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# **European Energy Supply at the Turn of the Century: Natural Gas and Electricity**

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**Europa-programmet**



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## 9. Petroleum Taxation and the Prices of Oil and Gas: Perspectives from the Supply Side

*Ole Gunnar Austvik*

*The first part of this article demonstrates that the development of OECD oil product prices and prices for crude oil differ more and more. The difference is mainly made up by taxes on consumption of oil products. While producing nations took most of the rent in the oil market in the 1970s and the early 1980s, consuming countries are now in this position. OECD countries' competitive position vis-à-vis Asia and lower investment in marginal oil fields outside the Middle East, are among those factors that may put a limit to oil product taxation.*

*The second part of the article discusses the development of European gas prices. In Europe taxes on consumption of natural gas are lower than on oil products. Uncertainty about the future development of gas taxation, and how, and to which extent, the market will become more liberal, may contribute to halt investments in new gas fields.*

### 1. Oil prices and taxes

Over the two last decades, taxes on oil products have increased substantially. Environmental arguments are often put forward to get political support when taxes are increased. To the extent oil consumption is reduced when taxes increase, it is possible that the environment benefits from this policy. However, environmental damages are often more cost effectively reduced through taxes on emissions, tradable quotas, regulations etc. Furthermore, the structure of energy taxation across products and carriers does not reflect their damage to the environment. For example, oil product taxes are higher on light products than on the more polluting heavy products. Among fossil fuels, the energy carrier being most friendly to the environment (natural gas) is taxed, while the most polluting one (coal) in some countries has a negative tax (a subsidy).

Probably, the most important reason for raising oil product taxes is fiscal. Taxes are highest where demand is rather inelastic and lowest where demand is more elastic. Such a tax structure minimizes social losses created (disregarding environmental damages). For example, gasoline demand is rather inelastic, and has a high tax, while demand for heavier products, such as fuel oil, is more elastic, and has a lower tax. Oil product taxes now contribute significantly to government revenues in most industrialized countries, and in particular in Europe, often as replacement for lower income taxes.

There are also domestic and social reasons for energy taxation. For example, coal subsidies are often given to maintain employment in the sector and/or in

specific geographic areas, security-of-supply reasons etc. In countries subsidizing coal production, these concerns are considered more important than the damage to the environment caused by coal.

Whatever the motive for taxation, a tax introduces a difference between the price a consumer pays and the producer receives for a commodity. In an autarchy (closed economy), a government can put a tax on consumption of this commodity and know, depending on demand and supply elasticities, that a share (between 0 and 100%) of this tax will be paid by consumers through higher consumer prices. The other share is paid by producers through lower producer prices.

In an open economy, with international commodity markets, a tax increase in a single country will, in most cases, be paid only by consumers in that country. In this situation, producers selling to this country may experience lower demand for their products, but they will get the same price as selling to other countries (disregarding price discrimination between countries). However, if "sufficiently" many countries raise consumption taxes, the effect on consumer and producer prices, respectively, is more similar to that in a closed economy. Such orchestrated taxes across consuming nations will, usually, be paid partly by consumers and partly by producers.

This article shows how oil product taxation within the OECD area has increased substantially over the last 15 years (albeit the differences between Europe, Japan and North America are significant). Crude oil prices developments referred, and calculations shown on how the taxes transfer into revenues per barrel for governments and costs per barrel for consumers, demonstrate that the different development for consumer and producer prices became especially significant after the oil price collapse of 1986. Another jump was made after the Iraq-Kuwait conflict in 1991. The consumption taxes making the difference between producer and consuming prices are now so significant, and OECD countries seem sufficiently representative for world oil demand, that they probably have contributed to the lower crude oil prices (i.e. consuming countries import prices) over the last decade. This have improved consuming countries', and deteriorated producing countries', terms of trade in the period.

There are, however, problems involved in continuing this policy. One limitation is that taxes on oil products put an extra cost on the industries using them as input factors in production processes. If these industries compete with their products in global markets with countries with lower taxes, they have a comparative tax disadvantage. This is put on top of other competitive disadvantages, such as higher labor costs, compared to, for example, many Asian firms.

Another way of expressing this problem is that the price of crude oil can be considered an international common good. Any movement the price makes is to the loss or benefit for all participants in the market, whatever the cause for change. For example, OECD consumption has not been the main driving force behind the historical top level of oil demand in 1996. Over the last 20 years, OECD countries have represented some declining 2/3 of global consumption, and a little higher share of world trade. Now, the most rapid growth in oil consumption is taking place outside the OECD area, particularly in the new Asian economies. The significant economic growth in these countries is followed by rapid increase in energy use in general, and in oil consumption, in particular.

Thus, in spite of the fact that energy consumption within the OECD area itself has become more efficient and diversified, OECD consuming countries will be harmed by the increased demand elsewhere in the world through a tighter crude oil market and pressure for higher prices, as is now seen. For example, if Europe continues to increase taxes when the oil market becomes more and more tight, and Asian growing economies and the (more energy intensive) US economy do not follow suit, increasingly more product markets now supplied by European firms will be taken over by others.

Furthermore, to the extent that petroleum taxes are borne by producers through lower crude oil prices, they may halt the development of marginal oil fields outside the Middle East. Lower, or the flattening out of, production outside the Middle East will increase consuming countries' dependency on Persian/Arabian Gulf oil and, hence, make Middle East policies, events and wars even more important for the oil market and price development in the future than they already are.

#### **a. OECD tax increases 1980-1994**

Taxes on oil products vary across countries and products. Within the OECD area, the highest level can be found in Western Europe. Here, taxes on gasoline as percentage of end user prices have increased from 43-66% in 1984 to 67-81% in 1994. Norway is a rather typical example of this development. Firstly, general indirect taxes (VAT) increased from 20% in 1980 to 23% in 1995. Secondly, and more important, special taxation on gasoline increased almost every year in the period 1978-1992. In nominal terms, the special tax on gasoline was 1.10 NOK/liter in 1978 and 3.72 NOK/liter in 1992. Thirdly, in 1991 a CO<sub>2</sub> tax of 0.6 NOK/liter was introduced. This tax was increased to 0.8 NOK/liter in 1992. Since then, gasoline taxes have remained stable in Norway. The total effect was an

increase in the tax share of Norwegian end user prices per liter gasoline from 50% in 1984 to some 70% in 1994.

In general, European taxes on heavier products have increased more than on (the lighter product) gasoline in the period. For example, the tax expressed as percentage of sales prices of heavy fuel oil increased from 0-25% of end user prices in 1984 to 7-49% in 1994.<sup>1</sup> Taxes as share of end user prices in selected countries are shown in table 1.

**Table 1 Taxes as share of end user prices in selected countries in 1984 and 1994**

	Unleaded gasoline		Diesel		LFO households		HFO in industry	
	1984	1994	1984	1994	1984	1994	1984	1994
<b>OECD Europe</b>								
Austria	49.9	n.a.	39.3	49.3	26.5	34.5	6.3	7.7
Belgium	55.2	73.8	26.6	56.9	14.5	24.1	0.0	6.7
Denmark	57.3	67.8	0.0	41.1	28.2	63.6	0.0	18.3
Finland	34.0	71.8	28.8	54.9	7.7	24.6	9.1	11.0
France	57.3	80.8	41.2	64.7	23.0	39.3	3.4	14.6
Germany	48.7	74.3	38.5	62.0	14.5	32.0	2.7	15.4
Italy	65.6	75.6	19.5	65.3	30.6	71.2	0.3	18.1
Netherlands	54.4	75.4	19.7	50.4	19.7	43.9	1.7	22.0
Norway	50.3	67.4	1.0	46.6	17.6	34.0	2.8	48.6
Sweden	42.7	75.8	18.3	45.7	21.2	56.2	24.6	28.4
UK	54.9	73.2	43.1	63.2	3.8	19.5	5.1	15.6
<b>Other countries</b>								
USA	23.8*	34.6*	23.8	39.3	n.a.	n.a.	n.a.	n.a.
Canada	25.0*	50.9*	23.3	41.5	n.a.	n.a.	n.a.	n.a.
Mexico	13.0	9.1	0.0	0.0	n.a.	n.a.	0.0	0.0
Japan	37.2*	48.3*	23.1	39.7	0.0	n.a.	0.0	2.9
Australia	24.6	55.0	26.6	57.1	n.a.	n.a.	n.a.	n.a.
Taiwan	12.2	47.2	12.3	43.0	n.a.	n.a.	2.9	7.2

n.a.: not available. \*: regular unleaded gasoline. LFO: light fuel oil. HFO: heavy fuel oil.

