



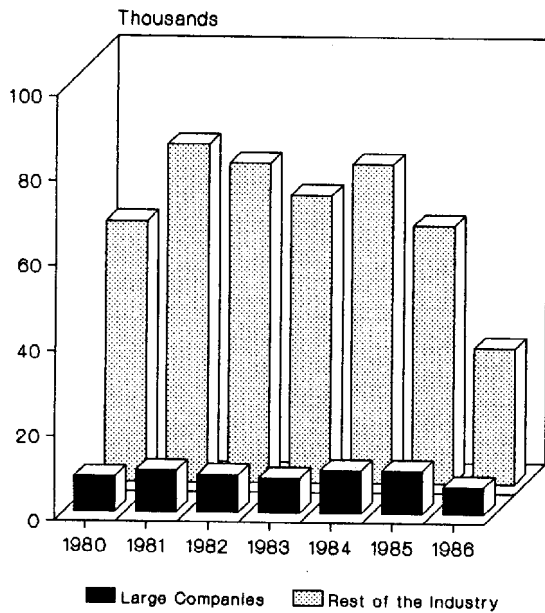
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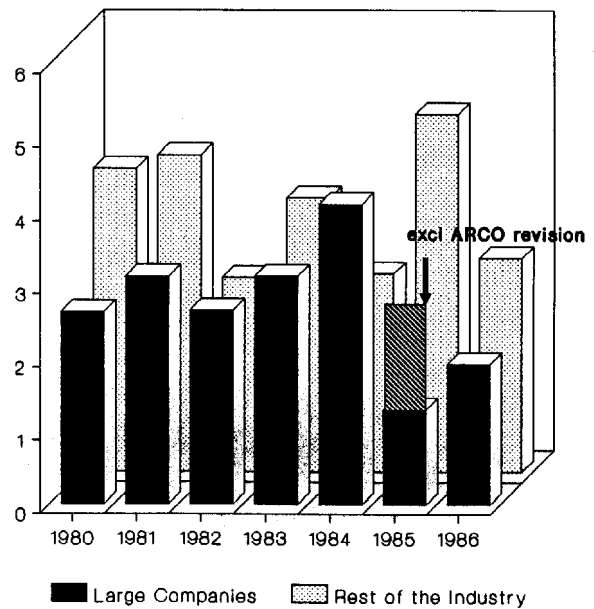
New York, N. Y. 10168

THE ROLE OF THE MAJORS IN U.S. OIL AND GAS EXPLORATION & PRODUCTION

WELLS DRILLED (Exploration & Development)



RESERVES BOOKED (Billions of barrels of oil equivalent)



January 1988

Historically, the thousands of independent oil and gas producers in the U.S. have accounted for 85-90% of all wells drilled while the small group of integrated major oil companies, currently numbering 17, have found 50-60% of the oil and more than one-third of the gas discovered in the U.S. This traditional difference between the two groups has been approximately maintained in the price-collapse year of 1986. In 1986 the independents accounted for about 83% of both exploration and development wells while the majors located 34% of all oil and gas reserves.

While this makes it appear that the majors are more effective in finding oil and gas than the rest of the industry, the reason for the difference lies in the selection of prospects: the majors have traditionally bypassed many of the smaller domestic fields with low productivity and concentrated on large finds where the risks of failure are very costly but the rewards in terms of reserves booked per well are potentially very high. Thus, the two types of oil companies have complemented each other, since there are many areas and prospects which only one of the two groups would find economically attractive or technically feasible. Many U.S. onshore fields may never have been found and developed were it not for the activities of the independent producers. This continues to be the case. In fact, as part of their current restructuring process some majors have sold a number of their smaller onshore fields and prospects to independents. On the other hand, the Alaskan North Slope, the largest formation ever discovered in North America, could only have been found and developed by the majors. Similarly the

majors have a dominant position in U.S. offshore drilling.

The following data illustrate the differences between the two groups. Our methodology is similar to the one used in the several previous reports on this subject published by PIRINC. We examine the annual reports and Form 10-K for 17 major integrated companies (see Appendix for a list) and, to the extent possible, compare the data with similar ones published for the entire domestic oil and gas producing industry.

In the oil producing sector we can reasonably assume that the bulk of the rest of the industry consists of "independent" producers which are generally much smaller by all standards of measurement than our group of majors. In the gas producing sector the rest of the industry includes also many small and medium-sized independents but also most U.S. pipeline companies with gas production. Some of these are large producers. Hence, in the gas producing sector the comparison of our sample with the rest of the industry is not "big" versus "small". Therefore, in the gas producing sector our group accounts for a smaller share of operations than in the oil producing sector. Still, the basic pattern is the same for both fuels. The majors drill substantially fewer wells than the rest of the industry but find a substantially higher volume of reserves per well.

