

Rising prices at the pump since 2022 reflect crude oil price trends as well as the increase in refining costs and the cost of fuel transport and distribution

Since 2022, in a context of strong geopolitical tensions and imbalance between oil supply and demand, fuel prices at the pump are reaching much higher levels than before the health crisis. The pump price of a litre of fuel was €1.82 in November 2023 against €1.47 on average between 2018 and 2019. This Focus study breaks down the price of a litre of petrol at the pump, taking into account fluctuations in the price of crude oil, the costs of refining fuels (defined as the difference between the price of refined products and the price of crude), transport-distribution costs (defined as the difference between prices at the pump excluding tax and the price of refined products) and taxes.

The high pump prices observed since 2022 are due to the rise in the price of crude oil (+17 euro cents per litre for the period January 2022-November 2023 compared to the 2018-2019 average) and the increase in the price gap between crude oil and refined products (+12 cents). Transport and distribution costs have increased more moderately since 2022 (+9 cents per litre). Regarding fuel taxes, excise duty (formerly TICPE) is frozen at its 2018 level. Only revenue from VAT, which varies depending on the price of the product excluding tax, has increased (+5 cents per litre) but much less than the price of crude oil.

While the increase in crude oil prices has repercussions on prices after refining and on distribution costs, econometric modelling shows that part of the increase in pump prices remains unexplained by these price fluctuations alone. Since 2022, prices of refined petroleum products have averaged 18% above the modelled price, given crude oil prices. This difference may reflect other energy costs linked to environmental goals or an increase in net refining margins in Europe, explained, among other things, by tensions in oil refining capacities. The difference between prices at the pump and simulated prices, given the prices of refined products, has been less pronounced since 2022 (+6%). This gap may represent an increased burden in transport-distribution costs (such as energy, compliance with regulatory constraints or payroll), and possibly an increase in net margin. The analysis is still surrounded by the uncertainty inherent in modelling fuel prices. In addition, since the end of September 2023, the fall in oil prices and the cost-price sales strategies employed by distributors have led to a more pronounced drop in pump prices in hyper- and supermarkets than in outlets of the major brands.

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Fuel prices at the pump are still higher in 2023 than before the health crisis

After plummeting in 2020 as a result of the lockdowns, the price of crude oil was once again above its pre-crisis level (considered as the average between 2018 and 2019) in summer 2021, then soared in early 2022 in a context of strong geopolitical tensions and an upturn in global oil demand (► [IEA report](#)).

Although the price of crude oil fell back partially from summer 2022, it took off again in summer 2023 as a result of the cutting of production quotas by OPEC+. Despite the resurgence in geopolitical tensions in the Middle East since 7 October, the price of crude oil stabilised in November at around \$80 per barrel, or 48 euro cents per litre of petrol, against a backdrop of fears over global demand (► [Figure 1](#)).

The rise in crude oil prices impacts directly on pump prices. Thus, in November 2023, the price of a litre of fuel at the pump reached €1.82 per litre against an average of €1.47 between 2018 and 2019.

The sharp rise in pump prices since 2022 compared to the pre-crisis level (+24%) was nevertheless much less pronounced than the rise in the price of crude oil (+47%). In fact, the price of oil accounts for only about a quarter of the price of fuel. Another quarter of fuel price represents first, the price difference between crude oil and refined petroleum products and second, transport-distribution costs. Finally, half of the price of fuel consists of taxes on energy products (excise duty, former TICPE) or on value added (VAT, ► [Figure 2](#)), with excise duty being a flat-rate tax, independent of the prices excluding taxes.

Fuel refining costs and transport-distribution costs have increased more, proportionally, than the price of crude oil

The fuel refining costs considered here (diesel and premium-grade petrol) correspond to the difference between the price of refined fuel and the price of crude oil listed in Rotterdam for the European market. They are distinct from the notion of gross refining margin

