

Energy markets and the macroeconomy

V. Baugnet
D. Dury⁽¹⁾

Introduction

Energy plays a crucial role in economic life, particularly in the functioning of advanced economies such as the euro area or Belgium. It is involved in every aspect of the daily life of households, in the movement of persons and goods, and as an input in the various production activities. Thus, energy is a substantial element of household consumption expenditure and business production costs.

In recent times, energy prices have been particularly volatile. In particular, having hovered around 20 US dollars per barrel in the 1990s, the price of crude oil has risen steadily since 2004, peaking at almost 150 dollars in mid 2008 before dropping to just under 35 dollars at the end of 2008. Since then, the price per barrel has climbed back, reaching 75 dollars on 16 August 2010 when this article went to press. The expected growth of global demand for energy, generated in particular by the development of the emerging economies, and the increasing scarcity of certain resources are factors which could cause a structural increase in prices in the future, possibly tempered by the expanding use of renewable energy and the downward trend in energy intensity in the industrialised countries. Prices could remain highly volatile, since, apart from the possible influence of financial factors, they are also influenced by the dynamism of demand, the intensity of investment permitting the exploitation of new oil reserves, and the development of new technologies. Economic policies are increasingly taking account of the issue of climate change: measures taken in that connection influence consumption patterns and the setting of energy prices.

Taking account of all these factors, it is vital to know what determines the movement in energy prices and how

shocks affecting global oil prices – which play a major role – ultimately feed into activity and prices. That information is necessary, among other things, to determine monetary policy. That is why the ECB focused on this subject in the Structural Issues Report 2010 which it produced with the Eurosystem NCBs (cf. ECB, 2010). Based largely on the findings of that report, this article highlights the specifically Belgian aspects. The first section describes the main long-term trends in Belgium in regard to production, imports, consumption, energy dependency and energy intensity. The second section analyses the setting of prices on the end product markets and the functioning of those markets. The third section offers a theoretical review of the main mechanisms by which oil prices are transmitted to activity and inflation, and then presents an illustration using simulations based on econometric models. The final section presents the conclusions.

1. Long-term trends in energy production and consumption

Energy production, imports, gross consumption and energy dependency

Energy market equilibrium is the outcome of the interaction between primary energy production, net imports and gross consumption. Primary production is the output resulting from the use of domestic natural resources. Up to 1975, coal was the only source of primary production of energy in Belgium. The gradual abandonment of coal mining led to a steady decline in primary production: from 13.9 million tonnes of oil equivalent (TOE)

⁽¹⁾ The authors wish to thank K. Burggraeve, D. Cornille, F. Coppens and C. Swartenbroeckx for their contribution to this article.

in 1960, it dropped to 6 million in 1974, and ceased altogether in the late 1990s. The nuclear industry began to develop in the second half of the 1970s, and reversed the downward trend in primary production of energy. According to statistical convention, the production of nuclear energy is classed as domestic even though the uranium is imported⁽¹⁾. The nuclear industry developed particularly rapidly in the 1980s following the start-up of four additional nuclear power stations; since 1997, production of nuclear energy has remained steady at around 12 million TOE per annum. Development of renewable energy started in the early 1990s, though very hesitantly at first. The growth of the renewable sector over the past twenty years is attributable primarily to the development of solid biomass (wood, biogas and waste). In 2008, it represented 95 p.c. of primary production of energy from renewable sources (or 2 million TOE), the rest being a small and stable amount of hydroelectric power, plus the production of solar energy and wind power- this latter has expanded fairly rapidly since 2004. Taking account of Belgium's characteristics – limited amount of sunshine, high population density, etc. – it is biomass – and more marginally wind power – that offer the main potential for growth in terms of renewable energy.

The development of nuclear and renewable energy has only partially compensated for the lack of oil and natural gas and the gradual closure of the coal mines. Consequently, Belgium has still had to resort to imports to meet its consumption needs. From 1960 to the present day, the pattern of imports has closely matched that of gross energy consumption. This refers to gross consumption, measured at the level of the extraction and production of the various primary energy sources, i.e. before their transformation into final forms of energy (notably electricity and refined oil products).

During the 1960s and for much of the following decade, gross energy consumption increased rapidly in Belgium: from 23.1 million TOE in 1960, it more than doubled in the space of twenty years to reach 49 million TOE in 1979. Net imports grew faster, given the need to compensate for the gradual reduction in the mining of domestic coal deposits; having represented 8.2 million TOE in 1960, net imports exceeded 45 million TOE in 1979. Following the 1973 and 1979 oil shocks, however, the growth of energy consumption slowed down, and even became negative in Belgium, measures having been implemented to limit it and thus reduce the country's energy dependency, mainly its dependency on oil. From 1983 onwards, gross energy consumption began rising again until the early 2000s, and imports mirrored that rise. A peak was reached in 2003-2004, at 59.1 million TOE for gross consumption and 54.1 million TOE for net imports. Since then, energy

consumption and imports have stabilised or even declined slightly, mainly as a result of a fall in energy intensity, as illustrated later in this article.

