States:												
Abu Dhabi			−30.4	−27.5			43.5		16.5	−20.4		
Angola					9.9	4.0				28.5		
Brunei					−.5							
Dubai									−5.4			

Ecuador	3.6						−6.0					
Egypt		−1.6	−12.8	−8.8	−16.3			−19.6				
Iraq								−8.0	−6.5			
Malaysia									−6.1			
Norway							3.2	5.7	6.2			
Oman							7.9					
Qatar								8.1				
Syria						−1.0						
Total	−57.7	−24.8	13.6	−436.6	239.3	102.1	185.3	−141.4	−153.3	−169.6	−108.2	
Summation (+)	3.6	16.9	63.1	49.9	256.0	150.3	220.5	128.8	35.4	98.7		
% imports type A	.0	.1	.3	.1	.6	.5	1.0	.6	.2	.9		
% total imports	.0	.1	.2	.1	.4	.3	.7	.4	.1	.6		
Summation (−)	−61.4	−41.7	−49.6	−486.5	−16.7	−48.2	−35.2	−270.2	−188.7	−268.3	−108.2	
% total type A	.6	.3	.2	1.2	.0	.2	.2	1.3	1.1	2.3	1.1	
% total imports	.2	.1	.1	.9	.0	.1	.1	.8	.7	1.6	.7	
Total type A	11,073.4	14,003.8	23,769.3	41,198.6	46,180.9	31,870.2	21,214.3	20,360.3	17,142.5	11,446.2	9,490.6	869.1
Total imports	29,395.5	33,758.6	38,733.1	57,126.7	62,039.2	48,806.9	32,451.2	34,769.9	26,623.1	17,302.7	14,948.8	1,343.6

Note: + and − indicate the sum of all the positive and negative numbers that are significant at the 10 percent level.

Table 4.8 **Average Effective Tax Rates for the U.S. Petroleum Industry Abroad (%)**

	1984	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973	1972
Abu Dhabi	70[b]	70[b]	70	71[a]	73[a]	75[a]	77[a]	78[a]	80	75[a]	70[a]	66[a]	61
Algeria	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	0	. . .	. . .	. . .	56
Angola	93[c]	93	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Bolivia	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	0	. . .	. . .	. . .	. . .
Brunei	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Cameroon	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Canada	56[b]	56[b]	56	48[a]	39	41[a]	43[a]	46	35	41[a]	47[a]	34[a]	21
China	81[c]	81	. . .	. . .	. . .	. . .	. . .	. . .	4	. . .	. . .	. . .	. . .
Congo	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Dubai	70[b]	70[b]	70	71[a]	73[a]	75[a]	77[a]	78[a]	80	75[a]	70[a]	66[a]	61
Ecuador	89[c]	89	97	101[a]	105[a]	109[a]	112[a]	116[a]	120	106[a]	92	. . .	0
Egypt	87[c]	87	75	73[a]	71[a]	70[a]	68[a]	66[a]	64	61[a]	59[a]	56[a]	53
Gabon	. . .	. .	. . .	. . .	. . .	. . .	. . .	. . .	0	. . .	. . .		. . .
Indonesia	57[b]	57[b]	57	57[a]	56	57[a]	58[a]	59[a]	60	59[a]	58	63[a]	68
Iran	94[b]	94[b]	94	91[a]	88[a]	86[a]	83[a]	80	92	91[a]	89[a]	88[a]	86
Iraq	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	0	. . .	. . .	. . .	. . .
Ivory Coast	77[c]	77	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	
Kuwait	70[b]	70[b]	70	71[a]	73[a]	75[a]	77[a]	78[a]	80	90[a]	101[a]	111[a]	121