French economic outlook

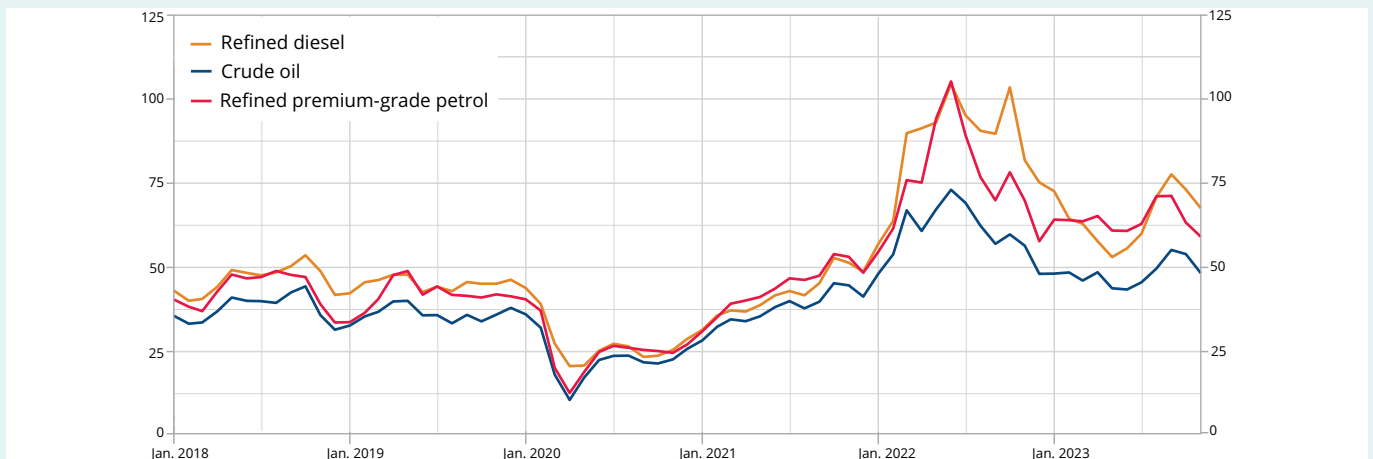
on Brent which corresponds to the difference between the valuation of a basket of refined petroleum products (including other products than the fuels considered in this Focus study) and the price of Brent.

These costs have more than doubled since 2022, representing, for all fuels as a whole, 19 euro cents on average per litre against 7 euro cents on average in 2018-2019 (► **Figure 3**). Several factors may have contributed to this increase, notably the disruption of world petroleum product markets following the Russian invasion of Ukraine, and the trend increase in the prices of emission allowances in the European Union’s Emissions Trading System (EU ETS). This increase may also be due to a rise in the net refining margin on petroleum products in the face of relatively inelastic demand for oil (► **Bonnet and al., 2023**).

Transport-distribution costs, defined as the difference between the price of fuels excluding tax and the price of refined products listed in Rotterdam for the European market, have increased since 2022 by 61% compared to the 2018-2019 average. At the end of 2023, this cost is 23 euro cents per litre on average for all fuels compared to 14 euro cents between 2018 and 2023. This increase in cost may reflect increases in transport and storage costs, also wage increases in transport or trade services (► **Prices of services**). Other regulatory and environmental factors may also have contributed to this rise, such as increased costs linked to the French energy saving certificate mechanism (CEE) or the incorporation of biofuels and ethanol produced from plant material, the prices of which increased in 2022 because of tensions on the agriculture commodities markets. Finally, the net transport-distribution margin may also have increased since 2022.

► 1. Crude oil prices and prices of petroleum products listed in Rotterdam since 2018

(in cents of euro per litre of fuel)



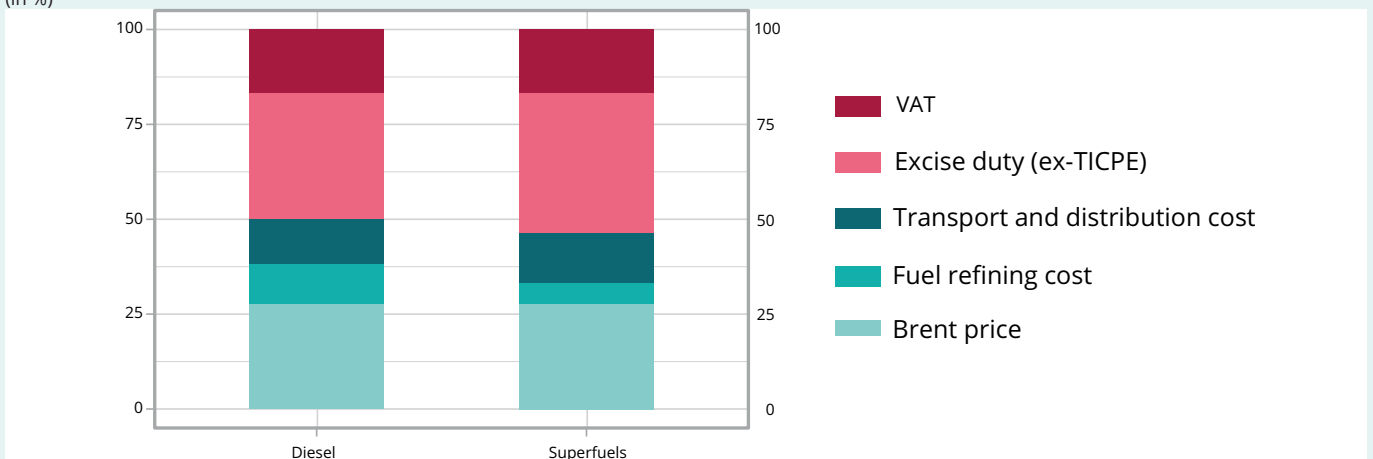
Last point: November 2023.