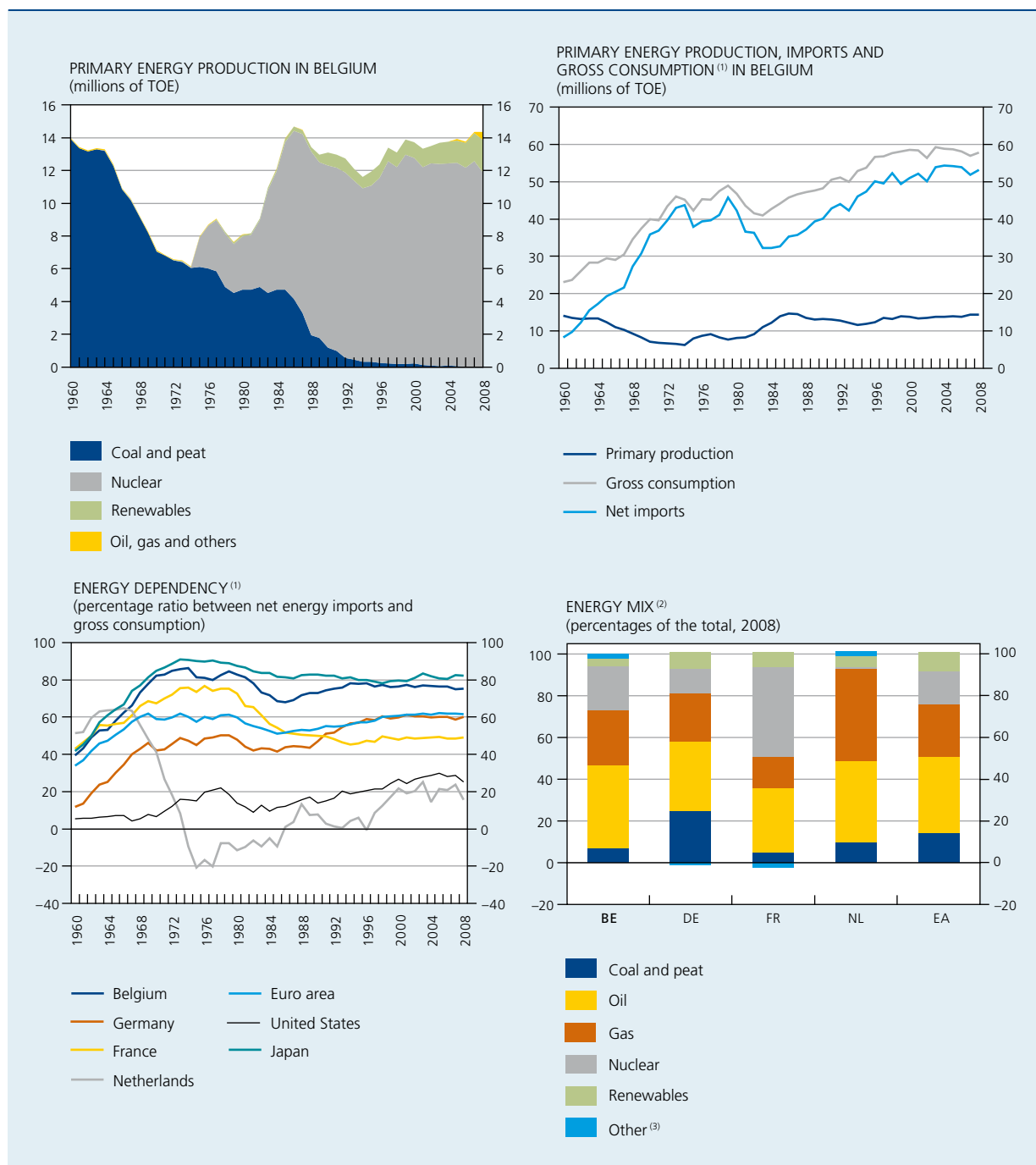
The ratio between net imports and gross consumption of energy provides a measure of energy dependency, which reflects the lack of domestic production capacity to satisfy energy needs. However, account must be taken of the fact that the import statistics include the quantities of petroleum products stored in international marine and aviation bunkers: those quantities do not constitute domestic consumption, but they may be significant, particularly in countries with a high level of port activity, such as Belgium. In 2008 these quantities were estimated at around 9.1 million TOE in Belgium. Leaving that aside, Belgium's energy dependency stood at 75 p.c. in 2008.