Source: IEA; Energy Prices and Taxes

<sup>1</sup> The percentage increases are to some extent also due to lower crude prices.

The lowest level of taxation of oil products within the OECD area is found in the US. When European gasoline prices ranged between 0.9 and 1.3 USD/liter in 1995, prices in the US were some 0.35 USD/liter, or a third of the European level. The bulk of the price discrepancies is made up by a different tax policy. However, even the US increased taxes in the period 1986-1991 with some 40% (under President Bush). However, since taxes in the US are on a very low level, this high percentage increase does not amount much per barrel of oil. After 1991, no changes in taxes have taken place (under President Clinton).

In Japan, taxes have been rather constant in the period. The tax *share* of the price in Japan has increased mostly due to the drop in crude oil prices. Outside the OECD, the differences between countries are significant, as well as inside the area. As can be seen from the table, newly industrialized Taiwan increased taxes substantially in the period, while Mexico has no special taxation of gasoline and not even VAT on other oil products.

#### **b. Crude oil price developments**

Over the last years, the value of a barrel of oil has been about one fourth of the value from the early 1980s. In the early 1980s, after the second oil shock, real crude oil prices were in the range of 60 USD/bbl (30-40 USD/bbl in nominal terms).<sup>2</sup> Today's prices are also lower than prices in the 1970s, before the second oil shock. In the period 1974-78 prices leveled some 30 USD/bbl (10-12 USD/bbl in nominal terms). In fact, real prices in 1973, before the first oil shock, were some 8-10 USD/bbl (3-4 USD/bbl in nominal terms); not too much lower than the prices prevailing over the last years.

The decline in crude prices since the early 1980s can be divided into two steps. The most significant drop took place in 1986, after Saudi Arabia had introduced their net-back pricing in 1985, with the following price collapse. From 1986, and until the beginning of the Gulf War in August 1990, real crude prices ranged between 20 and 30 USD/bbl. After the war, in 1991, prices have dropped continuously, at a nominal value of 15-20 USD/bbl., down to some 2/3 of the 1990 value in 1995. Only in the winter of 1996/97, prices increase again, due to a gradually tighter oil market, where demand grows more quickly than supply capacity additions.

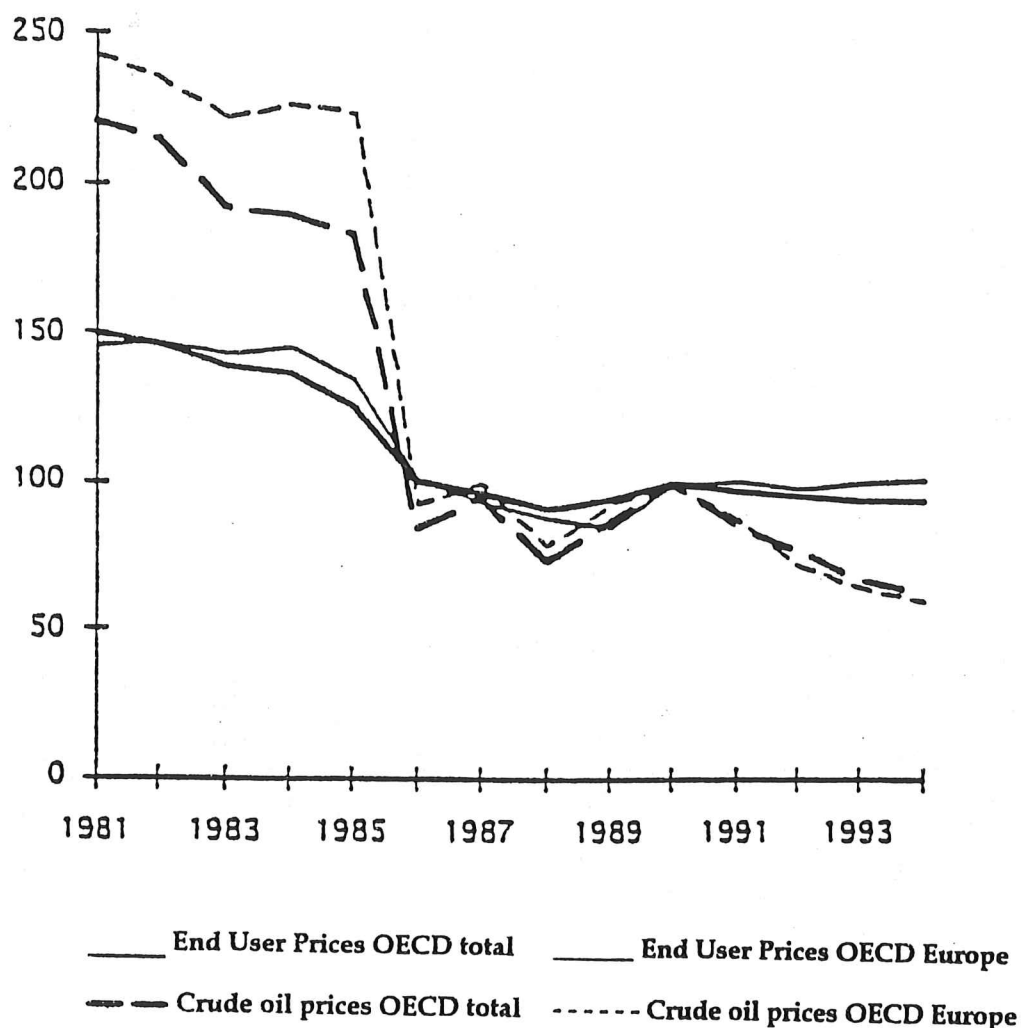
Prices to consumers have (especially in Europe) been much more stable than producer prices. In real terms, EU consumers now pay about the same as they did

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<sup>2</sup> Calculations of real prices depend somewhat on choice of depreciation rates.

in 1986 (after the 1986 tax increases). On the other hand, consumers in the US and Japan have experienced decline in real prices, also since 1990. On average for the entire OECD area, consumer prices are on about 60% of the level from the early 1980s (before the price collapse), and some 90% of the 1990 level. The index figures in figure 1 show this development for producer and consumer prices, respectively, for the period 1981-1994.

**Table 2 Index for real crude oil and oil product prices 1981-1994 in OECD and OECD Europe. National currencies. 1990=100**