How to read it: in November 2023, crude oil represented 48 euro cents per litre of fuel. The price of refined premium-grade petrol was 59 euro cents per litre and that of diesel 68 euro cents per litre.

Source: Reuters, INSEE.

► 2. Breakdown of the price of a litre of diesel and of unleaded petrol in November 2023

(in %)



How to read it: in November 2023, fuel refining costs and transport-distribution costs represent 10% and 12% respectively of the price of a litre of diesel.

Source: DGEC, Reuters, INSEE calculation.

Fuel subsidies helped ease rising pump prices in 2022

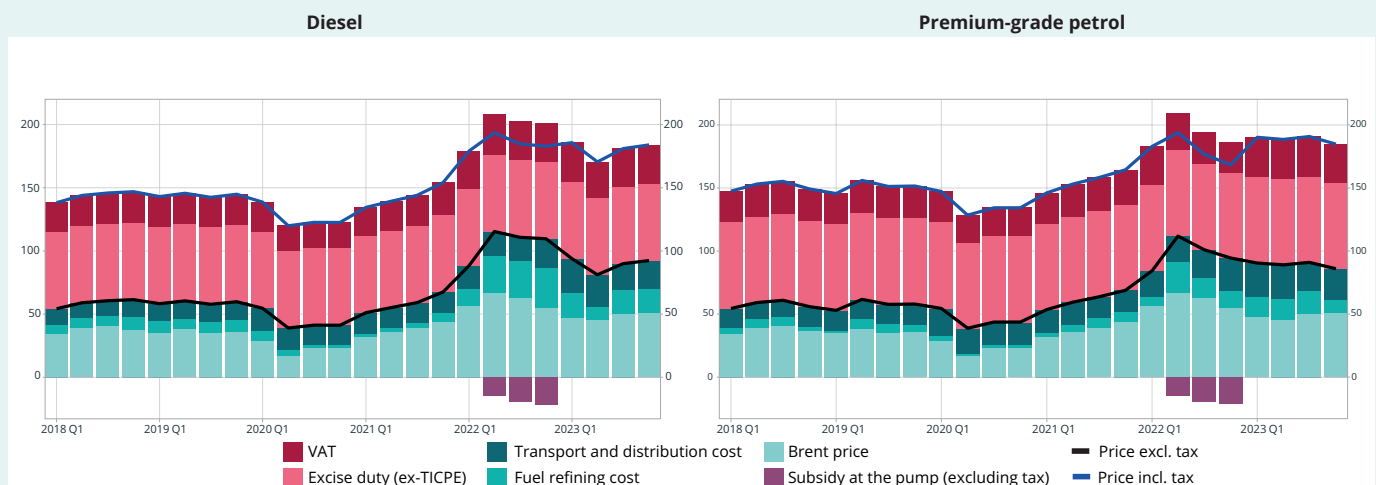
Taxes and subsidies on fuel had a moderating effect on the surge in prices at the pump. Firstly, excise duty on fuel (formerly TICPE) depends on volumes consumed and not on the market value of the fuel (► [INSEE, 2017](#)). Since 2018, in the absence of any revaluation, the duty for each type of fuel has remained constant and represents on average 64 euro cents per litre of fuel (► [Figure 3](#)). VAT, on the other hand, is proportional to price, including excise duty, at a rate of 20%. Thus an increase in the price of oil means an increase in VAT at the pump. All in all, the increase in the amount of tax on fuels since 2022 is 6% compared to the 2018-2019 average, i.e. a much smaller increase than that in oil prices (+47%). Thus the inertia of the excise duty on fuels has partly cushioned the rise in oil prices.

