ENERGY SAVINGS AND CONSERVATION

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FOREWORD

The paper is based on an earlier research report that examined the growth of energy consumption and prices in four developed countries, US, FRG, France, and the UK, from 1950 to 1980 (IIASA RR-82-18; May 1982). This research was updated through 1981 and expanded by the addition of GDP and energy consumption in Japan and OECD total. Moreover, additional information was compiled on production in the industry sector, revealing the structural changes that occurred in the last decade, coinciding with the period of transition from cheap and readily available towards expensive and scarce energy.

The purpose of the analysis was to perceive more clearly the relationship between GDP and energy consumption, the reasons for their unequal growth, the understanding and prospects for energy conservation and the lessening of the oil dependency. It was found that the widening gap between GDP and total primary

energy consumption that developed since the first oil price explosion of 1973 does not necessarily reflect actual savings in energy consumption. Instead, the apparent faster growth of GDP largely results from the pattern of structural changes in the industrialized countries' economies during the '70s and early '80s. This is an evolution favoring activities that generate a higher share of value added through more services, distribution, banking, finance and government, and less industry. And within the industry sector, a preference developed for less primary and more sophisticated industries. Also engendered by this evolution was the shift towards less energy intensive industries, some of them new as electronics that prospered in the '70s, while the decline of energy intensive industries progressed, especially that of the sick industries like steel and cement.

The sector by sector analysis (industry, households, road transportation) of purchased fuels and electricity traces the structural changes in the energy demand and oil dependency since 1970. In the USA, the oil dependency measured as the share of petroleum in total primary energy consumption rose continuously for nearly half a decade after the first oil price explosion, because of the continuously growing demand for gasoline that outweighed cuts in other petroleum products' consumption. A gradual lessening of the US oil dependency came only with the second oil price explosion, through the dramatic fall in gasoline consumption and recession caused cuts in the use of other petroleum products, notably in the industry sector. This tendency could be reversed, if and when the recession yields to an upturn and rising incomes.

In the European countries, the lessening of the oil dependency occurred much sooner than in the US. It came right after the first oil price explosion despite the fact that, similar to the US experience, gasoline demand was quick to resume growth at pre-energy crisis rates. But the pressure on total petroleum demand was eased because of the preferences of industry and households for natural gas. Thus, the future of the lessening of the oil dependency in the European countries depends largely on their access to natural gas. Natural gas also eased petroleum demand in Japan, while in the US total natural gas consumption decreased, displaced from industry and utilities' purchases since it had outpriced itself, vis á vis petroleum products. The situation is somewhat different in US households, where until 1979 the more slowly rising household gas prices induced homeowners to switch from oil to gas till household gas itself became also subjected to horrendous price rises, and the switch from oil to gas caused householders' grief.

A sector by sector analysis of energy prices, current and inflation-adjusted, has indicated that the growth of prices for the various energy commodities was unequal. Generally it is observed that the prices of fossil fuels tended to rise faster than the prices of energy commodities into which they were processed. For example, prices of petroleum purchased by industry rose at a faster clip than gasoline; coal and petroleum prices rose more strongly than those of electricity; and coal, petroleum and natural gas prices rose faster than household gas prices.

The effect of prices in consumption was also uneven. When the prices of natural gas rose faster than those of petroleum products, natural gas lost some of its markets in US industry

and utilities; whereas in France when natural gas prices rose faster than petroleum products, this did not materially curb the industry sector's demand for natural gas. A drop in French electricity plants' demand for natural gas occurred, however, when a larger nuclear power facility became operational.

On the other hand, a slower rise of natural gas prices as compared to petroleum products encouraged substitution in the industry sector (FRG and especially UK) and in the household sectors (FRG, France, especially UK, and also, up to 1979, USA). The relatively slow growth of electricity prices also favored substitution of petroleum by electricity in both industry and household sectors of all four countries.

The comparatively slower price rise of electricity and household gas not only displaced petroleum (and coal) from household energy purchases; it also enabled total household energy demand to grow substantially during the intershock period.

In the road transportation sector, there was even less conservation as long as the slow growth of inflation-adjusted prices (or more steeply rising current prices) met with rising incomes. Gasoline savings or conservation started in 1979 when prices rose stupendously. The consumption slide has since continued, as gasoline demand is curbed by prices and adverse business conditions, e.g., rising unemployment. By 1981, US gasoline demand (the main factor in total primary oil consumption) had slid below its level of 1973 and 1975--but it was still above 1970. In the European countries, savings or conservation of gasoline took longer to emerge. A cut in gasoline demand occurred in the FRG and UK in 1981, while French gasoline purchases were still showing a slight gain. Stagnation of gasoline demand may have occurred in all four

countries in the first half of 1982. Accordingly, in these countries gasoline demand is still far above the levels of 1973 and 1970.

A different situation prevails in the industry sector. In all four countries, the 1981 demand for purchased fuels and electricity has fallen below 1973 and 1970 levels while the indices for total industrial production have risen above 1970 and 1973 levels in the US, FRG, France, and were still barely above 1970 in the UK.

This observation tends to indicate that energy conservation, at least in the industry sector, has finally come to fruition. However, an analysis of the production indices of individual industries as compared to the total, points to the "underperformers" whose growth has deviated considerably from the national average. The underperformers include nearly all of the energy intensive, primary industries while industries that did better than the natural average are less energy demanding. In the United States it is estimated that three industries alone, steel, aluminum, and cement, consume 25% of total manufacturing energy demand. In 1981, the output of these industries was below the national average by 50 percentage points for steel, 17 percentage points for aluminum, 45 percentage points for cement. In the European countries, the slump in the steel and cement industries, whose growth have fallen far below the national average, has also materially contributed to energy conservation, especially in the UK where 1981 crude steel output has dropped to 38% of 1970.

These energy cuts are in addition to the slackening of the industry sector's energy demand that came with the recession

following the second oil price explosion; together, they explain much of the energy savings.

The analysis tends to indicate that the slackening of the demand for total energy that occurred after the second oil price explosion was wrought by structural changes in the output mix coinciding with the recession. Based on these observations comes the warning that with resumed growth of GDP, production and incomes, there will be a resurgence of energy demand--regardless of the structural changes that occurred in the 1970s. For it has to be kept in mind that only a little improvement of the sick industries, e.g., steel, cement, and a slight new growth of aluminum, could mean a big step in additional energy demand.

But with the growth of alternate energy supplies stunted by high interest rates and subsequent depression, and lulled into a false security by the failure to understand energy savings, serious dislocations may occur to meet a newly emerging energy demand.

The concern for a new imbalance in energy demand and supply was also expressed by the International Energy Agency although they recognize implantations of energy conservation. As recently stated by its executive director: "The current outlook for short-term stability in energy markets and the oil market in particular is deceptive because signals in today's surplus oil market do not reflect the underlying medium- and long-term trends. In fact, these trends point to recurrent oil supply stringency later in the 1980s..." (OECD/IEA World Energy Outlook, Paris 1982, Executive Summary).

PART I. OBSERVATIONS

1. The unequal Growth of GDP, Industrial Output, and Energy Consumption (Figure 1; Tables 1-3)

The oil price shocks of the 1970s led for the first time since 1950 to unequal growth of real GDP (adjusted for price fluctuations), total industrial production and energy consumption. However, the fact that energy consumption rose less than GDP should not be counted as a victory for energy conservation. It is argued that the greater part of these energy "savings" can be accounted for by the re-structuring of GDP and the changes in the mix of industrial output, coinciding with falling production, unemployment and lower incomes, changed preferences for some fuels over others and last but not least, the weather. And, it is feared, we may be faced with a renewed, and possibly more acute, energy crisis in the mid-1980's. When (and if) the long-expected economic recovery arrives with its rising energy demands, it will meet with our neglected development of alternative energy sources and true energy conservation.

There can be no argument that in the countries of the OECD, GDP has grown faster or fallen less than energy consumption ever since 1973--whereas in the previous long period of relatively cheap and abundant oil, energy consumption and GDP moved along the same lines. However, the fact that since 1973 more GDP could be obtained with less energy--the "breaking of the energy co-efficient"--is also due to the fact that the sources of GDP have changed. There was a shift in national economies favoring more services with light energy requirements, such as government and finance, and, within the industry sector there was a shift towards less energy intensive industries, such as electronics.

Moreover, GDP growth may have been overstated by the failure to compile "real" value added of services and other sectors of GDP

with the commonly used deflators. These deflators may not have been appropriate for conversion to "real" values at times of rampant inflation, such as the OECD countries have known in the wake of the first and second oil price explosions.

Another break occurred in the growth of total industrial production and energy consumption. In the period from 1950 to 1973, the indices for total industrial production moved mostly along the same lines as real GDP and total energy consumption. After the 1974/75 recession, the upward movement of the index of total industrial production was faster than that of GDP in the US, nearly as fast as that of GDP in Japan, but much slower than that of GDP and closer to that of total energy consumption in the FRG, France and the UK. This break between the growth of total industrial production and energy consumption will be explained later in the section dealing with selected industries.

Regarding total primary energy consumption, there is no argument that there were cuts in energy use.

The 1981 figures for total primary energy consumption showed that:

- the US dropped back to nearly its 1974 level;
- the FRG returned to its 1977 level;
- France kept to its 1978 level;
- the UK dropped below its 1970 level;
- Japan still held somewhat above its 1978 level;
- and the OECD total nearly returned to its 1977 level.

Among the four largest energy consumers inside the OECD, drops in energy consumption were greatest in the UK, followed by the FRG and the US, and were least in France.

This looks as if energy conservation has finally come to fruition. To some extent it has. But besides the need to save gasoline that started in 1979 in the US and in 1981 in Europe, there were also other factors at work to shape the development of energy consumption. These factors have left their mark on the uneven growth of energy consumption at sectorial level, namely industry, road transportation and households. Together these three sectors account for about two-thirds of national energy consumption/ (Figure 2; Tables 1,14,16).

Consumption by the road transportation sector shows that after overcoming the initial shock, the "growth as usual" of gasoline demand continued for half a decade after the first oil price explosion. At the same time, households' total energy demand (fuels and electricity) were also doing better than the national average. Only the energy demand of the industry sector (mining and manufacturing) failed to recover from the 1974/75 recession as vigorously as household and road transportation demand, although total industrial production continued to rise. The results of this unequal growth made for the "widening of the gap" between industrial output and energy input that developed in the FRG, France, the UK and especially in the US.

2. Total and Selected Industries' Growth

At first glance, the US experience lends credence to the view that price-induced prudent management of scarce resources has led to significant energy conservation. Indeed, total energy input per total industrial output has substantially decreased since 1973. In a lecture given at IIASA[1] it was calculated that the 1981 output of US industry (mining and manufacturing) was obtained with 39.5% less energy consumed than would have been

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[1] Guest lecture of M.J. Peck of Yale University on Energy Conservation in American Industry, 14 October 1982.

the case had 1973 rates of energy consumption continued. This calculation is based on the index of industrial production and the growth of total primary energy for the entire country.

A comparison of the 1970=100 based indices of total industrial production and the energy demand (fuels and electricity) by the industry sector shows that the gap between energy input and total industrial production tends to be even wider than total national energy consumption and total industrial output suggest. However, this observation does not necessarily justify any conclusions about the existence or size of energy savings. For a valid appreciation of energy conservation in the industry sector, it is necessary to take one further step. One must examine the individual industries or industry groups that lie behind the national average represented by total industry. Such a comparison indicates that not all industries performed in the same manner as the national average. There were considerable deviations from the average, especially in the US where the index of industrial production showed higher growth than GDP. Deviations from the average were also noticeable in the FRG, France and the UK, but they were less acute in these countries (Figure 3; Table 15).

In all four countries, the industries that did considerably better than the national average throughout the '70s and into the early '80s are mostly those with relatively modest energy input requirements; e.g. electro-technical machinery, commercial equipment, computers. Whereas among the "under-performers" one finds

almost all of the energy-intensive industries, e.g. basic metals and cement. It is estimated that in the US 25% of the manufacturing sector's energy demand is absorbed by only 3 industries: steel, aluminum, cement. In the US their growth has lagged for years behind the national average, and not much energy conservation has been implanted in these industries during the last decade. This takes care of a good deal of the "energy conservation".

Attention is drawn in particular to the slump in the steel industry responsible for the lion's share of the "savings" in industrial energy consumption. Crude steel production reached its high for the 1970s in the US in 1973, with an increase of nearly 15 percent over 1970 output. One year later French and German crude steel production peaked with 16 percent and 19 percent, respectively, above 1970. The German steel recovery of 1979 that had lifted total primary energy consumption through steel-connected coal requirements was only short-lived.

In 1980, French and German crude steel production were back at their 1970 levels; in 1981 they fell further to 10%, and 5%, respectively, below 1970. US production fell in 1980 to 16% below the 1970 level, but recovered in 1981 to only 9% below 1970. The UK, the country with the largest drop in energy consumption, hit another low in 1980 when crude steel dropped to 41% of 1976; in 1981 output fell further to only 38% of 1970.

Compared to the <u>total</u> industrial production, the 1981 steel industry was behind the national average by as many as

50.0 percentage points in the US
24.0 " " " FRG
39.3 " " " France
66.2 " " " UK.

In contrast to steel, aluminum is a younger, more growth-oriented industry. Output was rising through most of the '70s, especially in the UK where the industry was practically developed from scratch with the help of North Sea oil and gas. In the FRG, aluminum also showed considerable growth, but, starting from a broader base in 1970, its rise was not as spectacular as that in the UK.

The 1981 output of primary aluminum was 4 489 x 10^3 m.tons in the US; 728 x 10^3 m.tons in the FRG; 436 x 10^3 m.tons in France and 338 x 10^3 m.tons in the UK. In all four countries, 1981 output was above 1970. The 1970 = 100 based index rose to 124 (US), 114 (France), but to 235 (FRG) and to 855 (UK). In the US, where 75% of the four countries' combined primary aluminum was produced, the industry's growth was lagging behind the total national production index. The same was observed in France.

In comparison with the index of total industrial production, the 1981 primary aluminum industry was:

17.2 percentage points below in the US
15.8 " " " " France
but: 11.5 " " above the FRG
741.0 " " above in the UK.

Obviously, the lagging growth of US aluminum explains much of US energy conservation.

The development of the cement industry, the third among the US "majors", more closely resembles steel because its 1981 output fell in all four countries below 1970, although the drop was not as acute as that of steel. In 1981, output had fallen below the 1970 level by 3% (France); 4% (US); 18% (FRG) and 25% (UK).

Compared to the index of total industrial production, the 1981 cement output was:

45.2 percentage points below in the US
32.7 " " " " France
29.8 " " " " UK
17.7 " " " " FRG

With the US scoring high in the below average performance of each of the foremost energy intensive industries, there is no doubt that the claims of energy conservation deserve a second look. Especially since the 3 majors are not the only ones whose output trailed national growth. An analysis of purchased fuels and electricity used for heat and power in the manufacturing industries (based on the Census and Annual Survey of Manufactures) indicates that roughly 80% of the manufacturing sector's (purchased) energy demand was concentrated in 1971 in only six industry groups: chemicals; primary metals (iron and steel, primary aluminum and others), petroleum refining; paper; stone and clay (cement); and food processing.[2]

Five of the six industry groups were underperformers, compared to the growth of total industrial production. The exception is the chemical industry. In the US, the 1970=100 based index of production stood in 1981 at 179.4, or 38 percentage points above the national average. However, the chemical grouping includes a variety of industries with differing energy requirements that can not be isolated for meaningful statistical analysis.

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[2]See also C. Doblin, Energy Demand by US Manufacturing Industries (RM 78-44) IIASA, Laxenburg, September 1978.

In the three European countries (FRG, France, and the UK), the output of most of the energy intensive industries also lagged behind the national average, with the exception of chemicals, and as stated above, aluminum in the FRG and UK.

In all four countries, more conservation of energy in the industry sector may be in store, with a number of energy intensive industries, e.g. automobiles, petroleum refining, and coal mining, curtailing output as a consequence of the decrease in national energy consumption. With automobile and other industries' output declining for the first time in Japan, the energy "savings" and "conservation" in the OECD total stand to make further gains.

3. The Lessening of the Dependency on Oil (and Shifts in Fuel Preferences) (Table 3)

An adjustment brought on by the oil price explosions is the dwindling share of oil in total primary energy consumption, commonly referred to as the oil dependency. At the beginning of the 1970s oil dependency had been on the rise, reflecting the long-term trends of the displacement of coal by oil (and gas) and the strongly growing demand for gasoline. In the US, dependency on oil continued to grow through 1978 and the tendency was fianlly reversed only when gasoline consumption started its drastic fall in 1979. In the European countries, gasoline consumption continued to grow through 1980 (FRG, UK) and 1981 (France), although the dependency on oil had changed course earlier right after the first oil price explosion of 1973.

The drops in the share of oil in total primary energy consumption brought 1981 oil dependency down below the 1970 level in all OECD countries. The oil dependency, or percentage share of oil in total primary energy consumption, was:

	1970	1973	1978	1981
US	44	47	49	43
FRG	53	55	53	45
France	59	67	59	48
UK	42	44	39	34
Japan	69	75	73	62
OECD	51	53	52	46

What are the possibilities for a further reduction of the oil dependency? This may become clearer through an analysis of the petroleum products' consumption as part of the changing fuel preferences that occurred in the industry and household sectors between 1970 and 1981.

A direct comparison of data between countries may not always be feasible because of differences in classification of the consuming groups and differences in the factors for conversion of various energy commodities to a common denominator. However, the data seem to be well suited to indicate trends in energy consumption and shifts in fuel preferences in the industry and household sectors.

US energy consumption in terms of BTU for industrial and for residential and commercial use have been published since 1973 by the US Department of Energy in the Monthly Energy Review. For earlier years, the fuel consumption by type of use for 1960-1979 are published in the US Statistical Abstract 1980. Industry and household fuels and electricity consumption on a heat supplied basis (therms) are published by the UK in their Department of Energy's annual Digest of Energy Statistics and monthly Energy Trends. For the FRG, the industry and households including small-scale users fuels and electricity consumption in terms of coal equivalents (tce) are compiled and published by the Gesamtverband des Deutschen Steinkohlenbergbaus in their Energiebilanzen. In

France, sectoral consumption of energy is compiled in terms of oil equivalents (toe) for industry and "households and tertiary sectors excluding transportation"; data are available through the Institut Francais du Pètrole. In their compilations of fuels and electricity consumption by the industry sector, the Europeans (FRG, France, UK) distinguish steel from other industries.

Industry (Tables 6-9)

US industrial energy consumption shows two distinct trends, one stretching from the beginning of the decade through 1978, the other relating to the recession prone years of 1979 to 1981 that followed the second oil price explosion. In the first period, the preference for petroleum continued to grow through 1978, despite the fact that oil prices were rising sharply. The market share of natural gas began to decline--its prices had risen even more than those of oil. The share of coal was also shrinking--but not for price reasons. From 1979 onwards, the share of petroleum in the industry sector's energy consumption started to fall--but it did not fall below its 1973 or 1970 level--while natural gas regained a little ground (percentage-wise) and the coal slide came to a stop. Throughout the entire period 1970-1981, the preference for electricity increased consistently.

In the European countries the dependency on oil in the industry sector was, at the beginning of the decade, stronger than that in the US. The 1970 shares of oil in total industry sector energy consumption were respectively 38% in France, 39% in the FRG, and 46% in the UK, against 30% in the US. Between 1970 and 1973, these shares increased only slightly (France) or remained virtually the same (FRG and UK).

In contrast to what happened in the US, the Euopeans reacted immediately to the first oil price explosion: petroleum consumption by the industry sector has been falling rapidly since 1974/75. In 1981, the oil dependency of the industry sector had fallen below their levels of 1973 and 1970 in the FRG, France and the UK. While the Europeans reacted much faster and with greater cuts than the USA, it must in all fairness be stated that the European abstention from oil was largely made possible through their preference for natural gas, especially in the UK where this fuel became abundantly available. The preferences for petroleum and natural gas, expressed as percentage shares in the industry sector's total energy consumption from 1970 to 1981, are indicated below.

	1970		1973		1978		1981	
	Petroleum %	+ Nat. Gas %	Petroleum %	+ Nat. Gas %	Petroleum %	+ Nat. Gas %	Petroleum %	+ Nat. Gas %
US	30	+ 42	35	+ 39	40	+ 34	37	+ 36
FRG	39	+ 21	39	+ 26	32	+ 30	23	+ 31
France	38	+ 7[E]	4.2	+ 9[E]	38	+ 15[E]	29	+ 20[E]
UK	46	+ 6	44	+ 18	38	+ 27	32	+ 32

E = Estimated

Another shift in fuel preferences that occurred in the European industry sectors was the phasing out of solid fuels that continued through most of the decade. In France and the FRG, the coal slide stopped in 1978, with a slight upturn following. In the UK, however, the use of coal for industry fell consistently through 1981.

In all three of the European countries, the preference for electricity that also contributed to a lessening of the oil dependency increased through 1980, with only a minor setback in 1981. Even

in the UK electrification of industry was progressing, despite the competition from natural gas and despite the fact that between the oil shocks the index of total industrial production showed only modest gains.

Households (Tables 6-9)

In all four countries, the purchases of fuels and electricity by the household sector showed a higher growth rate than the energy consumption by the industry sector. The result of this uneven growth can be seen below:

	1981 Energy Consumption	
	Industry sector	Household sector
US	10% below 1970	8% above 1970
FRG	7% below 1970	8% above 1970
France	10% above 1970	29% above 1970
UK	26% below 1970	8% above 1970

The absence of savings and the amazing growth of the household sector's demand for energy as compared to industry in the FRG, France and the UK reflects the changes towards energy-intensive households that occurred in the last decade: more housing, more preferences for apartments, splitting of households into smaller units; progressive motorization and electrification of appliances and heating. Some of these structural changes had already run their course in the US, so that the US entered the 1970's with an energy consumption by the household sector that was, in absolute amounts, far above that of the Europeans. This explains to some extent why the Europeans had a higher growth in household energy consumption than the US, especially in the intershock period, even though population was at near stagnation level in the FRG and the UK, and grew only by 6% in France, while in the US population increased by 12% between 1970 and 1981.

The higher growth rate of energy consumption by the household sector as compared to industry was fostered in part by the relatively modest price rises for household gas and electricity which are the major components of household energy use. These are also the factors that account for the lessening of the oil dependency after 1973.

The dependency on petroleum products in the household sector was:

	1970	1973	1978	1981
US	27%	28%	25%	21%
FRG	57%	62%	59%	49%
France	55%	57%	45%	36%
UK	18%	21%	19%	18%

Another shift in the European countries was the phasing out of coal from households. This process had earlier been completed in the US. The share of solid fuels in total household energy consumption dropped between 1970 and 1981 from:

2.7% to 1.1% in the US
25.8% to 10.3% in the FRG
16.9% to 5.2% in France
48.7% to 19.9% in the UK.

While coal and oil decreased, the consumption of household gas (especially in the UK) and electricity increased.

