

## Box 5

**THE EVOLUTION OF CONSUMER PRICES FOR OIL PRODUCTS IN 2011**

The increase in consumer energy prices was a key factor behind the elevated rates of HICP inflation in 2011, accounting for almost half of the overall rate of 2.7% in the first 11 months of the year – substantially more than their weight (around one-tenth) in the HICP basket. Within energy price inflation over the same period (12.1%), the prices of oil products (transport and

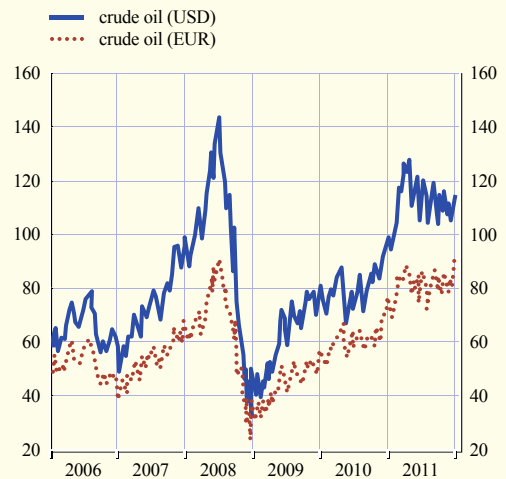
liquid heating fuels) increased twice as much (15.8%) as those of non-oil products (7.9%).<sup>1</sup> This box focuses on explaining developments in consumer prices for oil products, decomposing their evolution in 2011 into the main determining factors. This is done using a stylised representation of the pricing chain for oil products, which starts with international crude oil prices, goes through the refining process and the distribution to consumers, and ends with the imposition of taxes.<sup>2</sup>

### Crude and refined oil prices

The main factor behind the increase in consumer prices for oil products in 2011 was the development of crude oil prices, which averaged around USD 110 per barrel in 2011, significantly up on the average levels in 2010 (USD 80 per barrel). However, although oil products (both crude and refined) traded on international markets are generally quoted in US dollar terms, in order to understand the impact on euro area consumer prices and, in particular, the behaviour of distribution margins, it is their price in euro terms that is important. In this regard, the euro was, on average, stronger against the US dollar in 2011 than in 2010, although it weakened over the course of the year. Thus, unlike the slightly declining profile of crude oil prices in US dollar terms, between March and December 2011, crude oil prices in euro terms fluctuated around a level slightly above €80 per barrel (see Chart A). However, given the much lower levels in 2010, this translated into strong annual growth rates, which will prevail until around March 2012. Provided oil prices do not rise substantially in the meantime, annual energy price inflation should fall as a result of negative base effects.

Chart A Crude oil (Brent) prices

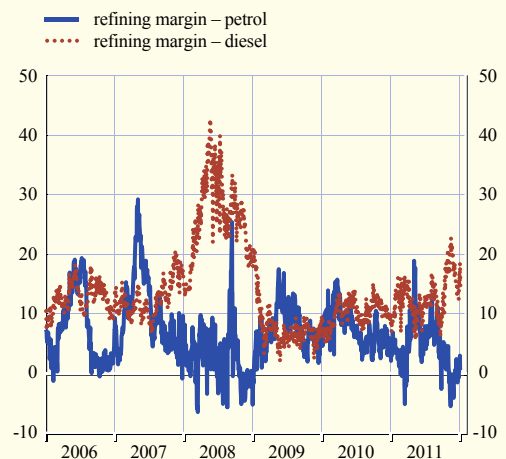
(USD/EUR per barrel)



Sources: Bloomberg, Thomson Reuters and ECB staff calculations.

Chart B Refining margins (crack spreads)

(USD per barrel)



Sources: Bloomberg, Thomson Reuters and ECB staff calculations.

1 Among the oil products, the average annual rates of increase were 14.0% for transport fuels and 24.8% for liquid heating fuels. Among the non-oil products, the average annual rates of increase were 8.7% for natural gas and 7.5% for electricity (the other two non-oil products, namely heat energy and solid fuels, which have lower weights in the HICP, increased on average by 7.2% and 3.3% respectively).

2 For a more detailed description and discussion, see Meyler, A., "The pass-through of oil prices into euro area consumer liquid fuel prices in an environment of high and volatile oil prices", *Energy Economics*, Vol. 31, No 6, pp. 867-881.