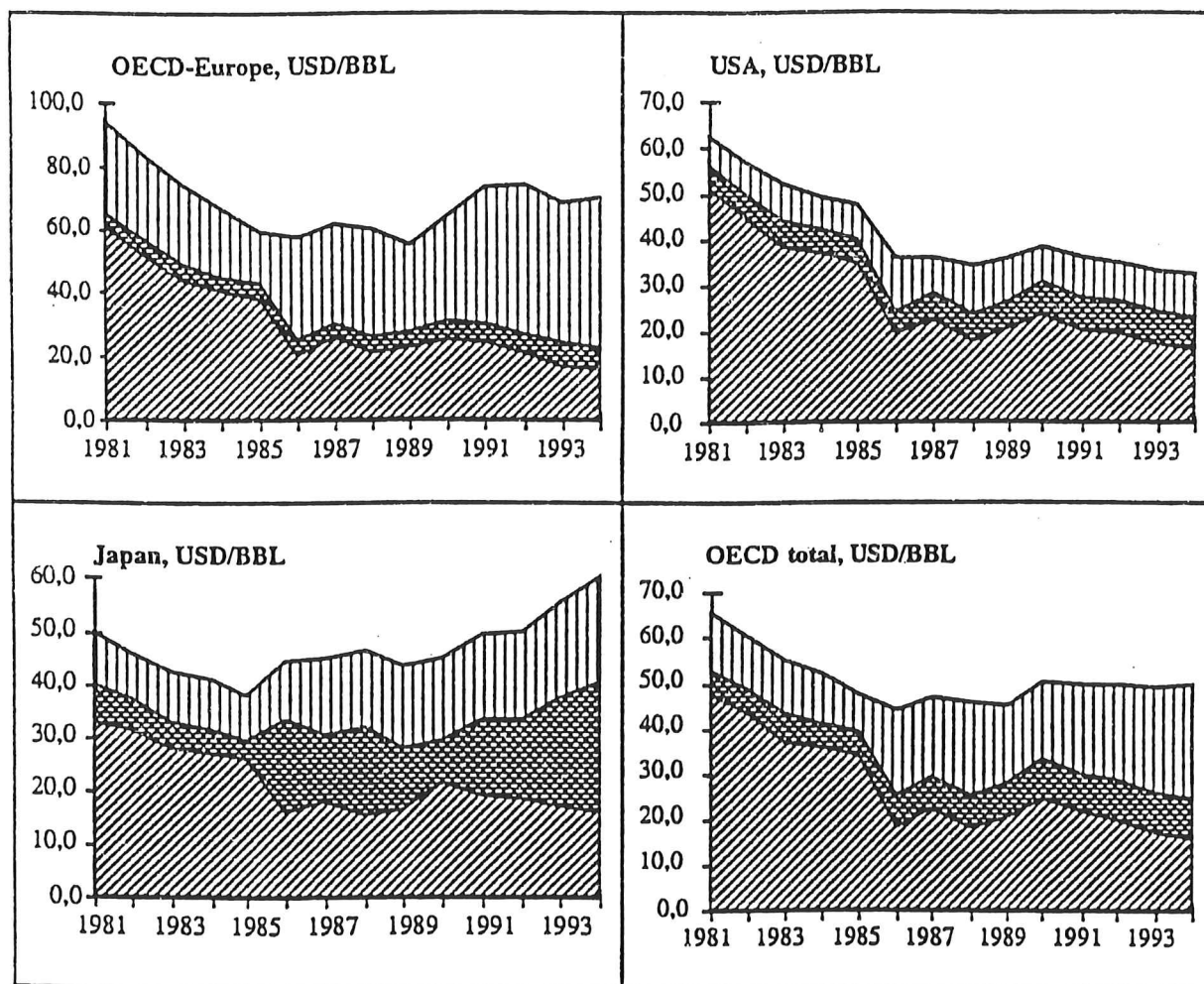
Source: IEA; Energy prices and taxes

On the basis of the IEA index rows, we have calculated prices for a representative barrel of oil (Brent crude) for consumers, producers and consuming countries' government take, respectively. In order to be able to transfer the indexes to prices per barrel we have also used a weighed%age tax share of different products within



each country or group of countries, and calculations of the take to refineries, marketing, transportation etc. Some input is used from, and comparisons made with, calculations by other bodies, as referred to in CERI (1994), Okugu/OPEC (1995) and ECON (1995 & 1996), where some tax and/or consumer price calculations per barrel of oil are presented. Due to the choice of depreciation rates,

**Table 3 Crude oil prices, taxes and end user prices on oil products (1994-value)  
American dollars pr. bbl.**



Crude oil price
  Illustrative costs etc.
  Taxes

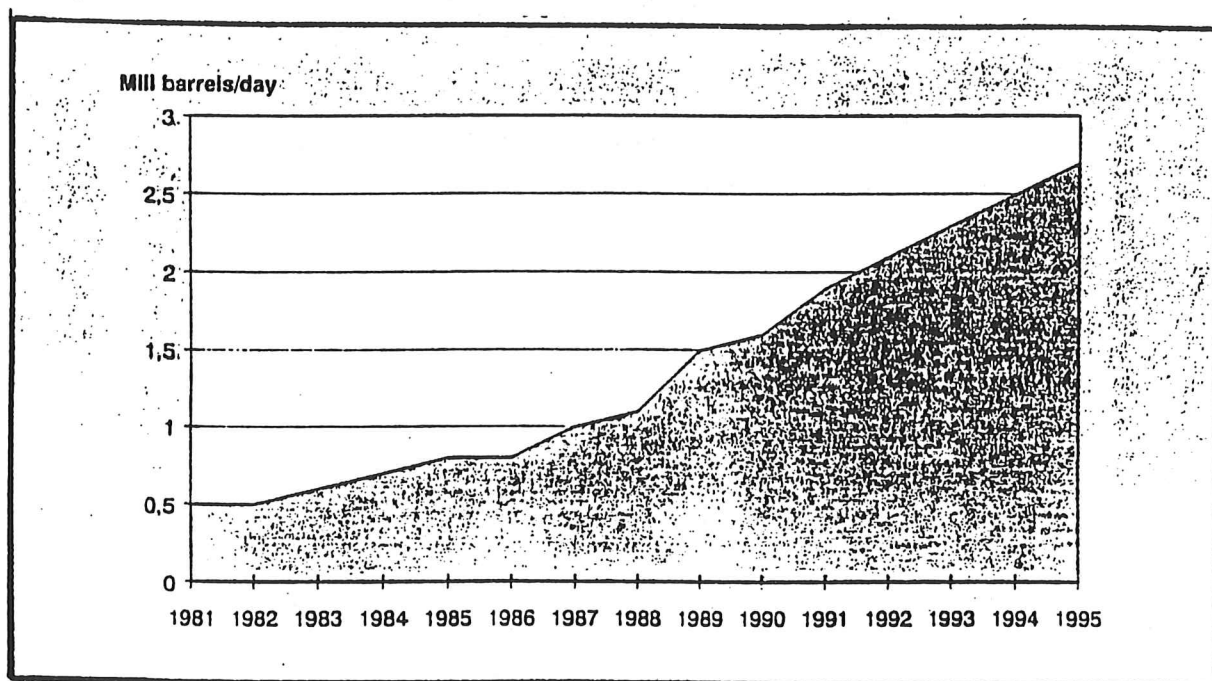
level of costs of transportation, marketing and refining and tax estimates, these, and the other calculations, should all be read as indications rather than as accurates. Figure 2 presents our results for OECD Europe, the US, Japan and OECD on



average, respectively. All calculations shown are referred to in constant 1994-USD/barrel of oil.<sup>3</sup>

The figures show that the price of crude oil decreased from 61 to 16 USD/bbl in the period. In OECD Europe, the decline in prices of 45 USD/bbl has partly been compensated for by an increase in taxes of some 20 USD/bbl. On average, in Europe, according to our calculations, the amount of taxes in a barrel of oil was some 47 USD/bbl in 1994, against 20-30 USD/bbl in the early 1980s. Thus, in spite of the dramatic drop in crude prices, the average price to consumers decreased (only) from 95 to 70 USD/bbl in the period.

**Table 4 Oil production 1981-1995**



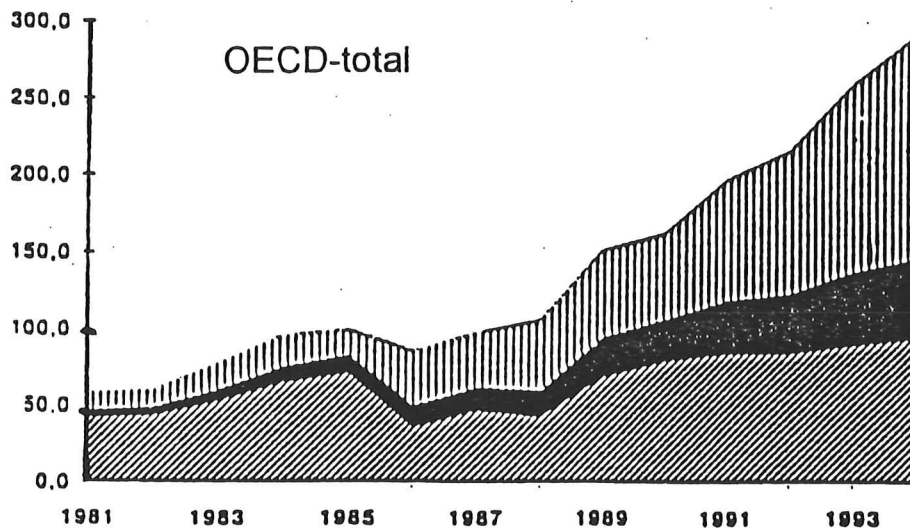
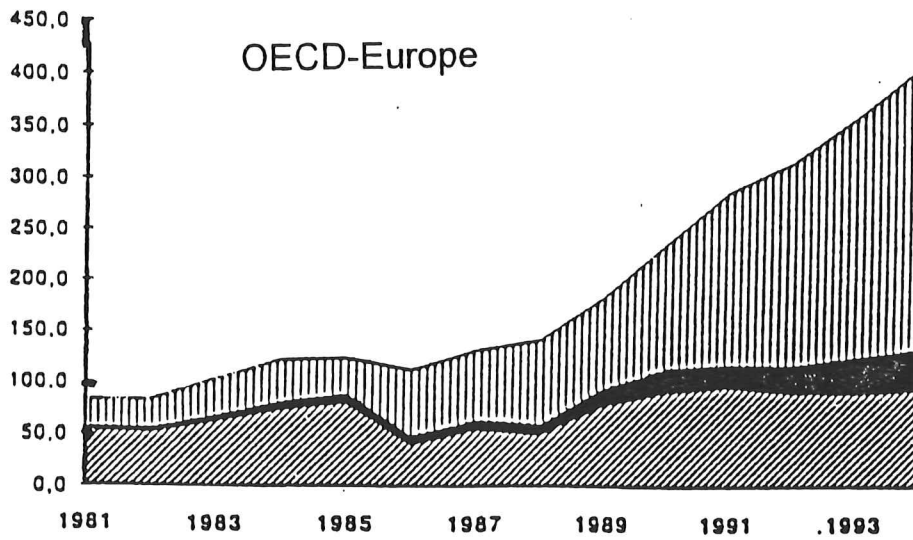
Source: Fact sheet 1996