Following a steep increase in the 1960s (from 39 p.c. in 1960 to 82 p.c. in 1970), Belgium's energy dependency stabilised and then actually declined until the first half of the 1980s (it was 68 p.c. in 1985). Energy dependency increased again up to the early 1990s, before stabilising at around 75 p.c. In comparison with the euro area, the rise in the dependency ratio was greater in Belgium between 1965 and 1975 since coal production declined faster there, whereas in some euro area countries – especially the Netherlands – gas production expanded. Conversely, in the first half of the 1980s, Belgium recorded a bigger decline in its energy dependency than the euro area, owing to the steeper fall in its energy consumption and a faster rise in domestic production, particularly nuclear energy. During the past twenty years, the energy dependency of Belgium and of the euro area have developed in parallel.

In the end, Belgium is still considerably more dependent than the euro area as a whole, and than neighbouring countries: in 2008, energy dependency was 49 p.c. in France, 60 p.c. in Germany and 25 p.c. in the Netherlands, and 62 p.c. for the euro area as a whole. Energy dependency is influenced by the presence of fossil natural resources and by the direction of the energy mix⁽²⁾. It is affected by multiple criteria (economic and environmental criteria and those concerning security of supply, etc.). In particular, the decision to develop nuclear or renewable energy has a favourable influence on the dependency ratio, as these two energy sources are produced locally.

(1) Compilation of an energy balance requires conversion of the primary energy sources into their energy equivalent, which pre-supposes knowledge of the calorific value of the various sources. For nuclear, geothermal and solar energy, the primary energy form taken into account for conversion is the heat produced. For other forms of renewable energy – hydroelectric, wind power, tidal energy, wave power, the energy of ocean currents and photovoltaic energy – the conversion is based on the electricity produced. Energy balances are generally expressed in tonnes of oil equivalent (TOE).

(2) Breakdown of gross energy consumption into primary sources.

CHART 1 PRIMARY ENERGY PRODUCTION, IMPORTS, GROSS CONSUMPTION AND ENERGY DEPENDENCY


Source: IEA.

(1) The contents of international marine and aviation bunkers are included in the net energy imports but not in the gross consumption figures. The energy dependency illustrated here is calculated after deduction of these bunkers from the net imports; it corresponds to the complement of the energy self-sufficiency rate published by the IEA.

(2) Breakdown of gross energy consumption into primary sources.

(3) The category "Other" consists mainly of net imports of electricity.

Thus, Belgium's high energy dependency is due primarily to the absence of fossil natural resources. The development of renewable energy is still fairly small in scale due both to a limited potential and a relatively late public support, but nuclear energy makes a significant contribution.

Against a backdrop of falling coal production and the sharp rise in oil prices in the 1970s, the Belgian authorities opted for a policy of developing nuclear power so as to reduce Belgium's energy dependency. In comparison with the euro area, Belgium's energy mix has a much higher

proportion of nuclear energy (21 p.c. against 16 p.c. for the euro area), but a smaller proportion of renewable energy (4 p.c. in Belgium compared to 9 p.c. for the euro area). The importance of nuclear energy in Belgium is reflected in its share of electricity production (in 2007, around 55 p.c. of electricity was generated by nuclear fuel in Belgium against 30 p.c. in the euro area). Despite the importance of nuclear energy, the ranking of primary energy sources in Belgium – oil is in first place (40 p.c.), followed by natural gas (26 p.c.), nuclear power (21 p.c.), solid fossil fuels (7 p.c.), and renewable energy (4 p.c.) – tallies with that in the euro area, where the figures are 37, 25, 16, 14 and 9 p.c. respectively. In the euro area, some of the fossil resources are of domestic origin.

The low energy dependency of the Netherlands is due to the existence of substantial gas reserves in the North Sea. This energy source therefore accounts for a very large share (44 p.c.) of the country's gross energy consumption. In France's case, it is mainly the decision to make maximum use of nuclear power that accounts for the low energy dependency, as that country has hardly any remaining fossil resources. Nuclear power represents 43 p.c. of gross consumption there, while gas accounts for a particularly small share (15 p.c.). Germany, which has an energy dependency close to the euro area average, is still mining coal and brown coal deposits, and to a lesser extent extracting oil and gas; that country has invested heavily in renewables, not least to compensate for the CO₂ emissions from the use of coal and brown coal, but not so much in nuclear power. In the euro area, some countries are even more dependent on imports than Belgium: that applies to Luxembourg (98 p.c. energy dependency), Ireland (90 p.c.), Italy (84 p.c.), Portugal (82 p.c.) and Spain (80 p.c.). The euro area has a much higher energy dependency than the United States (25 p.c.), a country rich in fossil fuels, but much lower than Japan (82 p.c.).