Based on the analysis of the energy consumption by groups of fuels and electricity at the sectorial level, what are the prospects for further energy conservation, respectively lessening of the oil dependency?

In the industy sector, a resurgence of petroleum consumption in the USA, where it was relatively less depressed than in Europe, seems more than likely with the end of the recession. This seems

likely, even though technologies for improved fuel utilization might be implanted. For the European countries, resumption of the growth of total energy consumption by the industry sector is also very likely with an economic upturn. The lessening of the oil dependency in Europe depends largely on future natural gas supplies.

In the household sector, the growth of total energy consumption in the European countries may slow down, as most of the structural adjustments mentioned above could shortly come to an end. At that time it could be expected that European households, like US households now, will no longer so rapidly increase their purchases of fuels and electricity. However, at times of growing incomes, much depends on pricing of energy commodities.

In the road transportation sector, a resurgence of gasoline demand could be expected with the economic upturn and the resumed growth of income.

Such resurgence could well occur, though the cars that use gasoline more efficiently may have moved from the drawing board to the consumers. Gasoline played a major role in the oil dependency of the US and the OECD total; the future of the lessening of the oil and total energy demand depends much on how gasoline is priced.

The impact of the growth of fuels and electricity prices on the consumption by industry, households and road transportation is detailed below in the next section.

4. The Impact of Energy Prices on Energy Consumption

i) The uneven growth of energy prices (Tables 10-13)

The growth trends of energy prices since 1950 and up to 1973 are well known. Prices paid by the industry, household and transportation sectors for groups of energy commodities generally de-

creased; and when they increased, the rise was less than that of the general price level as measured in terms of GDP deflators. Hence, the inflation-adjusted energy prices were generally declining, and falling at largely the same pace.

After 1973, the price increases led by crude oil were followed at uneven rates by the various energy commodities. The unevenness was two-fold. Differences in current energy price escalations between countries reflected varying degrees of inflation and fluctuating exchange rates. For instance, current prices of petroleum used by industry and households rose more in the UK where inflation was the highest and the US where the dollar was constantly weakening through 1979. In France and the FRG, with lower inflation and till recently stronger currencies, the energy price escalations were milder. In fact, the FRG is the only country of the four studied where the total energy price index of the industry sector increased only moderately between 1976 and 1979. This event, fortunate for the German economy, shows that the country could profit from a strong Deutsche Mark or a weaker dollar when buying petroleum from abroad. With the second oil price explosion of 1979, prices of energy purchased by German industry resumed their climb. And much of the comparative advantage eroded with the subsequent strengthening of the dollar vis-à-vis the Mark.

The second unevenness is the fact that the prices of various energy commodity groups were rising at different spee since 1973.

This uneven price growth does to some extent explain the changes in fuel preferences. Though crude oil called the shots for the price race, the sprints were not the same for all the runners. In the FRG and France, prices for household petroleum

products increased the most; in the US and UK prices for industry used petroleum products rose more than household petroleum. Moreover, in the US and France the price of natural gas used by industry outpaced petroleum. It is only quite recently, since 1981, that natural gas price escalations also ran ahead of petroleum in the FRG. By contrast, in the UK natural gas prices rose far less than those of petroleum products or any other energy commodities. UK natural gas prices did, however, increase more since 1980 (industry) and 1981 (industry and household) than they had done earlier. Solid fuels followed petroleum price rises; in the US and the UK they did so at a distance, whereas in the FRG and France oil and coal price escalations engaged in a close race. In all four countries, price increases were the least for electricity, both for industry and household use; household gas; and for a while, gasoline.

The effect of inflation adjusted prices on consumption is analyzed below for groups of energy commodities and by sectors.

ii) Energy commodity groups, prices and consumption

The growth of inflation adjusted prices and consumption is measured in terms of 1970 = 100 based index numbers for solid fuels; gas; petroleum products; electricity and gasoline (Tables 17-21).

Solid Fuels

The displacement of coal by petroleum and natural gas in the period from 1950 to 1973 met with the decline of inflation-adjusted prices (industry and households). In the USA, the coal slide came to a halt in the mid-1960s, when the rising demand for coal by the utilities started a new growth trend for total coal consumption. A decade later, the FRG and France had a renaissance of their total coal consumption also caused by the demand for coal in thermal

electricity generation. No such renaissance occurred in the UK, where the preference for natural gas seems to make the general phasing out of coal more permanent.

In the US, the return to coal by the utilities was largely motivated by prices, especially since 1973 when natural gas and petroleum prices rose so much faster than those for coal. The unequal price race is reflected in the average cost in cents per Million BTU of fossil fuels delivered to steam-electricity plants between 1973 and 1981:

US : Average cost in cents per Million BTU

	1973	1978	1981
Coal	40.5	111.6	153.3
Residual Oil	78.8	212.3	529.0
Natural Gas	33.8	143.8	282.8
All Fossil Fuels, Delivered to Steam-Electric Utility Plants	47.5	139.3	223.0

Source: DOE Monthly Energy Review, June 1982, p.88

In the FRG and France, the electricity plants' renewed use of coal was largely justified by anticipated security of supplies since coal price rises were not so far behind, and at times ahead of, petroleum. For these countries compilations of fossil fuels prices per heating value are not readily available. The discontinued OECD compilations of prices per toe of unwashed coal for utilities and heavy fuel oil prices paid by industry, indicate that in the FRG coal may have been more expensive on a toe basis than heavy fuel oil in 1973 and 1978. The same may have been true for France.

FRG: Prices paid in DM per toe

	1973	1978
Coal, Unwashed (OECD)	165	262
Heavy Fuel Oil (OECD)	92	293
Heavy Fuel (Price to the Trade)	106	210

France: Prices paid in F.Fr. per toe

	1973	1978
Coal unwashed (OECD)	123	402
Heavy Fuel Oil (OECD)	92	389
Natural Gas (OECD)	77	367

Source: C. Doblin, The Growth of Energy Consumption and Prices. IIASA RR-82-18, Laxenburg, 1982.

i) industry (Figure 4; Table 17)

In the industry sector (mining and manufacturing) the development of prices and consumption differed from that of the utilities (Table 17; Figure 4). In the US the phasing out of coal as an industry fuel continued, despite the fact that since 1976 the inflation-adjusted prices for coal used by industry have been continuously decreasing.

Continuous decline through 1980 with a slight upturn in 1981 of industry coal consumption in the face of rising inflation adjusted prices was seen in the UK.

In the FRG and France, the phasing out of coal consumption by industry gave way to a modest upturn that started in 1979. This upturn met with rising inflation-adjusted prices.

ii) households (Figure 5; Table 17)

The phasing out of coal in the household sector already completed in the USA by 1970, continued through 1981 in the FRG, France and the UK. Throughout this period, the inflation-adjusted prices of coal rose less than those of household petroleum products, but more than those of household gas and electricity.

Petroleum

i) industry (Figure 6; Table 18)

European industry responded to the steeply rising petroleum prices by cutting their demand continuously since 1974. The steady decline is showing in the fact that the 1970=100 based index of industry sector petroleum consumption stood in 1981 at 81 in France, 55 in the FRG, and 52 in the UK. In contrast, the US index of petroleum consumption by the industry sector was, as late as 1981, still 10 percentage points above 1970.

Overcoming the 1974/75 cutbacks, US industry's demand for petroleum was continuously growing for half a decade through 1979. This rising consumption in the face of steeply rising prices is astonishing. By 1979 the 1970=100 based indices had risen to 139 for consumption, and 342 for inflation adjusted prices. At the same time, contrary to what happened in the European countries, changes in preferences for electricity (for which prices rose at a slower pace) were moderate and nonexistant for natural gas. Rising prices did not seem to affect consumption, as long as total industrial output was on the rise (the 1970=100 based index of industrial production reached its highest point in 1979 with 143), and as long as aluminum was still growing (though not as much as total industry), and steel and cement were recovering from their low in 1975. After the second oil price shock in 1979, rocketing prices coincided with the decline of consumption, a drop in total industrial production, the demise of steel and cement, and the slowdown of aluminum.

ii) households (Figure 7; Table 18)

In the US, in contrast to what happened in the industry sector, reaction to the steeply rising petroleum prices was more direct. Purchases fell in 1974/75, had a slight recovery in 1976, but have been falling continuously ever since. By 1981, the 1970=100 based index of household petroleum purchases have fallen to 84, while inflation-adjusted prices reached 307.

The US households' decreasing demand for petroleum products met with increasing demand for electricity, whose prices were rising at a slower pace. This was similar to what happened in the European countries, where the 1970=100 based index for household petroleum products' consumption fell to 92 in the FRG, to 84 in France, and to 76 in the UK, while inflation-adjusted prices rose to 315 in the FRG, 247 in France, and 195 in the UK.

Gas (Table 19; Figures 8 and 9)

i) industry (Figure 8; Table 19)

All price and consumption data in the industry sector relate to natural gas, except for the UK where industrial consumption includes a diminishing share of town gas.

In the US, prices of natural gas for industry use rose more steeply than those of petroleum products; the manufacturing sector's reaction to the gas prices has been a continuous decline of consumption ever since 1974. In 1981, the 1970=100 based index reached the low of 77 for consumption, and a high of 427 for inflation-adjusted prices. This development is in contrast to US industry's reaction to the not-quite-as-steeply rising petroleum prices that for half a decade failed to discourage consumption.

In the FRG, prices paid by industry for natural gas were also rising though not as steeply as in the US, and through 1979 less than those of petroleum products. Industry purchases rose steadily through 1979, but decreased when gas prices rose more than petroleum products. By 1981, the 1970=100 based index was 225 for both consumption and inflation-adjusted prices.

In France, the price situation was similar to that of the US; prices of natural gas rose more than those of petroleum products. However, purchases of natural gas by the industry sector rose continuously through 1979, and stagnated in 1980 (data for 1981 is not presently available). Accordingly, the 1970=100 based indices stood in 1980 at 192 for inflation-adjusted prices and 285 for consumption. It may be worth noting that the French industry's (mining and manufacturing) demand for natural gas stagnated in the same year as the utilities demand for natural gas dropped from 17.9×10^9 kWh in 1979 to 12.3×10^9 kWh in 1980. According to the Institut Francais du Pétrole, this drop was caused by a large nuclear power plant coming into operation.

The most spectacular growth of natural gas consumption occurred in the UK. Inflation-adjusted prices fell from 1970 through 1974 to half their 1970 level. Thereafter they slowly ambled upwards, and by 1981 the 1970=100 based index had reached 118. Data for consumption of natural gas by industry are not readily available; instead use is made of the demand for "natural and town gas". By 1979, the 1970=100 based index for natural and town gas (with natural gas having the lions share) had climbed to a peak of 440; it dropped to 407 in 1981.

ii) Household Sector (Figure 9; Table 19)

Prices and consumption data of the household sector relate to natural gas in the US; to natural and manufactured gas in the FRG

and France (excluding liquefied petroleum) and to natural and town gas in the UK--though the share of town gas was recently phased out.

In the US, inflation-adjusted prices for household gas were rising steeply, discouraging demand. The 1970=100 based index of consumption reached a second high for the decade of 111 in 1979; it has since tumbled to 104 in 1981, while the continuously rising index for inflation-adjusted prices moved up to 180.6.

In the European countries the demand for household gas rose uninterruptedly without even a dent during the 1974/75 depression, so that the 1970=100 based index stood in 1981 at 352 in the FRG, 280 in France, and 247 in the UK.

Undeniably, the demand for household gas was fostered by very modest or even falling inflation-adjusted prices. This situation continued through 1979 when the 1970=100 based index for inflation adjusted household gas prices hovered at 100.1 in the FRG, and had slumped to 98.1 in France and 69.7 in the UK. Pursuant to the second oil price explosion, the indices rose in 1981 to 126 in the FRG, 130 in France, and 78 in the UK.

Electricity

In the 1950-1973 period, when the inflation adjusted prices for electricity and fossil fuels were declining, electricity demand grew faster than total primary energy consumption. Since 1973, electricity prices have been rising at a far slower rate than prices of the fossil fuels from which electricity is generated, and the demand for total electricity continued to grow faster than total primary energy consumption. The 1974/75 recession brought only minor cuts for total electricity consumption that were quickly

overcome. In France, electricity growth was resumed without a let-up through 1981. In the US, the growth rate (not total growth) has slowed down since 1979, with an actual cut in total sales of electricity not occurring until 1982. In the FRG, growth stopped in 1980, giving way to a small dip. In the UK, where electricity sales had grown on a modest scale (because of natural gas), a sizeable setback occurred in 1980 and 1981.

i) Industry (Figure 10; Table 20)

As stated above, after 1973 prices of electricity rose less than those of mineral fuels. An exception to this general rule is the US industry sector, where the inflation-adjusted prices for industry purchased electricity increased considerably, nearly as much as solid fuels, though still much less than petroleum products or natural gas. Rising electricity prices failed to discourage the growth of US industry's electricity consumption, just as rising prices of petroleum products had failed to stop growing consumption in the period between the two oil shocks. Only after the second oil price shock, when electricity prices rose sharply and the index of industrial production fell for the first time since 1975, did US industry purchases of petroleum products and electricity decline.

In the FRG, France and the UK, inflation-adjusted prices for industry-purchased electricity rose less than the prices of the mineral fuels (coal, oil, gas) from which electricity is

generated. In 1981, the 1970=100 based inflation-adjusted price index for industry-purchased electricity hovered at 109 in the FRG, was somewhat higher at 115 in France and 120 in the UK, while the inflation-adjusted price index for solid fuels had risen to 175 in the FRG, 167 in France, and 147 in the UK. This enabled sales of electricity to the industry sector to cut into the markets of coal and petroleum products, a trend that has continued through 1981.

In the UK, however, growth stopped in 1979, giving way to considerable cuts in electricity sales to industry in the face of sharply rising prices; this coincided with substantial drops in the total industrial production index. In the FRG and France, where the cutbacks in total industrial production were less than in the UK, the sharply rising industry sector prices were no deterrent to continuous electricity sales to industry that prevailed through 1981 (last year for which data are currently available).

As a result of the disparate growth of inflation-adjusted prices and consumption, the 1970=100 based indices stood in 1981 at:

	Inflation-adjusted Prices	Sales to Industry
Industry Sector		
US	164	144
FRG	109	129
France	115	148
UK	120	102

ii) Households (Figure 11; Table 20)

The development of electricity consumption and prices in the household sector during the 1970s merits consideration. In the USA, the inflation-adjusted price of no other energy commodity grew as little as that of household electricity in the 1970s.

The 1970=100 based index stood in 1976 at 117; after 4 years of stagnation, it suddenly jumped to 123 in 1980 and then to 130 in 1981; this was still below the level obtained for industry-purchased electricity and far below that of any other household fuels, e.g., gas or petroluem products, for which the index of inflation-adjusted prices had risen in 1981 to 181 (household gas) and 307 (petroleum). Also, consumption in the US of no other energy commodity, not even that of gasoline, grew as much as household electricity. After the first oil price explosion of 1973, consumption merely stagnated in 1975, with growth as usual resuming from 1976 through 1980, and with only a minor setback following in 1981. The continued fall in household consumption of petroleum products and the continual growth of electricity sales to households tends to indicate that some of the market for household petroleum had gone to electricity.

In the FRG and France, where electricity (and petroleum products) were still replacing coal, the growth of household electricity consumption was even more spectacular. From the beginning to the end of the decade, sales of household electricity almost doubled in the FRG and trebled in France. Relatively slow rising prices certainly helped. In France, the inflation-adjusted prices for household electricity suffered only a slight increase in 1974, followed by stagnation and decreases below 1970 (always inflation-adjusted) that lasted through 1979 when the 1970=100 based index stood at 95. The second oil price explosion finally lifted the index to 102 in 1980 and 101 in 1981. While these prices undoubtedly fostered household electricity consumption, its biggest lift may have come from the 1975 promotion of electricity for home heating.

In the FRG, inflation-adjusted household electricity prices rose somewhat more than in France, and they also rose more than industry electricity prices as stated above; but altogether the increase was comparatively small. The inflation-adjusted 1970=100 based price index for household electricity rose to 111 in 1976; this was followed by a small decrease that lasted through 1980, only to rise again in 1981, when the 1970=100 based price indices adjusted for general inflation stood at 114, while the same indices for household petroleum and household coal stood at 315 (petroleum) and 151 (coal).

In the UK, household electricity consumption peaked in 1974. Obviously, the market for household electricity was lost to natural gas--its inflation-adjusted prices had fallen uninterruptedly since 1972.

By way of summary, the 1970=100 based indices of household electricity for 1981 are:

Households	Inflation-adjusted Prices	Sales to Households
US	130	159
FRG	114	203
France	101	303
UK	110	137

Gasoline (Road Transport) (Figure 12; Table 21)

The long-term growth of gasoline consumption in the 1950 to 1973 period met with inflation-adjusted prices decreasing strongly in the FRG and France, and somewhat more moderately in the UK and the US. After the first oil price explosion gasoline prices rose, but nowhere was the increase as high as that of petroleum products purchased by households or industry. Subsequently, in the years between the oil shocks, the prices of gasoline at the pump, tax included and inflation-adjusted, tended

to stagnate or even decline slightly. By 1978, the inflation-adjusted price was 13% above 1970 in the US, 11% above 1970 in France, and only 2% above 1970 in the FRG, while in the UK, the inflation-adjusted price had dropped to nearly 10% below.

Some explanation for the relatively slow rise of gasoline prices may be due to the fact that gasoline taxes were also slow to rise as, for example, in the US where the Federal tax on gasoline did not increase at all between 1970 and 1978 (4.0 cents per gallon or 1.06 cents per liter) and State taxes increased only very little (from 1.85 cents to 2.06 cents per liter); thus the tax bite on gasoline eroded from 31% in 1970 to 18% in 1978, calculated on a current price per liter tax included as 9.50 cents in 1970 and 16.52 cents in 1978. The conversion to liters on the basis of 3.79 liters per US gallon was made for comparability with the Europeans (Table 22).

In the European countries gasoline is taxed more heavily, which partly explains why it is so much more expensive than in the US. Between 1970 and 1978, gasoline taxes were rising, not by 7% as in the US, but by 13% in the FRG, 14% in the UK and 17% in France. Since current gasoline prices increased far more than that, the tax bite eroded as in the US, albeit at a higher level between 1970 and 1978: from 72% to 61% in the FRG, 73% to 44% in the UK, and 74% to 56% in France.

Since 1978, gasoline taxes have been raised continuously in the three European countries, whereas in the US, the Federal tax of 4.0 cents per gallon (1.06 cents per liter) was not changed to date. The chief tax writer in the House of Representatives, Mr. Rostenkowski favors a gasoline tax hike by 5 cents per gallon for 1982 to pay for the "massive reparation of the nation's bridges and roads".[3]

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[3] International Herald Tribune, 11 Nobember 1982.

With the above-described slow rise in the inflation-adjusted prices, consumption of gasoline was quick to rebound after the 1974/75 recession, and to resume its growth thereafter at pre-energy crisis rates for nearly half a decade.

The second oil price shock brought to an end the period of slow increases in the inflation-adjusted prices. In 1979 inflation-adjusted gasoline prices suffered a very large increase, especially in the US , and continued to do so through 1981 in all four countries. The effect on consumption in the US was an immediate and sharp cutback in 1979 and the first 6 months of 1982. In the European countries the 1978 jolt in the inflation-adjusted gasoline prices was not quite as violent as in the US ; moreover, the FRG and France were not yet as close to the brink of recession and soaring unemployment--thus in the FRG, gasoline consumption raced upwards through 1980 with a cutback finally coming only in 1981; the UK development was similar with continued increase of the demand for gasoline in 1980, and a drop in 1981; whereas in France, 1980 brought stagnation, and in 1981 a slight increase of gasoline demand.

5. Summary

The analysis has shown that the effect of prices on consumption is manifold and at times difficult to isolate from other factors that shape demand, e.g., structural changes, incomes, employment, production, fuel preferences and the weather. Moreover, long-term delivery contracts may keep price fluctuations from becoming immediately effective. Keeping in mind these considerations, the tendency for increasing prices to curb consumption were seen in the following cases: The sudden and high price escalations of the first oil price explosion of 1973 did temporarily cut consumption; the second sharp increase that came

with the second oil price explosion also caused a severe drop in the demand for most energy commodities--some cutbacks starting early as in the US (1979), others with some delay (1980, 1981) in the European countries. In the period between the two oil shocks, decreases apparently caused by price increases were seen in the falling demand for petroleum products by the industry sectors in the FRG, France and the UK. However, an even higher growth of inflation-adjusted prices did not curb the demand for petroleum products in the US, during the intershock period.

Another example of prices curbing demand may be seen in the case of natural gas. The fact that natural gas prices tended to rise faster than those of petroleum products kept the USA demand for natural gas from growing. In the FRG, as long as natural gas prices tended to rise less than petroleum prices, natural gas demand grew--but a cutback set in by the end of the decade when prices for natural gas also rose faster than petroleum products.

More clearly was the hand of prices seen in the consumption growth of those energy commodities whose inflation-adjusted prices tended to undergo only minor increases in the intershock period: gasoline, household gas (except in the USA), household electricity, also industry sector purchased electricity in the FRG and France; and of course, the prime example, the UK's strong growth of natural gas consumption boosted by relatively slow rising prices.

On the other hand, there are also numerous cases where prices did not have an impact on consumption. This includes the solid fuels, where decreasing prices in the pre-1973 period did not prevent its displacement in industry and household use, though it was a different case with the USA utilities. Likewise, up

until the second oil shock came around, the phasing out of solid fuels from manufacturing and households continued--with prospects for minute comebacks only in the FRG and French industry sectors.

The analysis has made it abundantly clear that it was hardly the price factor alone that prompted energy savings or energy conservation, if there was any. This becomes the more amazing if one considers the growth of current prices the buyer is charged; and not the inflation-adjusted ones that are an abstraction unknown to him. It is a fact that for half a decade of the energy crisis in the US, and for an even longer period in the FRG, France and the UK, there were no savings at all to be seen in total energy consumption of the road transport (gasoline) and household sectors. Soaring consumption was only stopped in these sectors when sharply rising energy prices coincided with some or all of these factors: rampant inflation, adverse business conditions, falling incomes, growing unemployment. This occurred in the US in 1979, and with some delay in 1980 to 1981 in the FRG, France and the UK.

In contrast to households and road transport, the total energy demand by the industry sector grew only moderately (France) or fell considerably below 1973 and 1970 levels in the US and in the FRG, and particularly in the UK. Obviously the industry sector's total energy consumption depends on the development of industrial production. Not just total production, but the development of total and individual heavy energy consuming industries. In the United States, the index of total industrial production has risen somewhat more than GDP, while energy consumption by the industry sector has fallen far below these levels. This apparent energy conservation was not achieved by massive technological improvements in the efficiency of energy

utilization; instead the energy conservation largely resulted from the decline of energy intensive industries, e.g., steel and cement whose output dropped below 1973 and 1970 levels; while at the same time the growth of the aluminum industry lagged behind that of the national average, as measured in the total industrial production index. Obviously, with recent drops in total industrial output, more energy conservation is achieved. The same observation holds for the FRG, France and the UK, where the sick industries steel and cement also fell below 1973 and 1970 output levels.