Libya	81[c]	81	83[a]	85[a]	87[a]	89[a]	91[a]	92	90	90[a]	90[a]	90[a]	89
Malaysia	47[b]	47[b]	47	48[a]	48[a]	49[a]	49[a]	50	0	. . .	. . .	. . .	. . .
Mexico	. . .	. . .	29	. . .	. . .	. . .	. . .	67	76	58[a]	40	33[a]	25
Neutral Zone	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Nigeria	95[c]	95	86	86[a]	85[a]	85[a]	85[a]	84	80	79[a]	69[a]	64[a]	59
Norway	94[c]	94	71	68[a]	66[a]	64[a]	62[a]	59	86	. . .	. . .	. . .	. . .
Oman	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Peru	77[c]	77	. . .	. . .	. . .	. . .	. . .	. . .	194	150[a]	106[a]	92[a]	80
Qatar	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Saudi Arabia	65[b]	65[b]	65	. . .	. . .	. . .	. . .	. . .	96	93[a]	90[a]	88[a]	85
Sharjah	70[b]	70[b]	70	71[a]	73[a]	75[a]	77[a]	78[a]	80	75[a]	70[a]	66[a]	61
Syria	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Trinidad	80[c]	80	. . .	. . .	. . .	. . .	. . .	. . .	118	116[a]	115[a]	114[a]	113
Tunisia	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
United Kingdom	42[c]	42	58	52[a]	46	54[a]	62[a]	70	0	. . .	38	42[a]	46
Soviet Union	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Venezuela	42[b]	42[b]	42	45[a]	48	47[a]	46[a]	45	160	150[a]	139	122[a]	105
Zaire	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .

[a]:Linear interpolation.

[b]:Same as the 1982 figure.

[c]:Same as the 1983 figure.

Table 4.9 **Empirical Results: Relations between Third-Party/Affiliate Differentials and Tax Rates**

Variable	Coefficient	Standard Error	*t*-statistic
1973–78:			
Dependent variable: purchase-price differential:[a]			
Constant	.057	.068	.846
Tax rate	−.039	.077	−.499
Dependent variable: transportation-cost differential:[b]			
Constant	.241	.088	2.746
Tax rate	−.268	.100	−2.668
1980–84:			
Dependent variable: purchase-price differential:[c]			
Constant	.179	.387	.463
Tax rate	−.295	.539	−.546
Dependent variable: transportation-cost differential:[d]			
Constant	.253	.173	1.466
Tax rate	−.402	.253	−1.587

Note: All variables are normalized by the appropriate estimated purchase-price (transportation-cost) differential standard error.

[a] $N = 78$. $R^2 = .019$. R^2 (adjusted) $= -.007$.
[b] $N = 78$. $R^2 = .091$. R^2 (adjusted) $= .067$.
[c] $N = 66$. $R^2 = .005$. R^2 (adjusted) $= -.026$.
[d] $N = 66$. $R^2 = .039$. R^2 (adjusted) $= .009$.

weaker relation in the second one. To probe this relation further, attention was centered on the year 1976, which had the most extensive set of information on individual country effective oil income tax rates. Spearman rank correlations between third-party and affiliate estimated purchase price (and transportation cost) differentials and effective income tax rates[22] were computed in an attempt to reduce the influence of measurement errors. As can be seen from table 4.10, the price differential/effective income tax rate rank correlation yields, as predicted, a positive value, 0.34, with a standard error of 0.23, while the transportation cost/effective income tax rate rank correlation is negative, as predicted, and equal to -0.14 with a standard error of 0.23. The first estimated rank correlation coefficient is significantly different from zero at the 10 percent level, while the second is not.[23] Taken together, the regression and rank correlation results provide only very weak support for an influence of effective income tax rate on transfer prices between affiliated parties.

4.5 Conclusion

In general, multinational corporations can reduce their tax obligations by setting transfer prices that differ from arm's length prices. Their ability to do

Table 4.10 **Rank Correlation: Relations between Third-Party/Affiliate Differentials and Tax Rates, 1976**

Variables Correlated	Spearman Rank Correlation Coefficient
Purchase-price differential/tax rate	.339
Transportation-cost differential/tax rate	−.145

Note: The twenty-two observations are normalized by the appropriate estimated purchase-price (transportation-cost) differential standard error.

so is constrained by tax regulations in their home and host countries. The effectiveness of these regulations, however, is not easily determined.

In this paper, we have conducted the first systematic empirical analysis of transfer prices. The industry we have studied, petroleum, has a long history of tax-motivated transfer pricing. Even after the changes in the tax treatment of the industry in the mid-1970s, there have been allegations of transfer-price abuse, but little in the way of hard evidence.