At the same time, fuel subsidies in 2022 have had a downward impact on fuel prices. The reduction at the pump, including tax, was 18 cents per litre between April and August 2022, then 30 cents between September and mid-November 2022 before dropping to 10 cents until the end of 2022. Since 2023, a means-tested fuel allowance with a lower budgetary cost has replaced the subsidy at the pump. This allowance is recorded as a social benefit in the national accounts (► [Household income](#)).

Although this accounting breakdown highlights a widening of the gap between the price of oil and that of refined products, and also higher transport-distribution costs, it is not possible to estimate net margins for refining and transport-distribution, i.e. price variations once the increase in intermediate production costs is taken into account.

► 3. Breakdown of the price of a litre of diesel and of premium-grade petrol since 2018

(in cents of euro per litre of fuel)



Note: Q4 2023 (data to end of November 2023).

How to read it: in Q4 2023, fuel refining costs and transport-distribution costs represent 19 and 22 euro cents respectively of the price of a litre of diesel.

Source: DGEC, Reuters, INSEE.

Since 2022, increases in prices of refined petroleum products and in prices at the pump (excluding tax) have been more pronounced than simulated increases based only on the market price of crude oil

Long-term econometric modelling of fuel prices reveals a possible gap between observed prices and those expected solely due to crude oil prices (► [Method box](#)). Modelling is in two stages. First, the equation for the price of refined oil listed in Rotterdam is linked to the price of crude oil, an input in the refining process, and in this way it is possible to compare the refiners' selling price to the expected price, given the listed value. Second, using the equation for fuel prices excluding tax, linked to the price of refined petroleum products, the distributors' selling price can be compared to the expected price, given the acquisition cost of refined fuel.

According to the model chosen here, the price of refined oil first contracted compared to the simulated price during the health crisis (-7% on average in 2020-2021) before bouncing back more strongly, higher than the simulated price since 2022. Since then the prices of refined petroleum products have been, on average, 19% above the price modelled for premium-grade petrol (► [Figure 4a](#)) and 18% above for diesel (► [Figure 4b](#)). Over the entire period 2020-2023, the prices of refined products have been 5% above the simulated price based on crude oil prices, compared to the relationship estimated over the period 2007-2019. This difference may reflect the increase in energy and environmental costs not taken into account in the model, especially the increase in prices of emission allowances in the ETS. It may also reflect margin behaviours.

French economic outlook

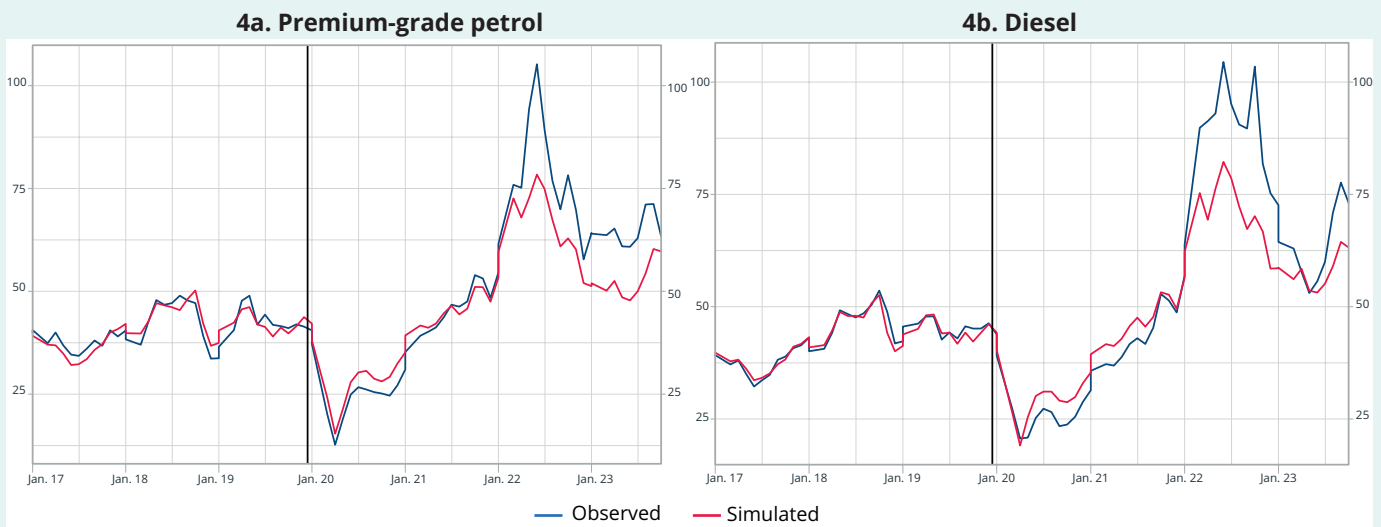
Similarly, since 2022, according to the model used here, the price at the pump, excluding tax, as sold by the distributors has been higher than the simulated price (+6%), given the prices of refined oil products. This difference is less pronounced than that for the refining industry prices. It is slightly higher for premium-grade petrol (► Figure 5a) than for diesel (► Figure 5b) and has been partially absorbed at the end of 2023. Again, this difference reflects factors not taken into account in the model, especially those linked to regulatory obligations (energy saving certificate, incorporation of biofuels), but also the increase in the cost of other normal operating