Our **main findings** for the period 1980-86 are that the 17 majors (including the interests operated on behalf of their royalty owners):

- (1) **booked** almost half of all new oil liquids (crude and NGL) reserves and more than one-third of all new gas reserves;
- (2) **drilled** 12% of all U.S. wells;

- (3) had a drilling **success rate** average of 83% (wells that find oil or gas as a share of all wells), compared to 70% for the industry as a whole;
- (4) **added to their reserves** 3.5 times as many oil-equivalent barrels per well drilled than the industry as a whole;
- (5) accounted for a steady **production share** of about 55% of total U.S. oil production and a declining share--from 49% to 42% -- of U.S. gas production; and
- (6) at the end of 1986 held a **reserve share** of 62% of total U.S. oil and gas reserves.

I. RESERVES AND PRODUCTION

The large companies' share of U.S. oil and gas reserves has been falling throughout the decade, as their share of reserve additions has not matched their earlier share of total reserves. See Table I. This is not a signal of a declining role for the large companies, but rather a reflection of the inclusion in the reserve base of massive fields such as Prudhoe Bay, whose reserves are declining.

The majors have a larger share of U.S. oil reserves (two-thirds) than gas reserves. One reason for the relatively lower gas reserves, the inclusion of large gas pipeline companies in the rest-of-the-industry group, has already been cited. Another is the recent write-downs of gas reserves, particularly those in North Alaska. In 1985, for example, when ARCO revised its natural gas reserves downward by 8 TCF, the large companies' share (including royalty) of total gas reserves fell from 60% to 56% in one year (the Department of Energy data for total U.S.

TABLE I
CHANGES IN U.S. OIL AND GAS RESERVES,
LARGE COMPANIES AND U.S. TOTAL, 1980-86

(See note for units)

	Large Companies			U.S. Total		
	<u>Liquids</u>	<u>Gas</u>	<u>Total</u>	<u>Liquids</u>	<u>Gas</u>	<u>Total</u>
Reserves, 1979 Dec 31	22844	109159	42146	36425	200997	71966
Total Reserve Changes, 1980-86						
Revisions	2508	-2082	2140	14348	18927	17695
Improved Recovery	3456	668	3574	*	*	*
Ext, Discov, Addns	4367	34222	10418	10422	91180	26545
Net Purch/(Sales)	1066	3495	1684	N/A	N/A	N/A
Production	-14336	-54628	-23996	-26141	-119518	-47275
Reserves, 1986 Dec 31	19929	89977	35839	35054	191586	68931

Large Company Share of U.S. Total** (%)

Reserves, 1979 Dec 31	73	63	68
New Reserves Booked, 1980-86	49	35	43
Reserves, 1986 Dec 31	66	55	61

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*Included in revisions

**Shares have been adjusted for the royalty volume, estimated at 1/7.

Notes: New reserves booked includes net revisions, improved recovery and exploratory additions. Company data have been taken from most recent annual reports, and may include restatements which the company does not carry back through all years. Therefore, data do not add.

Units: Liquids in millions of barrels, gas in billions of cubic feet, total in millions of barrels of oil equivalent.

Source: Annual reports of 17 large companies, and the U.S. Department of Energy

reserves did not include an analogous adjustment). If ARCO data are excluded from the major company sample for the 1984-86 period, the majors' share of gas reserves actually rises slightly.*

Our group of 17 majors (including their royalty production) accounted for a steady 54-56% of total U.S. oil production during period 1980-86. In the lower-48 region the share declined somewhat in the early years but has held steady at 45% since 1984. For natural gas the picture is somewhat different. The majors' share of total U.S. production declined steadily throughout the period, from 49% in 1980 to 42% in 1986. Hence, their gas production declined faster than that of the rest of the industry even before 1986. In 1986 the majors' gas output dropped by 40% more than that of the U.S. as a whole. One likely reason for this disproportionate decline is structural: the majors had a relatively high proportion of gas committed under long term contract to pipelines, whose system sales were rapidly declining in 1986.

In the first nine months of 1987 the majors' domestic crude production declined by about 4%, according to preliminary data; U.S. production fell by about 5%. The majors' slower decline appears to be due primarily to Alaska where production rose last year. The majors' natural gas production appears to have remained unchanged from the previous year while that of the industry as a whole rose by about 2%.