Our findings indicate that there are systematic differences between transfer and arm's length prices for many exporting countries. Some of these countries exhibit consistent patterns over time, but others do not. Moreover, the relation between transfer-price/arm's length–price differentials and corporate tax rates appears to be weak. There are at least four possible hypotheses for this. First, the nature and enforcement of IRS regulations may be so effective that companies are precluded from reducing their tax obligations through transfer pricing. Second, it may be easier to avoid taxes through other channels. Third, transfer prices may serve a primarily managerial role within the firm, as described by Eccles (1985) and Robbins and Stobaugh (1973).[24] Finally, marginal and average effective tax rates may be sufficiently different as to prevent identification of any relation between the former and transfer-pricing behavior. These hypotheses are not all mutually exclusive, and untangling them is unlikely to prove easy. While this study represents a step in the empirical analysis of transfer pricing, it is clear that much work remains to be done in this area.

Notes

1. Briefly, this practice arose out of U.S. foreign policy goals in the Middle East following World War II. The practice began with the establishment of an income tax on petroleum company profits by Saudi Arabia in 1950. The IRS issued a ruling accepting the deductibility of this tax against U.S. income tax in 1955. In the 1960s, market prices for crude oil declined, but transfer prices, called "posted," or

"tax-reference," prices (used in determining petroleum companies taxes paid to oil-producing countries), did not, effectively increasing transfers from the U.S. Treasury to foreign governments (for details, see U.S. Congress 1977; for an economic analysis, see Jenkins and Wright 1975).

In the mid-1970s foreign crude oil reserves (except in Canada) were nationalized, limiting the ability of U.S. multinationals to claim payments to foreign governments as creditable against U.S. income tax. The rules on deductibility of foreign taxes were tightened by the U.S. Tax Reduction Act of 1975 and the Tax Reform Act of 1976. McDaniel and Ault (1977) summarize these changes.

2. The primary use of the data in Anderson (1988) was to adjust crude oil import prices for quality. Weiner (1986) used the data to test hypotheses about contracting and spot trading.

3. Reporting of the data by firms that import crude oil into the United States is mandatory under the U.S. Federal Administration Act (1974) and the U.S. Energy Policy and Conservation Act (1975), which were part of the basis for U.S. domestic crude oil price regulation. We were unable to find out whether these data were the same as those reported to the IRS. However, these regulations did not provide an incentive for misreporting transfer prices of imported crude oil (for a description and analysis of U.S. petroleum regulation in the 1970s, see Kalt 1981), and it appears unlikely that MNCs maintained separate accounting systems for the DOE in addition to their tax and managerial systems. Since the U.S. deregulation of crude oil prices in 1981, the data have been collected for statistical purposes only. The reporting form was not changed until late 1984, after which the information we use here was no longer requested.

4. Firms are not required to report in months in which they import less than 500,000 barrels into the United States. In comparison, crude oil imports into the United States averaged roughly 200 million barrels per month during this period. The data base covers approximately 90 percent of U.S. crude oil imports.

5. The MNC's U.S. tax credits and liabilities are incurred immediately when its foreign affiliates are organized as branches rather than separately incorporated abroad as subsidiaries. Most U.S. petroleum MNCs organize their foreign operations as branches, implying that the transfer-price incentive discussed in the text is relevant only when $t_f > t_{US}$. As indicated below, this is always the case in our data.

6. For a more detailed description, see Plasschaert (1979).

7. The data base contains landed as well as f.o.b. prices. Shipments for which the two prices were equal were assumed to change hands on a c.i.f. basis and were not used in the regressions.

8. Shipments that loaded in one year and landed in the next were counted in the loading year. An alternative to conducting annual regressions would have been to run one regression with interaction terms to allow for changes over time. The data base contains so many observations (see table 4.4 below) that there is little to be gained from pooling years for additional degrees of freedom.

9. Not every country exported through every transaction type every year. Dummy variables are omitted in cases where no transactions from a given country of a given type exist.

10. Transaction type variables could be considered to represent endogenous choice, thus leading to biased coefficient estimates. A logit test using transaction type as dependent variable and effective tax rates, described later on, as explanatory variables was performed, and it showed no significant relation between transaction type and country-specific effective tax rates.