Final energy consumption and energy intensity

While gross consumption reflects the primary energy sources exploited in the economy and hence its sensitivity to movements in the prices of energy commodities, final consumption illustrates the consumption patterns of the users, i.e. essentially businesses and households. Final energy consumption is obtained after the primary energy sources (nuclear, gas, solid fuel and oil) have been transformed into usable forms of energy (electricity and refined oil products in particular). Transformation activities – by firms in the energy sector, or by industrial firms themselves in the case of in-house production – and transportation generate losses, connected mainly with the efficiency of electricity generating stations⁽¹⁾. That explains

the lower figure, expressed in TOE, for final consumption (39.6 million TOE in 2007, including for non-energy use), compared to gross consumption (57 million TOE in 2007).

In Belgium, final consumption of energy is divided mainly into petroleum products (50 p.c. in 2007), natural gas (27 p.c.) and electricity (18 p.c.). The principal long-term trends are the growing importance of natural gas and electricity, at the expense of solid fossil fuels (coal). That decline is attributable chiefly to the steel industry, particularly on account of the decline in furnace output. The percentage of petroleum products, which had risen sharply up to the end of the 1970s, has remained fairly stable since then.

The energy product consumption profile varies from one sector to another. Thus, in Belgium, petroleum products account for a significantly larger share of the energy basket of households⁽²⁾ than of industry, owing to household consumption of heating oil. Firms consume proportionately more electricity and solid fuels than households, in relation to other forms of energy. In transport, final consumption consists almost exclusively of petroleum products.

Overall, the product breakdown of final consumption in Belgium is very similar to that in the euro area. Conversely, there are differences in the consumption profile of the main sectors. Thus, Belgian households tend to consume proportionately more petroleum products (32 p.c.) than their counterparts in the euro area (20 p.c.). On the other hand, they make less use of renewable energy to meet their consumption needs (3 p.c. in Belgium compared to 12 p.c. in the euro area). The Belgian industrial sector consumes relatively more gas (43 p.c.) but less petroleum products (8 p.c.) than European industry, where gas and petroleum products account for 33 and 15 p.c. respectively. The structure of the gas transport network is likely to be part of the reason for these differences, as Belgium has an international supply centre in Zeebrugge.

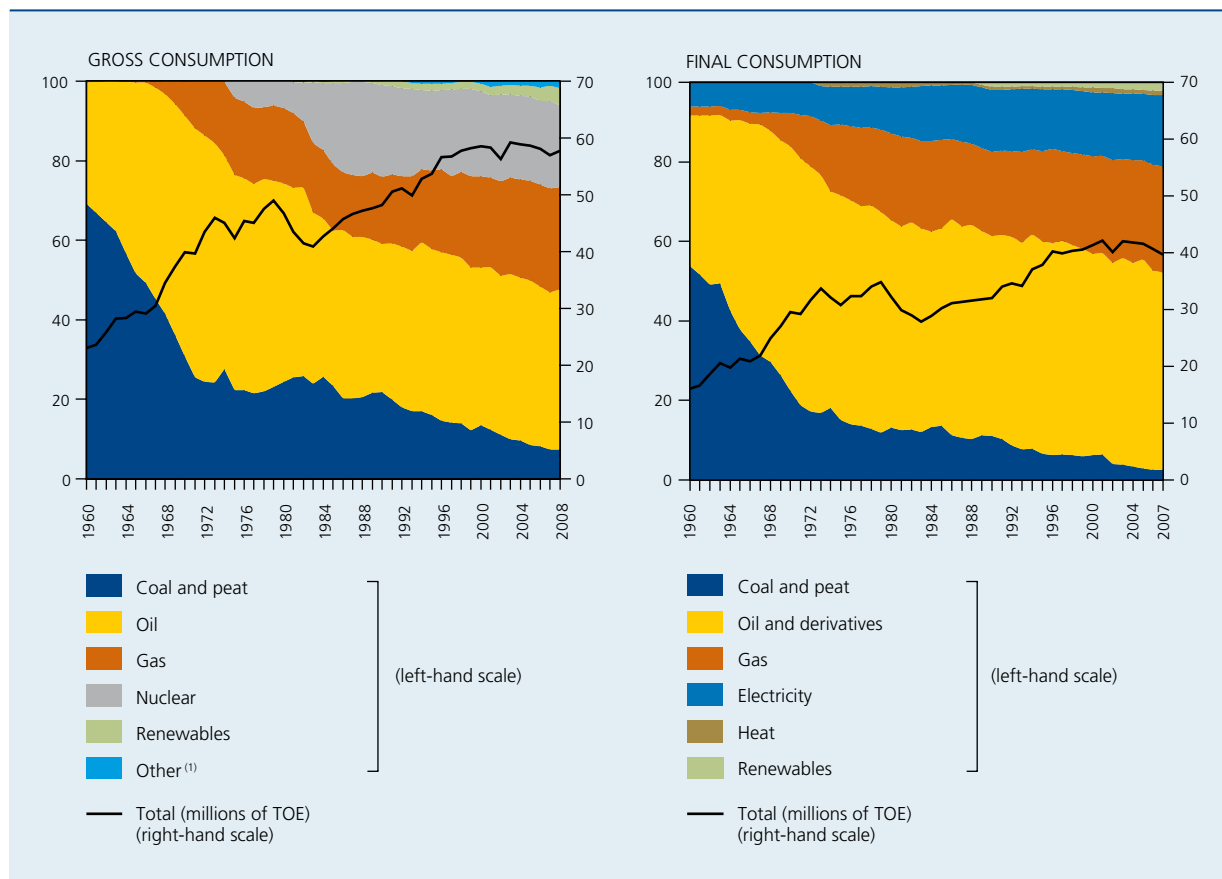
Looking at the breakdown of final consumption by sector, the principal energy consuming sector is industry, which in 2007 represented 36 p.c. of final consumption in Belgium. Next come transport, be it for private or commercial purposes, (28 p.c.), household consumption (excluding transport) (23 p.c.), services (11 p.c.) and agriculture (2 p.c.). From 1990 to 2007, the various sectors in Belgium displayed a divergent final consumption pattern: industry and households reduced their energy