costs in trade and transport services, such as the increase in payroll. This rise may also correspond to margin behaviours.

In autumn 2023, cost-price sales strategies led to a greater drop in prices at the pump in the major supermarkets

At the end of September 2023, the government encouraged distributors to sell their fuels at cost price. In order to study the potential effect of this measure according to category of distributor, we analyse the

► 4. Price of refined oil listed in Rotterdam, simulated and observed (in cents of euro per litre of fuel)



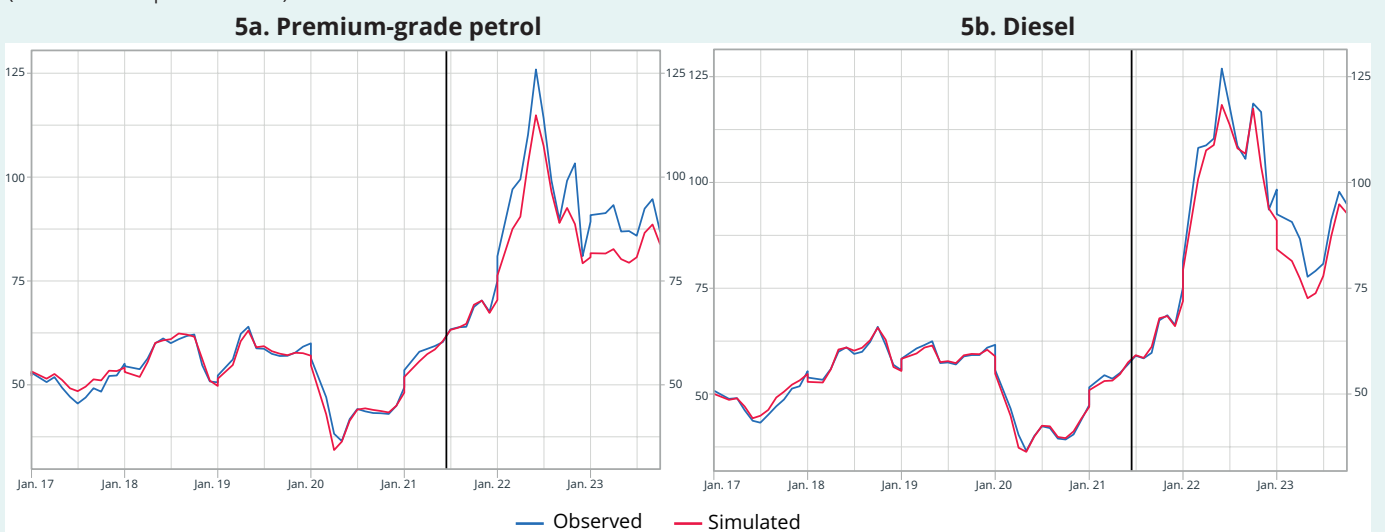
Last point: November 2023.

Note: estimation period to the left of the vertical line.

How to read it: in November 2023, the observed price of refined premium-grade petrol (or refined diesel) listed in Rotterdam was 59 (or 68) euro cents whereas, according to the econometric model selected, the simulated price was 54 (or 58) euro cents per litre, or a difference of +10% (or +17%) compared to the theoretical long-run equilibrium price.