The next major step in the pricing chain is the refining process. Before crude oil can be used by consumers, it needs to be refined either into petrol (gasoline) or diesel (gas oil) – the latter may be used for both transport and home heating purposes. Chart B shows the refining margins (so-called crack spreads) for refined petrol and refined diesel, which are calculated simply as the difference between the price of the refined product and the price of the crude oil.<sup>3</sup> Diesel margins fluctuated around a level slightly above USD 10 per barrel for most of 2011, before increasing substantially to around USD 20 per barrel for a short period in late November and early December. Petrol margins showed a markedly different pattern, however, fluctuating considerably between USD 0 and USD 10 for most of 2011, but entering into negative territory in late November and early December (i.e. the price of refined petrol was below that of crude oil).

One reason for the divergence between the refining margins towards the end of the year may be the fact that Europe is considered to be structurally “long” in petrol (i.e. it produces more petrol than it requires), but “short” in diesel (the share of diesel cars in new passenger car registrations rose substantially during the 2000s; in addition, diesel is the main type of fuel used in commercial vehicles). Being structurally long in petrol may then be accentuated by the fact that the refining process generally requires that, to increase the output of diesel, refiners also have to increase the output of petrol (as both are products of the refining process). These structural market features, combined with the onset of winter (when demand for liquid heating fuels rises), may have been the main factors behind the recent sharp divergence in petrol and diesel refining margins.

### Distribution and taxes

The next steps in the pricing chain are the distribution of refined products to consumers and the imposition of taxes. To estimate distribution margins and the impact of taxes, the ECB uses data on consumer prices for transport and liquid heating fuels from the European Commission’s weekly Oil Bulletin, which, unlike HICP data are: i) available in terms of price level (i.e. euro cent per litre) rather than as indices; ii) provided including and excluding taxes; and iii) for transport fuel, broken down into petrol and diesel.<sup>4</sup> Charts C and D, which plot the annual rates of change in the weekly Oil Bulletin data alongside the monthly HICP data, illustrate that, although the Oil Bulletin data are not official statistics on consumer prices, they capture official HICP dynamics very well. Moreover, as they cover both petrol and diesel prices, it can be seen that, on average, diesel prices increased at a higher rate (17.5%) than petrol prices (12.0%) during 2011, which may have been due to differences in refining margins, as discussed above. A higher annual rate of change was also evident in the prices of liquid heating fuels (around 25% on average). This higher percentage change was attributable not only to refining spreads (which also had an impact on diesel prices), but also to there being lower excise duties on heating fuel than on other oil products. As excise duties are fixed amounts, higher (lower) excise duties mean that the percentage change in consumer prices is lower (higher) in response to a given percentage change in oil prices.

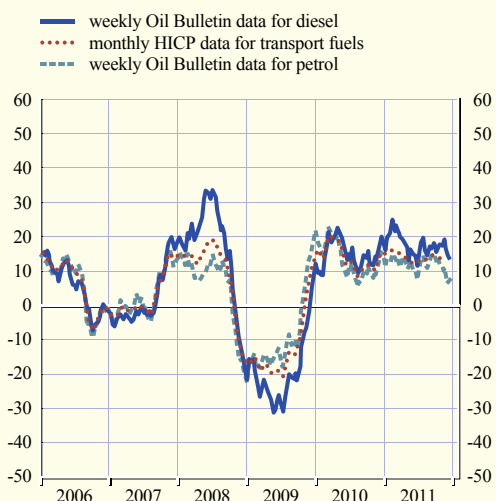
In order to quantify the contributions of the different factors to the developments in consumer prices for oil over 2011, the table presents the estimated decomposition of consumer prices for oil products (based on data from the weekly Oil Bulletin), with each component having been

<sup>3</sup> The actual margin of the refiner can depend on the specific grade of the crude oil used as input, the price of the other refined outputs obtained, as well as non-oil cost factors.

<sup>4</sup> These data are available at [http://ec.europa.eu/energy/observatory/oil/bulletin\\_en.htm](http://ec.europa.eu/energy/observatory/oil/bulletin_en.htm). In addition to being available in both pre- and post-tax terms, these data have a number of other attractive features, namely that they are available at high frequency (weekly) and in a timely manner (data on consumer prices on Monday are usually available by the Wednesday or Thursday of the same week).