(1) Transformation losses also occur when oil is refined to produce final petroleum products (fuel), but they are smaller in scale than those arising in electricity production.

(2) The final energy consumption of households includes that relating to heating, lighting, and electrical appliances, but not energy relating to private transport (which is included in the final consumption of transport activities).

CHART 2 GROSS AND FINAL ENERGY CONSUMPTION IN BELGIUM

(percentages of the total, unless otherwise stated)



Source: IEA.

(1) The category "Other" consists mainly of net imports of electricity.

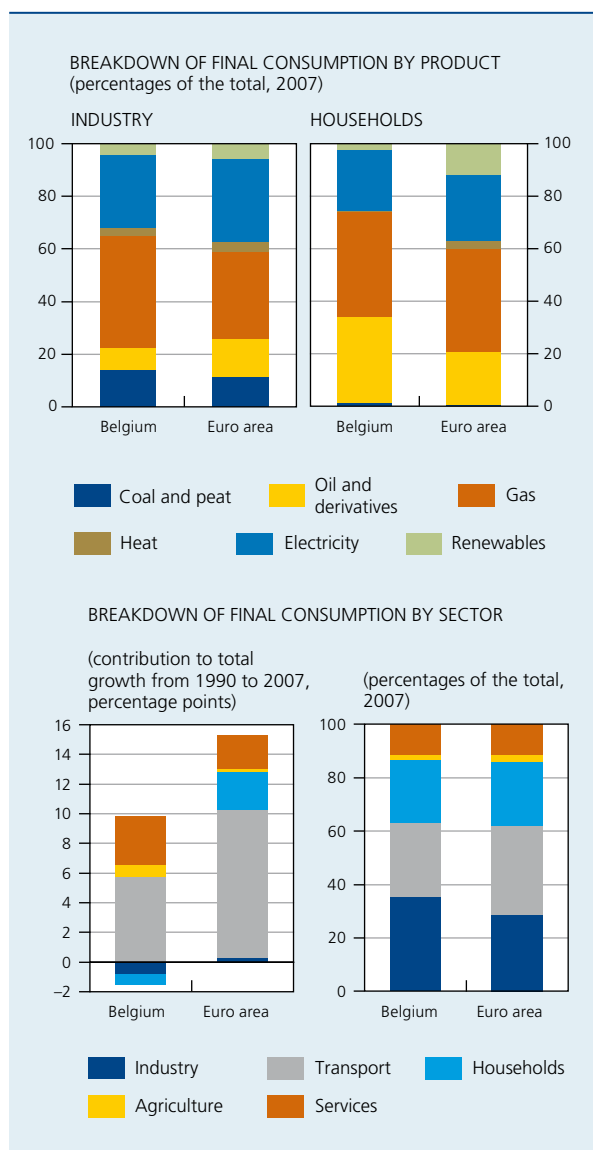
consumption slightly (by 2 and 3 p.c. respectively), while there were large increases in the other sectors: 24 p.c. in transport, 37 p.c. in the service branches, and 50 p.c. in agriculture. In view of the initial weight of each sector in final consumption, it was transport and services that made the biggest contribution to the rise in total final consumption over the period, whereas the contribution of industry and households was negative.

In the euro area, all sectors made a positive contribution to the growth of total final consumption from 1990 to 2007. As in Belgium, the biggest contribution came from transport, but in contrast to Belgian households, those in the euro area made a positive contribution to the increase in energy consumption. The data per country present a very varied picture, with a particularly steep increase in consumption in the southern European countries (especially in Spain, Portugal, Malta and Cyprus), a smaller rise in France and Germany, and a reduction in consumption in the Netherlands and Finland.