In the US, taxes rose from 6 to 9 USD/bbl in the period, while consumer prices dropped from 63 to 32 USD/bbl. Since 1986, real consumer prices have remained fairly stable in the US. Japan has not increased taxation of oil products in the

3 Details on figures, methods of calculations etc are presented in Ole Gunnar Austvik, "Avgifter tar forskjellen; Olje- og gassprisene faller, mens forbruksprisene holder seg" in *HIL-paper*, No. 17, (working paper Lillehammer College), April/October 1996 and Ole Gunnar Austvik, "Avgifter og petroleumspriser: Tar konsumentlandene olje- og gassinntektene?" *Sosialokonomien*, No. 5, May 1996. These articles are in Norwegian language only.

period. In yen, consumer prices declined, but prices in US dollars, shown in this graph, increased sharply due to the appreciation of the Japanese currency. For this

**Table 5 Seller's and buyer's value of Norwegian oil exports 1981-1994**



Taxe revenues
  Illustrative costs etc.
  Crude oil value

reason, the Japanese tax per barrel was 10 USD/bbl in 1986 and some 20 in 1994 (in spite of the constant taxes).

For the OECD area on average, the figures show a tax increase from 12 USD/bbl in 1985 to some 25 USD/bbl in 1994 (constant 1994-prices), and consumer prices of some 50 USD/bbl in 1994. Thus, much rent taken by oil producers from 1974 until the drop in prices in 1985/86 ("the OPEC era"), is now taken by the treasuries in consuming countries.

### **c. Impact on the value of Norwegian oil exports**

For Norway, as for other oil exporting nations, the decrease in crude prices has led to a deterioration of the country's terms of trade since 1986. This means that, as long as crude prices are falling, Norway must export increasingly more oil in order to maintain the same level of international purchasing power per barrel of oil. Norwegian oil exports have more than tripled over the last 15 years. In 1995, Norway reached the no. 2 position as a world exporter, after Saudi Arabia, and a production of 3 million barrels per day (mb/d).

In spite of falling prices, overall export revenues have stayed in the range of 8-14 billion dollars per year throughout the period. However, if Norway had sold her oil at the same prices as in 1985, the value of the 1994 export would have been some 40 billion dollars, or three times higher than the actual figure. On the other hand, due to higher oil product taxes, the buyer's value of this oil has become increasingly higher. Figure 4 shows buyer's and seller's value of Norwegian oil exports in the period 1981-1994 for OECD Europe and OECD average, respectively.

In 1994, in OECD Europe, when Norwegian oil export revenues leveled some 14 billion USD, the value for EU consumers was around 63 billion USD. In 1985, the value of Norwegian oil exports was some 9 billion USD (and the volume 0.8 mb/d), while the value of this amount of oil for EU consumers was around 19 billion USD. The buyer's value for the OECD economies on average was 45 billion USD in 1994, against 15 billion USD in 1985. Tax revenues share of buyer's value, were in OECD Europe some 42 billion USD in 1994, against 5 billion USD in 1985. For OECD on average, tax revenues were 23 billion USD in 1994, against 3 billion USD in 1985 for the amount of oil Norway exported in each year.<sup>4</sup>

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<sup>4</sup> For more details see Austvik, "Avgifter tar forskjellen: Olje- og gassprisene faller, mens forbruksprisene holder seg" and Austvik, "Avgifter og petroleumspriser: Tar konsumentlandene olje- og gassinntektene?"

#### **d. Has OECD Oil Product Taxation Influenced the Price of Crude Oil?**

To a large extent, an answer to this question depends on whether OECD countries are representative for world oil demand and on the relationship between demand and supply elasticities.

In 1995, OECD countries represented some 60% of total demand and about 66% of world import. Net demand for oil in the period 1985-95 grew with 9.5 mb/d, reaching the historical record level of 68 mb/d in 1995. In this period, demand from former Soviet Union and Eastern Europe dropped with 4-5 mb/d. Demand growth in the rest of the world was, thus, astonishing 14 mb/d over the decade (or some 25% increase if demand in the former Soviet Bloc had remained constant).<sup>5</sup>

Of this growth, OECD economies represented less than 5 mb/d, almost equally divided between its three main "regions," Europe, North America and Japan. Almost 8 mb/d of the growth took place in non-OECD Asia, in particular countries like China, India, Indonesia, Malaysia, Pakistan, the Philippines, Singapore, South Korea, Taiwan and Thailand. The rest of the growth is mostly represented by South American and Middle East (Persian Gulf) countries; and very little from Africa.

On the supply side, the drop in demand in the former Soviet Bloc is more or less matched with a similar decline in production. The 14 mb/d increase in demand in the rest of the world is met mainly by higher OPEC production. Total OPEC production increased some 10 mb/d, of which Saudi Arabia alone represented 5 mb/d; and the other countries around the Persian Gulf most of the remaining. The production growth in this period has more or less brought OPEC countries back on production levels similar to the period 1973-80 and the highest since 1981 (some 28 mb/d) and their free capacity from the 1980s has step by step been filled. Non-OPEC production has increased, as well. The single most important country has been Norway (some 2 mb/d in added production capacity in the period).

Today, production represents 95-98% utilization of world capacity (depending on whether/how Iraq is included in the figures or not). Such a degree of capacity utilization has not existed since the pre oil shock periods of 1973 and 1979/80. If demand continues to grow with the same speed, production capacity must increase more quickly to dampen a pressure towards higher prices. There is no other place than in the Middle East this is possible to an extent that will suffice.

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<sup>5</sup> Volume figures from British Petroleum, *BP Statistical Review of World Energy*, annual report, 1996.

Thus, while non-OECD economies (in Asia) take an increasingly larger share of world oil demand, Middle East producers are again the core of supply growth and stability. The balance between demand growth in Asia and supply from the Middle East, decides more and more market tightness and price stability. As the price of oil is an international common good (or some may say evil) the outcome of this balance is equally important for OECD economies as had they been the main determinants on the demand side of the equation.

Nevertheless, over the last decade OECD countries have been rather representative for total world oil demand. Thus, to some extent, these countries' oil product taxation policies may fulfill the prerequisite to be representative for the demand side in order to have the potential to influence crude oil prices. However, in the coming decade, this may less and less be the case.

Effects of oil product taxation on crude oil prices depend also on price elasticities for demand and supply. If either demand or supply is rather inelastic, the effect of taxes on consumption or production (volumes) is limited (as are social losses). It will always be the one side that is least elastic that pays most of the tax. For example, if demand is more elastic than supply, more than half of the tax will be paid by producers. If supply is totally inelastic with respect to prices, producers pay the entire tax (and vice versa). If demand is rather inelastic, and supply more elastic (with respect to prices), consumers pay most of the tax, and so on.

With a net raise of supply of oil with some 10 mb/d over the last decade, some of it in "high cost" areas, in a period when real prices have declined, it could put forward that supply has not been very elastic with respect to prices. There is still economic rent to be made for producers even at today's prices, indicating that investments in oil production is more profitable than investments in (most) other sectors.

Taking the two main arguments together, on whether OECD countries are representative for world oil demand and the relationship between demand and supply elasticities, there seems to be reason to believe that OECD oil product taxation has influenced crude oil prices in the period. However, the analysis of the effect of taxes on prices is empirically complex. The price of crude oil is influenced by a number of other factors than taxes. The many economic and political-economic approaches for crude oil price formation illustrate a lack of consensus about how the market works.<sup>6</sup> In the period we have studied, taxes are

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<sup>6</sup> See i.e. Ole Gunnar Austvik, *Energy Economics*, compendium for course to 'Master of Science in Energy Management', Norwegian School of Management (Handelshoyskolen BI), Sandvika, January 1996.

changed at the same time as other events have taken place. Nevertheless, what we can conclude as a minimum, taxation on consumption must be taken into account, as an increasingly more important factor, by anyone analyzing (long term) oil market developments since 1986.