11. Applying the Bonferroni inequality $P(E_1, \ldots, E_m) \leq 1 - \sum_{i=1}^{m} P(E_i^c)$, where E_i stands for event i and E_i^c for the complement of event i, gives this result. As an example, suppose that the events E_1, E_2 are that the t-statistics associated with two

regression coefficients are in the acceptance region for the null hypothesis. Then the $\leq .05$ level test of both being in the acceptance region is that each is in the .025 acceptance region. In comparison, if the two t-statistics are independent, then the exact distribution of B can be calculated; a .025 level test on each coefficient is equivalent to a $1 - (1 - .025)^2 = .0494$ level test of the null hypothesis.

12. The null hypothesis that Canadian data fit the overall regression is rejected at conventional significance levels.

13. The exceptions are China (transaction type T) and Venezuela (transaction type A), but neither is statistically significant at conventional levels.

14. The suggestion has been made that transaction A prices may follow closely transaction H prices, thus indicating that affiliates set oil prices at the level set by their host government. The Bonferroni test leads to a rejection, at the 5 percent level, of the hypothesis of no price differentials between transactions types A and H.

15. In addition, the differences that are significantly different from zero at the 5 percent level are so indicated.

16. Malaysia is the exception.

17. These regressions omit the explanatory variables API gravity, sulfur, and credit days.

18. The result that the United States has received relatively small net inflows differs markedly from that of Jenkins and Wright (1975) for the period before our data start.

19. See the discussion earlier in the paper. For a summary of U.S. taxation of income earned abroad, see Hines (1988a).

20. Average effective tax rates greater than one reflect the fact that the tax base used by the IRS for foreign operations of U.S. companies differs from the tax base as defined by other governments.

21. As can be seen in table 4.4, the price differentials for 1979 are very large. This is in part due to the disruption in the oil market, which resulted in rapid price changes. Since the differentials were almost certainly affected, we have dropped 1979 from the regressions.

22. Taking into account the standard error of the estimated differentials.

23. The approximate distribution for order statistics suggested by Kendall and Stuart (1967, sec. 31.19) is used to obtain the critical value.

24. This hypothesis requires the additional, questionable assumption that it is too costly for the MNC to maintain separate accounting systems for managerial and tax purposes.

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Comment

Lorraine Eden

The petroleum industry is an international oligopoly, consisting of four stages: extraction, shipping, refining, and distribution. The purpose of the Bernard and Weiner paper is to test the effectiveness of U.S. transfer price regulation at the extraction and shipping stages. The key variable in their analysis is "transaction type," which consists of three main categories: U.S. imports from foreign affiliates (A), host governments (H), and third parties (T). The authors hypothesize that, over the 1973–84 period, U.S. petroleum multinationals (MNCs) underinvoiced crude oil exports from high-tax source countries into the United States in order to reduce overall tax payments. Thus $P(T) - P(A)$ should be positively related to $t(J) - t(US)$, where imports of A, H, and T come from country J, and $t(J)$ is the marginal income tax rate in country J. In addition, MNCs may have also overinvoiced shipping charges.

In many cases (see table 4.4), the authors do find significant transfer price manipulation (TPM); for example, repeated overinvoicing through Nigeria and Indonesia and underinvoicing through Saudi Arabia. The peak years appear to be 1976, 1977, and 1981. Overall, there is net underinvoicing, equal to less than 2 percent of the total value of affiliate imports into the United States (dominated by the large underinvoicing in 1979 by Adu Dhabi and in 1981 by Saudi Arabia [$527 million]). More significant differences in transport costs occur than in transfer prices (see table 4.6). In general, the reverse occurs: Nigeria, Libya, and Algeria undercharge and Saudi Arabia overcharges; Indonesia is mixed. The total value of net shipping transfers is an overcharge of less than 1 percent of affiliate imports (dominated by a huge overcharge by Saudi Arabia, also in 1981, of $354 million).

The authors conclude that little manipulation of transfer prices and shipping charges occurred and that it was only weakly related to income tax differentials. Three rationales are offered for these results: the effectiveness of U.S. transfer price regulation, MNCs using other channels to avoid taxes, or problems related to using average tax rates to proxy for marginal rates.