In comparison with the euro area, industry represents a considerably larger share of total final consumption in Belgium (36 p.c. against 29 p.c. for the euro area). For proper comparison of national consumption by sector, it is preferable to refer to energy intensity, defined as the ratio between energy consumption and value added⁽¹⁾. This makes it possible to measure the efficiency with which energy resources are used. However, in making comparisons, it is necessary to bear in mind that many factors, such as economic structure, climatic conditions, population density, transport infrastructures and standards of living, influence the final consumption of energy, without giving any indication of efficiency or inefficiency.

(1) The energy intensity calculated on the basis of gross energy consumption is influenced by the methods used in the final production of energy, owing to differences in yields. Thus, if a country makes more use of a production method involving substantial losses, its gross energy intensity is higher. Conversely, the energy intensity calculated on the basis of net energy consumption is unaffected by this factor and is a more appropriate measure of final energy use by firms from the non-energy sectors and households.

CHART 3 BREAKDOWN OF FINAL ENERGY CONSUMPTION BY PRODUCT AND BY SECTOR IN BELGIUM AND IN THE EURO AREA
(percentages of the total, 2007)



Source: Eurostat.

Note: The final energy consumption of households includes that relating to heating, lighting and electrical appliances, but not energy relating to private transport (which is included in the final consumption of transport activities).

First, it is evident that in most of the major developed economies overall energy intensity – defined here as the ratio between gross energy consumption and GDP – increased in the 1960s and the early 1970s before adopting a downward trend. Starting from a higher level, energy intensity fell more steeply in the United States than in the euro area. In Japan, where it is particularly low, it has remained stable since the mid 1980s. In Belgium, it increased only slightly in the 1960s and in recent decades has followed a downward trend similar to that of the euro area. In the end, however, Belgium's energy intensity

(0.21 TOE per thousand dollars) is well above the average for the euro area and for neighbouring countries (where energy intensity ranges between 0.16 and 0.18 TOE per thousand dollars).

The downward trend in energy intensity in the main industrialised economies is due partly to sectoral shifts – particularly the declining importance of industry in value added, and the corresponding increase in the importance of services, which consume less energy, with the exception of transport. Also, firms have been encouraged to switch to technologies permitting more efficient use of energy, as the rising cost of energy inputs increasingly drove up their production costs. That cost increase was due partly to successive oil shocks, but also to the increasing incorporation in energy costs of externalities relating to climate change and environmental issues.

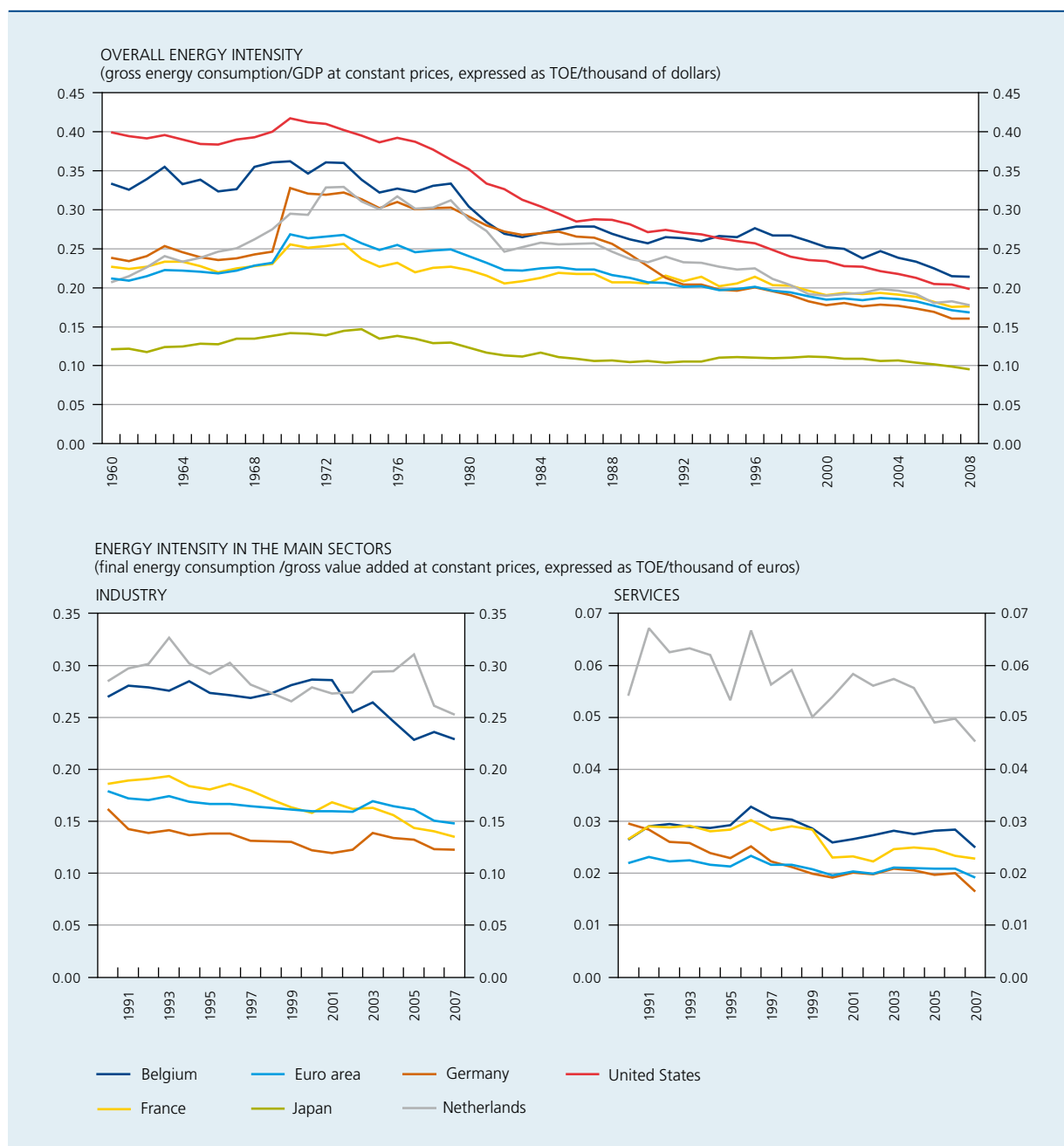
Energy intensity has fallen in both services and industry⁽¹⁾ but the decline was more marked in the latter sector. In Belgium, energy intensity fell by 15 p.c. in industry and 5 p.c. in services between 1990 and 2007. In the euro area, the decrease amounted to 17 p.c. in industry and 13 p.c. in services. The energy intensity of Belgian industry is still significantly higher than that of the euro area and that of France and Germany, and is close to that of the Netherlands. Conversely, the energy intensity in services is very close to the euro area average.