#### **e. Supply of Oil and Limits to Taxation**

For consuming countries, it may seem very tempting to increase energy taxation further in the future. In many sectors, either demand, supply or both are rather inelastic and, thus, imply small social losses compared to a no-tax situation. With a political pressure towards lower income taxes, higher oil product taxes are an obvious alternative to consider as a source for government revenues. There are, nevertheless, limits to taxation.

One aspect to take into consideration is the desire to diversify supply. To the extent that taxes push crude oil prices down, consuming countries must consider which price is in their interest in order to maintain a desired level of flows of oil to the market. The lowest limit for crude oil prices to drop to for new investments to be made, is the long run marginal cost (LRMC) of production. Determining LRMC is, however, an intriguing question of definition, expectations and politics.

In economic terms (disregarding world politics), LRMC would, to a large extent, be the cost of bringing new Middle East oil to the market. Production capacity in Saudi Arabia, Kuwait, Iran, Iraq and the Emirates may well be doubled within a decade (an increase of some 20 mb/d)<sup>7</sup> if reserves, production techniques and costs were the only factors taken into consideration. However, such a production growth is not very likely to take place, nor is it desirable for the producing nations concerned. For security-for-supply reasons, a "too high" dependency on Middle East oil is not desirable for consuming countries either. Thus, in this context, marginal production takes place in other countries than in the Middle East, not least in the US and other higher cost production areas. Consuming nations should not desire to concert consumption taxes across nations higher than that prices cover LRMC in these more marginal areas.

Where this lower limit is, depends not least on how secure supplies from the Middle East are considered to be, the cost of other oil (reserves, technology), energy efficiency and flexibility etc. The combination of improved technology in high cost areas, such as in the North Sea, Venezuela etc. and Western military

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7 See Ole Gunnar Austvik, "En vurdering av produksjonskapasiteten for råolje i 5 land ved Den persiske gulf" in *NUPI-rapport*, No. 150, 1990.



presence in the Persian Gulf area (if it works in the long run) indicates that such a lower desired limit can be taken down from perhaps 15-20 USD/bbl to 10-15 USD/bbl in the years to come (LRMC in the Middle East area may be in the range of 5-10 USD/bbl).<sup>8</sup> This perspective indicates the possibility of higher taxes than today. At prices in the range of 10-15 USD/bbl, most producers would continue to make (some) economic rent (and, thus, invest in new capacity) also outside the Middle East.

However, it is not sure that consuming countries "sufficiently" are able to orchestrate taxation across nations. Competition in product markets between the new economies in Asia and "established" OECD countries may become so intense that the cost of input factors (read: oil) for OECD economies must be lowered for industries to prevent them from being competed out of markets.

The tighter the market, the more consuming countries will compete for oil and the conflicts of interest will become more apparent when taxes shall be raised. If demand continues to increase faster than capacity additions, the pressure towards higher crude prices may also drive taxes down. The desired role of oil in the overall energy balance, and the supply of other energies, will influence this picture, as well.

## 2. European Gas Prices and Taxes

In the highly concentrated structure of the European gas market, gas is sold and resold many times on its way from the field of production to the final user, often between monopolies/oligopolies and monopsonies/oligopsonies. The huge, and often sunk, costs in pipelines and infrastructure make participants in the market strongly interdependent, much more than in the oil market.

In today's market, producers (exporters) sell gas to transmission companies (pipelines) who act both as transporters and merchants in the market. The gas the pipelines buy at its entry, they resell at its exit at the city gate to their customers;

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<sup>8</sup> See Ole Gunnar Austvik, "Limits to Oil Pricing. Scenario Planning as a Device to Understand Oil Price Developments" in *Energy Policy*, Vol. 20, No. 11, November 1992, pp. 1097-1105 for a closer discussion of this lower limit in combination with other factors influencing oil market developments. In this article a lower economic-political limit for oil prices at present (early 1990s) conditions is indicated at the level 15-20 USD/bbl. Similarly an upper (sustained) limit for oil prices is indicated to be in the range of 30-40 USD/bbl. The article argues that short term prices may vary more. See also Ole Gunnar Austvik, "The War over the Price of Oil: Oil and the Conflict on the Persian Gulf" in *International Journal of Global Energy Issues*, Vol. 5, No. 2/3/4, October 1993, pp. 134-143, for a discussion of oil-political arguments behind the Iraq-Kuwait conflict.

local distribution companies (LDCs), power plants and large industrial users. The LDCs act as both transporters and merchants, as pipelines do, and resell the gas to final consumers (end users) in private households and businesses. Power plants and large industries are end users themselves, and use gas as an input factor in production processes, such as for electricity, chemical products etc. Typically, producers and pipelines write long term contracts (up to 20 years), while pipelines write medium term contracts with their customers (1-5 years).

#### **a. Towards a more liberal market**

If the market should become liberalized, gas needs not to be sold and resold quite so many times as under today's system. Under a liberal market system, producers should make direct contracts with LDCs, power plants and the industry, and buy transmission services from the pipelines (as for a toll road). The fee for this transportation should cover pipelines' normal profit, but should not give any economic profit to them. Pipelines' roles as both transporters and merchants should be unbounded, and they should act only as transporters. Intermediates, such as brokers and marketers, may become new actors to clear (parts of) the market. While pipelines are often natural monopolies (or at best natural oligopolies) their behavior and pricing practices should be regulated by a public authority. Producers and customers however, are not necessarily natural monopolies, and competition may be used as a measure to promote competitiveness.

In order to create competition in these segments, sales monopolies in exporting countries should be abolished, and customers should compete for gas (as they to some extent already do in today's market). Since LDCs are natural monopolies in the areas in which they operate, it is necessary to regulate them, as well as pipeline companies. If the market *theoretically* becomes completely and perfectly liberalized, each firm in the gas chain either operates as a price taker, due to perfect competition, or is efficiently regulated by a public authority.<sup>9</sup> Competition should be established when possible, regulation when necessary (when competition does not work) and unbundling introduced when economies of scope are not present (or exhausted).

However, there are many reasons why it seems rather unlikely that the European gas market will become completely and perfectly liberalized in the foreseeable future. Firstly, the varying degree of scale and scope economies in market

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<sup>9</sup> In this context, "regulation" means that public interference takes place into firms behavior by encouragement or force.



segments makes it difficult to establish an optimal portfolio of competition, regulation and unbundling throughout the gas chain. It is also technically difficult to find regulatory schedules that do not create new inefficiencies in the market. The second-best solutions that liberalization often aims at (as opposed to the first-best solutions nationalization of firms usually do), may end up as third- or fourth-best solutions, in reality. Secondly, as the market develops, authorities are often slow to change regulation in an optimal manner. US experiences tell us that policy making can be expensive if it is slower than market changes. Thirdly, strong economic interests in firms to be regulated, lead these to lobby in order to prevent more competition and/or regulation. Fourthly, as European gas trade is international, also within a Maastricht version of the European Union (EU), the economic reasoning behind a possible opportunistic behavior by one gas firm trading with firms in other countries may be supported by nation states which have a desire to maintain rent to the country and political influence following the firm's strong position in a market for an essential good like natural gas. Fifth, the most important suppliers to the market are outside the EU.

Nevertheless, due to market growth and the building of infrastructure, it is likely that the European gas market will become *more liberal* than it has been. Competition between pipelines will most likely intensify. Market growth indicates that competition between customers will increase, as well. Higher demand may bring new supplying countries to the market, such as Kazakhstan, Iran and others, and increase the number of oligopolists selling to the market.

On the political level, the EU has proposed 3 directives aiming at a) a more transparent market, b) allowing transit of gas between high-pressure grids and c) introducing Third Party Access (TPA) to pipelines and unbundle their role as both merchants and transporters.<sup>10</sup> Among these, TPA is not introduced yet, due to heavy resistance from the industry and the European Parliament. Renewed emphasis on a politically led liberalization of the market should not be excluded, however, on EU and/or national levels. This is recently seen from the TPA compromise proposal by the Irish Presidency in the fall of 1996.