*It is interesting to note that a second firm, BP (Standard Oil), has now written down its North Slope gas reserves; the data are reflected in end-87 figures.

The large companies' reserve-to-production ratio (Table II) appears higher than the industry-wide average, especially for natural gas. However, inclusion of the market-less Prudhoe Bay gas volume, even after the aforementioned downward revisions, is largely responsible. Excluding estimated Prudhoe Bay gas reserves from both the sample and the U.S. total brings the gas R:P ratios for the two groups in line, at slightly under 11 years.

TABLE II
RESERVE-TO-PRODUCTION RATIOS,
LARGE COMPANIES AND U.S. AVERAGE, 1980-86
(Years)

	Large Companies		U.S. Total	
	<u>Liquids</u>	<u>Gas</u>	<u>Liquids</u>	<u>Gas</u>
1980	10.69	11.42	9.86	10.64
1981	10.57	11.70	9.89	10.77
1982	10.27	12.86	9.56	11.51
1983	10.24	14.29	9.52	12.68
1984	10.32	13.30	9.46	11.49
1985	10.08	12.79	9.56	12.10
1986	9.80	13.47	9.45	12.27

Source: Annual reports for 17 large integrated companies, and
U.S. Department of Energy

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The ratio has been growing in recent years, due to the natural gas surplus, which has forced production down. As noted, the large companies have absorbed the lion's share of the cutback--more than 80% of the 3 TCF decline.

The R:P ratio for oil, now at almost 10 years for the large companies, has been falling throughout the 1980's, declining by nearly a year, but has remained slightly above that of the rest of the industry throughout the period. The R:P ratio for one company, however, fell from almost 14 years in 1980 to about 9

years in 1986. Excluding this one firm's data, the large company sample declined much more moderately, from 10.2 in 1980 to 9.9 years in 1986.

## II. RESERVE ADDITIONS

As pointed out, the majors accounted for nearly 50% of all oil reserves and 35% of all gas reserves added during the period 1980-86. However, a more representative gas figure for the period would be the 43% share obtained if the year 1985, when ARCO took its Alaskan gas write-down, is excluded (see Table III).

TABLE III  
RESERVES BOOKED AND PRODUCTION  
LARGE COMPANIES AND U.S. TOTAL, 1980-86  
(See note for units)

|                              | ---Large Companies--- |            |              | ---U.S. Total--- |            |              |
|------------------------------|-----------------------|------------|--------------|------------------|------------|--------------|
|                              | <u>Liquids</u>        | <u>Gas</u> | <u>Total</u> | <u>Liquids</u>   | <u>Gas</u> | <u>Total</u> |
| <u>Reserves Booked</u>       |                       |            |              |                  |            |              |
| 1980                         | 1435                  | 4611       | 2250         | 3814             | 16723      | 6771         |
| 1981                         | 1364                  | 7371       | 2668         | 3651             | 21446      | 7443         |
| 1982                         | 1181                  | 6187       | 2275         | 2256             | 17288      | 5313         |
| 1983                         | 1628                  | 5907       | 2673         | 4302             | 14523      | 6870         |
| 1984                         | 2210                  | 7393       | 3517         | 4266             | 14409      | 6814         |
| 1985                         | 1682                  | -3257      | 1106         | 4076             | 11891      | 6179         |
| 1986                         | 831                   | 4596       | 1644         | 2405             | 13827      | 4850         |
| <u>Production</u>            |                       |            |              |                  |            |              |
| 1980                         | 2090                  | 9211       | 3719         | 3706             | 18699      | 7012         |
| 1981                         | 2049                  | 8868       | 3617         | 3690             | 18737      | 7003         |
| 1982                         | 2025                  | 7944       | 3430         | 3671             | 17506      | 6766         |
| 1983                         | 2005                  | 7020       | 3246         | 3745             | 15788      | 6537         |
| 1984                         | 3052                  | 7696       | 3413         | 3813             | 17193      | 6853         |
| 1985                         | 2082                  | 7209       | 3357         | 3805             | 15985      | 6632         |
| 1986                         | 2033                  | 6680       | 3214         | 3711             | 15610      | 6471         |
| <u>Replacement Ratio (%)</u> |                       |            |              |                  |            |              |
| 1980-86                      | 72                    | 60         | 67           | 95               | 92         | 94           |

Note: "Reserves Booked" includes discoveries, net revisions and improved recovery.

Units for reserves and production: Liquids in millions of barrels, gas in billion cubic feet, total in millions of barrels of oil equivalent.

Source: Annual reports of 17 large integrated companies, and U.S. Department of Energy.