The difference in the energy intensity of industry between Belgium and neighbouring countries may be due to intrinsic effects, namely a higher energy intensity in certain branches of activity, structural effects resulting from the over-representation of branches of activity which are particularly energy intensive, or a combination of the two.

To demonstrate the intrinsic effects, it is necessary to have energy intensity figures at the most detailed level possible, whereas the international statistics are generally published at relatively aggregate level. According to those data, energy intensity is higher in Belgium than in each of the three neighbouring countries in the branches of non-metallic minerals, iron and steel, metallurgy and non-ferrous metals, and textiles and leather. The Belgian chemical sector also has a high energy intensity, in line with that in the Netherlands. In contrast, Germany has a low energy intensity in all areas of its industry, and has an average energy intensity which is about half that of Belgium. French industry also seems to have a fairly low energy intensity.

(1) In contrast, in agriculture (not included in the chart), energy intensity remained more or less unchanged between 1990 and 2007. Energy intensity cannot be calculated in the same way in transport, as the energy consumption figures do not distinguish between commercial and private transport, while value added relates only to commercial transport.

CHART 4 ENERGY INTENSITY



Sources: EUROSTAT, EU KLEMS, IEA.

Note: Industry comprises manufacturing industry and the extraction of energy and non-energy products. Services exclude transport but include construction.

Structural effects are said to be unfavourable if the country tends to specialise in a branch of activity which consumes more energy than the industrial average. The branches which traditionally consume the most energy are iron and steel, metallurgy and non-ferrous metalworking, non-metallic minerals, chemicals and petrochemicals. Belgium – like the Netherlands – suffers from an unfavourable structural effect in relation to Germany and France since those branches represent a larger percentage (38 p.c.) of

value added. Those branches represent 28 p.c. of industrial value added in Germany and 25 p.c. in France.

It should be noted that the distinction between intrinsic and structural effects is not clear-cut, since the classes of activity for which data are available are not entirely uniform. They may comprise – to a degree which varies from one country to another – sub-branches which vary in their energy intensity. Thus, petrochemicals and basic

TABLE 1 ENERGY INTENSITY IN THE MAIN BRANCHES OF INDUSTRY

(final consumption of energy/gross value added at constant prices, expressed as TOE/thousand of euros, 2007)

	BE	DE	FR	NL
Industry	0.23	0.12	0.14	0.25
of which:				
Mining and quarrying	0.20	0.08	0.14	0.99
Non-metallic minerals	0.60	0.35	0.45	0.40
Iron and steel, metallurgy and non-ferrous metals	0.31	0.20	0.19	0.23
Machinery and equipment	0.12	0.11	0.07	0.13
Chemicals et petrochemicals	0.40	0.15	0.32	0.53
Transport equipment	0.05	0.04	0.06	0.03
Food and tobacco	0.18	0.14	0.18	0.37
Paper, paperboard and publishing	0.22	0.16	0.16	0.25
Textiles and leather	0.17	0.08	0.06	0.05
<i>p.m. Weight in industry of the most energy intensive branches of activity⁽¹⁾</i>	<i>0.38</i>	<i>0.28</i>	<i>0.25</i>	<i>0.38</i>

Sources: IEA, EU KLEMS.