Since the authors have an unusually detailed data base and have performed the most rigorous tests of TPM to date, their failure to find significant evidence of transfer pricing in response to tax differentials is an important result and one that may be extensively cited. Their results clearly contradict the widely held view of substantial MNC price manipulation in the petroleum industry (see Jenkins and Wright 1975; Bertrand 1981). Therefore it is important to determine whether their conclusions are robust or confounded by statistical problems.

Lorraine Eden is associate professor in the Norman Paterson School of International Affairs at Carleton University.

Since there are several issues involved, let me deal with them individually. The key issues are (1) how to measure transfer price manipulation, (2) the factors affecting TPM, and (3) the relevant income tax differential.

How Should Transfer Price Manipulation Be Measured?

Transfer price manipulation has a different meaning in the theoretical MNC literature than in government regulations. *Theoretical* transfer price manipulation (TTPM) is measured by the gap between the transfer price $P(A)$ and the shadow price, the marginal cost of the exporting firm (Eden 1985). *Regulatory* transfer price manipulation (RTPM) is measured by the gap between $P(A)$ and $P(T)$, the price at which the same product is sold to or bought from an unrelated buyer (e.g., Sec. 482). There is no reason for TTPM and RTPM to be the same or for one necessarily to imply the other (Eden 1989).

In Bernard and Weiner, while the motivation for transfer pricing is based on theoretical models of TPM, the definition used in the tests is the regulatory one, $P(T) - P(A)$. However, the implicit reference hypothesis in the background must be that such an empirical gap does not also exist between $P(T)$ and $P(H)$ or between $P(A)$ and $P(H)$. If significant differences exist between these other pairs of prices, the evidence on RTPM is much less clear. In fact, the authors do find a significant differential between $P(A)$ and $P(H)$ (see n. 14); however, they do not report calculations for the third price gap.

Related to this is another question as to the role played by firm A in the host country. Prior to this time period, many countries nationalized their oil fields. In these cases, A acts as a middleman, supplying technical expertise in return for crude petroleum, so that $P(H)$ should be related to $P(A)$. In other countries, A extracts the oil from private fields, and $P(H)$ represents an unrelated price like $P(T)$; or, alternatively, $P(H)$ may be a posted price. Given note 14, the latter situation may be the representative one. In the absence of information as to the share of A's exports (or of T's exports) purchased from the host government relative to own production, it is impossible to determine what these price gaps mean. Hence, a significant $P(T) - P(A)$ gap may not indicate RTPM at all.

In addition, the value of price manipulation to the petroleum multinationals depends on the relative shares of their affiliates' purchased versus produced crude oil. Bernard and Weiner find significant underinvoicing equal to 2 percent of the value of affiliate imports; however, if much of this was purchased rather than produced, the relevant denominator is value added, not sales. The underinvoicing percentage would therefore be larger, implying more RTPM than first appears.

What Factors Affect TPM?

Eden (1989) explores the factors that affect TPM in a model of a vertically integrated multinational petroleum company. During the 1973–84 period,

most petroleum affiliates were organized as branches in order to take advantage of deductible losses and U.S. percentage depletion. In addition, most were taxed on an overall basis so that surplus and deficit foreign tax credits were pooled. Eden finds that TTPM depends on differences in the statutory tax rates, days of credit, the host country's pricing policy for calculating the income tax, and the importing government's definition of an acceptable transfer price. Under posted prices (mostly prior to 1974, although data are unavailable), the MNC should theoretically overinvoice since a higher $P(A)$ does not affect host taxes. However, after 1978 the U.S. government disallowed crediting posted prices so that underinvoicing would be the preferred route, given high statutory rates abroad. Moreover, if tax credits are pooled, the relevant tax rate is the weighted average statutory rate, not the tax rate where A is located.

Even if MNCs do not theoretically transfer price (i.e., assume that $P(A)$ equals marginal cost), there are several reasons why $P(A)$ would not equal $P(T)$: gravity and sulphur characteristics differ; number of credit days differs; per-unit transport costs vary; the MNC refinery may have monopsony power in the external market; there may be transactions costs associated with the external market; the posted price is different from the transfer price; statutory tax rates and method of foreign tax crediting differ; and royalties are charged by the host country. Bernard and Weiner control for the first three: days of credit, transport costs, and characteristics of oil; but this is not sufficient to guarantee that $P(T)$ equals $P(A)$ even if no TTPM occurs.