In 1986 total oil reserves booked (net revisions, improved recovery and exploration) in the U.S., at 2.4 billion barrels, were 41% lower than in 1985. The reserves booked by the majors, at 831 million barrels, were about half of the 1985 level. Comments in several of the majors' annual reports suggest they may have adopted a more conservative stance in estimating the results of exploration as well as revisions because of the very low prices in 1986. If correct, this could mean upward reserve revisions in 1987 and beyond. The \$3.50-4.00 increase in the oil price prevailing in 1987 will start this process.

A note on our term "reserves booked." We have included net revisions, improved recovery and additions resulting from exploration. Many analysts focus solely on exploratory additions in assessing upstream effort and success. However, the Department of Energy may classify as a "revision" what companies classify as an exploratory addition (or discovery). One example is the treatment of the Lisburne and Endicott fields in Alaska: "additions" to the companies and "revisions" to the DOE. With these differences in field-by-field treatment, a comparison based exclusively on exploratory additions is not meaningful. Furthermore, development drilling also brings forth new reserves. The massive infill drilling effort in recent years has been an important source of enhanced data and understanding, and thus has resulted in upward revisions of previous reserve estimates. These reserve increases are genuine, and are not just "paper revisions," as they are often disparagingly referred to. Finally, the substantial effort in improved recovery, which over the 1980-86 period added the equivalent of 3.4 billion barrels to the

majors' reserves, or about 22% of all reserves booked by the majors, is not shown separately in the Department of Energy data, but is included in DOE's "revisions" category. Ignoring revisions to reserves in the U.S. data thus excludes the results of the effort to improve recovery as well.

The large companies' replacement ratio--reserves booked as a percent of production--is much lower than the U.S. average. Overall, the petroleum industry replaced about 94% of the volume produced between 1980 and 1986. In contrast, the large companies replaced only about two-thirds of their production volume. Once again, a single company is an important factor. Excluding that company, the large companies' replacement ratio for oil alone moves sharply from 72% to 80%, but is still below the industry average.

These data imply that should the large companies choose to maintain their R:P ratios, they will need to explore more aggressively, purchase reserves, or cut back production. They may well allow their R:P ratios to fall further, especially those companies with significantly higher R:P ratios than the average. But given the low replacement rates, they can be expected to take action to brake the rate of the R:P drop. Economics will dictate the trade-off between aggressive exploration and reserves acquisition, but there is no question that the companies will have to pursue both. In the 1986 low price environment, companies emphasized their low risk opportunities in their drilling programs. Actual and projected price increases will likely allow both higher risk (higher reward) drilling, and, as noted, should lead to upward revisions of already proved reserves.

### III. DRILLING

The large companies drill a small share of all of the wells in the U.S.--about 11-12% between 1980 and 1984. In recent years, their share has risen markedly, reaching a high of 17% in 1986 (Table IV). While all drilling activity fell substantially in 1986, the large companies cut back their activities by only 38% as against 47% for the rest of the industry. The likely reason is a combination of cash, commitments and confidence. The majors were clearly in a better cash position than the independents last year, since most of the them had an overall profit while many independents did not. They probably also had higher drilling commitments at the beginning of the year and, because of their relative financial strength, they could better afford to make decisions based on the longer term price expectations than many independents. Still, even a 38% drilling reduction in a single year is a quantum drop by historical standards.

Another factor to take into account in comparing the activities of the two groups is that since 1975 the independents have received more favorable tax treatment than the majors, provisions designed to give them a relatively higher cash flow on their exploration and production expenditures. Independents may calculate depletion on a percentage basis (currently 15% of the first 1000 B/D of oil or gas equivalent production), while integrated companies, which include all majors, are required to use cost depletion. Majors are also required to capitalize 30% of their "intangible" drilling costs (items with no salvage value) while the independents can expense all of these costs. The

price collapse of 1986, however, left all players with drastic reductions in revenue and earnings and many independent companies were caught by the provisions of the alternative minimum tax.