**Chart C Transport fuels**

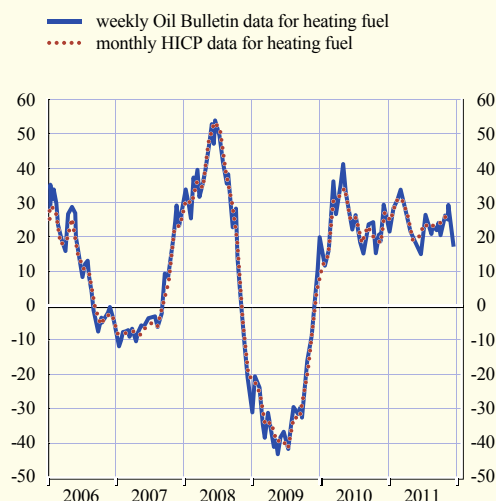
(annual percentage changes)



Sources: European Commission (DG ENER), Eurostat and ECB staff calculations.

**Chart D Liquid heating fuels**

(annual percentage changes)



Sources: European Commission (DG ENER), Eurostat and ECB staff calculations.

converted into euro cent per litre terms for comparability purposes. On average across the euro area, compared with 2010, petrol prices including taxes rose by 16 euro cent per litre to 151 euro cent per litre in 2011. By contrast, owing to lower indirect taxes, the prices of diesel and heating fuel remained lower on average in 2011 (at 135 euro cent per litre and 91 euro cent per litre respectively), although the price increases were larger (20 euro cent per litre and 18 euro cent per litre respectively).

The single largest and common factor behind these increases was the rise in crude oil prices (12.7 euro cent per litre). Taxes were the second biggest factor, with a combination of rises in excise duties and “multiplier” effects from value added tax (VAT). These multiplier effects reflect the fact that VAT is levied as a percentage of the pre-tax price plus the excise duty: an increase in either pre-tax prices or excise duties will thus also give rise to an increase in VAT. The actual

**Estimated decomposition of average consumer prices for oil products in the euro area**

(euro cent per litre, unless otherwise indicated)

	Petrol			Diesel			Heating fuel		
	2010	2011	Change	2010	2011	Change	2010	2011	Change
<b>Crude oil</b>	<b>38.0</b>	<b>50.7</b>	<b>12.7</b>	<b>38.0</b>	<b>50.7</b>	<b>12.7</b>	<b>38.0</b>	<b>50.7</b>	<b>12.7</b>
Refining costs and margins	3.5	2.0	-1.6	4.8	5.8	1.0	4.8	5.8	1.0
Distribution costs and margins	12.2	13.0	0.8	12.9	14.5	1.6	9.7	10.1	0.4
<b>Pre-tax consumer price</b>	<b>53.7</b>	<b>65.7</b>	<b>12.0</b>	<b>55.7</b>	<b>71.0</b>	<b>15.3</b>	<b>52.5</b>	<b>66.6</b>	<b>14.1</b>
Taxes, of which:	81.3	85.5	4.2	59.4	64.2	4.8	21.0	24.5	3.5
Excise duty	59.3	60.5	1.2	40.9	42.1	1.2	9.1	9.6	0.5
VAT	22.0	25.0	3.0	18.5	22.1	3.6	11.9	14.9	3.0
VAT rate	19.5%	19.8%	0.3 p.p.	19.1%	19.5%	0.4 p.p.	19.4%	19.6%	0.2 p.p.
<b>Post-tax consumer price</b>	<b>135.0</b>	<b>151.1</b>	<b>16.2</b>	<b>115.1</b>	<b>135.2</b>	<b>20.1</b>	<b>73.5</b>	<b>91.0</b>	<b>17.6</b>

Source: ECB staff calculations.

impact stemming from the hikes in VAT rates (on average between 0.2 percentage point and 0.4 percentage point) was of a smaller magnitude. In each case, taxes pushed up the consumer price, with the strongest rise being for diesel (4.8 euro cent per litre). By comparison, refining and distribution costs and margins had less of an impact. Distribution costs and margins resulted in stronger increases for diesel (1.6 euro cent per litre) than for petrol (0.8 euro cent per litre) and heating fuel (0.4 euro cent per litre), while refining costs and margins pushed the consumer price down for petrol (by 1.6 euro cent per litre), but up for diesel and heating fuel (by 1.0 euro cent per litre).

Looking forward, under the assumption that refining margins do not alter substantially and that there are no major widespread changes in the taxes on oil products, the path for crude oil prices implied by current futures prices is such that – mainly owing to base effects – it will have a significant dampening impact on the annual rate of change in consumer prices for oil products in the first few months of 2012.