It is obvious that with an economic upturn, growing industrial output, and rising incomes, many of the energy savings may come to naught again.

A similar fate may be in store for the lessening of the oil dependency. In the USA, the lessening of the oil dependency measured by the share of oil in total primary energy consumption began in 1979, with a cutback in the soaring demand for gasoline; at the same time, oil dependency in the industry sector also lessened, while petroleum was being displaced from the household sector since 1974/75.

In the FRG, France and the UK, lessening of the oil dependency at the national level and in both industry and households has been in progress ever since the first oil price shock; it was made possible by the preferences for natural gas. While these supplies seem to be assured for the UK, much of the continued lessening of the oil dependency in the FRG and France depend on the future of gas supplies.

The experience of the 1970s and early 1980s suggests that the most effective way to curb energy consumption is through sudden, steep price increases coupled with a cutback in economic

growth, incomes and lately, rising unemployment. Not all of the observed structural changes curbing energy consumption contributed to a sound development, fostering more energy efficient societies. The "price of breaking the energy coefficient" was obviously high.

PART II. FIGURES

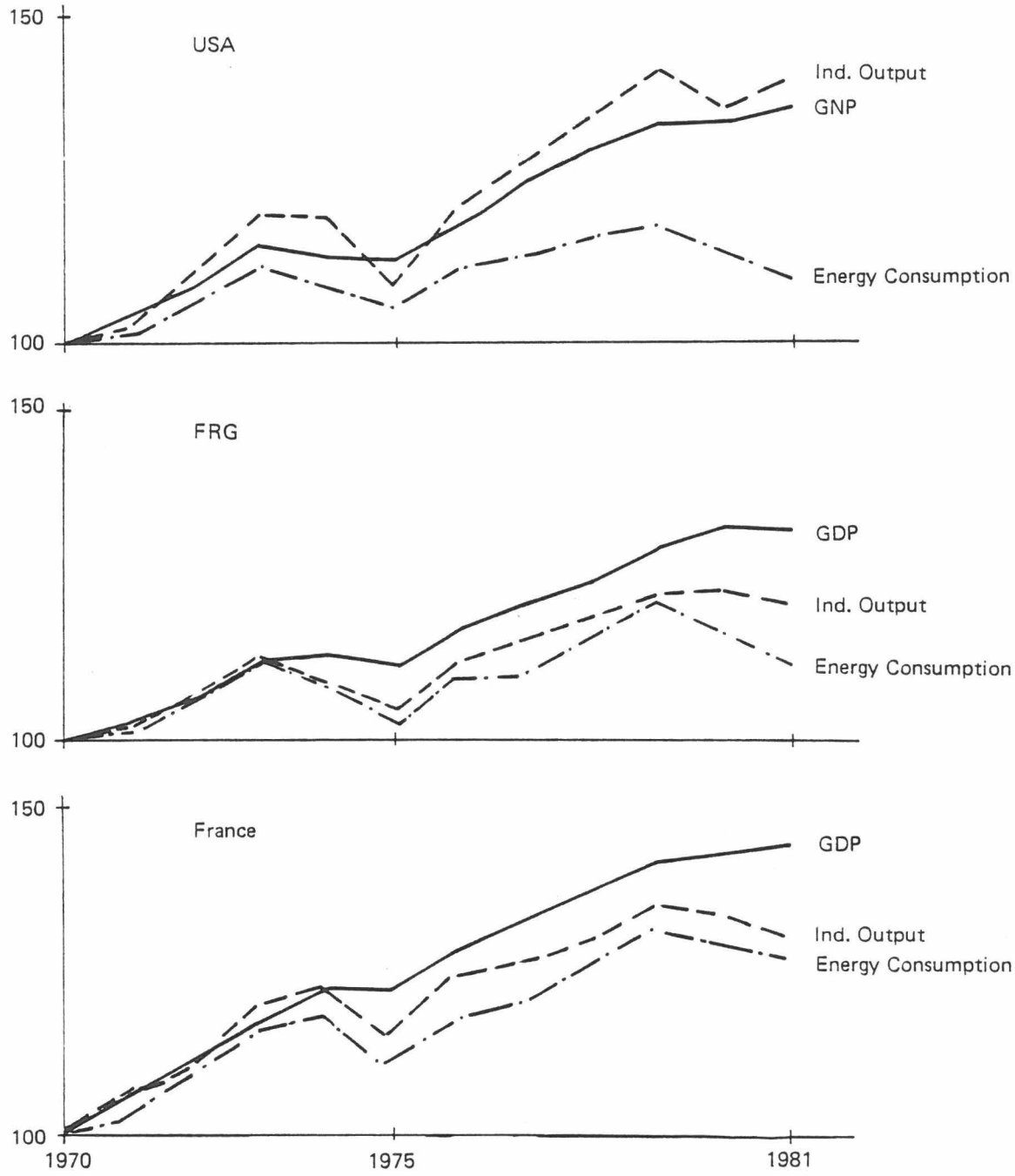

FIGURE 1 Real GDP, Industrial Output and Total Primary Energy Consumption, 1970–1981. Index Numbers, 1970 = 100

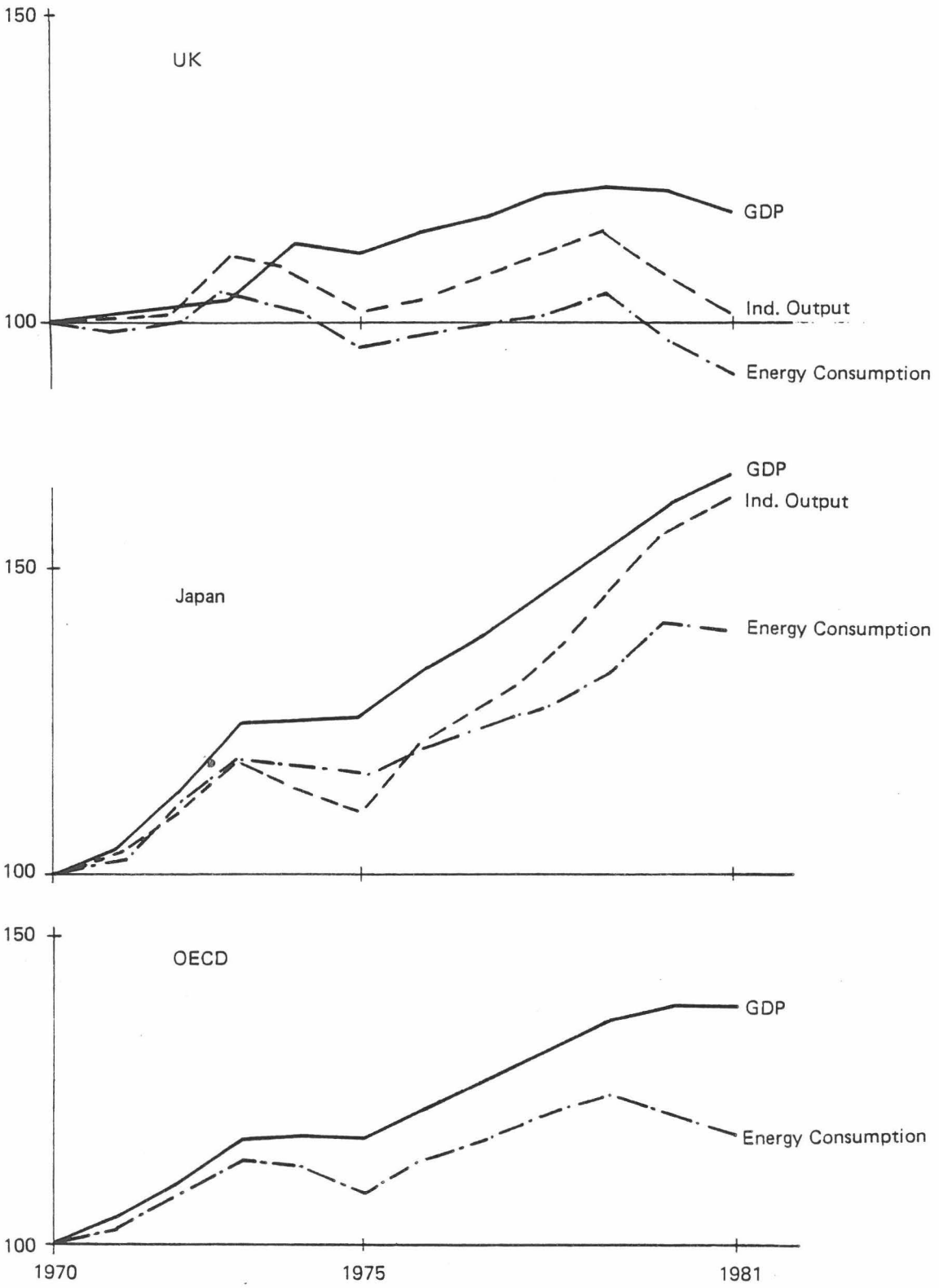

FIGURE 1 Continued

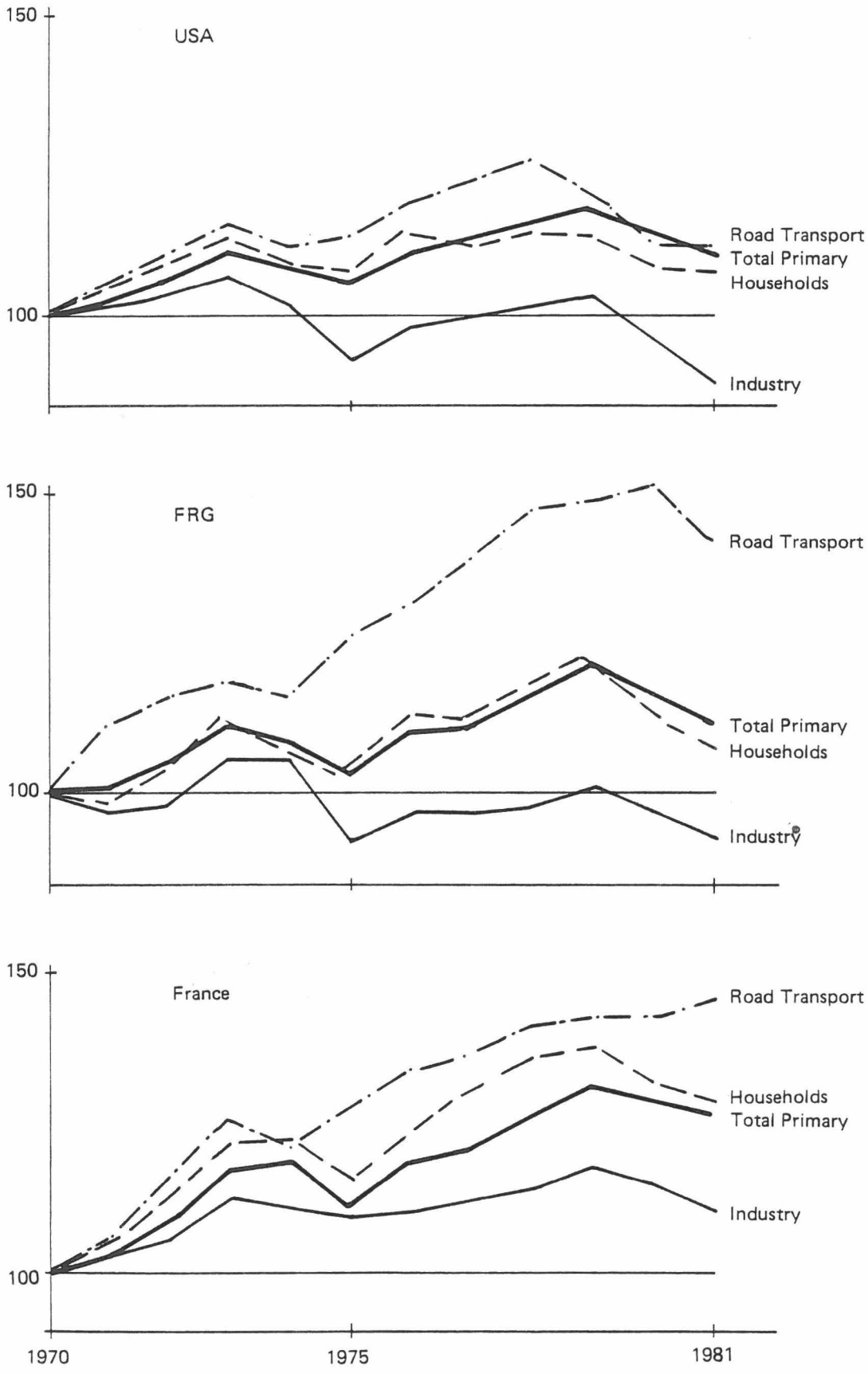

FIGURE 2 Energy Consumption. Total Primary and by Sectors: Industry, Households and Road Transport (Gasoline). 1970 –1981. Index Numbers, 1970 = 100

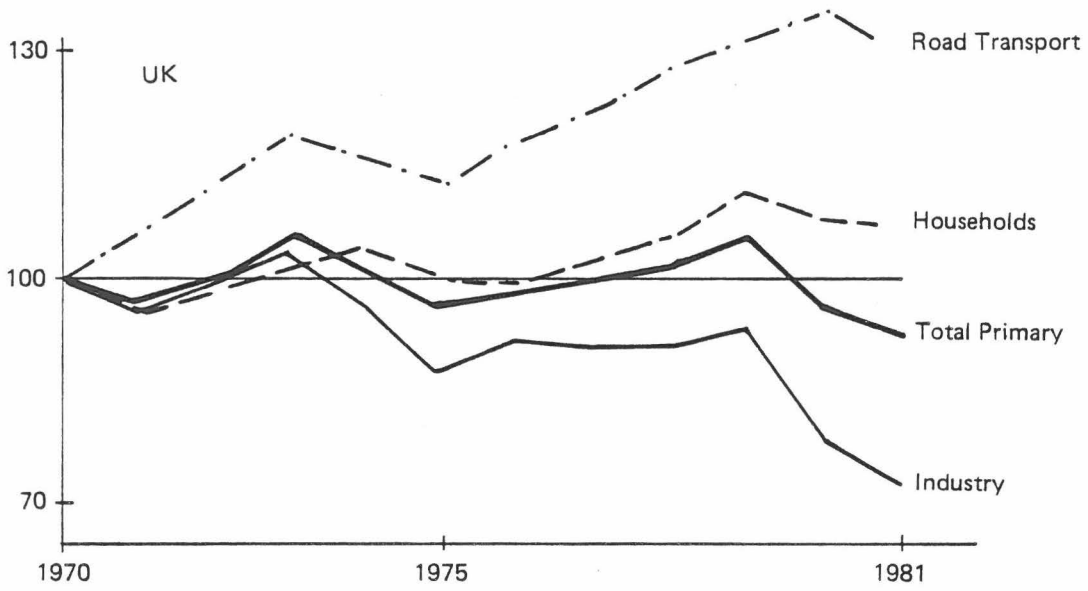

FIGURE 2 Continued

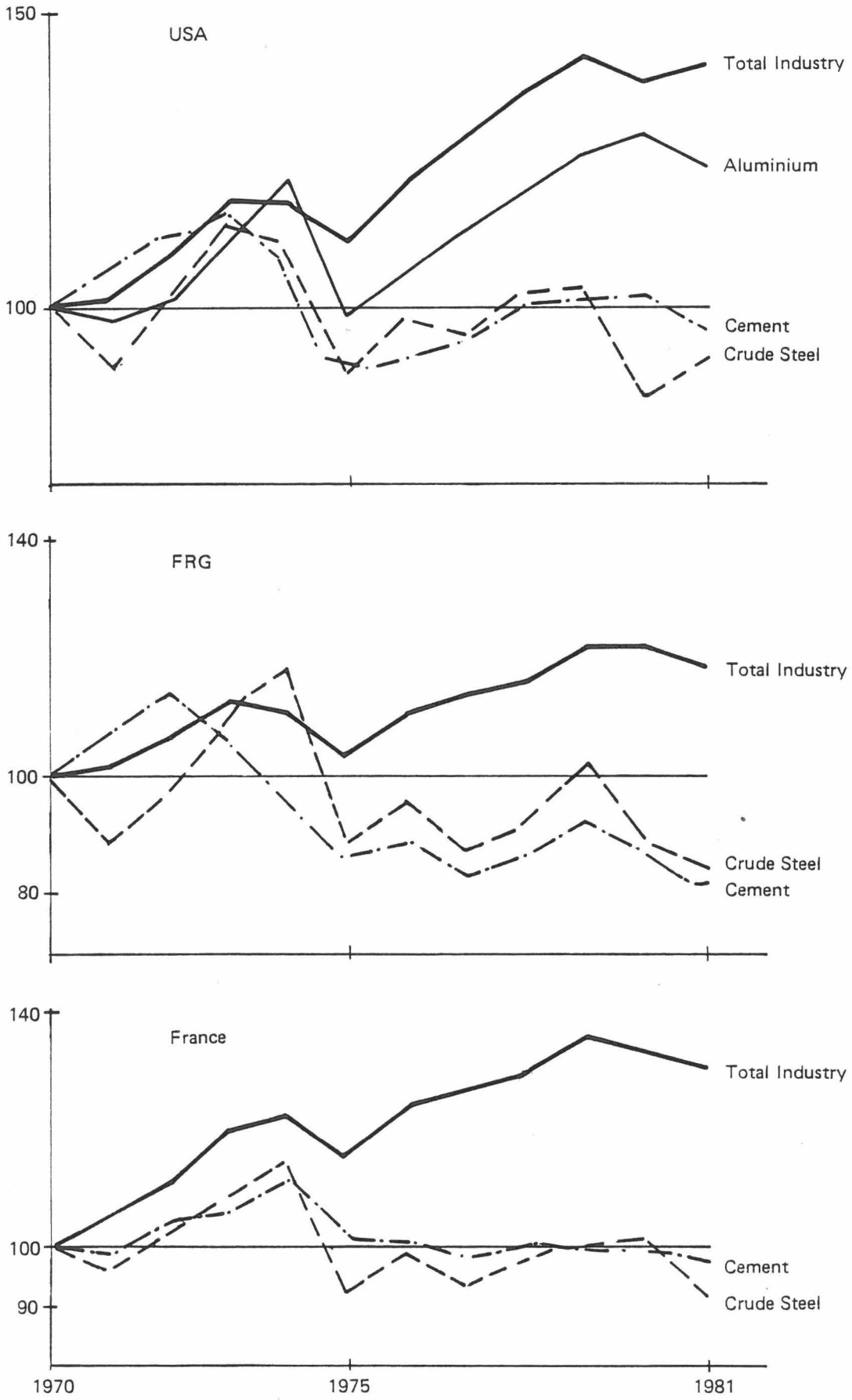

FIGURE 3 Growth of Total and Selected Industries, 1970–1981. Index Numbers, 1970 = 100

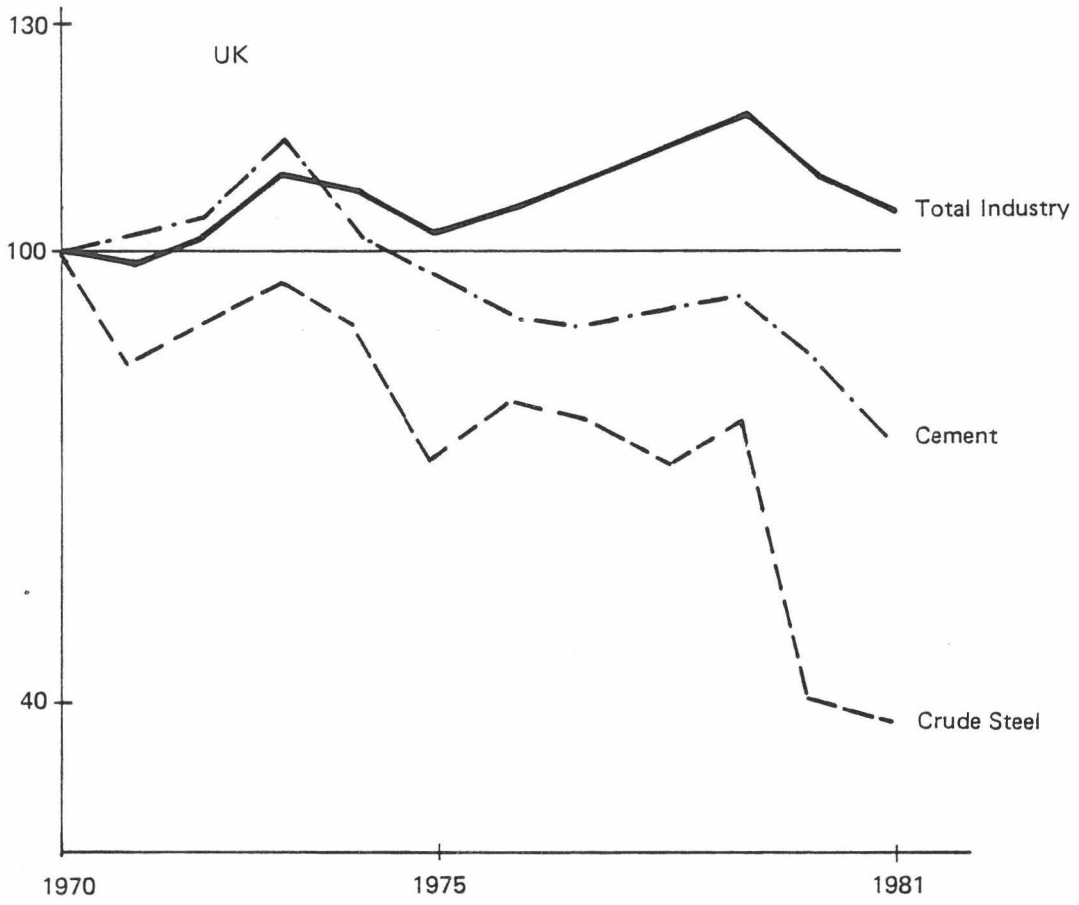

FIGURE 3 Continued

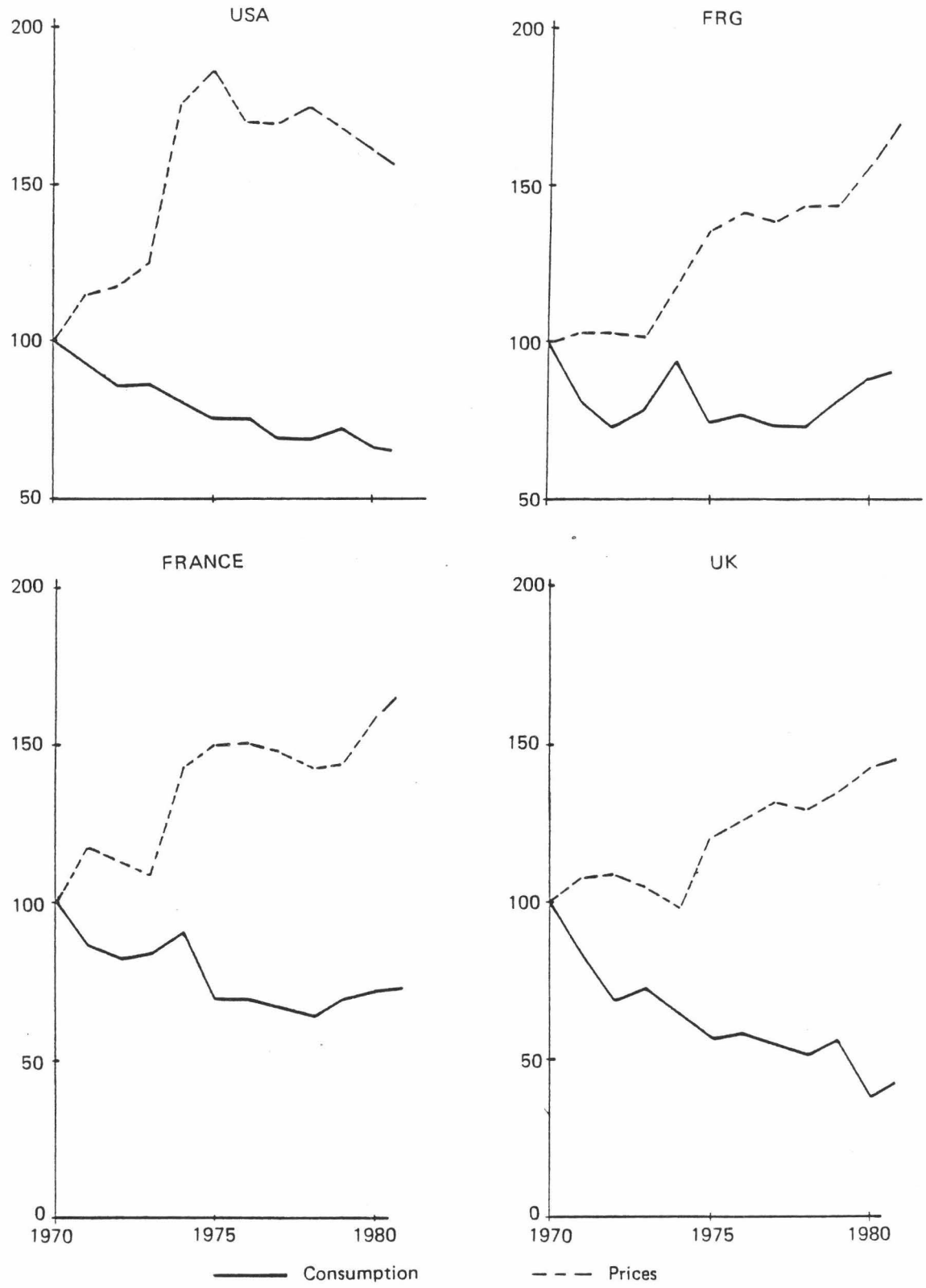

FIGURE 4 Coal Industry Sector Consumption and Inflation—Adjusted Prices, 1970—1981. Index Numbers, 1970 = 100