Source: Reuters, INSEE modelling.

► 5. Price of refined oil, excluding tax, simulated and observed (in cents of euro per litre of fuel)



Last point: November 2023.

Note: estimation period to the left of the vertical line.

How to read it: in November 2023, the observed price of premium-grade petrol (or diesel) excluding tax was 85 (or 90) euro cents per litre whereas, according to the econometric model selected, the simulated price was 79 (or 87) euro cents per litre, or a difference of +7% (or +3%) compared to the simulated price.

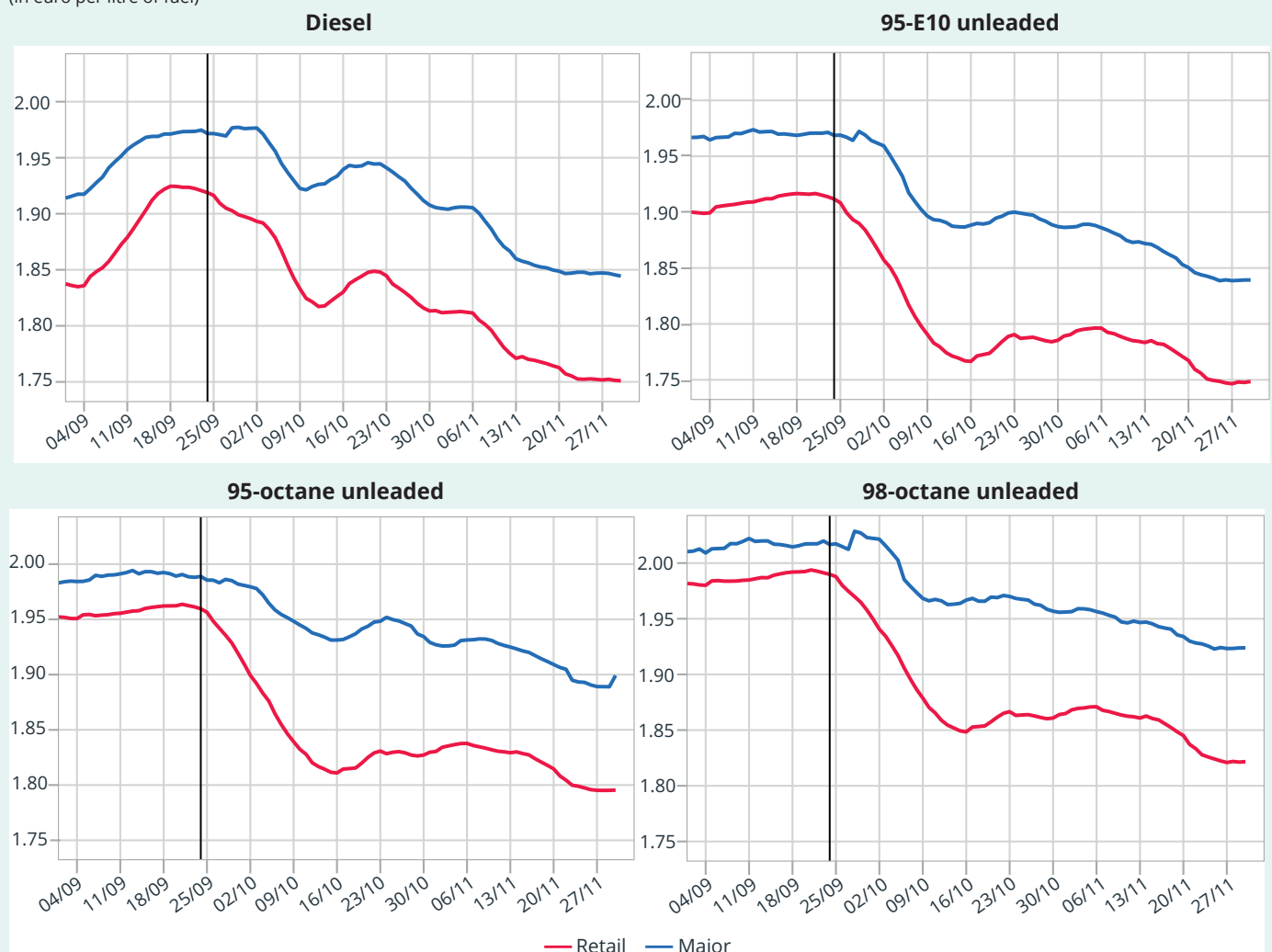
Source: DGEC, Reuters, INSEE modelling.