An important difference between the European gas market and many other markets being liberalized, is that natural gas is a non-renewable resource. With a

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10 European Union, *Council Directive of 29 June 1990 Concerning a Community Procedure to Improve the Transparency of Gas and Electricity Prices Charged to Industrial End Users*, CEL-Title 90/377/EEC, 1990 and European Union, *Council Directive of 31 May 1991, on the TRANSIT of Natural Gas through Grids*, CEL Title 91/296/EEC, 1991 and European Union, *Proposal for a Council Directive Concerning Common Rules for the Internal Market in Natural Gas (Third Party Access, TPA, directive)*, Com 91/548 Final SYN 385, 1992.

limited supply, and prices to a large extent fixed by prices of alternative energies, there is an economic rent to be earned in the market, even after it is liberalized. The total rent is determined by the difference between market prices and the sum of cost of production, transportation, storage, distribution, gas use etc. (including normal profit). The existence of, and fight over this rent among commercial and political actors, contributes to politicizing the European gas market more than most other markets, within the EU and as well as between the EU and outside exporting nations.

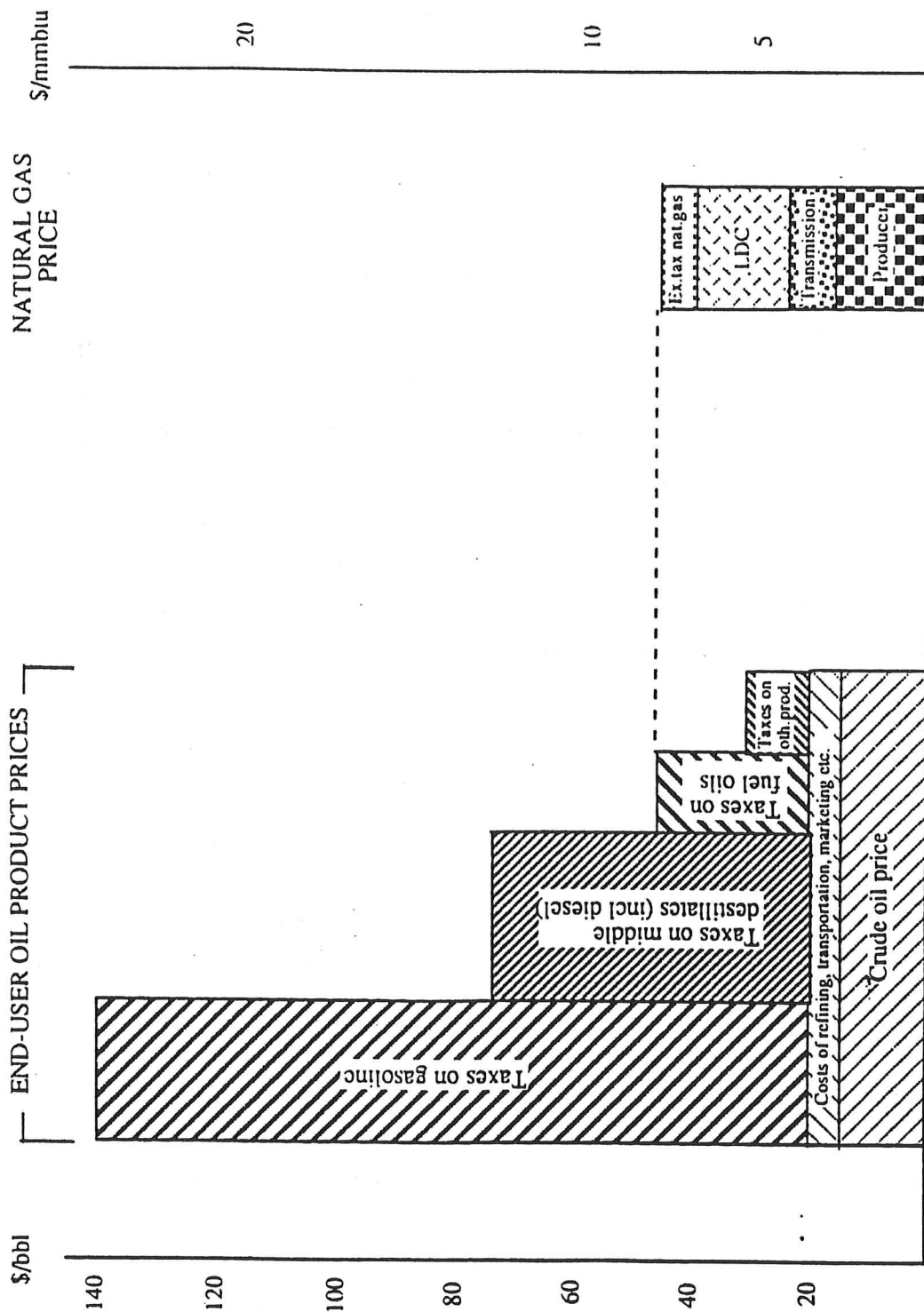
### **b. Pricing of European gas**

Figure 5 is a simplified illustration of how gas prices in the European market are determined. In the figure, the pricing mechanism is assumed only to reflect contracts where gas competes with *fuel oils*. In reality, gas competes with middle distillates, coal and electricity, as well, although oil products are the single most important alternative. In the following discussion, we disregard more "short-term" gains and losses transmission and distribution companies can make through changes in sales prices of gas within a contract period.

The left set of bars shows end user prices on oil products. The basis for these prices is the price of crude oil and costs to refining, marketing, transportation etc. In the figure, the crude oil price and the costs are illustrated as if they are equal across product types. The main difference between the prices on different product types results from different oil product taxation. For a representative barrel of oil, the calculations shown in the first part of this article, indicated an average tax of 47 USD/bbl in OECD Europe and average end user price of some 70 USD/bbl in 1994. Gasoline has the highest taxation and would yield a per barrel price of some 140 USD in Europe, while taxes (and end user prices) are falling on heavier products.

Usually, prices on crude oil are set in USD/bbl (a price per volume unit of crude oil), while prices on gas usually are set in USD/mmbtu (a price per unit of energy content of the gas). The ordinates to the left and right, respectively, only illustrate the relationship between the two prices. The gas price bar to the right shows that gas prices to end users are determined by the price of its alternatives, here fuel oils. The price of the alternatives to gas determines the size of the "cake" to be distributed between consuming countries' governments (excise taxes on natural gas), distribution and transmission networks and producers (and, thus, the frame for producing countries' treasuries take from producers). Until now, margins to

**Table 6 European gas prices; the relationship to oil prices and petroleum excise taxes (simplified illustration)**



LDCs and pipelines are not reacting to changes in market prices, and are more based on arguments on capital costs. Thus, the price of gas to the exporter can be changed in the following ways (keeping taxes on gas itself constant):

- A higher crude oil price raises fuel oil prices and, thus, end user prices on gas.
- Higher taxes on fuel oils also increase end user prices on gas.
- Higher taxes on all other oil products will, if they reduce lower crude oil prices, lead to lower fuel oil prices, and, thus, lower end user prices on gas.
- If taxes on all oil products raise simultaneously, it is not clear whether the taxes are under- or overcompensated of a possible lower crude price resulting. It is the composition of oil product taxation that determines whether or not gas prices benefit from increased taxation.