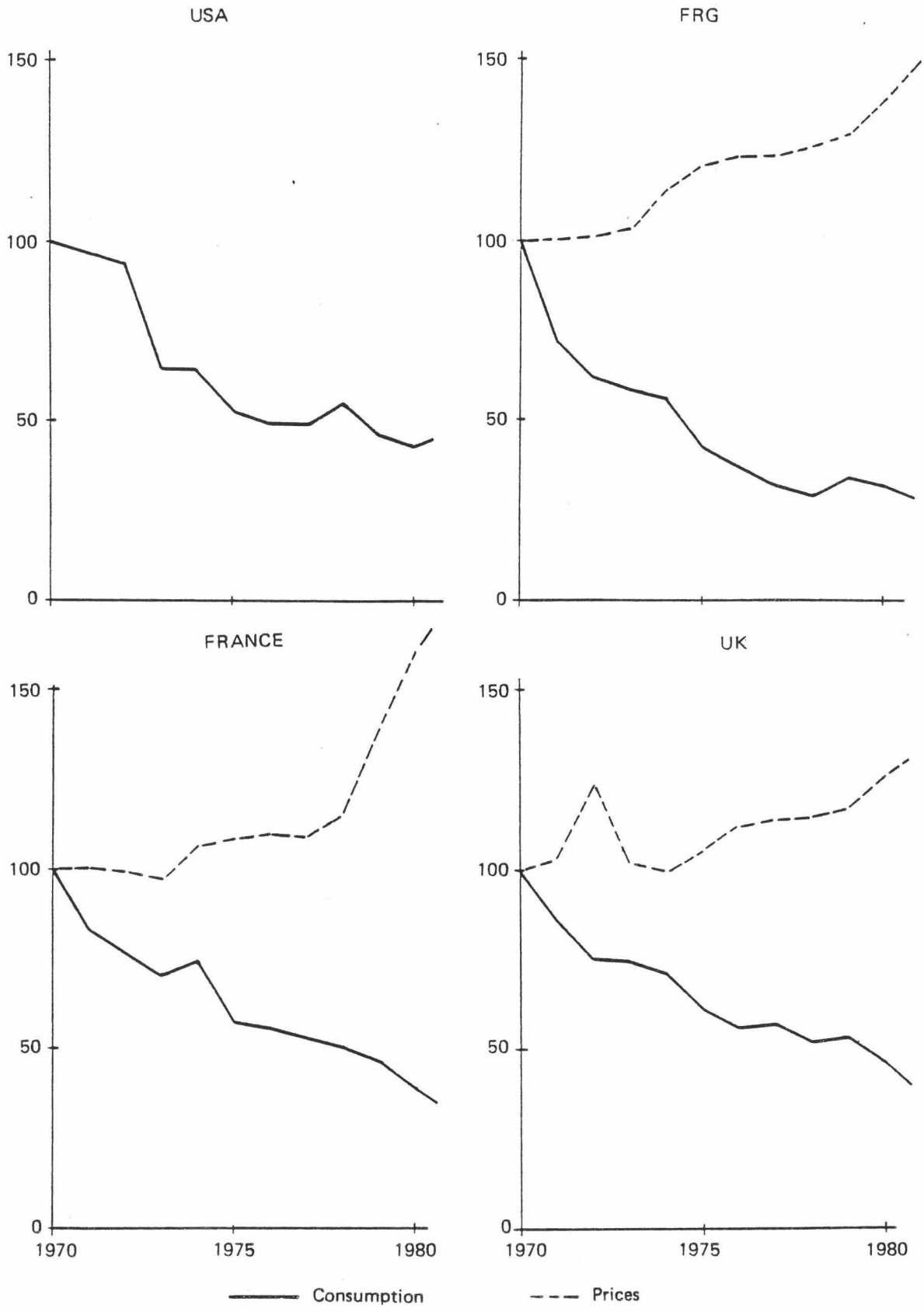

FIGURE 5 Coal Household Sector Consumption and Inflation—Adjusted Prices, 1970—1981. Index Numbers, 1970 = 100

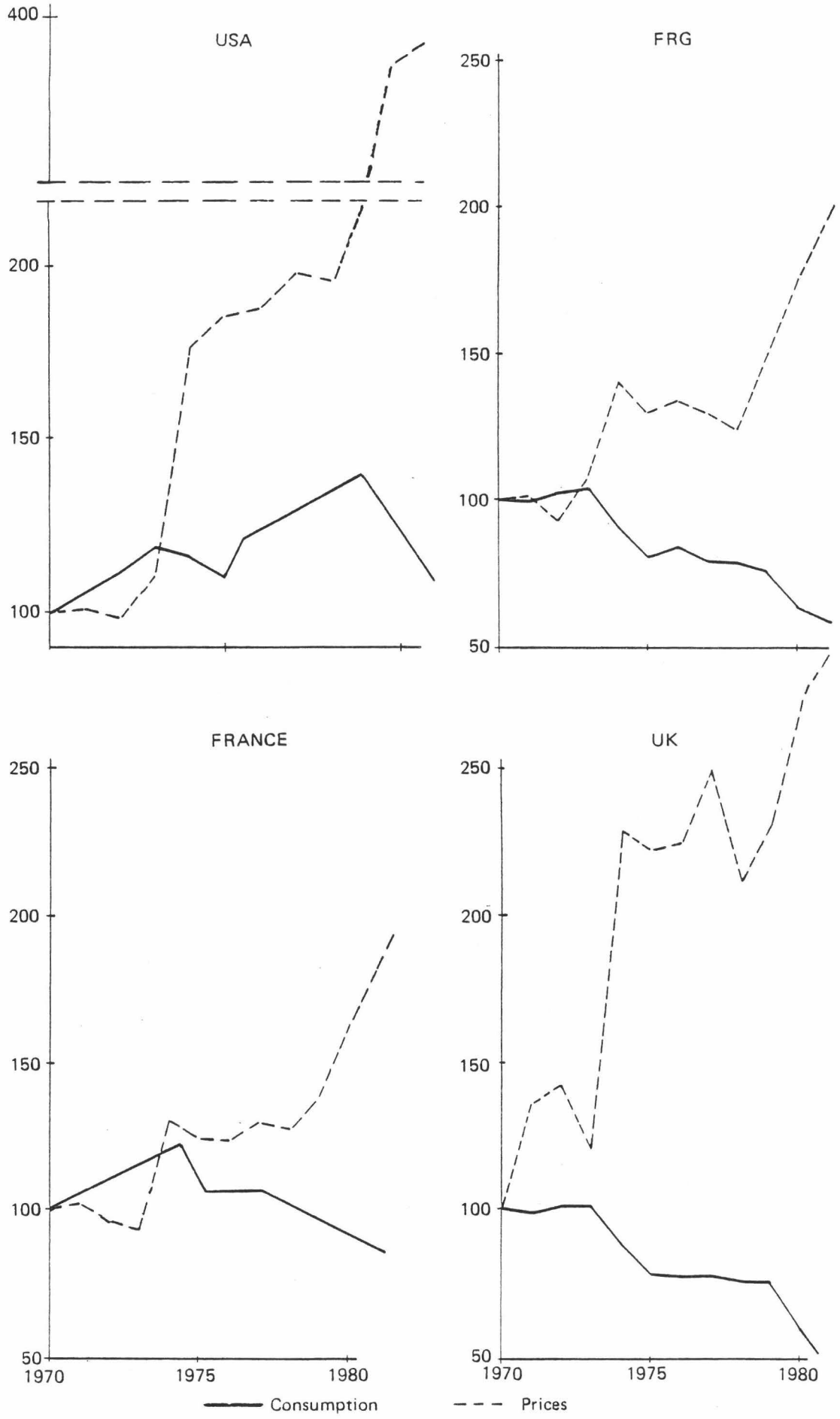

FIGURE 6 Petroleum Products Industry Sector and Inflation—Adjusted Prices, 1970—1981. Index Numbers, 1970 = 100

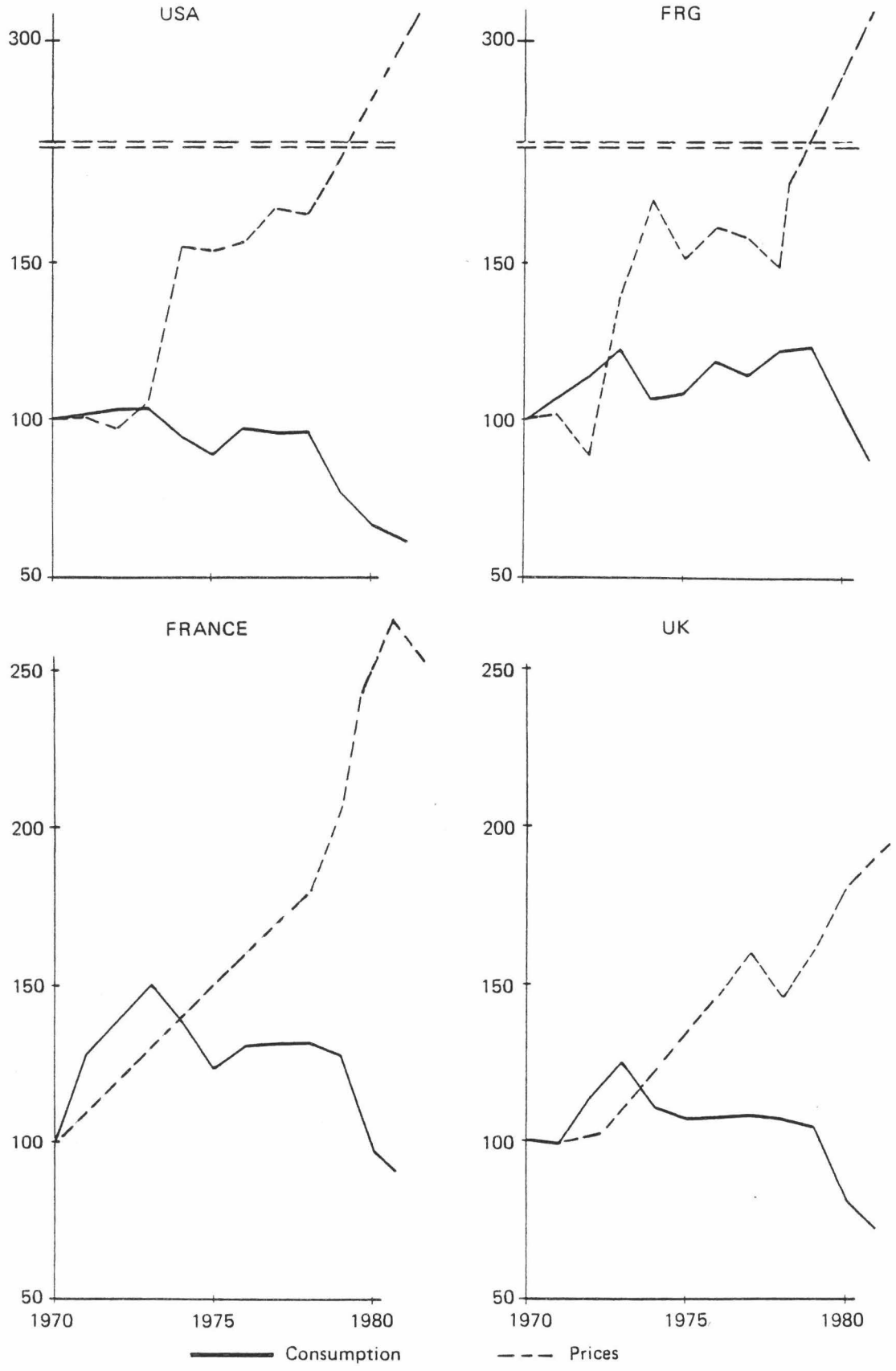

FIGURE 7 Petroleum Products Household Sector and Inflation—Adjusted Prices, 1970—1981. Index Numbers, 1970 = 100

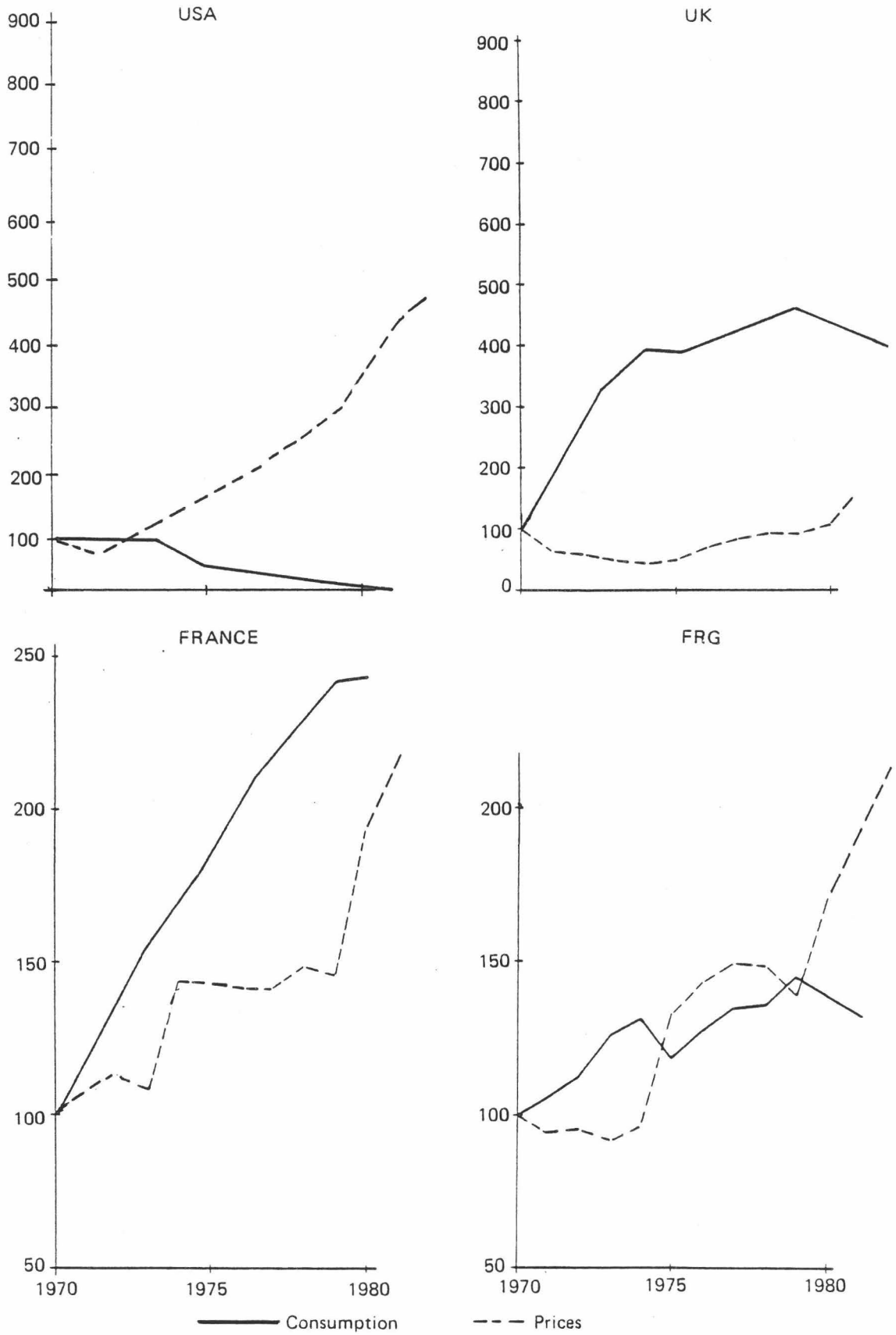

FIGURE 8 Natural Gas Industry Sector Consumption and Inflation–Adjusted Prices, 1970–1981.
Index Numbers, 1970 = 100
(UK Industry Sector Consumption Includes Natural and Manufactured Gas)

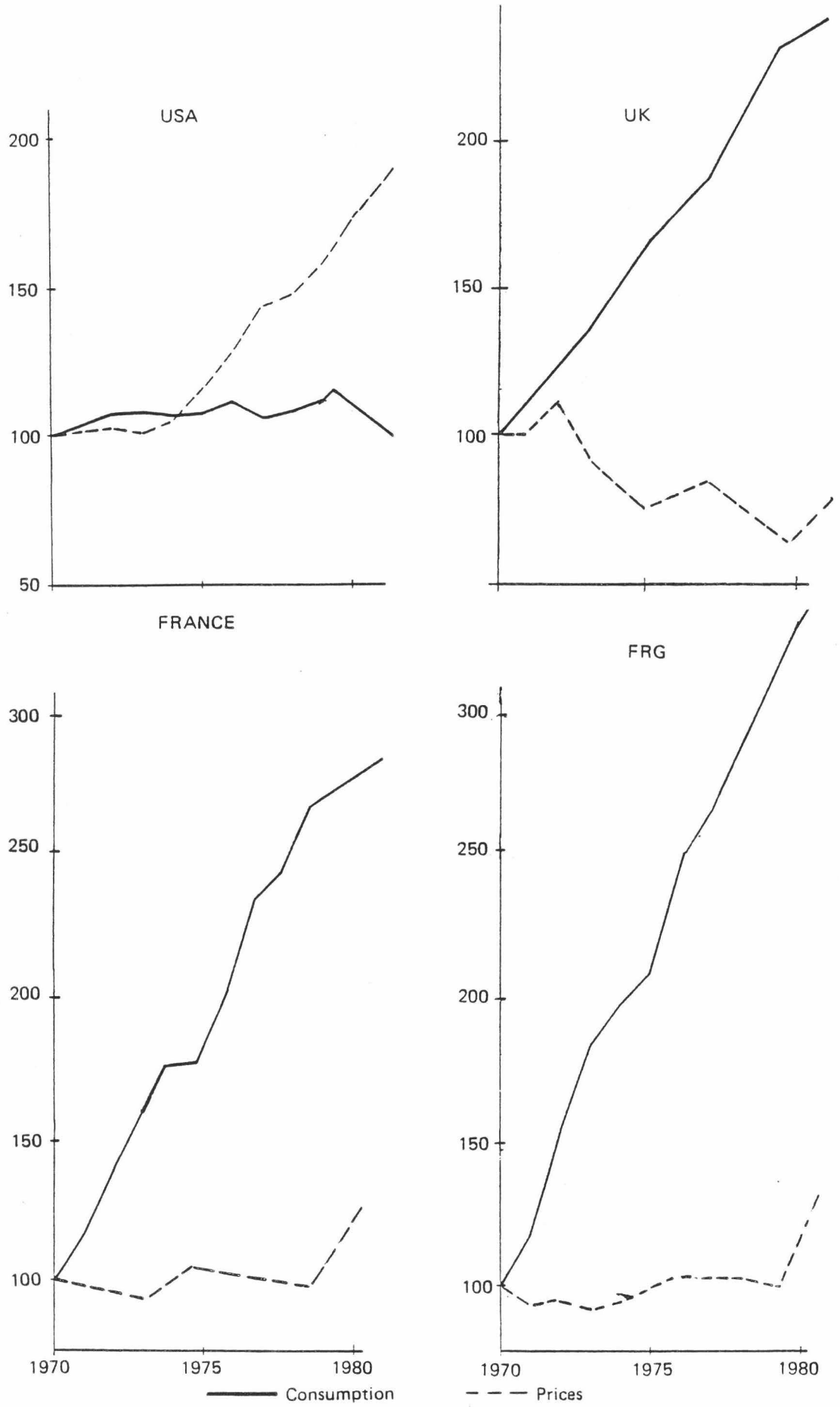

FIGURE 9 Gas, Manufactured and Natural, Household Sector Consumption and Inflation—Adjusted Prices, 1970—1981. Index Numbers, 1970 = 100