**TABLE IV**  
**WELLS DRILLED, LARGE COMPANIES AND U.S. TOTAL, 1980-86**  
 (Number of wells, and percent)

|                                          | Exploration & Development |            |              | ----Exploration---- |            |              | ----Development---- |            |              |
|------------------------------------------|---------------------------|------------|--------------|---------------------|------------|--------------|---------------------|------------|--------------|
|                                          | <u>Productive</u>         | <u>Dry</u> | <u>Total</u> | <u>Productive</u>   | <u>Dry</u> | <u>Total</u> | <u>Productive</u>   | <u>Dry</u> | <u>Total</u> |
| <b>U.S. TOTAL</b>                        |                           |            |              |                     |            |              |                     |            |              |
| 1980                                     | 49252                     | 20234      | 69486        | 3862                | 9008       | 12870        | 45390               | 11226      | 56616        |
| 1981                                     | 62262                     | 26972      | 89234        | 5183                | 12247      | 17430        | 57079               | 14725      | 71804        |
| 1982                                     | 58162                     | 25827      | 83889        | 4653                | 11229      | 15882        | 53509               | 14598      | 68007        |
| 1983                                     | 51901                     | 23837      | 75738        | 3783                | 10062      | 13845        | 48118               | 13775      | 61893        |
| 1984                                     | 59434                     | 25549      | 84983        | 3922                | 11216      | 15138        | 55512               | 14333      | 69845        |
| 1985                                     | 49249                     | 21459      | 70708        | 3013                | 9144       | 12157        | 46236               | 12315      | 58551        |
| 1986                                     | 25830                     | 12494      | 38324        | 1772                | 5474       | 7246         | 24058               | 7020       | 31078        |
| 1980-86                                  | 356090                    | 156372     | 512362       | 26188               | 68380      | 94568        | 329902              | 87992      | 417794       |
| <b>Success Rates</b>                     |                           |            |              |                     |            |              |                     |            |              |
| 1980-86                                  | 69                        |            |              | 28                  |            |              | 79                  |            |              |
| <b>LARGE COMPANIES</b>                   |                           |            |              |                     |            |              |                     |            |              |
| 1980                                     | 6969                      | 1311       | 8280         | 883                 | 907        | 1790         | 6086                | 404        | 6490         |
| 1981                                     | 8182                      | 1615       | 9797         | 983                 | 1154       | 2136         | 7200                | 461        | 7661         |
| 1982                                     | 7280                      | 1599       | 8879         | 882                 | 1057       | 1939         | 6399                | 542        | 6940         |
| 1983                                     | 6756                      | 1439       | 8195         | 687                 | 896        | 1583         | 6069                | 543        | 6612         |
| 1984                                     | 8378                      | 1731       | 10109        | 765                 | 1128       | 1893         | 7613                | 803        | 8216         |
| 1985                                     | 8344                      | 1791       | 10136        | 808                 | 1188       | 1996         | 7537                | 604        | 8140         |
| 1986                                     | 5202                      | 1135       | 6337         | 494                 | 743        | 1237         | 4709                | 391        | 5100         |
| 1980-86                                  | 51112                     | 10621      | 61732        | 5501                | 7072       | 12573        | 45610               | 3749       | 49159        |
| <b>Success Rates</b>                     |                           |            |              |                     |            |              |                     |            |              |
| 1980-86                                  | 83                        |            |              | 44                  |            |              | 93                  |            |              |
| <b>Large Company Share of U.S. Total</b> |                           |            |              |                     |            |              |                     |            |              |
| 1980                                     | 14                        |            | 12           | 23                  |            | 14           | 13                  |            | 11           |
| 1981                                     | 13                        |            | 11           | 19                  |            | 12           | 13                  |            | 11           |
| 1982                                     | 13                        |            | 11           | 19                  |            | 12           | 12                  |            | 10           |
| 1983                                     | 13                        |            | 11           | 18                  |            | 11           | 13                  |            | 11           |
| 1984                                     | 14                        |            | 12           | 20                  |            | 13           | 14                  |            | 12           |
| 1985                                     | 17                        |            | 14           | 27                  |            | 16           | 16                  |            | 14           |
| 1986                                     | 20                        |            | 17           | 28                  |            | 17           | 20                  |            | 16           |
| 1980-86                                  | 14                        |            | 12           | 21                  |            | 13           | 14                  |            | 12           |

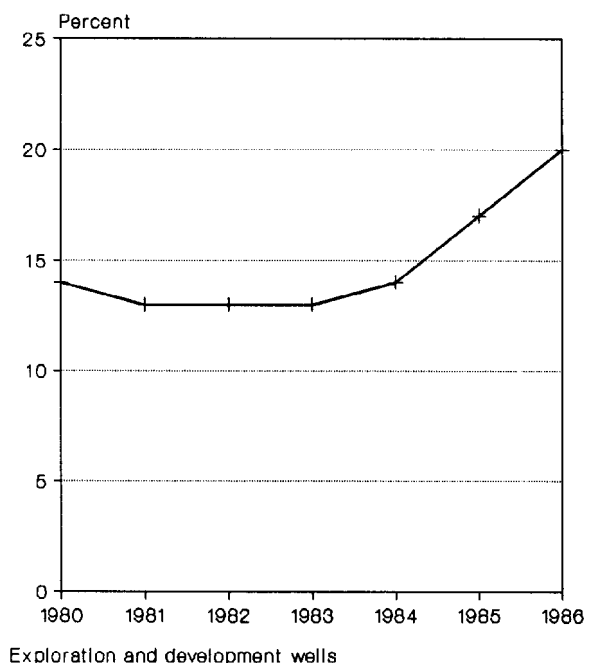
Source: Annual reports and Form 10-K for 17 large integrated companies, and the American Petroleum Institute.