daily fuel price statements from several thousand petrol stations run by major petrol brands or by hyper- and supermarket retail chains. Fuel prices are usually lower in the large supermarkets than in outlets run by the major brands, reflecting not only the location of the petrol stations but also the intensity of the competition and the sales strategies employed by the brands (► [Gautier and al., 2017](#)). In particular, the major brands are much more present than supermarkets on motorway service areas and therefore find themselves in an oligopolistic situation. However, the costs of operating a motorway service station are higher. In addition, in hyper- and supermarkets, fuel can also be considered temporarily as a loss leader, which can lead to a compression of the net distribution margin.

Since the end of September 2023, prices at the pump in hyper- and supermarkets have fallen by 11 euro cents per litre, against 7 euro cents per litre with the major brands (► [Figure 6](#)). However, this drop takes place in a context of declining refined oil prices (-8 cents per litre on average since the end of September). It is more pronounced in unleaded petrol than diesel in hyper- and supermarkets, mainly reflecting downward movements in the markets. For the major brands, pump prices fell much less than the prices of refined oil products, which may be due to a later price adjustment when market values were trending downwards rather than upwards (► [Audenis and al., 2002](#)) for the brands in an oligopolistic situation. ●

► 6. Pump price of fuels, including tax, by category of distributor

(in euro per litre of fuel)



Last point: 30 November 2023.

Method: prices are a weekly moving average of daily readings taken in 3,900 hyper- and supermarket chains and 2,700 major brand outlets. These data by category of distributor are the result of matching data on the government website on fuel prices by service station (<https://prix-carburants.gouv.fr/>) and a list of brand outlets obtained by scraping data from the <https://carburants.org/> website. Outliers where the price at the pump per litre, including tax, is less than €1 or more than €3 are excluded from the sample for analysis.

Note: the vertical bar corresponds to 24 September 2023, date when the government encouraged distributors to sell their fuel at cost price.

How to read it: On 30 November 2023, the pump price of a litre of 95-E10 unleaded was €1.75 in hyper- and supermarkets compared to €1.84 for the major brands.

Source: "prix-des-carburants.gouv.fr" (co-managed by the DGEC and the DGCCRF), INSEE calculation.

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Method box: econometric modelling of prices of refined products then prices at the pump excluding tax

The data used for this Focus study are based in part on the market values for oil listed in Rotterdam for the European market (prices of crude oil and refined petroleum products). Weekly prices including tax and excluding tax are published by the Directorate General for Energy and Climate (DGEC). Prices of unleaded petrol are an aggregate of the prices of 95-octane unleaded, 95-E10 unleaded and 98-octane unleaded according to the annual consumption structure of the consumer price index. Aggregated fuel prices reflect the respective annual weighting of premium-grade petrol and diesel.

Econometric modelling of the prices of refined oil products and the prices of fuels at the pump, excluding tax, was based on ► [Bortoli and Milin, 2016](#) and ► [Bessone, Meyer and Subran, 2005](#).

Modelling the price of refined oil products sold by the refining industry

The expected price of refined oil products is estimated by regressing the price of refined products listed in Rotterdam against the price of crude oil using an error correction model. The model assumes that the only long-term economic determinant of the factory gate price of refined products is the price of crude oil. It does not take into account other factors, such as the price of the emissions allowance in the ETS. This relationship is estimated monthly, differentiating diesel and unleaded fuel, and takes the following form:

$$\Delta P_t^{Raffinage} = cst + \Delta P_{t-1}^{Raffinage} + \sum_{i=0}^1 \Delta (Brent_{t-i}) + \lambda_1 (P_{t-1}^{Raffinage} - Brent_{t-1}) + \epsilon_t$$

With :

$P_t^{Raffinage}$: the factory gate price of refined fuel listed in Rotterdam for the European market in euro cents per litre.

$Brent_t$: the price of crude oil listed in Rotterdam for the European market in euro cents per litre of fuel.

Estimation period: January 2007–December 2019.

The long-term econometric relationship seems relevant as it is stationary, and the restoring force is significant.