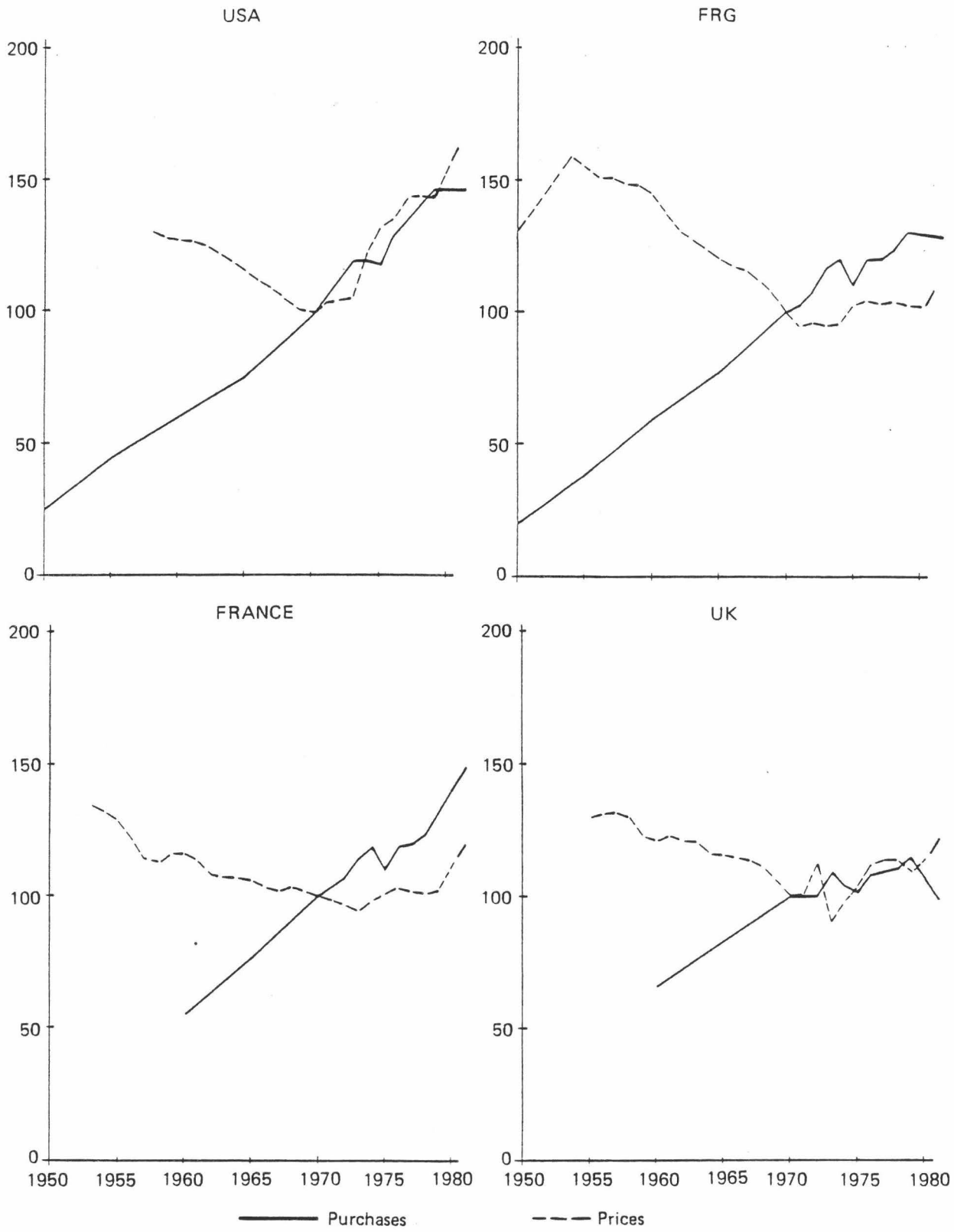

FIGURE 10 Electricity Industry Sector Purchases and Inflation—Adjusted Prices 1950—1981. Index Numbers, 1970 = 100

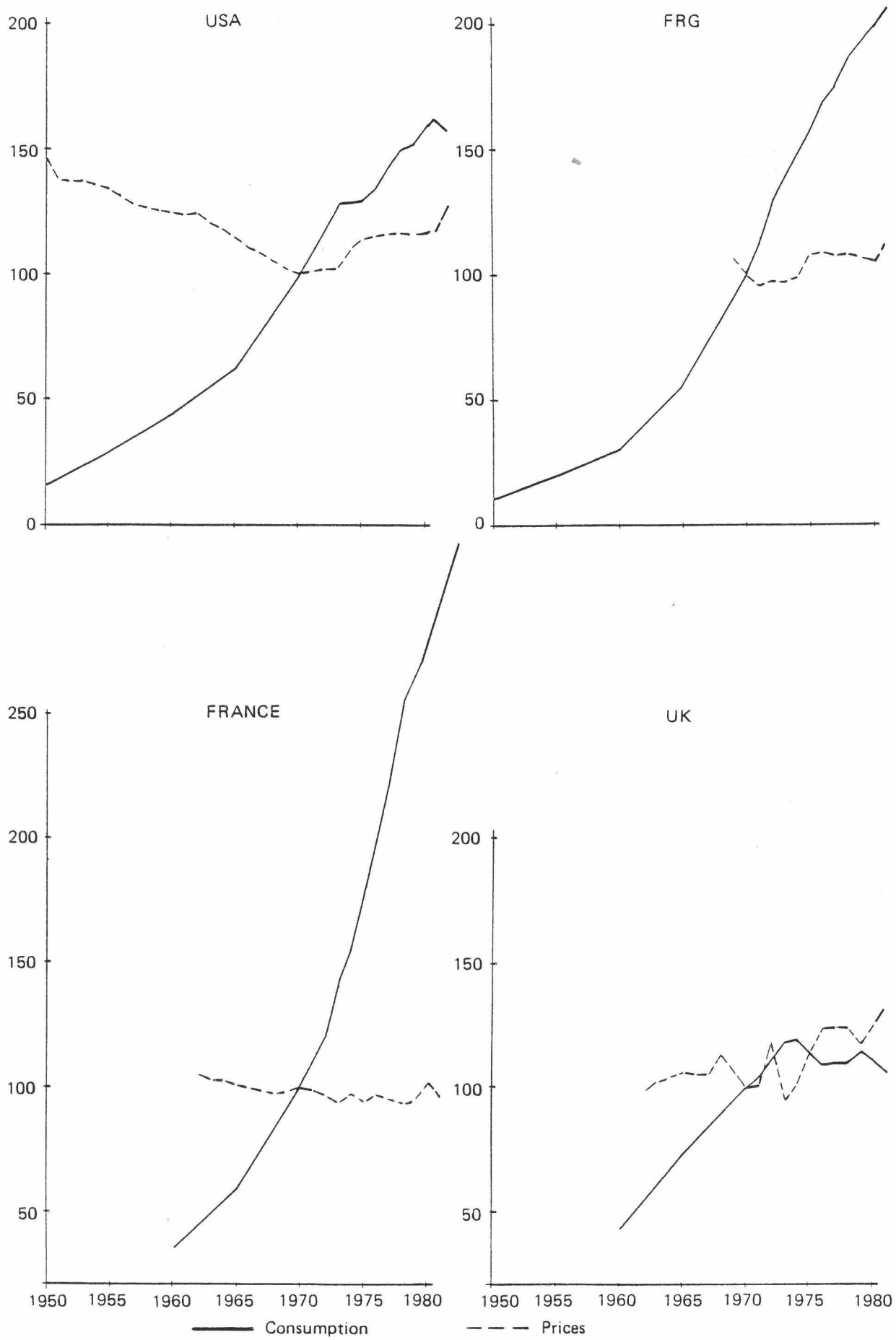

FIGURE 11 Electricity Household Sector Consumption and Inflation–Adjusted Prices, 1950–1981
Index Numbers, 1970 = 100

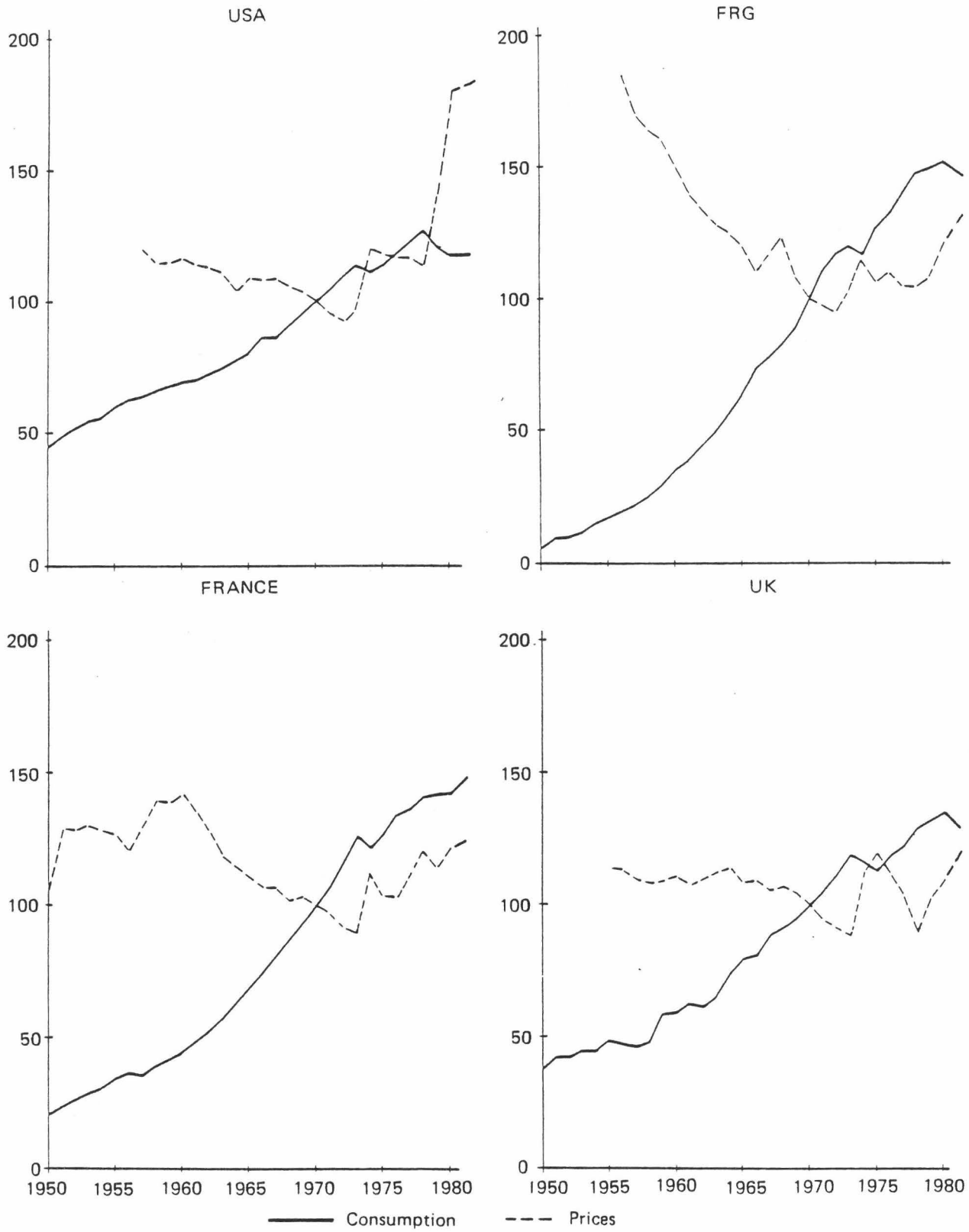

FIGURE 12 Transportation, Gasoline Consumption and Inflation—Adjusted Prices, 1950—1981. Index Numbers, 1970 = 100

PART III. TABLES

Table 1. The Growth of Population, GDP, Industrial Output, and Energy Consumption in OECD Countries, 1970-1981.

Index Numbers, 1970 = 100

Year	Population	GDP (constant prices)	Industrial Output	Energy Consumption (total primary)	Population	GDP (constant prices)	Industrial Output	Energy Consumption (total primary)
	USA				*UK*			
1970	100.0[R]	100.0[a]	100.0	100.0	100.0	100.0	100.0	100.0
1971	101.4	103.1	100.1	101.8	100.4	100.0	100.0	98.4
1972	102.6	108.9	108.0	106.7	100.7	101.9	102.0	100.6
1973	103.6	114.8	117.7	111.2	100.9	103.8	111.0	105.5
1974	104.6	113.2	117.0	108.4	100.9	113.0	108.0	101.1
1975	105.6	113.1	110.4	105.3	100.9	111.1	102.0	96.4
1976	106.7	118.5	121.6	111.0	100.9	115.4	104.0	98.1
1977	107.7	124.9	128.5	113.7	100.9	116.8	108.0	100.3
1978	108.9	130.4	136.9	116.5	100.7	120.7	112.1	100.6
1979	110.1	134.0	142.9	117.6	100.9	122.1	114.8	105.2
1980	111.4	133.9	137.8	113.1	100.9	120.7	107.4	96.4
1981	112.4	136.5	141.5	109.9	100.7	117.8	101.9	93.4
	FRG				*JAPAN*			
1970	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1971	101.0	102.6	101.0	100.8	102.1	103.5	103.0	102.5
1972	101.6	105.8	105.8	105.2	103.6	113.1	110.0	109.9
1973	102.1	112.4	112.7	112.3	105.0	124.6	127.0	119.0
1974	102.1	112.9	110.7	108.6	106.5	124.4	124.0	118.7
1975	101.8	110.0	104.6	103.1	107.8	125.4	110.0	115.5
1976	101.3	116.6	112.7	109.9	109.0	134.2	122.0	121.1
1977	101.2	120.1	115.0	110.5	110.0	138.9	128.0	123.9
1978	101.0	124.0	117.0	115.5	111.0	146.0	135.0	127.1
1979	101.2	129.6	123.1	121.2	112.0	153.3	146.0	132.4
1980	101.5	131.9	123.1	115.8	112.9	160.1	156.0	131.0
1981	101.6	131.7	120.6	111.1	113.6	164.8	161.0	129.2
	FRANCE				*OECD*			
1970	100.0	100.0	100.0	100.0	100.0	100.0		100.0
1971	101.0	105.0	106.0	102.2	101.3	103.9		102.5
1972	101.8	110.8	111.0	110.0	102.1	109.6		108.1
1973	102.6	117.6	120.0	117.5	103.0	116.3		113.8
1974	103.3	121.6	123.0	118.0	103.9	117.0		113.4
1975	103.7	121.9	115.0	110.6	105.3	116.5		108.1
1976	104.1	128.1	124.0	117.3	106.1	122.3		114.3
1977	104.5	132.0	126.0	120.3	106.9	126.7		116.7
1978	104.9	137.1	129.0	123.4	107.7	131.5		121.8
1979	105.3	141.7	135.0	128.0	108.5	135.8		124.2
1980	105.7	143.5	133.0	126.2	109.4	137.6		120.8
1981	106.3	143.9	130.0	125.6	.	137.9		118.0

a = US GNP
R = US resident population revised with 1980 census.

SOURCES: Compiled from Tables 2, 3, 15 and 16.

Table 2. The growth of GDP in OECD countries at constant and current prices, 1970-1981

	GDP at 1975 Prices and 1975 Exchange Rates						GDP at Current Prices and in National Currencies				
	USA	FRG	France	UK	Japan	OECD	USA	FRG	France	UK[a]	Japan
	In Billion (10^9) Dollars						$10^9$$	10^9DM	10^9F.Fr.	10^9£	10^{12}Yen
1970	1361	379	278	208	398	3504	992.7	679.0	783	43.6	73.7
1971	1402	389	292	212	412	3639	1077.6	756.0	872	49.5	81.0
1972	1482	401	308	216	450	3839	1185.9	827.2	981	55.3	92.7
1973	1562	426	327	235	496	4076	1326.4	920.1	1114	64.3	113.1
1974	1541	428	338	232	495	4100	1434.2	986.9	1278	74.7	135.3
1975	1539	420	339	231	499	4081	1549.2	1033.9	1452	94.5	149.0
1976	1613	442	356	240	534	4284	1718.0	1125.0	1678	111.6	167.5
1977	1700	455	367	243	553	4441	1918.0	1200.6	1885	126.9	186.3
1978	1774	470	381	251	581	4608	2156.1	1290.7	2141	145.3	202.7
1979	1824	491	394	254	610	4763	2413.9	1398.2	2440	166.3	218.9
1980	1822	500	399	251	637	4822	2626.5	1491.9	2759	192.3	234.9
1981	1858	499	400	245	656	4833	2922.2	1551.9	3094		248.5

a = Gross Domestic Product at factor cost, based on expenditure data

SOURCES: GDP at 1975 prices and 1975 exchange rates, see OECD Main Economic Indicators, August 1982 and earlier issues; also OECD National Accounts of OECD countries, 1950-1978, Vol.I.
GDP at current prices and national currencies, see:
USA: Economic Report of the President, February 1982; FRG: Statistisches Jahrbuch 1982; France: Annuaire Statistique 1981 and Observatoire Economqiue de Paris, oral communication; UK: CSO Economic Trends July 1982 and earlier issues.

Table 3. The Growth of Primary Energy Consumption by Groups of Fuels in OECD Countries, 1970-1981

U S A

	Total	Solid Fuels	Natural Gas	Petroleum	Nuclear	Hydro & Others
	In 10^6 toe					
1970	1582	299	519	696	5	63
1971	1610	284	530	720	10	66
1972	1688	294	535	777	14	69
1973	1758	313	531	821	21	72
1974	1715	305	512	788	30	79
1975	1666	303	470	771	45	78
1976	1756	324	479	829	50	74
1977	1799	329	470	875	64	61
1978	1842	329	471	895	71	76
1979	1860	358	487	875	64	76
1980	1790	364	481	806	63	76
1981	1739	378	466	754	68	73

SOURCE: Primary energy, see domestic consumption by primary energy type 1973-1981 in DOE Monthly Energy Review May 1982; for backdating to 1970, see Bureau of Mines tables on total calculated consumption by each mineral energy fuel and electrical energy from water and nuclear power, published in US Statistical Abstract. Converted from BTU on the basis of 1 TOE = 42.4310^6BTU.

F R G

	Total	Solid Fuels	Natural Gas	Petroleum	Nuclear	Hydro & Others
	In 10^6 toe					
1970	235.8	89.2	12.9	125.2	1.5	6.9
1971	237.6	83.7	16.9	130.0	1.4	5.6
1972	248.0	80.1	21.5	137.5	2.2	6.8
1973	264.9	82.1	26.9	146.2	2.7	6.9
1974	256.1	82.5	32.5	131.8	2.9	6.4
1975	243.2	70.6	34.4	126.7	5.0	6.6
1976	259.2	75.8	36.3	137.1	5.5	4.4
1977	260.6	71.5	38.8	135.7	8.3	6.3
1978	272.3	73.6	42.3	142.3	8.3	5.9
1979	285.7	79.7	46.2	144.8	9.7	5.3
1980	273.1	81.5	45.0	130.0	10.0	6.6
1981	261.9	82.8	41.5	117.2	12.3	8.0

SOURCE: Gesamtverband des Deutschen Steinkohlenbergbaus. Energiebilanzen. TCE converted to TOE on the basis of 1 TOE = 1.4286 TCE.

NOTE: 1981 Preliminary; oral communication, 1 September 1982.

Table 3 (continued)

France

	Total	Solid Fuels	Nat. Gas	Petro-leum	Nu-clear	Hydro	Other
			In 10^6 toe				
1970	149.5	38.1	9.3	88.6	1.1	12.5	.
1971	152.8	34.9	10.9	94.6	3.0	9.4	.
1972	164.4	31.1	12.9	107.8	3.1	9.5	.
1973	175.7	30.5	15.0	117.3	3.1	9.8	.
1974	176.4	31.6	16.0	113.2	3.1	12.5	.
1975	165.3	27.5	17.5	102.7	3.9	13.8	.
1976	175.4	32.3	18.8	109.8	3.3	11.2	.
1977	179.7	31.4	20.1	106.6	3.8	17.8	.1
1978	184.5	32.4	20.8	108.8	6.5	15.2	.8
1979	191.4	35.0	23.4	108.6	8.4	13.0	3.0
1980	188.6	34.0	23.6	102.1	12.9	16.0	(3.2)
1981P	187.8	32.1	24.8	90.7	22.1	14.7	3.4

SOURCE: Primary Energy 1970-1980 see "Consommation totale d'energie primaire corrigé", bilan général in Comité Professionnel du Pétrole 1980; updated to 1981 with oral communication from Grenoble, August 1982.

For conversion of kWh to TOE:
1000 kWh = 0.2222 TOE;
Source: Petrole 80, p.A-11.

U K

	Gross Inland Cons. Total	Energy Use Total	Solid Fuels	Nat. Gas	Petro-leum	Nu-clear	Hydro & Other
			In 10^6 toe				
1970	208.0	198.0	92.3	10.5	88.2		7.0
1971	204.9	194.9	82.0	17.0	89.0		6.9
1972	209.4	198.8	72.0	24.0	95.4		7.4
1973	219.5	207.9	78.2	26.0	96.6		7.1
1974	210.5	198.6	69.3	31.2	89.7		8.4
1975	200.7	191.9	70.6	32.6	80.3	6.4	1.2
1976	204.1	194.0	71.8	34.6	78.9	7.6	1.1
1977	208.7	199.0	72.2	36.9	80.3	8.4	1.2
1978	209.3	199.9	70.5	38.3	82.0	7.9	1.2
1979	218.9	209.4	76.2	42.0	81.8	8.1	1.3
1980	200.5	193.3	71.1	41.8	71.4	7.8	1.2
1981	194.2	186.6	69.6	42.4	65.2	8.1	1.3

Gross Inland Consumption: 1970 see Digest of UK Energy Statistics, 1981 Table 3; 1980-1981 see UK Energy Trends, July 1982 Table 2.
Consumption for energy use: 1970-1979 see Digest of UK Energy Statistics, 1981 Table 3; 1980-1981 see UK Energy Trends, July 1982, Table 1.

Table 3 (continued)

	Japan						*OECD*					
	Total	Solid Fuels	Petro-leum	Nat. Gas	Nu-clear	Other	Total	Solid Fuels	Petro-leum	Nat. Gas	Nu-clear	Other
	In 10^6 toe						In 10^6 toe					
1970	284	64	195	4	1	19	3096	699	1567	613	18	195
1971	290	59	204	4	2	21	3172	657	1630	651	25	209
1972	312	57	227	4	2	21	3346	653	1758	687	34	213
1973	338	57	255	6	2	18	3523	687	1865	712	45	214
1974	337	63	242	7	5	20	3511	691	1784	743	57	236
1975	328	59	234	8	6	21	3348	660	1704	671	77	234
1976	344	58	246	10	8	22	3540	710	1825	689	90	224
1977	352	55	260	12	8	19	3612	708	1871	689	114	230
1978	361	51	262	16	15	18	3771	728	1960	709	132	243
1979	376	56	263	19	17	21	3846	774	1943	741	134	254
1980	372	66	241	22	20	23	3740	812	1793	735	145	255
1981	367	72	229	22	21	23	3653P	826P	1675P	722P	170P	260P

SOURCE: Total Primary Energy Requirements, see OECD Total Primary Energy Requirements.