The large companies also drill a somewhat higher share of exploration than development wells. It is the conventional wisdom that the independent sector takes the greater risk in drilling. The large companies, however, classify about 20% of their wells as exploration (new field wildcat, deeper and shallower pool test, and extension), while the rest of the industry classifies 18% in this riskier group. (The large companies follow the Securities and Exchange Commission's well classification guidelines, which may have a bias away from development wells and toward exploration wells. The industry's traditional standard, the Lahee system, has the opposite classification bias.)

Success rates--the share of wells which find commercial quantities of oil or gas--are consistently higher for the large companies than for the rest of the industry. For instance, about 80% of the industry's development wells and about 28% of its exploration wells drilled over the 1980-86 period were successful. In contrast, the large companies' success rates were 93% and 44%. For both groups, the success rates have fallen, partly because a commercial prospect at \$28 per barrel may be sub-commercial at \$15 or \$20. This effect,

FIGURE I

LARGE COMPANY SHARE OF SUCCESSFUL WELLS DRILLED



however, is precisely the one which will bring the aforementioned upward revisions with rising prices. The large companies' higher and more stable success rate is reflected in their high share of productive wells--in 1985 and 1986, with a total U.S. drilling share of 14% and 17%, they drilled 27% and 28% of all successful exploration wells.

Although the industry will emphasize low risk drilling while prices remain low, the data do not show a shift to development drilling in 1986. The very low prices at mid-year combined with price uncertainty throughout the year caused some development drilling to be deferred. With production revenues under threat, companies were unwilling to undertake large development projects.

#### V. ADDITIONS PER WELL

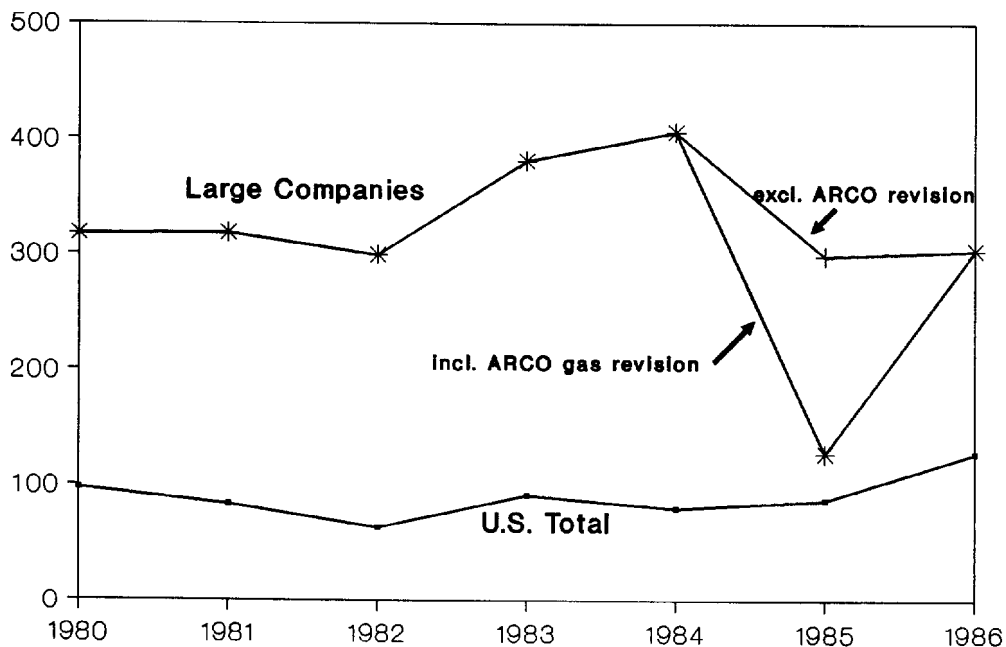
The large companies have consistently added more reserves per well than the industry average--3.5 times more in the 1980-86 period. It is the companies' continued success at finding large deposits that belies the notion that because the large companies drill a small portion of the wells they are insignificant in the U.S. exploration and development effort. The large companies' success is due to many factors, some of which have been discussed earlier. Their choice of tracts, for instance, has traditionally been more likely to be offshore or frontier, in other words, high risk and high reward.