Thus the difference between the observed price of refined products and the simulated price is not explained by the variation in the price of crude oil but by other factors not taken into account in the model (in particular the price of the emissions allowance in the ETS).

Modelling the selling price at the pump, excluding tax, sold by distributors

Modelling the distributors' selling price at the pump highlights two long-term determinants of the pump price, excluding tax. First, the factory gate prices of refined products correspond to the acquisition cost by the transporters. Second, long-term gross transport-distribution costs have been structurally increasing since the mid-2010s. By adding a positive trend over the estimation period, this change can be controlled over a long period, and it is then possible to partly capture the effect of regulatory constraints (incorporating biofuels and energy saving certificate).

The net transport-distribution margin is also estimated monthly and separately for diesel and unleaded..

$$\Delta P_t^{HT} = cst + \Delta P_{t-1}^{HT} + \sum_{i=0}^1 \Delta (P_{t-i}^{Raffinage}) + \lambda_1 (P_{t-1}^{HT} - P_{t-1}^{Raffinage} - Tendance_{t-1}) + \epsilon_t$$

With :

P_t^{HT} : the pump price of fuel, excluding tax, in euro cents per litre.

$P_t^{Raffinage}$: the factory gate price of refined fuel listed in Rotterdam for the European market in euro cents per litre.

Tendance: a positive trend reflecting the structural increase in transport-distribution costs over the estimation period.

Estimation period: January 2014–June 2021.

The long-term econometric relationship linking the pump price, excluding tax, to refined product prices and to the trend mentioned above appears stationary, and the restoring force is also significant. Thus the difference between the observed price of refined products and the simulated price is not explained by the variation in the price of refined products but by other factors not taken into account in the model. For example, this may be due to the fact that the long-term trend imperfectly models the impact of regulatory constraints linked to the energy saving certificate and the incorporation of biofuels. ●

► 7. Modelling the price of refined oil listed in Rotterdam against the price of crude oil

	Explained variable			
	Premium-grade petrol		Diesel	
	ECM	LT relation	ECM	LT relation
$\Delta P_{t-1}^{Raffinage}$	0.128 (0.081)		0.009 (0.080)	
$\Delta Brent_t$	1.118*** (0.060)		1.035*** (0.038)	
$\Delta Brent_{t-1}$	0.004 (0.112)		-0.036 (0.095)	
λ_1	-0.265*** (0.055)		-0.189*** (0.046)	
$Brent_t$		1.088*** (0.025)		1.134*** (0.018)
Constant _t	-0.006 (0.162)	9.577*** (0.994)	0.002 (0.103)	5.231*** (0.735)
RMSE	1.98	3.18	1.26	2.35
Stat. DW	1.959		1.988	
Observations	154	156	154	156
R ²	0.762	0.925	0.853	0.961
R ² Adjusted	0.756	0.925	0.849	0.961
Test F	119.577*** (df = 4; 149)	1,902.960*** (df = 1; 154)	216.093*** (df = 4; 149)	3,788.854*** (df = 1; 154)

Note : *p<0.1; **p<0.05; ***p<0.01.

► 8. Modelling the price at the pump, excluding tax, against the price of refined oil listed in Rotterdam

	Explained variable			
	Premium-grade petrol		Diesel	
	ECM	LT relation	ECM	LT relation
ΔP_{t-1}^{HT}	0.087 (0.081)		-0.074 (0.082)	
$\Delta P_t^{Raffinage}$	0.562*** (0.025)		0.743*** (0.025)	
$\Delta P_{t-1}^{Raffinage}$	0.077 (0.062)		0.177** (0.082)	
λ_1	-0.274*** (0.071)		-0.431*** (0.099)	
$P_t^{Raffinage}$		0.783*** (0.021)		0.940*** (0.013)
Tendance _t		0.094*** (0.009)		0.106*** (0.005)
Constant _t	0.042 (0.105)	5.173*** (1.792)	0.070 (0.081)	-1.133 (1.039)
RMSE	0.95	1.81	0.72	1.14
Stat. DW	2.003		2.007	
Observations	87	89	87	89
R ²	0.907	0.943	0.941	0.983
R ² Adjusted	0.902	0.942	0.939	0.983
Test F	198.984*** (df = 4; 82)	712.828*** (df = 2; 86)	329.495*** (df = 4; 82)	2,505.764*** (df = 2; 86)

Note : *p<0.1; **p<0.05; ***p<0.01.