P = Preliminary

SOURCES: Total Primary Energy Requirements, see:

1970-1973 OECD Energy Balances, 1960-1974, Paris 1976
1973-1974 OECD Energy Balances, 1973-1975, Paris 1977
1975-1978 OECD Energy Balances, 1975-1979, Paris 1981
1978-1980 OECD Energy Balances, 1970-1980, Paris 1982
1980-1981 OECD, Correspondence, 7 September 1982.

Table 4. Electricity Production and Sales in OECD Countries, 1970-1981

	USA				FRG			France			UK			Japan	OECD
	Net Electr. Production[a]	Sales to: Total	Industry	Households	Total Generation (Gross)	Sales to: Industry	Households	Total Generation (Gross)	Sales to: Industry	Households	Total Generation (Gross)	Sales to: Industry	Households	Production	Production
	In Billion kWh														
1970	1532	1391	573	448	250.0	127.5	43.1	140.0	80.2	21.2	250.0	91.8	77.2	.	3490
1971	1614	1466	593	479	266.0	130.7	48.5	148.0	82.5	23.4	257.0	92.1	80.7	.	3684
1972	1714	1578	639	511	287.0	137.0	55.7	165.0	86.0	26.6	264.0	92.0	86.9	.	3976
1973	1861	1713	686	579	299.0	149.2	60.2	182.0	91.8	30.2	282.0	100.7	91.3	470	4629
1974	1867	1706	685	578	312.0	153.0	63.8	188.0	95.6	33.0	273.0	95.7	92.5	459	4322
1975	1918	1747	688	588	302.0	140.5	67.8	185.0	88.4	38.2	272.0	93.8	88.9	476	4374
1976	2038	1855	754	606	334.0	152.3	72.5	203.0	95.7	42.9	277.0	99.8	84.8	512	4664
1977	2124	1948	786	645	335.3	152.7	75.2	210.8	96.4	47.5	283.1	100.6	85.9	533	4847
1978	2206	2018	809	674	353.3	157.7	80.7	226.7	99.6	53.9	287.7	102.2	85.8	564	5056
1979	2247	2071	842	683	372.2	166.6	83.2	241.4	107.0	58.2	300.0	105.5	89.7	590	5232
1980	2286	2094	815	717	368.8	165.6	85.6	258.1	113.6	61.5	284.9	96.3	86.1	612	5334
1981	2294	2122	826	712	357.4	164.0	87.3	276.4	118.5	64.3	277.6	93.5	84.5		

a = excludes industrial facilities and railways having own generating facilities.

SOURCE: Net electricity production by the utilities and sales, total and thereof to industry and households, 1970-1972, see US Statistical Abstract, 1974 Table 871, p.524; 1973-1981 see DOE Monthly Energy Review, May 1982.
FRG, France, UK: Total gross generation and sales to industry and households from EUROSTAT Electric Energy Monthly Bulletin, 1982 August (generation) and June (sales), and earlier issues, also EUROSTAT Energy Statistics 1975.
Japan; OECD: Electricity Production from UN Yearbook of World Energy Statistics, 1979 and 1980, Table 50.

Table 5. Gasoline Consumption in OECD Countries, 1970-1981

	USA Motor Gasoline Product Supplied		FRG Motor Spirit, Inland Deliveries	France Motor Spirit, Inland Deliveries	UK Motor Spirit, Inland Deliveries	OECD Motor Gasoline
	Thousand Barrels per day	Million Barrels per year	10^6 tons[a]	10^6 tons	10^6 tons	10^6 tons	10^6 tons
1970		2131	250.7	15.9	12.5	14.2	369.0
1971		2213	260.4	17.6	13.3	15.0	386.7
1972		2351	276.6	18.6	14.5	15.9	411.2
1973	6674	2436	286.6	19.0	15.8	16.9	434.0
1974	6537	2386	280.7	18.5	15.2	16.5	425.7
1975	6675	2436	286.6	20.2	15.9	16.1	438.8
1976	6978	2547	299.6	21.1	16.8	16.9	457.9
1977	7177	2620	308.2	22.3	17.0	17.4	470.0
1978	7412	2705	318.2	23.5	17.6	18.4	486.2
1979	7034	2567	302.0	23.8	17.7	18.7	476.6
1980	6579	2401	282.5	24.2	17.8	19.2	455.8
1981	6586	2404	282.8	22.7	18.2	18.7	
Jan-June							
1981	6547		140.6	11.3	8.6	9.2	
1982	6515		139.9	11.3	8.7	9.3	

a = 1 metric ton gasoline = 8.50 barrels

SOURCES: US:
1970-1973 see Domestic Product Demand for Gasoline from US Survey of Current Business, Biennial Supplement
1973-1981 see Motor Gasoline, Product Supplied in 1000 barrels per day from DOE Monthly Energy Review, September 1982.
FRG, France, UK: Motor Spirit, Inland Deliveries from EUROSTAT Hydrocarbons Monthly Bulletin, September 1982.
OECD see Developed Market Economies, Motor Gasoline Consumption in 1000 metric tons, from UN Yearbook of Energy Statistics, 1979 and 1980.

TABLE 6. USA. Industry and household energy consumption by groups of fuels and electricity, 1970-1981.

Mineral fuels and purchased electricity by end use sections	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
	Quadrillion (10^{15}) Btu											
Industry												
Solid fuels	4.841		.	4.341	4.107	3.811	3.786	3.513	3.503	3.702	3.144	3.125
Natural gas, dry	10.387		.	10.388	10.003	8.532	8.761	8.636	8.539	8.549	8.395	7.963
Petroleum	7.374		.	9.103	8.707	8.192	9.092	9.789	10.046	10.294	9.272	8.123
Electricity[a]	1.952		.	2.376	2.370	2.378	2.606	2.715	2.793	2.907	2.814	2.850
Total energy	24.554		.	26.208	25.187	22.913	24.245	24.653	24.881	25.452	23.625	22.062
Household and commerce												
Solid fuels	0.373		.	0.291	0.292	0.238	0.227	0.225	0.239	0.210	0.160	0.167
Natural gas, dry	7.110		.	7.626	7.518	7.581	7.866	7.461	7.624	7.891	7.540	7.404
Petroleum	3.741		.	4.321	3.932	3.760	4.160	4.148	4.062	3.687	3.280	3.125
Electricity[a]	2.803		.	3.495	3.475	3.604	3.747	3.955	4.116	4.184	4.355	4.400
Total energy	14.027		.	15.733	15.217	15.183	16.000	15.789	16.040	15.972	15.334	15.096
	10^6 toe[b]											
Industry, total	579		.	618	594	540	571	581	586	600	557	520
Household and commerce	331		.	371	359	358	377	372	378	376	361	356

[a] Electricity sales, including hydroelectricity; losses excluded.

[b] Converted to toe on the basis of 1 toe = 42.43 x 10^6 Btu.

SOURCE: 1970 compiled from "Fuel consumption by type of use, 1960-1979" in US Statistical Abstract 1980, table 1351 p.765, and electricity sales in US Statistical Abstract 1979 p.613
1973-1980 see DOE Monthly Energy Review, May 1982.

Table 7. FRG. Industry and household energy consumption by groups of fuels and electricity, 1970-1981.

Final energy consumption	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981 Prelim.
						10^6 tce						
Industry												
District heating	1.4	1.3	1.2	1.3	1.3	1.2	1.3	1.3	1.4	1.5	1.3	1.1
Solid fuels	20.7	17.0	15.2	16.5	19.6	15.6	16.1	15.5	15.4	17.2	18.7	19.7
Gas (nat.&other)[b]	19.4	20.5	21.8	24.4	25.5	23.0	24.8	26.2	26.4	28.2	27.2	26.0
Petroleum	35.4	35.2	36.4	37.0	32.3	28.8	29.3	28.0	27.9	26.7	22.7	19.5
Electricity	13.9	14.2	15.0	16.4	17.0	15.4	16.8	17.1	17.5	18.5	18.2	17.8
Total	90.8	88.2	89.6	95.6	95.7	84.0	88.3	88.1	88.6	92.1	88.1	84.1
Households and small-scale users												
District heating	2.9	2.8	3.2	3.3	3.1	3.3	3.7	3.6	4.0	4.2	4.3	4.2
Solid fuels	21.8	15.6	13.4	12.6	12.1	9.1	8.0	7.0	6.4	7.4	7.2	6.5
Gas (nat.&other)	6.5	7.6	10.0	11.8	12.7	13.4	15.9	17.0	18.5	20.3	21.6	22.9
Petroleum	54.8	58.9	62.6	67.4	58.5	59.5	65.3	62.6	67.1	67.7	57.0	50.6
Electricity	9.7	10.7	12.1	13.1	13.7	14.6	15.6	16.3	17.5	18.1	18.5	19.1
Total	95.7	95.6	101.3	108.2	100.1	99.9	108.5	106.5	113.5	117.7	108.6	103.3
						10^6 toe[a]						
Industry	63.56	61.47	62.72	66.92	66.99	58.80	61.81	61.67	62.06	64.47	61.67	58.87
Household and small-scale uses	66.99	66.92	70.90	75.74	70.07	69.93	75.95	74.55	79.45	82.39	76.02	72.31

[a] For conversion to toe, the tce were multiplied by 0.700.

[b] Industry gas consumption not comparable to data in Table 19 that relate to natural gas only. The share of natural in total gas consumption by the industry sector rose from 43% in 1970 to 72% in 1980.

SOURCE: Gesamtverband des Deutschen Steinkohlenbergbaus, Essen, Energiebilanzen and personal communication, 8 September 1982.

Table 8. France. Industry and household energy consumption by groups of fuels and electricity, 1970-1981.

Final Energy Consumption	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Industry	10^3 toe											
Solid fuels												
Iron and steel	9956		9125	9566	10468	8131	8434	7958	7683	8402	8241	8100
Other industries	4829		3089	2856	2872	2101	1829	1909	1780	1876	2247	2900
Gas												
Iron and steel												
Natural & Man.Gas	1098		1216	1371	1511	1431	1614	1676	1794	1844	1842	2100
Blast Furnace Gas, internal use	2595		2260	2340	2450	1907	1887	1719	1604	1617	1391	.
Other industries	4038		5000	5824	6248	6508	7450	8149	8956	10162	10203	11200
Petroleum Products												
Iron and steel	2116		2351	2457	2630	2075	2208	2100	2086	1768	1413	1100
Other industries	18671		21925	23139	24205	20410	21028	21235	20860	20647	19417	15800
Electricity												
Iron and steel	2300		2379	2592	2881	2520	2714	2642	2726	2791	2755	2500
Other industries	14118		15389	16580	17193	16071	17250	17763	18264	18996	19078	18700
Sub-Total	59721		62734	66725	70458	61154	64414	65151	65753	68103	66587	.
- Blast Furnace Gas	4267		3710	3900	4195	3252	3379	3085	3000	3103	2919	.
- Coal for Electricity	1342		1556	1693	1650	1486	1551	1558	1595	1619	1577	1500
T O T A L	54112		57468	61132	64613	59416	59484	60508	61158	63381	62091	59400
Households and Services[a]												
Solid Fuels	7811		5875	5443	5868	4492	4301	4153	3963	3805	3179	3100
Gas (Natural & Manuf.)	3856		5330	6098	6885	6931	7940	8974	9440	10305	10530	10800
Petrol.Products	23859		28360	30534	27872	24771	26203	26414	26297	24781	21581	21100
Liqu.Petrol.Gas	1427		1316	1621	1690	1740	1785	1824	1933	2005	2085	
Electricity	9214		11474	12918	13934	15561	17282	18833	21053	22495	23707	24500
TOTAL	46158		52355	56614	56249	53495	57511	60198	62686	63391	61082	59500

[a]Excludes transport and communication

Source: Communication from Institut Français du Pétrole; September 1982.

Note: Industry sector gas consumption not comparable to data in Table 19 that relate to natural gas only.

Table 9. UK. Industry and household energy consumption by groups of fuels and electricity, 1970-198 .

Final consumers, Heat supplied basis	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Industry	10^6 therms											
Solid fuels[a]												
Iron and steel	4,248	3,693	3,451	3,756	3,154	2,818	3,190	2,823	2,607	2,864	1,447	1,923
Other industries	5,261	4,247	3,237	3,315	3,051	2,700	2,479	2,525	2,397	2,566	2,176	1,973
Gas (incl. town gas)[b]												
Iron and steel	244	343	437	396	395	371	438	484	446	538	451	.409
Other industries	1,172	2,131	3,251	4,201	4,692	4,701	5,241	5,458	5,574	5,687	5,611	5,348
Petroleum products												
Iron and steel	2,328	2,185	2,089	2,066	1,648	1,357	1,279	1,205	1,161	1,168	653	.568
Other industries	8,945	8,982	9,294	9,324	8,264	7,434	7,441	7,520	7,402	7,403	6,088	5,244
Electricity												
Iron and steel	373	350	349	378	370	370	420	417	448	455	316	.349
Other industries	2,118	2,156	2,149	2,355	2,217	2,202	2,339	2,383	2,419	2,533	2,405	2,280
Total	24,689	24,067	24,257	25,791	23,791	21,953	22,827	22,815	22,454	23,214	19,147	18,094
Households												
Solid Fuels	7137	6136	5397	5318	5059	4343	4009	4073	3736	3819	3313	3137
Town Gas	2915	2508	2217	1590	1039	495	145	44	19	20	.	.
Natural Gas	627	1422	2292	3225	4345	5396	6049	6546	7242	8205	8439	8764
Petrol.Prod.	1335	1321	1523	1668	1482	1434	1435	1450	1433	1405	1125	1014
Electricity	2629	2753	2966	3116	3161	3045	2905	2932	2929	3061	2939	2882
Total	14643	14140	14395	14917	15086	14713	14543	15045	15359	16501	15816	15797
	10^6 toe[c]											
Total Industry	58.02	56.56	57.00	60.61	55.91	51.59	53.64	53.62	52.77	54.55	45.00	42.52
Total Households	34.41	33.23	33.83	35.05	35.45	34.58	34.18	35.36	36.09	38.78	37.17	37.12

[a] includes coke oven gas and creosote/pitch mixtures.

[b] industry consumption of town gas decreased for iron and steel from 129 x 10^6 therms in 1970 to zero in 1978; for other industries it decreased from 557 x 10^6 therms in 1970 to 5 x 10^6therms in 1980.

[c] for conversion to toe, the therms were multiplied by 0.00235.

SOURCE: UK Department of Energy, 1979 and 1982 Digest of Energy Statistics, London, 1979 and 1982.

Table 10. USA. GNP deflators and the growth of (current) energy prices, by groups of fuels and electricity, 1950-1981 (index numbers, 1970=100).

		Industry sector prices					Household sector prices					Transport prices
Year	GNP deflator	Total energy	Solid fuels	Natural gas	Petroleum products	Elec-tricity	Total energy	Solid fuels	Gas	Petroleum products	Elec-tricity	Gasoline
1950	58.7	82.0	55.4		84.2				67.4	66.4	85.5	68.0
1951	62.7	85.0	56.6		90.8				67.0	70.2	86.2	70.0
1952	63.5	84.8	56.8		89.6				68.3	71.9	87.0	71.8
1953	64.5	87.2	58.9		91.6				70.4	75.7	88.2	76.0
1954	65.3	85.6	55.5		89.2				71.8	76.1	88.5	78.1
1955	66.8	85.9	54.8		91.0				74.6	78.7	89.6	79.2
1956	68.9	88.5	59.8		96.2				74.9	82.5	89.9	81.9
1957	71.2	93.3	64.9		103.0		84.2		77.1	86.7	90.3	85.2
1958	72.3	89.7	64.2	73.5	93.9	94.2	84.4		81.7	81.8	91.4	84.1
1959	73.9	89.7	64.0	80.0	93.4	94.5	85.8		84.4	82.9	92.3	85.1
1960	75.2	90.5	63.6	84.2	94.6	95.6	88.0		90.1	81.4	94.0	87.6
1961	75.8	91.5	62.9	85.1	96.1	96.0	88.2		91.2	84.7	94.3	86.6
1962	77.2	91.1	62.3	86.1	95.1	96.4	88.5		91.2	84.8	94.3	87.0
1963	78.4	90.7	62.4	88.6	94.1	95.7	88.8		91.2	86.6	94.3	86.9
1964	79.6	88.2	62.4	87.6	89.7	94.8	88.4		91.5	84.6	93.8	86.6
1965	81.4	89.9	62.1	89.6	92.8	94.5	90.0		91.8	86.4	93.3	89.9
1966	84.0	92.1	63.5	93.3	96.3	94.1	91.4		92.4	88.7	93.3	91.9
1967	86.5	94.2	66.5	96.5	98.9	94.4	92.7		92.2	91.5	94.2	94.7
1968	90.4	93.1	69.0	89.5	97.0	95.3	94.0		93.1	94.4	95.0	96.0
1969	94.9	95.0	74.9	90.1	98.5	96.1	95.8		94.8	96.4	96.8	99.1
1970	100.0	100.0	100.0	100.0	100.0	100.0	100.0		100.0	100.0	100.0	100.0
1971	105.1	108.5	121.1	104.7	106.1	109.7	106.9		107.1	106.3	106.6	100.7
1972	109.5	111.7	128.9	110.1	107.8	114.7	111.3		112.7	106.7	112.0	101.9
1973	115.8	126.5	145.1	122.3	127.4	122.1	119.0		117.9	123.1	117.6	111.9
1974	125.7	196.1	221.2	156.6	221.2	154.0	148.9		132.6	194.9	138.9	151.4
1975	137.4	230.8	256.7	209.2	255.0	182.6	170.3		159.0	211.0	157.3	161.7
1976	144.5	250.1	245.4	276.8	271.2	196.1	187.5		185.4	226.2	167.2	168.5
1977	152.9	284.6	259.1	373.8	302.5	219.9	211.9		220.6	256.4	178.3	178.2
1978	164.1	303.7	286.2	413.0	315.4	236.7	229.3		242.4	271.6	191.4	185.9
1979	178.0	384.3	300.0	523.9	436.4	255.2	265.4		281.6	381.3	206.3	251.5
1980	193.9	540.5	310.4	732.1	662.1	303.7	323.8		335.4	534.2	238.7	349.5
1981	211.7	653.9	330.9	904.8	790.9	346.4	377.2		382.4	648.9	274.5	389.1

SOURCE:

All industry sector energy prices are from the series of producer price indices by major commodity groups, total, and its components. "Producer price paid by industry" is synonymous with "wholesale price", the same index for "total fuels and related products" appearing as "producer price" in the Economic Report of the President, and as "wholesale price" in the Statistical Yearbook, etc.

All household energy prices are the Bureau of Labor Statistics (BLS) consumer price indices by classes of expenditure.

The following price indices were used:

		Series	*Energy groups*	*Source*
Industry sector				
Total energy	BLS	Producer price indices by major commodity groups	Total fuels and related products and power including crude oil and electricity	Economic Report of the President 1982, p.300.
Solid fuels		"	Coal; coke (foundry by-product)	US Statistical Abstract 1980 and Monthly Labor Review June 1982 and earlier issues
Natural gas		"	Gas fuels	
Petroleum products		"	Refined petroleum	"
Electricity		"	Electric power	"
Household sector				
Total energy		BLS consumer price indices by expenditure classes; US city average; all urban consumers	Total household fuels including gas and electricity; fuel oil, coal and bottled gas	Economic Report of the President 1982, p.300; Bureau of Labor Statistics 1975 Reference Edition; and Monthly Labor Review June 1982 and earlier issues
Solid fuels		"	Separate index no longer published	
Natural gas		"	Utility piped gas	
Petroleum products		"	Fuel oil No. 2	
Electricity		"	Household electricity	
Transport sector		"	Private transportation, motor fuel	Economic Report of the President 1982, p.293.

Table 11. FRG. GDP deflators and the growth of (current) energy prices, by groups of fuels and electricity, 1950-1981 (index numbers, 1970=100).

		Industry sector prices					Household sector prices					Transport prices
Year	GDP deflator	Total energy R	Solid fuels	Natural gas	Petroleum products	Elec-tricity	Total energy	Solid fuels	Gas	Petroleum products	Elec-tricity	Regular gasoline
1950	52.3		41.0	68.2	79.8	68.8						
1951	55.4											
1952	59.2											
1953	60.0											
1954	60.8		63.9	96.5	105.8	96.5						
1955	62.3		64.3	96.5	107.5	96.5						
1956	63.8		68.1	96.5	109.0	96.5						117.9
1957	66.2		73.9	99.8	116.2	99.8						112.5
1958	68.5		77.8	101.8	109.5	101.8						112.5
1959	69.2		77.6	102.3	105.5	102.3						110.7
1960	71.1		77.5	102.4	107.9	102.4						107.1
1961	74.1		77.5	102.0	101.1	102.0						103.6
1962	77.2		78.9	101.4	108.2	101.4						103.6
1963	79.6		80.9	100.9	107.4	100.9						101.8
1964	81.3	94.7	83.0	100.8	99.6	100.8						101.8
1965	84.7	95.5	87.1	102.3	95.7	102.3						101.8
1966	87.7	95.6	87.0	103.0	95.3	103.0	89.3					96.4
1967	88.8	98.9	87.1	103.0	105.8	103.0	90.5					103.6
1968	90.1	95.6	82.5	102.2	102.4	101.4	95.8					110.7
1969	93.4	93.6	85.2	100.5	96.2	99.9	95.7	87.8	100.4	94.7	99.5	101.2
1970	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1971	107.7	106.5	111.9	101.6	109.5	102.7	105.4	108.7	101.1	110.4	102.4	105.4
1972	113.7	110.2	118.4	108.8	106.7	109.6	110.1	116.0	106.7	102.3	111.3	108.9
1973	120.6	120.6	124.2	110.6	129.8	114.7	128.2	125.2	108.8	168.8	117.6	123.2
1974	128.9	149.5	154.7	123.6	181.8	123.3	149.8	147.8	119.0	220.5	128.3	148.2
1975	137.4	176.8	191.2	183.2	181.4	144.3	165.1	169.0	136.1	211.8	151.3	148.6
1976	142.0	191.6	205.5	207.5	193.4	150.8	176.4	178.5	148.1	233.3	157.9	156.1
1977	147.4	194.2	205.7	218.3	192.0	152.3	178.0	182.8	151.8	232.8	159.1	151.6
1978	153.0	200.0	223.8	224.9	189.5	158.6	182.2	192.8	156.8	227.9	165.3	156.1
1979	158.7	219.1	232.4	224.9	238.4	162.7	220.1	206.2	158.9	406.2	169.1	170.9
1980	166.4	262.2	267.8	285.7	293.0	170.0	242.7	233.5	166.8	465.9	176.4	202.1
1981	173.6	323.9	303.1	390.7	357.8	189.9	278.4	261.7	218.9	545.9	197.7	245.0

R = Revised

NOTE: The discrepancy within the industry prices between total energy and energy commodity groups may be explained by differences in the weighting of fuel oils.

SOURCE:

For industry sector prices, the FRG has two detailed series. One are the producer prices (Erzeugerpreise) for industrial products, published by the Statistische Bundesamt in Preise und Preisindizes für industrielle Produkte (Erzeugerpreise), Fachserie 17, Reihe 2; the other are the basic materials' prices, published in Index der Grundstoffpreise, Fachserie 17, Reihe 3. Both are monthly publications, with annual data published in Statistisches Jahrbuch.