As shown in Figure II, the large companies prove about 300,000 barrels of oil equivalent (reserves booked, plus royalty volume) for each well they drill. For each exploratory well, they prove about 1,000,000 barrels of oil equivalent. The 1986

results, for this measure too, were lower than in earlier years, due to a shift to the lower risk prospects and the necessary conservative reserve valuation in the 1986 price environment. On average, the U.S. petroleum industry proves less than 100,000 barrels of oil equivalent for each well drilled (exploratory and development), compared to the aforementioned 300,000 barrels for the majors. A calculation for the U.S. total which is limited to exploratory results would not be comparable to the large company data.

FIGURE II

**RESERVES BOOKED PER WELL**  
(Thous. bbls oil equivalent)



Note: Wells include dry holes. New reserves booked per well include revisions, improved recovery and exploratory additions, compared to exploration and development wells. Large company reserve additions include royalty volumes, estimated at 1/7.

## VI. UPSTREAM EXPENDITURES

Companies complying with Financial Accounting Standards Board's Statement of Accounting Standards No. 69 report "Costs Incurred" in oil and gas exploration and production activities.

Compiled since 1980, our large company figures show the expected pattern of high expenditures in the earlier period, falling in the 1983-85 period, and plummeting in 1986 (Table V).

TABLE V

**COST INCURRED BY LARGE COMPANIES FOR  
U.S. OIL AND GAS  
EXPLORATION AND DEVELOPMENT, 1980-86**  
(Millions of Dollars)

|                                   | <u>Exploration</u> | <u>Development</u> | <u>Subtotal</u> | <u>Property<br/>Acquisition</u> | <u>Total</u> | <u>Expl. % of<br/>E&amp;D Subtotal</u> |
|-----------------------------------|--------------------|--------------------|-----------------|---------------------------------|--------------|----------------------------------------|
| 1980                              | 6650               | 9219               | 15869           | 8231                            | 24100        | 42                                     |
| 1981                              | 9160               | 13180              | 22340           | 7682                            | 30022        | 41                                     |
| 1982                              | 9433               | 14437              | 23870           | 5207                            | 29077        | 40                                     |
| 1983                              | 7844               | 10751              | 18595           | 6863                            | 25458        | 42                                     |
| 1984                              | 8789               | 12027              | 20815           | 30166                           | 50982        | 42                                     |
| 1985                              | 8125               | 12834              | 20959           | 5596                            | 26555        | 39                                     |
| 1986                              | 4188               | 8468               | 12655           | 1429                            | 14084        | 33                                     |
| Avg. Annual                       | 7741               | 11559              | 19301           | 9311                            | 28611        | 40                                     |
| Percent Change from Previous Year |                    |                    |                 |                                 |              |                                        |
| 1981                              | 38                 | 43                 | 41              | -7                              | 25           |                                        |
| 1982                              | 3                  | 10                 | 7               | -32                             | -3           |                                        |
| 1983                              | -17                | -26                | -22             | 32                              | -12          |                                        |
| 1984                              | 12                 | 12                 | 12              | 340                             | 100          |                                        |
| 1985                              | -8                 | 7                  | 1               | -81                             | -48          |                                        |
| 1986                              | -48                | -34                | -40             | -74                             | -47          |                                        |
| 1980-1986                         | -37                | -8                 | -20             | -83                             | -42          |                                        |

Source: Annual reports of 17 large integrated companies.

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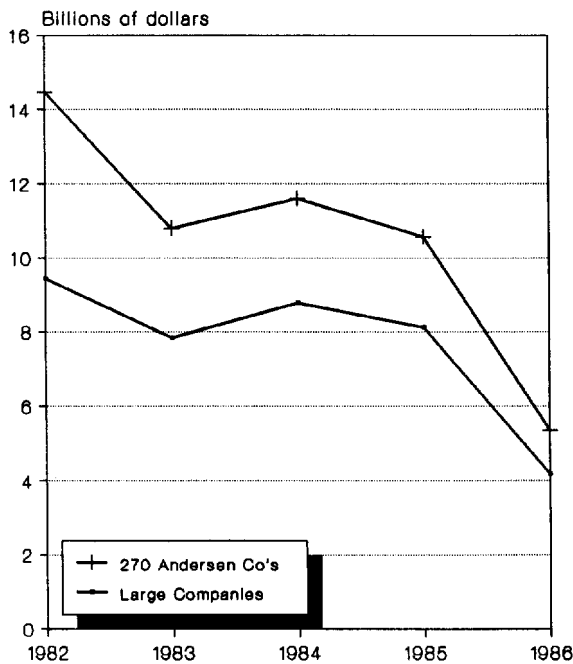
Particularly volatile, because of the well-publicized mergers, were expenditures for property acquisition. Focusing on exploration and development expenditures alone, we see that