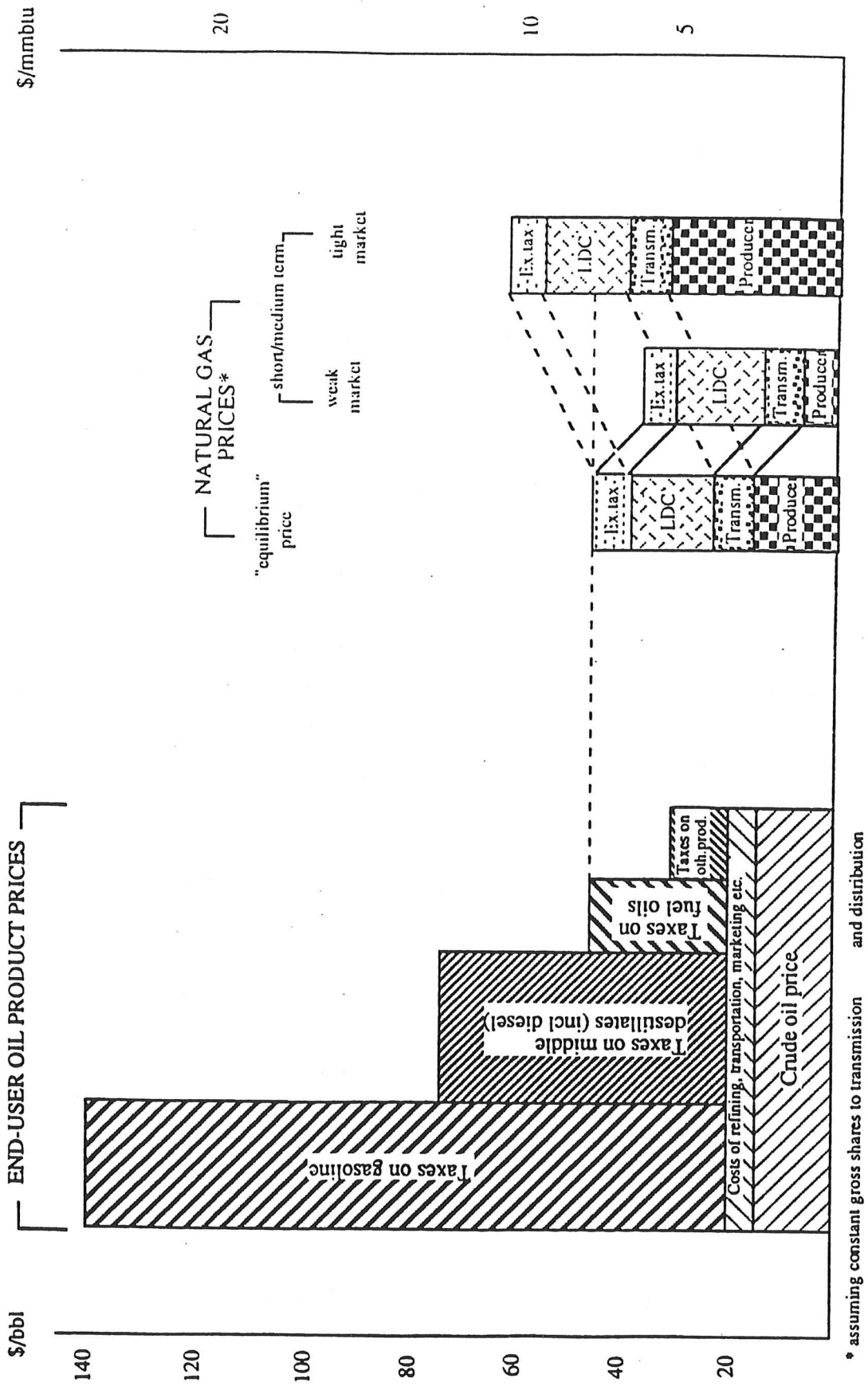
From these mechanisms, it is often said that the producer takes the "price risk" and the pipelines take the "volume risk" in today's market. However, as long as price and volume are interconnected in a market, it is the producer that *over time* takes most of the risk connected with gas sales today. Nevertheless, it is thinkable that transmission companies face so much difficulties in selling gas to their customers, that they have to lower prices and/or volumes sold to an extent that the take-or-pay (TOP) clauses become effective. In that situation, the companies involved may face a loss.

### **c. Prices in a more liberal market**

In general, liberalization of the European gas market will increase the number of actors operating and transactions made in the market, as well as the speed of reactions in one segment to changes in another. For example, when producers and customers make direct contracts and pipelines are not acting as balancing intermediators anymore, market conditions may more quickly affect producers' prices. The number of actors increases and the volumes of each contract (at least for producers) decrease. Brokers and marketers may establish themselves to clear (parts of) the market, in addition to the direct contact between parties.

Under liberalization, prices (for exporters) become more volatile as they react to market changes not only in the long term, but through gas-to-gas competition also in the short and medium term (which in the gas market may be up to as much as 5-10 years). In a surplus situation, a "gas bubble" would suppress prices in short-term contracts. On the other hand, when demand exceeds supply, spot and other short-term prices will be pushed up. When a short-term (or even spot) market for natural gas is developed, it may work as a barometer for the (underlying) trend in long-

**Table 7 European gas prices; price volatility in a liberalized market (simplified illustration)**



\* assuming constant gross shares to transmission and distribution

term prices. Depending on how the balance between supply and demand develops, prices may actually end up both below and above the prices within the existing system.

A tight gas market will produce more long-term, and a weak market more short-term contracts (including possible spot sales). With a higher number of actors and increased volatility, "long-term" in a new market structure will be shorter than in the existing system. More short-term transactions indicate greater variations in short- and medium-term prices depending on market tightness. How strong and quick responses will be, depends, besides on market conditions, on degree and shape of liberalization and firms' remaining market power. The increased number of short-term contracts will partly replace existing long-term contracts, but partly also satisfy customers not able to buy gas under today's system (with greater rigidity). Thus, demand may grow under liberalization.

The question has been raised whether gas could be priced independently of its alternatives. Over time, that is not possible for any commodity. For example, in the US gas prices have been lower than its alternatives for many years. However, these low prices were probably a result of the gas "bubble" existing after the mid 1980s, representing an over supply in the market. As consumption gradually reabsorbed available production capacity, prices have been rising. Also in the US, the market value principle for end user prices of gas seems to be valid, even though differences may occur in the short and medium term (which in the gas market may be a number of years).

However, if supply continuously overshoots demand, prices may remain lower than the price of the alternatives for longer time. This may, for example, happen if demand grows and the marginal producer makes economic rent even at low prices, and, therefore, continues to invest in new capacity. Similarly, if energy markets in general become tight and demand for gas overshoots supply, prices may over some time be higher than the price of the alternatives.

If pipelines become regulated, or competition between them intensifies, gas from different sources meets in "gas-to-gas competition" at the customers level (at the city gate where LDCs, power plants and large industrial users buy their gas), rather than on importing countries' borders (where merchant pipelines buy their gas). If producers maintain today's market position (as oligopolists), and transaction costs are not too high, they should meet a weaker and more diversified group of buyers at the customers level than at today's monopsonistic import level. Customers should also be better off by meeting a somewhat more diversified group of exporters than the monopolist they face in the form of a merchant pipeline.



In this case, customers' purchasing price should drop at the same time as producers' price increases. This implies that customers and producers share the rent made available from increased competition between pipelines. For both producers and customers it will be important to maintain a purchasing position as concentrated as possible. If, on the other hand, exporting countries' selling monopolies are abolished or weakened, and today's purchasing pipeline consortium maintained, each company within a single producing/exporting country should sell gas directly to the purchasing pipeline consortium. This would improve the relative position of the merchant pipelines and should lower producer prices to the benefit of the pipeline.

Theoretically, if no regulation of single firms takes place, but unbundling (throughout the gas chain) and price transparency are introduced and horizontal collaboration is made illegal both between producing companies and pipelines, this should have the potential of increasing the relative market power to pipelines. This is due to the assumption that pipelines have greater elements of natural monopoly (economies of scale and/or scope) than do producing companies. Thus, the most significant threat to pipelines' profit may be an actual regulation of the terms for operation, rather than increased competition, unless competition takes place only in the transmission segment. If regulation of transporters' behavior eventually is introduced, LDCs and pipelines may become more concerned about how regulation is made and may try to "trap" the regulator to serve their interests.

On the other hand, if nothing else happens than that competition increases between gas sellers / producers / exporters, pipelines' market position will be strengthened and profit transferred from producers to transporters (in new contracts). For example, this may be the effect if the ESA control committee (EFTA Surveillance Agency) finds the Norwegian sales (and field) organization (the GFUs) illegal according to EU/EEA competition rules and no other "liberalization" steps are taken further down the gas chain.

If pipelines' transporting and merchant functions are unbundled and their margins are competed or regulated down, they may be unable to fulfill their obligations towards producers in existing take-or-pay clauses. These experiences were made in the US in the mid 1980s after the introduction of Open Access under Order 436 simultaneously with the oversupply of gas in the market, as well. Similarly, contracts signed between pipelines and LDCs can neither be maintained. Pipelines' stabilizing brokerage function must be taken over by producers and customers through a greater and more diverse contract portfolio. Many of the existing contracts must be replaced with new contracts between producers and

customers. Alternatively, producers may be forced to relieve merchant pipelines from their TOP obligations.

Corrected for transaction costs, producers would benefit from selling gas directly to customers when end user markets are tight. Similarly, customers could benefit from buying gas directly from producers in a weak market. Thus, the process moving from one set/type of contracts to another as the market becomes more liberal, may take the form of various parties claiming the termination or renegotiation of existing contracts (perhaps on a force majeure basis).