For the price indices 1970 to 1981, we used the producer prices (Erzeugerpreise) throughout, whereas in the earlier study of the Growth of Energy Prices and Consumption 1950-1980, use was also made of the basic materials prices (Grundstoffpreise) for compilation of the index for total energy used by the industry sector.

For household sector prices, the "cost of living price series, relating to total private households" was selected. These should be distinguished from the retail price series that in general rose at a higher pace in the 1970s than the cost of living series.

The following price indices were used:

	Series	*Energy groups*	*Source*
Industry sector			
Total energy	Weighted average of the producer prices for: Solid Fuels (20); Natural Gas (27); Petroleum Products (34); Electricity (19). These weights were derived from the 1975 distribution of energy consumption by the industry sector.		Statistisches Bundesamt, Fachserie 17, Reihe 2; Statistisches Jahrbuch and Wirtschaft und Statistik
Solid fuels	Producer prices (Erzeugerpreise) for industrial products	Coal mining products (coal; coke and briquettes)	Fachserie 17, Reihe 2 Statistisches Jahrbuch and Wirtschaft und Statistik
Natural gas	"	Natural gas	"
Petroleum products	"	Petroleum products	"
Electricity	"	Total electricity	"
Household sector			
Total energy	Prices and price indices for the cost of living, all private households	Total electricity, gas, coal and liquid fuels, excluding gasoline	Fachserie 17, Reihe 7 Statistisches Jahrbuch and Wirtschaft und Statistik
Solid fuels	"	Coal and other solid fuels	"
Natural gas	"	Gas (city and natural)	"
Petroleum products	"	Liquid fuels excluding gasoline	"
Electricity	"	Electricity	"
Transport sector	Prices per liter of Normalbenzin, Markenware	Einzelhandel Verbraucherpreise für ausgewählte Waren	Statistisches Jahrbuch 1981 and earlier issues, Fachserie 17, Reihe 7

Table 12. France. GDP deflators and the growth of (current) energy prices, by groups of fuels and electricity, 1950-1981 (index numbers, 1970=100).

		Industry sector prices					Household sector prices					Transport price
Year	GDP deflator	Total energy	Solid fuels	Natural gas	Petroleum products	Electricity	Total energy (incl. gasoline)	Solid fuels	Gas	Petroleum products	Electricity	Regular gasoline
1950	38.0											40.4
1951	39.3											50.7
1952	43.7											56.2
1953	45.9	55.8			61.3	61.7						59.9
1954	46.7	56.0			61.6	61.7						59.9
1955	47.4	56.2	49.4		63.0	61.1						60.0
1956	49.6	58.2	50.0		65.4	60.9						60.0
1957	52.6	64.9	53.5		79.0	60.2						68.3
1958	62.2	71.3	60.9	102.0	86.6	64.0						86.6
1959	64.4	79.0	68.8	118.6	91.0	74.6						89.3
1960	65.0	79.0	68.1	118.7	90.3	75.5						92.5
1961	67.2	79.4	70.1	102.5	89.7	76.7						91.6
1962	70.4	79.5	69.2	99.9	88.8	76.7	76.1	73.9	81.6		73.8	90.7
1963	74.6	80.2	70.4	100.6	88.2	79.9	78.2	77.2	80.4		76.8	88.8
1964	77.6	80.1	70.9	106.4	86.4	82.9	79.8	79.4	80.0		79.9	88.8
1965	79.5	79.8	71.3	100.6	85.1	84.2	80.1	80.2	79.9		80.4	87.9
1966	81.9	80.4	71.3	101.2	85.0	84.7	83.0					87.9
1967	84.2	81.6	71.0	100.4	86.2	86.0	85.0					89.7
1968	88.0	85.7	73.1	100.0	90.8	91.1	88.1	86.0	89.2		86.0	89.7
1969	95.1	92.6	76.3	100.0	97.2	97.0	94.8	93.6	94.8		93.6	98.1
1970	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1971	105.8	111.1	125.4	113.5	108.6	104.4	106.7	106.4	106.3		104.7	102.8
1972	112.1	113.4	128.0	126.6	108.8	109.3	109.7	112.1	110.5		109.1	103.7
1973	121.1	117.6	132.2	131.5	112.6	114.0	114.1	118.1	115.5		113.8	108.4
1974	134.5	170.7	194.0	194.5	176.6	133.6	156.8	145.0	139.0		132.8	151.4
1975	152.6	191.6	229.4	218.7	190.1	154.6	169.2	166.3	163.4		143.4	158.7
1976	167.6	210.5	252.9	237.6	207.4	173.1	187.3	184.3	174.4		162.6	172.4
1977	182.7	232.9	269.9	257.7	236.8	185.9	209.2	198.7	185.5		174.0	202.4
1978	199.9	251.4	286.9	296.7	255.7	202.5	227.3	230.9	200.3	359.2	187.6	220.8
1979	220. 5	290.1	318.8	320.4	304.2	226.1	263.6	308.2	216.4	456.8	209.1	252.8
1980	246.6	373.0	392.3	474.2	402.5	277.5	331.9	396.1	277.3	670.2	251.3	298.5
1981	276.1	450.1	459.8	620.0	503.0	316.6	395.7	474.5	357.9	681 7	278.8	342.8

NOTE: The discrepancy within the household sector energy prices for total energy and its components may be explained by the inclusion of gasoline in total household energy.

SOURCE:

Wholesale price index numbers, including tax, are compiled by the Institut National de la Statistique et des Etudes Economiques (INSEE), based on 1962 = 100. The household sector prices are from the series of prices paid by modest households in all of France, index numbers based on 1970 = 100.

The following price indices were used:

	Series	*Energy groups*	*Source*
Industry sector			
Total energy	Wholesale prices including tax energy products (Indices des prix de gros, produits énergétiques)	Total energy products, incl. coal; refined petroleum products; electricity; "Gaz de France"; natural gas (crude oil seems to be excluded)	INSEE Annuaire Statistique de la France, and Bulletin Mensuel de la Statistique July 1982
Solid fuels	"	Coal, total	"
Petroleum products	"	Petroleum products	"
Natural gas	Producer prices (Indices des prix à la production)	Gas distribué (hors vente aux ménages)	"
Electricity	"	Total electricity (all voltages)	"
Household sector			
Total energy	Consumer price indices (indices mensuels des prix à la consommation ménages dont le chef est ouvrier ou employé)	Total coal, gas electricity and gasoline; petroleum products added since 1978	"
Solid fuels	"	Coal	"
Natural gas	"	City distributed gas	"
Petroleum products	"	Liquid fuels	"
Electricity	"	Total electricity	"
Transport sector	"	Gasoline	"

Table 13. UK. GDP deflators and the growth of (current) energy prices, by groups of fuels and electricity, 1950-1981 (index numbers, 1970=100).

		Industry sector prices					Household sector prices					Transport
Year	GDP deflator	Total energy	Solid fuels	Natural gas	Petroleum products (heavy fuel oils)	Electricity	Total energy	Solid fuels	Gas	Petroleum products (heating oils)	Electricity	Motor spirit
1950	49.0											
1951	49.3											
1952	53.7											
1953	55.1											
1954	55.9											
1955	58.1		61.1	118.8	96.4	75.4						65.9
1956	61.0		70.3	129.4	116.9	80.3	53.3					69.0
1957	63.2		74.9	135.8	121.3	83.3	56.7					69.0
1958	65.4		79.1	142.0	102.2	85.0	59.2					70.6
1959	66.1		79.1	141.2	93.3	81.3	60.2					72.1
1960	66.1		80.8	142.5	88.9	80.0	61.6					73.1
1961	68.3		83.7	144.9	81.8	84.3	65.5					73.4
1962	70.8		86.6	148.0	91.1	85.9	68.6	62.3	81.7		70.5	77.6
1963	72.5	79.6	86.6	148.2	86.1	87.5	72.8	64.8	83.3		74.7	81.4
1964	74.7	81.0	86.6	148.0	80.6	87.0	75.0	66.0	86.5		78.1	84.9
1965	78.5	86.4	86.6	146.2	75.3	91.0	78.6	68.5	87.3		84.2	84.9
1966	82.1	89.8	88.1	147.8	79.6	94.2	83.0	75.3	89.7		87.0	89.6
1967	84.5	91.8	85.1	146.9	92.5	96.5	85.3	78.4	90.5		89.7	89.1
1968	88.2	94.2	82.1	147.6	101.1	98.6	91.8	82.1	96.8		100.0	94.5
1969	93.1	96.3	83.6	129.4	100.0	98.5	94.6	86.4	100.8		100.0	97.1
1970	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1971	109.4	110.6	117.8	72.3	148.7	110.2	110.3	112.3	109.4		111.5	103.0
1972	117.7	114.0	128.1	65.5	142.4	112.7	118.9	124.3	115.3		117.9	107.2
1973	125.8	119.0	132.0	65.0	139.2	114.0	122.3	128.4	115.0	126.0	120.5	114.0
1974	144.1	164.9	141.0	65.7	329.3	142.5	143.2	142.8	122.4		146.8	161.7
1975	184.1	208.3	223.0	94.5	409.8	189.6	190.7	192.4	141.2		213.3	220.0
1976	211.0	296.0	266.0	149.0	474.0	239.0	236.0	236.0	171.0	309.0	264.0	237.0
1977	240.5	363.0	317.0	204.0	600.0	275.0	274.0	275.0	200.0	384.0	301.0	254.0
1978	266.1	384.0	345.0	252.0	564.0	303.0	295.0	305.0	206.0	389.0	332.0	241.0
1979	305.7	450.0	414.0	287.0	710.0	335.0	324.0	357.0	213.0	493.0	360.0	317.0
1980	363.2	592.0	521.0	390.0	993.0	413.0	406.0	456.0	249.0	659.0	458.0	406.0
1981	402.3	701.1	590.0	475.0	1189.0	481.0	492.0	535.0	314.0	783.0	551.0	485.0

SOURCE:
The following price indices were used:

	Series	*Energy groups*	*Source*
Industry sector			
Total energy	1963–1970: Index numbers of wholesale prices of materials purchased by selected broad sectors of industry; 1970–1981 Current fuel price index numbers	1963–1970: "Fuel" includes coal, heavy fuel oil, gas, electricity; 1970–1981: "Fuel" includes coal, fuel oil, gas and electricity (may exclude crude oil)	UK Annual Abstract of Statistics 1980 edition, p. 463, Table 18.2 and earlier issues; UK Department of Energy, Energy Trends; May 1980; 1981; August 1982
Coal; gas; heavy fuel oils; electricity	1955–1970	Coal prices in £ per ton; gas prices in pence per therm; heavy fuel oil prices in £ per ton; electricity prices in pence per kWhr;	UK Department of Energy: Digest of UK Energy Statistics 1979, Table 87 Prices of fuels used by industry. For backdating see also earlier issues and Doblin 1976
	1970–1981	Current fuel price index numbers; industry sector	UK Department of Energy, Energy Trends, May 1980; 1981; August 1982
Household sector			
Total energy (fuel and light)	1955–1970	General index of retail prices	UK Department of Energy: Digest of UK Energy Statistics 1979, p. 119, table 84 and Monthly Digest of Statistics March 1980;
Coal; gas; heating oils and premium kerosene; electricity	1970–1980	Current fuel price index numbers; domestic sector	UK Energy Trends May 1980; 1981; August 1982.
Transport sector	1955–1969 1970–1973	Prices in national currency per liter regular gasoline	Extrapolated, see Doblin 1976; Digest of UK Energy Statistics, 1980
	1974–1981	Current fuel price index numbers; domestic sector, motor spirit	Digest of UK Energy Statistics, 1980; UK Energy Trends May 1980; 1981; and August 1982.

Table 14. Industry Sector (total). Energy Consumption; Inflation-Adjusted Prices for Purchased Energy; and Total Industrial Production in the USA, France, FRG, and the UK, 1970-1981.

Index Numbers, 1970 = 100

	Energy Consumption (All Fuels & Electr.)	Energy Prices (All Fuels & Electr.)	Industrial Production (Total)	Energy Consumption (All Fuels & Electr.)	Energy Prices (All Fuels & Electr.)	Industrial Production (Total)
	U S A			*France*		
1970	100.0	100.0	100.0	100.0	100.0	100.0
1971		103.2	100.1		105.8	106.0
1972		102.0	108.0	106.2	100.7	111.0
1973	106.7	109.2	117.7	113.0	97.1	120.0
1974	102.6	156.0	117.0	119.4	126.9	123.0
1975	93.3	168.0	110.4	109.8	125.6	115.0
1976	98.7	173.1	121.6	109.9	125.7	124.0
1977	100.4	186.1	128.5	111.8	127.5	126.0
1978	101.3	185.1	136.9	113.0	125.8	129.0
1979	103.7	215.9	142.9	117.1	131.6	135.0
1980	96.2	278.4	137.9	114.7	151.3	133.0
1981	89.9	308.9	141.5	109.8	163.0	130.0
	F R G			*U K*		
1970	100.0	100.0	100.0	100.0	100.0	100.0
1971	97.1	98.9	101.0	97.5	101.1	100.0
1972	98.7	96.9	105.8	98.3	114.0	102.0
1973	105.3	100.0	112.7	104.5	94.6	111.0
1974	105.4	116.0	110.7	96.4	114.4	108.0
1975	92.5	128.7	104.6	88.9	113.1	102.0
1976	97.2	134.9	112.7	92.5	140.3	104.0
1977	97.0	131.8	115.0	92.4	150.9	108.0
1978	97.6	130.7	117.0	90.9	144.3	112.1
1979	101.4	138.1	123.1	94.0	147.2	114.8
1980	97.0	157.8	123.1	77.6	163.0	107.4
1981	92.6	186.6	120.6	73.3	174.2	101.9

SOURCES: Energy Consumption see Tables 6-9. Inflation-Adjusted Prices see current price indices Tables 10-13, adjusted for inflation with GDP deflators (also Tables 10-13); and Industrial Production see Table 15.

Table 15. Industrial Production Indices, Total and Selected Industries, 1970-1981; 1970 = 100

U S A

	Total Industry (Mining, Manufacturing, Utilities)	Primary Metals Total	Crude Steel	Aluminum	Cement	Paper (Consumer Paper Prod.)	Stone and Earth Mining	Coal Mining	Oil and Gas Extraction	Petroleum Refinery
1970	100.0	100.0	100.0[a]	100.0[a]	100.0[a]	100.0	100.0	100.0	100.0	100.0
1971	100.1	94.9	91.6	98.7	105.4	103.8	94.3	94.3	99.3	102.8
1972	108.0	105.6	101.3	103.7	111.1	110.5	99.3	98.5	100.3	107.1
1973	117.7	118.9	114.7	113.6	115.1	116.7	110.8	97.9	99.4	113.1
1974	117.0	116.1	110.8	122.9	108.9	120.5	110.4	99.3	98.2	110.1
1975	110.4	90.2	88.7	97.4	90.4	103.0	108.3	107.2	103.3	110.2
1976	121.6	101.9	97.3	106.8	90.7	109.0	119.7	110.8	102.1	118.2
1977	128.5	103.1	94.9	114.0	95.2	112.7	126.4	111.5	107.6	125.2
1978	136.9	112.2	103.8	120.7	101.7	114.0	132.8	108.4	113.6	129.0
1979	142.9	113.5	104.1	126.1	103.9	116.3	139.3	128.2	110.9	127.8
1980	137.8	95.7	84.5	128.8	100.7	118.5	134.4	138.7	121.5	118.0
1981	141.5	100.9	91.3	124.3	96.3	123.9	131.0	133.6	133.8	115.2

	Total Industry (Mining, Manufacturing, Utilities)	Food Products	Chemicals Total Chem.	Consumer Chem.	Non-Electr. Machinery	Electrical Machinery	Commercial Equipment	Office Machinery Computers	Automobiles
1970	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0[b]	100.0
1971	100.1	102.9	105.2	106.2	94.7	96.9	99.5	97.0	125.1
1972	108.0	106.2	116.1	114.7	106.1	108.1	107.1	117.9	130.1
1973	117.7	109.8	124.9	121.6	125.6	125.0	122.1	134.3	144.8
1974	117.0	113.0	128.4	125.6	134.3	123.5	127.6	138.8	109.6
1975	110.4	110.5	122.5	120.0	125.6	114.9	142.7	149.3	116.7
1976	121.6	118.4	140.8	132.0	135.5	129.8	156.9	167.2	152.4
1977	128.5	123.5	150.3	143.1	145.4	139.9	173.2	180.6	171.4
1978	136.9	127.8	164.2	152.8	154.2	157.2	191.7	210.4	171.6
1979	142.9	131.6	176.2	163.0	164.4	172.6	206.2	222.9	157.9
1980	137.8	133.9	172.3	165.7	163.8	170.4	215.0	.	119.6
1981	141.5	136.2	179.4	176.9	171.9	175.9	233.9	.	119.4

a = Compiled from monthly output in metric tons, published in UN Monthly Bulletin of Statistics, 1978 January and 1982 June

b = See UN Yearbook of Industrial Statistics, 1979 Edition, New York 1981, p.547

Source: US Federal Reserve Board Index of Industrial Production, 1967=100 in Federal Reserve Bulletin, 1971 (June) to 1982 (June)

Table 15 continued. Indices of Industrial Production.

F R G

	Total Industries (Mining, Manuf. Utilities)	Coal Mining	Petroleum Refining	Primary Metal Iron Producing Industries	Crude Steel	Non-Ferrous Metals (and Semifabric.)	Aluminum	Cement	Paper (Cellulose & Paper)
1970	100.0	100.0	100.0	100.0	100.0[a]	100.0	100.0[a]	100.0[a]	100.0
1971	101.6	97.4	101.1	90.5	89.5	100.0	138.0	107.0	100.2
1972	106.2	91.7	104.1	96.9	97.4	103.5	143.8	112.6	105.6
1973	112.8	88.5	110.5	112.1	110.4	117.6	172.1	107.0	113.9
1974	110.5	87.4	101.8	120.7	118.7	119.0	222.5	93.9	119.5
1975	103.6	85.0	95.6	93.6	89.7	102.0	219.0	87.4	98.6
1976	110.7	82.2	100.4	96.4	95.7	124.3	225.2	89.1	115.3
1077	113.9	77.2	103.5	91.8	88.0	125.1	239.9	84.1	120.6
1978	116.1	76.9	102.1	96.5	93.1	130.1	238.8	86.3	126.0
1979	122.4	79.2	116.9	106.6	103.9	139.1	239.5	91.5	135.6
1980	122.0	79.7	108.8	102.9	98.9	138.2	236.0	89.4	137.3
1981	119.8	80.6	96.5	100.0	95.1	134.1	235.3	82.3	146.8

	Total Industries (Mining, Manuf. Utilities)	Food	Chemicals	Machinery (Non-Electr.)	Electro-Technical Machinery	Commercial Equipm. incl. Computers	Computers	Automobiles
1970	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1971	101.6	104.6	105.3	97.9	99.7	105.4	119.7	100.8
1972	106.2	107.2	112.5	97.2	108.1	120.0	155.5	110.2
1973	112.8	111.0	126.9	100.6	121.7	121.3	154.5	112.2
1974	110.5	112.2	130.5	101.5	122.7	127.4	172.8	92.6
1975	103.6	113.5	114.5	95.7	113.9	106.9	138.4	86.9
1976	110.7	117.2	131.3	97.0	123.9	114.6	156.0	93.8
1977	113.9	118.7	131.8	97.3	133.0	150.8	214.0	96.2
1978	116.1	120.7	138.9	97.0	133.4	170.1	246.9	107.4
1979	122.4	123.2	146.9	101.6	136.7	191.4	283.9	111.4
1980	122.0	125.8	140.5	105.0	141.1	217.9	331.2	107.4
1981	119.8	128.7	142.6	105.1	138.6	241.7	388.4	117.2

a = Compiled from monthly output in metric tons, published in UN Monthly Bulletin of Statistics, 1978 January and 1982 June
Source: Index der Nettoproduktion für das produzierende Gewerbe, seasonally adjusted in FRG Statistisches Jahrbuch, 1978, p.177 and 1981, p.185.

Table 15 continued . Indices of Industrial Production.

France

	Total Industr. (Mining, Manufacturing, Utilities)	Solid Fuels	Petroleum Refining	Primary Metals Total (incl. Transform.)	Crude Steel	Aluminum	Cement	Paper (Paper and (Cartons)
1970	100	100	100	100	100.0[a]	100.0[a]	100.0[a]	100
1971	106	89	106	99	95.9	100.6	99.8	102
1972	111	82	117	102	103.1	103.1	104.3	110
1973	120	73	132	113	108.3	94.0	105.9	115
1974	123	69	125	116	115.9	103.1	112.0	121
1975	115	66	106	102	92.3	100.3	102.4	101
1976	124	63	119	107	99.6	100.9	101.4	111
1977	126	59	116	108	94.8	104.7	99.8	114
1978	129	56	115	111	97.9	102.5	100.2	119
1979	135	54	125	118	100.2	103.5	99.4	124
1980	133[R]	51	111	119	101.4	113.2	100.3	122
1981	130	51	96	.	90.7	114.2	97.3	121

	Total Industr. (Mining, Manufacturing, Utilities)	Food (Agric.& Food Prod.	Chemicals (incl. Rubber)	Mechanical Engineering	Electrical Engineering Total	Telegraph Telephone	Electronic Radio-Elec.	Automobiles	Plastic Materials Processing
1970	100	100	100	100	100	100	100	100	100
1971	106	105	108	114	111	128	120	114	.
1972	111	110	116	115	121	158	119	124	.
1973	120	112	128	123	137	194	124	134	161
1974	123	112	132	133	151	225	132	126	156
1975	115	115	117	130	149	243	141	125	134
1976	124	116	134	131	163	254	155	159	152
1977	126	119	140	133	170	281	155	163	159
1978	129	125	146	136	175	304	150	166	158
1979	135	126	158	141	179	297	176	175	169
1980	133[R]	127	159	139	187	309	199	173	174
1981	130	.	.	.	189	.	.	.	.

R = Revised

a = Compiled from monthly output in metric tons, published in UN Monthly Bulletin of Statistics, 1978 January and 1982 June

Source: Indices Annuels de la Production Industrielle in INSEE, Annuaire Statistique de la France, 1981; updated with Bulletin Mensuel de la Statistique, 1982, January and August.

Table 15 continued. Indices of Industrial Production.