spending in 1984 and 1985, while lower than the 1982 peak of \$24 billion, was in line with the 1980-85 average. In 1986 it fell to \$12.7 billion, a 40% decline about in line with the industry-wide percentage decline in drilling activity.

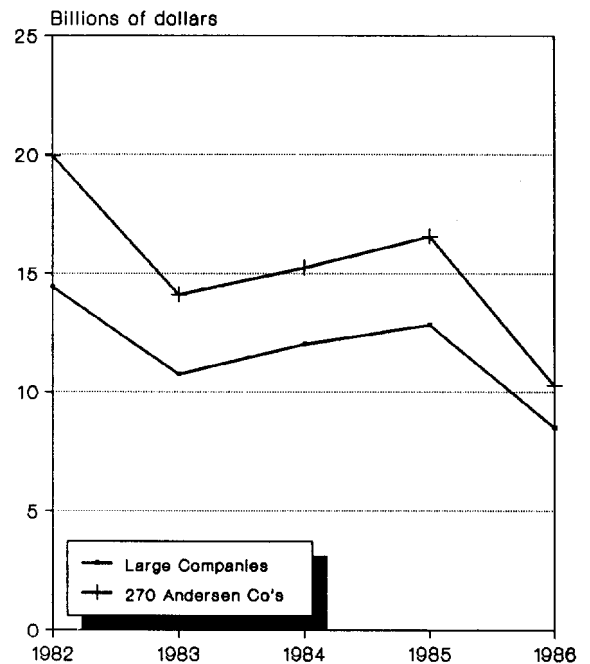
Data on costs incurred are not available for the industry as a whole, but Arthur Andersen & Co. compiles them for several hundred public companies each year, publishing them in "Oil & Gas Reserve Disclosures." As shown in Figure III, these data for 270 companies (including the 17 large ones) show very similar trends, but the large companies' share has increased significantly over the period 1982-86.

FIGURE III

COSTS INCURRED FOR EXPLORATION



COSTS INCURRED FOR DEVELOPMENT



In 1985 the deteriorating price outlook brought a shift toward development expenditures, which accelerated in 1986 when

development expenditures accounted for two-thirds of the exploration and development total, compared to just below 60% in recent previous years. The expenditure shift has probably not yet been fully reflected in well counts, but further confirms the move toward the lower risk end of each company's inventory of prospects. This would hold true for the trade-off between development and exploration efforts as well as for the choice of lower-cost prospects within each category.

Another factor which gives greater weight to development efforts is the companies' expenditures on improved recovery programs. While annual reports do not provide information on spending for improved recovery, they do specify reserve additions due to improved recovery--between 1983 and 1986, about 2.4 billion barrels of oil or about the same volume that the companies added through exploratory drilling in those years. Another change in upstream expenditures in 1986 was the significant increase in the share of foreign exploration and development expenditures. In 1984 36% of all such expenditures went for foreign activities, in 1985 it was 39% and in 1986 it rose to 55%. Among the likely reasons for this shift are long term contractual commitments abroad, better opportunities for major finds, significant improvements in foreign fiscal regimes which potentially offset the price decline, and an attempt to offset the declining domestic reserve base by increasing foreign reserves on a geographically diversified basis.

There are no expenditure data available yet for 1987. According to surveys conducted by Salomon Brothers, Inc. at the end of 1986 and the end of 1987, however, upstream expenditures

fell again in 1987, and are projected to recover some in 1988, approaching the 1986 level.

APPENDIX

Large Companies Included

Amerada Hess Corp.	Exxon Corp.	Standard Oil
Amoco Corp.	Marathon Oil Co. (USX)	Sun Company Inc.
ARCO	Mobil Corp.	Tenneco Inc.
Chevron Corp.	Pennzoil Co.	Texaco Inc.
Conoco Inc. (Du Pont)	Phillips Petroleum Co.	Unocal Corp.
Diamond Shamrock Corp.	Shell Oil	

Data for Gulf Oil Corp. and Getty Oil Co. are included separately until their respective mergers with Chevron Corp. and Texaco Inc.