#### d. Gas taxation

European taxes on gas usage have been more moderate than oil product taxation. As percentage share of end user prices, gas taxes have increased from some 15% in

**Table 8 Taxes as share of end user prices on gas and coal in selected countries**

	Households		Electricity		Industry		Coal industry	
	1984	1994	1984	1994	1984	1994	1984	1994
Austria	16.7	16.7	0.0	n.a.	0.0	0.0	0.0	0.0
Belgium	14.5	21.0	0.0	0.0	0.0	0.0	0.0	n.a.
Denmark	18.0	20.0	n.a.	n.a.	n.a.	n.a.	0.0	14.7
Finland	1.7	21.2	n.a.	n.a.	1.7	4.1	9.6	13.8
France	15.7	13.6	0.0	0.0	0.0	0.0	0.0	0.0
Germany	12.3	19.0	n.a.	16.6	0.0	13.5	0.0	0.0
UK	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Italy	13.4	42.1	0.0	0.0	0.0	11.6	0.0	n.a.
Netherlands	16.0	19.1	0.1	n.a.	0.0	n.a.	0.0	n.a.
Spain	1.5	n.a.	1.5	n.a.	1.5	n.a.	n.a.	n.a.
USA*	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Canada	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Japan	0.6	2.9	0.0	n.a.	0.9	2.9	n.a.	2.9
New Zealand	8.1	14.9	n.a.	n.a.	11.3	16.8	1.6	n.a.

\* Taxes on gas use vary between 3-6% of end user prices (IEA).

Source: IEA: Energy Prices and Taxes. (n.a.: not available/relevant).



1984 to some 20% in 1994. Taxation of gas to power plants and the industry is lower, in many countries zero. Even though gas taxes are low compared to oil product taxation, taxes on polluting coal are even lower, in fact coal is subsidized in many countries. This tax structure reinforces the impression that energy taxation in consuming countries is not primarily set with reference to the environment.

If gas taxes are raised, a first effect could be that the increase is partly producer and partly consumer paid. However, a tax raise must eventually be pushed down in the gas chain. Consumer prices can not over time be higher than the price of its alternatives. Taxes may be paid by end users in the short term and more permanently on the cost of a lower growth of gas demand. Transporters may also pay the tax in the short term at the cost of a lower profit margin. If, however, demand growth should be maintained, or the market is matured in a way that end user prices on gas equal prices on its alternatives, the tax must be paid by producer or the transporters through negotiations.

There may be different limits to gas taxation across sectors. Industries that use gas are in regional or European competition in using gas as an input factor. In the product markets, however, they are to a larger extent in global competition, in the same way as industry using oil as an input factor. Private households do not compete in global markets, but choose their energy (mix) according to relative prices (including taxes), technology, cost of switching between energies etc. This uneven competitive position across gas consuming sectors may imply that taxation on gas use in households/business will remain higher than on industry and power plants. Tax rates will depend on technology in the use of gas, as well.

At a given margin to transporters, the long-run marginal cost (LRMC) of bringing new gas to the market will set a limit to how low producer prices can be, and, thus, put a ceiling on gas taxes. If the share of natural gas shall continue to grow, exporters' prices should be higher than if consumption should remain stable. This may particularly be the case if new gas should come from Iran, Kazakhstan, northern Norway and Siberia (at least if Russian economy develops as a market economy).

With oversupply in a more liberal market, gas-to-gas competition may force prices to customers and consumers down. With fixed gross margins to transporters, this will push producer prices down, as well. In this situation, taxes must be lower than in a situation where gas prices equal the substitute price, in order to give producers a price that covers cost. However, in the "long run," end users' price of gas must equal the price of its alternatives. As long as gas prices are lower than prices on the alternatives, more users will switch to gas. Since we are facing an exhaustible, non-renewable resource, at some stage supply increases must take an

end, and prices to users again equal prices of its alternatives. As long as "long-run" in the gas industry may be 5-10 years and more (as in the US), a situation where supply continuously overshoots demand may put a limit to taxation for a rather long period.

If, however, energy taxes to a larger extent than today are set to reflect each carrier's environmental benefits and costs, taxes on gas should be low, and taxes on coal increased (and subsidies removed). Among fossil fuels, natural gas is the environment's best friend. The removal of coal subsidies should increase demand for gas. The price of gas should, however, remain the same as its alternatives. A (theoretical) removal of all gas taxes should, therefore, not increase gas consumption through lower prices to consumers. Low gas taxes would benefit producers (and possibly transporters) through higher prices and consuming countries through continued increases in supplies.

The conflict of interest on who should carry the cost of the tax, is not an issue between companies only. Producing countries' governments take most of the rent on the supply side, as consuming countries' governments take most of the rent on the demand side (both through taxation). Thus, energy taxation is a conflict of interest between producing and consuming countries, even more than between companies.

#### **e. Liberalization, taxation and gas supply**

The effects of higher gas taxes and market liberalization may become particularly problematic for producers when deciding upon whether to develop huge new gas fields or not. Firstly, liberalization will require more direct contacts with customers and greater activity in the markets to (partly) replace the broker role of transmission companies. Producers/exporters need time to develop this expertise and network to make a large enough portfolio of contracts to defend (the huge) investments. Furthermore, access to storage facilities is crucial to be able to supply customers on a regular basis.

Secondly, increased price volatility due to liberalization requires higher expected yield on investments as compared to today's more stable prices. In a liberalized market, the financing of new huge gas field developments will probably look more like the situation when oil fields are developed. Today, *ex ante*, the huge contracts to a large extent guarantee for investment costs.

Thirdly, and probably most problematic, is that purchasing countries through energy taxes have a political tool that, *ex post*, have the potential of deriving much of their expected rent. Therefore, one element that should be included in future

contracts is decisions over how a tax burden shall be shared within the industry. There is, however, difficult to limit future parliaments' ability to put new taxes on the use of gas. If the gas tax instrument is used to a larger extent than today, producers are not anymore facing market prices only, even in a liberalized market. With an active use of gas taxes, prices are heavily influenced by political decision making. If this situation cannot be solved, producers may not be able to take the price risk anymore, and, consequently, delay huge new investment projects. The consequence may be a slower growth in European gas consumption than most prognoses now foresee.

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## Literature

Austvik, Ole Gunnar, "En vurdering av produksjonskapasiteten for råolje i 5 land ved Den persiske gulf" in *NUPI-rapport*, No. 150, 1990

--- "Limits to Oil Pricing. Scenario Planning as a Device to Understand Oil Price Developments" in *Energy Policy*, Vol. 20, No. 11, November 1992, pp. 1097-1105

--- "The War over the Price of Oil: Oil and the Conflict on the Persian Gulf" in *International Journal of Global Energy Issues*, Vol. 5, No. 2/3/4, October 1993, pp.134-143

--- "Norwegian Petroleum and the European Union, Paying for the 'No?'" in *Geopolitics of Energy*, January 1995

--- "Liberalization of the European Gas Market; The Workings of Invisible and Visible Hands," report from a research project under the Norwegian Research Council in *HIL-paper*, No. 31 (working paper Lillehammer College), November 1996

--- *Energy Economics*, compendium for course to 'Master of Science in Energy Management', Norwegian School of Management (Handelshøyskolen BI), Sandvika, January 1996

--- "Avgifter tar forskjellen; Olje- og gassprisene faller, mens forbruksprisene holder seg" in *HIL-paper*, No. 17 (working paper Lillehammer College), April/October 1996

--- "Avgifter og petroleumspriser: Tar konsumentlandene olje- og gassinntektene?" *Sosialøkonomen*, No. 5, May 1996

British Petroleum, *BP Statistical Review of World Energy*, annual report, 1996

ECON, *Energy Taxes in the OECD*, report, No. 332, 1995

--- "Energy Taxes; Trends and Structures in the OECD and Selected Non-OECD Countries," report, No. 44, 1996

- European Union, *Council Directive of 29 June 1990 Concerning a Community Procedure to Improve the Transparency of Gas and Electricity Prices Charged to Industrial End Users*, CEL-Title 90/377/EEC, 1990
- *Council Directive of 31 May 1991, on the TRANSIT of Natural Gas through Grids*, CEL Title 91/296/EEC, 1991
- *Proposal for a Council Directive Concerning Common Rules for the Internal Market in Natural Gas (Third Party Access, TPA, directive)*, Com 91/548 Final SYN 385, 1992
- IEA (International Energy Agency), *Energy Prices and Taxes*, quarterly publication OECD, Paris
- Okugu, Bright, "Sharing the Downstream Barrel; Imbalance May Impact Investment" in *OPEC Bulletin*, May 1995
- Reinch, A. E., Considine, J. I. and MacKay, E. J., *Taxing the Difference; World Oil Market Projections 1994-2009*, CERl (Canadian Energy Research Institute), September 1994