United Kingdom

	Total Industr. (All, other than constr.)	Coal Mining	Petroleum Refining (and coal products)	Primary Metals Total (Metal Manufactures)	Crude Steel	Aluminum	Cement	Paper (Boxes, Cartons, Fibreboard)
1970	100.0	100.0	100.0	100.0	100.0[a]	100.0[a]	100.0[a]	100.0
1971	99.8	98.5	103.4	91.3	85.4	300.0	103.1	96.8
1972	102.1	76.4	102.6	91.4	91.3	433.3	105.1	102.1
1973	110.4	84.3	110.0	100.0	96.1	636.4	116.4	111.2
1974	107.8	69.7	105.7	91.7	80.9	739.4	103.6	115.6
1975	102.7	81.6	91.2	80.1	72.5	778.8	98.4	91.2
1976	105.4	75.7	96.4	84.0	80.3	845.4	91.9	92.7
1977	110.4	73.5	93.7	83.6	78.4	881.8	90.0	101.7
1978	114.0	72.8	92.5	82.9	73.2	875.8	92.7	102.4
1979	118.3	72.9	96.1	83.7	77.4	909.1	94.0	103.4
1980	110.2	75.0	85.1	59.8	40.7	945.5	86.2	91.1
1981	104.5P	72.9	78.1	62.9	38.3	845.5	74.7	.

	Total Industr. (All, other than constr.)	Food	Chemicals General	Chemicals Pharmaceuticals	Mechanical Engineering	Electrical Engineering Total	Electrical Engineering Radio & Electronic Components	Electrical Engineering Electronic Components	Automobiles
1970	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1971	99.8	99.8	100.8	107.0	97.5	101.6	99.5	97.5	100.5
1972	102.1	103.9	104.5	115.8	93.6	106.6	115.0	92.2	102.2
1973	110.4	106.2	118.6	136.5	101.8	121.2	138.8	119.0	104.6
1974	107.8	104.1	126.6	153.4	106.1	125.1	153.7	133.7	97.5
1975	102.7	100.2	107.2	156.0	104.8	119.8	123.9	158.2	88.0
1976	105.4	103.2	121.8	171.6	100.0	117.5	132.1	163.6	88.2
1977	110.4	105.4	124.0	179.6	98.5	122.2	150.4	193.7	94.4
1978	114.0	106.5	123.3	185.0	96.9	129.2	164.1	255.2	91.3
1979	118.3	107.5	131.6	180.8	95.8	135.9	173.7	378.5	87.4
1980	110.2	106.7	121.2	176.1	89.9	136.9	185.6	398.4	75.6
1981	104.5P	104.3	.	.	80.0	130.3	.	.	64.6

P = Preliminary

a = Compiled from monthly output in metric tons, published in UN Monthly Bulletin of Statistics, 1978 January and 1982 June

Source: Index of Industrial Production (All industries except construction, 1975=100; from UK CSO Annual Abstract of Statistics, 1981 and 1982 Editions, London 1981 and 1982; and CSO Monthly Bulletin of Statistics, 1982 July.

Table 16. Household Sector (total). Energy Consumption; Inflation-Adjusted Prices; and Total Population Growth in the USA, FRG, France, and the UK, 1970-1981

Index Numbers, 1970 = 100

	Energy Consumption (All Fuels & Electr.)	Inflation-Adjusted Prices (All Fuels and Electricity)	Population Growth	Energy Consumption (All Fuels & Electr.)	Inflation-Adjusted Prices (All Fuels and Electricity)	Population Growth
U S A				*France*		
1970	100.0[a]	100.0	100.0[R]	100.0[c]	100.0	100.0
1971		101.7	101.4		100.9	101.0
1972		101.6	102.6	113.4	97.4	101.8
1973	112.2	102.8	103.6	122.7	94.2	102.6
1974	108.5	118.5	104.6	121.9	116.6	103.3
1975	108.2	123.9	105.6	115.9	111.0	103.7
1976	114.1	129.8	106.7	124.6	111.9	104.1
1977	112.6	138.6	107.7	130.4	114.5	104.5
1978	114.4	139.7	108.9	135.8	113.7	104.9
1979	113.9	149.1	110.1	137.3	119.5	105.3
1980	109.3	167.0	111.4	132.3	134.6	105.7
1981	107.6	178.2	112.4	128.9	143.3	106.3
F R G				*UK*		
1970	100.0[b]	100.0	100.0	100.0	100.0	100.0
1971	99.9	97.9	101.0	96.6	100.8	100.4
1972	105.9	96.8	101.6	98.3	118.9	100.7
1973	113.1	106.3	102.1	101.9	97.2	100.9
1974	104.6	116.2	102.1	103.0	99.4	100.9
1975	104.4	120.2	101.8	100.5	103.6	100.9
1976	113.4	124.2	101.3	99.3	111.8	100.9
1977	111.3	120.8	101.2	102.7	113.9	100.9
1978	118.6	119.1	101.0	104.9	110.9	100.7
1979	123.0	138.7	101.2	112.7	106.0	100.9
1980	113.5	145.9	101.5	108.0	111.8	100.9
1981	107.9	160.4	101.6	107.9	122.3	100.7

a = US energy consumption includes commerce;
b = FRG energy consumption includes small-scale users.
c = French energy consumption includes services, but excludes transport and communication.

R = US 1970-1981 population revised with 1980 population census.

SOURCES: Population. USA see resident population (incl. Hawaii and Alaska) from US Department of Commerce, Bureau of the Census. Population Estimates and Projections, series P-25 No.918; issued August 1982. FRG, France and UK see UN Monthly Bulletin of Statistics, August 1982 and OECD Main Economic Indicators, August 1982.
Energy Consumption, All Fuels and Electricity used by Households, see Tables 6-9.
Inflation-Adjusted Prices for all fuels and electricity purchased by households, see current price indices, Tables 10-13, adjusted for inflation with GDP deflators (also Tables 10-13).

Table 17. Solid Fuels. Inflation-Adjusted Prices and Consumption by Industry and Households in the USA, FRG, France, UK, 1970-1981. Index Numbers, 1970 = 100.

	Industry Sector		Household Sector		Industry Sector		Household Sector	
	Consumption	Inflation-Adjusted Prices	Consumption	Inflation-Adjusted Prices	Consumption	Inflation-Adjusted Prices	Consumption	Inflation-Adjusted Prices
	U S A				*France*			
1970	100.0	100.0	100.0[a]		100.0[c]	100.0	100.0[d]	100.0
1971	.	115.2	.		.	118.5	.	100.6
1972	.	117.8	.		82.6	113.7	75.2	99.5
1973	89.7	125.3	78.0		84.0	109.2	69.7	97.5
1974	84.8	176.0	78.3		90.2	144.2	75.1	107.8
1975	78.7	186.8	63.8		69.2	150.4	57.5	109.0
1976	78.2	169.8	60.9		69.4	151.1	55.1	110.1
1977	72.6	169.5	60.3		66.7	147.7	53.2	108.8
1978	72.4	174.4	64.1		65.2	143.4	50.7	115.5
1979	76.5	168.5	56.3		69.5	144.6	48.7	139.8
1980	64.9	160.4	42.9		70.9	159.1	40.7	160.6
1981	64.6	156.3	44.8		74.4	166.5	39.7	171.9
	F R G				*UK*			
1970	100.0	100.0	100.0[b]	100.0	100.0	100.0	100.0	100.0
1971	82.1	103.9	71.6	100.9	83.5	107.7	86.0	102.7
1972	73.4	104.1	61.5	102.0	70.3	108.8	75.6	124.3
1973	79.7	103.0	57.8	103.8	74.4	104.9	74.5	102.1
1974	94.7	120.0	55.5	114.7	65.3	97.8	70.9	99.4
1975	75.4	139.2	41.7	123.0	58.0	121.1	60.9	104.5
1976	77.8	144.7	36.7	125.7	59.6	126.1	56.2	111.8
1977	74.9	139.6	32.1	124.0	56.2	131.8	57.1	114.3
1978	74.4	146.3	29.4	126.0	52.6	129.7	52.3	114.6
1979	83.1	146.4	33.9	129.9	57.1	135.4	53.5	116.8
1980	90.3	160.9	33.0	140.3	38.1	143.4	46.4	125.6
1981	95.2	174.6	29.8	150.7	41.0	146.7	44.0	133.0

a = includes commerce b = includes agriculture and small-scale users c = includes coal used for electricity generation in industry-owned facilities
d = includes services

Sources: Energy consumption see tables 6-9; Inflation adjusted prices see current price indices tables 10-13, adjusted with GDP deflators (also tables 10-13).

Table 18. Petroleum Products. Inflation-Adjusted Prices and Consumption by Industry and Households in the USA, FRG, France, UK, 1970-1981

Index Numbers, 1970 = 100

	Industry Sector[R]		Household Sector[R]		Industry Sector		Household Sector[c]	
	Consumption	Inflation-Adjusted Prices	Consumption	Inflation-Adjusted Prices	Consumption	Inflation-Adjusted Prices	Consumption	Inflation-Adjusted Prices
	U S A				*France*			
1970	100.0	100.0	100.0[a]	100.0	100.0	100.0	100.0[d]	100.0
1971	.	101.0	.	101.2	.	102.5	.	.
1972	.	98.5	.	97.5	116.8	96.6	117.4	.
1973	123.4	110.6	115.5	106.2	123.1	93.0	127.2	.
1974	118.1	176.0	105.1	155.1	129.1	131.3	117.0	
1975	111.1	185.6	100.5	153.6	108.2	124.7	104.9	
1976	123.3	187.7	111.2	156.5	111.8	123.9	110.7	
1977	132.8	197.8	110.9	167.7	112.3	129.6	111.7	
1978	136.2	192.2	108.6	165.6	110.4	127.9	111.7	179.7
1979	139.0	245.2	98.6	214.2	107.8	138.0	106.0	207.2
1980	125.7	341.5	87.7	275.5	100.2	163.2	93.6	271.8
1981	110.2	373.6	83.5	306.5	81.3	182.2	83.5	246.9
	F R G				*U K*			
1970	100.0	100.0	100.0[b]	100.0	100.0	100.0[c]	100.0	100.0
1971	99.4	101.7	107.5	102.5	99.1	135.9	99.0	.
1972	102.8	93.0	114.2	90.0	101.0	142.4	114.1	.
1973	104.5	107.6	123.0	140.0	101.0	110.7	124.9	100.2
1974	91.2	141.0	106.8	171.1	87.9	228.5	111.0	.
1975	80.8	132.0	108.6	154.1	78.0	222.6	107.4	.
1976	84.2	136.2	119.2	164.3	77.4	224.6	107.5	146.4
1977	79.1	130.3	114.2	157.9	77.4	249.5	108.6	159.7
1978	78.8	123.9	122.4	149.0	76.0	212.0	107.3	146.2
1979	75.4	150.2	123.5	256.0	76.0	232.3	105.2	161.3
1980	64.1	176.1	104.0	280.0	59.8	273.4	84.3	181.4
1981	55.1	206.1	92.3	314.5	51.6	295.6	76.0	194.6

R = Revised

a = includes commerce b = includes agriculture and small-scale users c = heavy fuel oils
d = includes services (and liquefied petroleum gas)

SOURCES: See Table 17

Table 19. Gas. Inflation-Adjusted Prices and Consumption by Industry and Households in the USA, FRG, France, UK, 1970-1981. Index Numbers, 1970 = 100.

	Industry Sector		Household Sector		Industry Sector		Household Sector	
	Consumption	Inflation-Adjusted Prices	Consumption	Inflation-Adjusted Prices	Consumption	Inflation-Adjusted Prices	Consumption	Inflation-Adjusted Prices
	U S A				*France*			
1970	100.0	100.0	100.0[a]	100.0	100.0**	100.0	100.0[C]	100.0
1971	.	99.6	.	101.9	.	107.3	.	100.5
1972	.	100.6	.	102.9	121.0	112.4	138.2	98.1
1973	100.0	105.6	107.3	101.6	162.4	108.6	158.1	95.4
1974	96.3	124.5	105.7	105.5	173.6	144.6	178.6	103.3
1975	82.1	152.3	106.6	115.7	181.3	143.4	179.7	107.1
1976	84.3	191.6	110.6	128.3	208.9	141.9	205.9	104.4
1977	83.1	244.5	104.9	144.3	228.0	141.1	232.7	101.5
1978	82.2	251.7	107.2	147.7	250.9	148.4	244.8	100.2
1979	82.3	294.3	111.0	158.2	283.1	145.4	267.2	98.1
1980	80.8	377.6	106.0	173.0	284.9	192.3	273.1	112.4
1981P	76.7	427.4	104.1	180.6	.	224.6	280.1	129.6
	F R G				*U K*			
1970	100.0	100.0	100.0[b]	100.0	100.0[R]	100.0	100.0[R]	100.0
1971	136.1	94.3	116.9	93.9	174.7	66.1	111.0	100.0
1972	156.6	95.7	153.8	93.8	260.5	65.5	127.3	115.3
1973	184.3	91.7	181.5	90.2	324.6	51.7	135.9	91.4
1974	190.4	95.9	195.4	92.3	359.3	45.6	152.0	84.9
1975	185.5	133.3	206.2	99.1	358.2	51.3	166.3	76.7
1976	201.2	146.1	244.6	104.3	401.1	70.6	174.9	81.0
1977	227.7	148.1	261.5	103.0	419.6	84.8	186.1	83.2
1978	226.5	147.0	284.6	102.5	425.1	94.7	205.0	77.4
1979	242.2	141.7	312.3	100.1	439.6	93.9	232.2	69.7
1980	233.7	171.7	332.3	100.2	428.1	107.4	238.3	68.6
1981	225.3	225.1	352.3	126.1	406.6	118.1	247.4	78.1

a = includes commerce b = includes agriculture and small-scale users c = includes services
P = Preliminary R = Revised

Note: The inflation-adjusted prices relate to natural gas for the industry sector, and natural and manufactured gas sold to households. For compilation and sources, see Table 17.
The consumption, in the industry sector, relates in the US, the FRG, and in France to natural gas; and in the UK to natural and town gas. Because of differences in coverage, data are not directly comparable to industrial gas consumption in Tables 7 (FRG) and 8 (France). The consumption in the household sector relates to natural and manufactured, respectively town gas in all four countries. See tables 6-9.

Table 20. Electricity. Inflation-Adjusted Prices and Sales by the Utilities to Industry and Households in the USA, FRG, France, UK, 1970-1981. Index Numbers, 1970 = 100.

	Industry Sector		Household Sector		Industry Sector		Household Sector	
	Electricity Utilities Sales	Inflation-Adjusted Prices	Electricity Utilities Sales	Inflation-Adjusted Prices	Electricity Utilities Sales	Inflation-Adjusted Prices	Electricity Utilities Sales	Inflation-Adjusted Prices
	U S A				*France*			
1970	100.0[a]	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1971	103.5	104.4	106.9	101.4	102.9	98.7	99.1	99.0
1972	111.5	104.8	114.1	102.3	107.2	97.1	124.3	96.9
1973	119.7	105.4	129.2	101.8	114.5	94.1	141.1	94.0
1974	119.5	122.5	129.0	110.5	119.2	99.3	154.2	98.7
1975	120.1	132.9	131.3	114.5	118.2	101.4	178.5	94.0
1976	131.6	135.7	135.3	115.7	119.3	103.4	200.5	97.1
1977	137.2	143.8	144.0	116.6	120.2	101.8	222.0	95.2
1978	141.2	144.2	150.4	116.6	124.2	101.3	251.9	93.8
1979	146.9	143.4	152.5	115.9	133.4	102.5	272.0	94.9
1980	142.2	156.6	160.0	123.1	141.6	112.5	287.0	101.9
1981	144.2	163.6	158.9	129.7	147.8	114.7	303.3	101.0
	F R G				*U K*			
1970	100.0	100.0	100.0[b]	100.0	100.0	100.0	100.0	100.0
1971	102.5	95.4	112.5	95.1	100.3	100.7	104.5	101.9
1972	107.5	96.4	129.2	97.9	100.2	112.7	112.6	117.9
1973	117.0	95.1	139.7	97.5	109.7	90.6	118.3	95.8
1974	120.0	95.7	148.0	99.5	104.2	98.9	119.8	101.9
1975	110.2	105.0	157.3	110.1	102.2	103.0	115.2	115.9
1976	119.5	106.2	168.2	111.2	108.7	113.9	109.8	125.1
1977	119.8	103.3	174.5	107.9	109.6	114.3	111.3	125.2
1978	123.5	103.7	187.2	108.0	111.3	113.9	111.1	124.8
1979	130.7	102.5	193.0	106.6	114.9	109.6	116.2	117.8
1980	129.9	102.2	198.6	106.0	104.9	113.7	111.5	126.1
1981	128.6	109.4	202.6	113.9	101.9	119.6	109.5	137.0

Source: For sales of electricity see Table 4. For inflation adjusted prices, see current prices (Tables 10-13) adjusted for inflation with GDP deflators (also Tables 10-13). Notes see next page.

Notes to Table 20

Electricity consumption may be compiled from different sources; these are the utilities' sales of electricity to industry and households (Table 4) and electricity consumption as part of final energy consumption by the industry and household sectors (Tables 6-9). For comparison with the growth of prices, the utilities' sales are selected (Table 20). Generallly, the growth index implied in the electricity sales (Table 4) agrees with the electricity consumption (Tables 6-9), with the exception of a few minor and major differences detailed below.

Minor differences, and their explanations, worth noting, are:

US electricity consumption by the household sector; the discrepancy in the index compiled from Tables 4 and 6 is due to the fact that the utilities sales relate to the residential sector only (DOE Monthly Energy Review, June 1982 P. 65) whereas the electricity consumption as part of final consumption (DOE, op. cit., p. 20) includes the residential and commercial sector. A difference in trend is seen only for the year 1981, where sales to the residential sector decreased, while consumption by the combined residential and commercial sector still increased. The 1970 = 100 based index numbers stood in 1981 at 158.9 (sales to residential sector) and 157.0 (consumption by the residential and commercial sector).

FRG electricity consumption by the household sector. The utilities' sales to the household sector (Table 4) relate to the household sector only, whereas the electricity consumption as part of total final energy consumption (Table 7) includes households and small-scale users.

Major differences that should be kept in mind for interpretation of the series are that for both France and the UK, the electricity consumption by the industry sector (Tables 7 and 8) includes purchases and self generated electricity. In recent years, in either countries, purchased electricity (Table 4) tended to rise at a faster pace than purchases plus self generated (Tables 7,8).

Another major difference in the series relates to the French household sector; this is due to the fact that the electricity sales (Table 4) relate to households only; they rose more vigorously, especially since the mid 1970s, than the electricity consumption by the combined household and service sector, excluding transport and communication, shown in Table 7.

Table 21. Gasoline. Inflation-Adjusted Prices and Consumption in the USA, FRG, France and the UK, 1970-1981. Index Numbers, 1970 = 100

	U S A		F R G		France		U K	
	Consumption	Inflation-Adjusted Prices	Consumption	Inflation-Adjusted Prices	Consumption	Inflation-Adjusted Prices	Consumption	Inflation-Adjusted Prices
1970	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1971	103.9	95.8	110.7	97.9	106.4	97.2	105.6	94.1
1972	110.3	93.1	117.0	95.8	116.0	92.5	112.0	91.1
1973	114.3	96.6	119.5	102.2	126.4	89.5	119.0	90.6
1974	112.0	120.4	116.4	115.0	121.6	112.6	116.2	112.2
1975	114.3	117.7	127.0	108.2	127.2	104.0	113.4	119.5
1976	119.5	116.6	132.7	109.9	134.4	102.9	119.0	112.3
1977	122.9	116.5	140.3	102.8	136.0	110.8	122.5	105.6
1978	126.9	113.3	147.8	102.0	140.8	110.5	129.6	90.6
1979	120.5	141.3	149.7	107.7	141.6	114.6	131.7	103.7
1980	112.7	180.2	152.2	121.5	142.4	121.0	135.2	111.8
1981	112.8	183.8	142.8	141.1	145.6	124.2	131.7	120.6

Sources: Consumption see Table 5; Inflation-Adjusted Prices see Current price indices Tables 10-13, adjusted for inflation with GDP deflators (also Tables 10-13).

Table 22. Gasoline Prices and Taxes per Liter in National Currencies, in the USA, FRG, France and the UK, 1970-1982.

	USA		FRG		France		UK	
	Price incl. Tax	Fed. Tax + State Tax	Price incl. Tax	Tax	Price incl. Tax	Tax	Price incl. Tax	Tax
	Cents		DM		Fr.		Pence	
1970	9.50	1.06 + 1.85	.56	.4040	1.07	.7945	6.81	4.95
1971	9.76	.	.59	.4060	1.10	.7960	7.03	4.95
1972	10.03	.	.61	.4074	1.11	.8020	7.25	4.95
1973	10.55*	1.06 + 1.98	.69	.4504	1.16	.8035	7.47	4.95
1974	14.04	1.06 + 2.01	.83	.5150	1.62	.8485	10.99	4.95
1975	14.96	1.06 + 2.03	.832	.5210	1.69	.9568	15.61	4.95
1976	15.57	1.06 + 2.03	.874	.	1.85	.	16.65	6.59
1977	16.41	1.06 + 2.06	.849	.	2.16	.	17.37	7.14
1978	16.52	1.06 + 2.06	.874	.532	2.36	1.3256	16.27	7.14
1979	22.61	1.06 +	.957	.535	2.69	1.7473	21.76	8.09
1980	31.42	1.06 +	1.132	.566	3.20	1.8392	27.92	12.66
1981	34.59	1.06 +	1.372	.6275	3.70	1.9030	30.89	15.94
15 Jan. 1981	32.66	1.06 +	1.232	.582	3.44	1.8828	28.60	13.73
15 June 1981	34.93	1.06 +	1.415	.673	3.71	1.9232	33.19	18.15
15 Jan. 1982	33.91	1.06 +	1.334	.663	4.00	2.1679	34.29	18.29
15 June 1982	30.29	1.06 +						

SOURCE: USA 1970-1973 average retail dealer motor gasoline selling price in US 1976 Statistical Abstract; 1974-1982 US city average retail price, tax included, regular leaded gasoline full serve in US DOE 1982 June. Monthly Energy Review. Gasoline taxes see US 1976 and 1980 Statistical Abstract, updated with International Herald Tribune, 11/11/82.
NOTE: Prices and taxes per gallon were converted on the basis of 1 US Gallon = 3.79 liters.

FRG 1970-1981 retail price, tax included for Normalbenzin, Markenware self service in Statistisches Jahrbuch 1981 p. 512, from Statistisches Bundesamt, Preise Fachserie 17, Reihe 7, (Monthly).

FRANCE 1970-1980 retail price, tax included, regular gasoline (essence auto ordinaire) sold in Paris, agglomeration from Annuaire Statistique de la France 1981, p. 658, updated in INSEE Bulletin Mensuel de Statistique 1982, June.

UK 1970-1981. See typical retail prices of 2 Star (regular) petrol in UK Department of Energy (Anual) Digest of Energy Statistics 1980, updated in UK Department of Energy, Monthly Energy Trends.
NOTE: Prices converted to liter on the basis of 1 imperial gallon = 4.549 liter.

NOTE: For updating of FRG, France, UK gasoline prices see also EUROSTAT 1982 February, Hydrocarbons Monthly Bulletin. Gasoline taxes FRG, France, UK see EUROSTAT 1975 Energy Statistics 1970-1974; EUROSTAT 1980 January and 1982 February, Hydrocarbons, Monthly Bulletin.