What Tax Differential Should Be Used?

Bernard and Weiner use $t(J) - t(US)$, the difference between the average effective tax rate in the host country and in the United States to proxy for the tax differential. This measure is problematic on both theoretical and empirical grounds.

As other papers in this volume show, statutory tax rates affect financial and transfer price decisions; marginal effective tax rates affect real capital investment decisions. The relevant gap between the statutory rates depends on the organizational structure (branch/subsidiary) of the affiliate, deferral, whether the affiliate has a surplus or deficit of foreign tax credits, the per-country or overall limitation, the ability to carry tax credits forward and backward, and the definition of the tax base including the use of posted prices (Eden 1989). Average tax rates on a per-country basis may therefore be a poor proxy for the relevant differential. And, as pointed out earlier, other variables besides a tax gap affect RTPM.

In Bernard and Weiner's empirical work, the tax rates in table 4.8 used to calculate the tax differential are problematic for several reasons. First, most tax rates other than for the years 1976 and 1982 were determined by the interpolations between 1976 and 1982 or were assumed to be constant (e.g., 1983 and 1984). Given that U.S. law changed considerably over this period,

using interpolated rates may have confounded the results in table 4.9. A more reliable test (although the number of cases falls substantially) would be to use only 1976 and 1982 data. Additional support for this is shown by table 4.1, where the foreign tax as a percentage of U.S. taxable income falls from .8 to .9 in the 1972–78 period and to .6 in 1980–82. Clearly, what happened was a shift of foreign taxes from creditable to deductible status. This is also reflected in the tax credit as a percentage of the foreign tax, which rises over the period.

A second problem with the tax data is the elimination of years without a tax rate. Unfortunately, most of the transfer pricing was caused by Saudi Arabia, which, owing to absence of tax data, was excluded from the runs. Abu Dhabi, the other large manipulator, has tax rates that were interpolated for all but three years; its tax data are, therefore, not very reliable.

A third problem is that shipping charges are regressed against the same average tax differential as transfer prices. This is problematic because it assumes that the MNCs use shipping affiliates rather than independent firms and that both the shipping and the extraction affiliates are located in the same host country. Data are unavailable on either of these issues. Assuming that the shipping affiliate is located elsewhere, under the overall limitation it is legitimate to use a foreign statutory rate pooled across all affiliates. However, that information is also not available.

Finally, a vertically integrated petroleum MNC can take its profits at any stage; tight regulation of the transfer price at one stage may simply shift profits to another stage or by means of another form (e.g., financial maneuvers). Given that the petroleum MNCs were forced to report prices of shipped crude oil, it is not surprising that the authors find little evidence of RTPM. The authors argue that the limited evidence of RTPM implies the effectiveness of government regulation; however, regulation at one stage does not ensure effectiveness.

Conclusions

In summary, this is a nice paper trying to handle a complex task. The authors have taken a new and rigorous approach to the transfer pricing problem, isolating differences between $P(T)$ and $P(A)$ and relating them to tax differentials. The paper concludes that the petroleum MNCs did *not* substantially manipulate transfer prices between 1973 and 1984. This is a surprising result since it is contrary to theoretical predictions of MNC behavior, conventional wisdom, and previous tests.

My conclusions are somewhat different. Although the Bernard and Weiner approach is clearly superior to earlier tests, both the amount of transfer pricing and the tax differential, as measured in the paper, are problematic on theoretical and empirical grounds. Additional information is needed to determine the actual amount of transfer price manipulation in response to tax differentials.

As explained above, the required information would include the organizational form of the affiliates, the statutory tax rate affecting each affiliate, the foreign tax credit limitation used, the share of affiliate exports produced within the MNC relative to that purchased from the host government, the location of the shipping affiliate, the role of the posted price, and the size of the royalty payment. Clearly, this is a tall order.

My presumption, therefore, in the absence of this additional evidence, is to continue to assume the petroleum MNCs guilty until proved innocent.

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