(1) Iron and steel, metallurgy and non-ferrous metals, non-metallic minerals, chemicals and petrochemicals.

chemicals have an important position in the Belgian chemical industry, as these activities need to be located as close as possible to the place of supply, in this case the port of Antwerp. In general, within the industrial branches of activity, it seems that Belgium specialises in the initial product processing stages, which by their nature consume the most energy.

Information obtained from the input-output tables, the latest version of which dates from 2005, shows that the costs of energy inputs in Belgium represent a proportion of the total production costs of firms (4.9 p.c.) which exceeds the average for the euro area (4.1 p.c.). That figure is 3.5 p.c. in France and 3.3 p.c. in Germany; in contrast, it is 6.3 p.c. in the Netherlands. It should be noted that these weights depend not only on the quantities of energy consumed, but also on the average price of energy products.

The energy consumption of households is above the euro area average, and that is another factor explaining Belgium's higher energy intensity. Thus, over the period from 1999 to 2005, annual consumption of energy for domestic purposes (excluding transport) expressed as TOE per capita was significantly above the average for the euro area and for the neighbouring countries. However, there

was a marked fall in 2006 and 2007, bringing consumption down to Germany's level, though it was still above the figure for France and the Netherlands, and the euro area average.

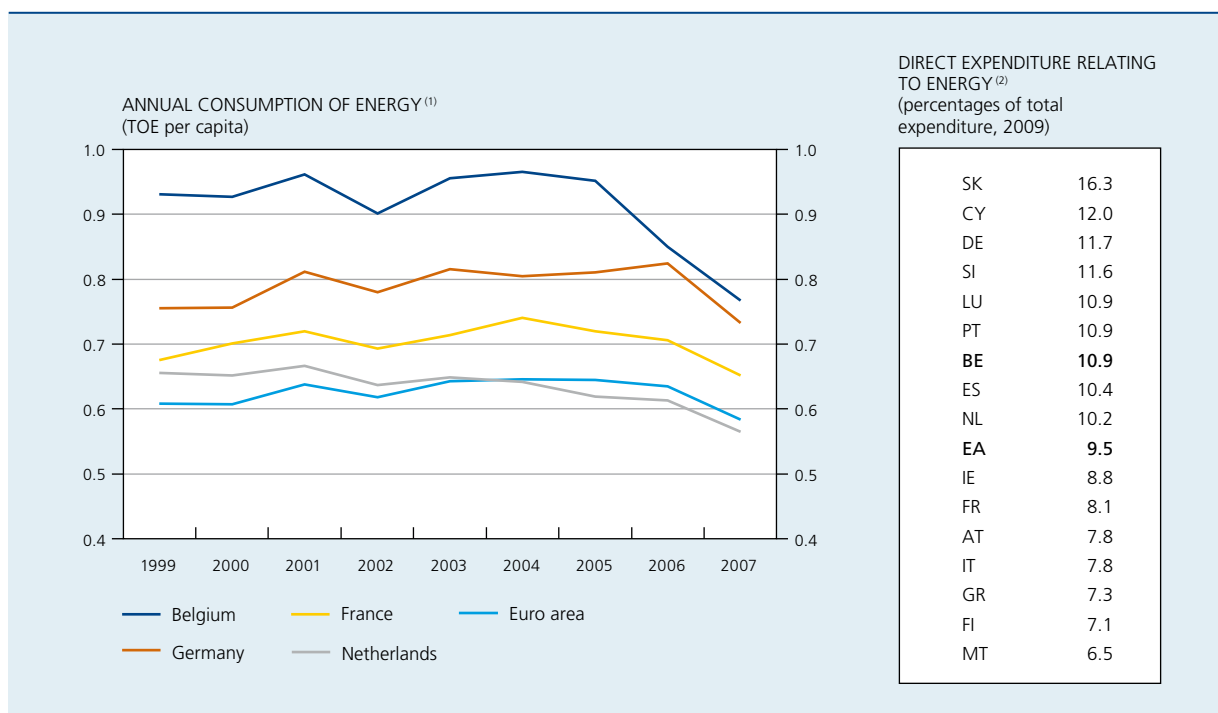
At first sight, climatic differences do not justify higher consumption in Belgium. Thus, the number of degree-days - the number of degree-days measures the severity of weather conditions over a period of time; it is defined as the number of heating days multiplied by the difference between the outdoor temperature recorded and a desirable indoor temperature - is much the same in Belgium as in the Netherlands and the euro area, and only slightly higher than in France, but considerably less than in Germany.

Conversely, the energy efficiency of buildings, which depends on such factors as their age and insulation and the structure of the housing stock (individual homes, blocks of flats), could help to explain the difference in household energy consumption. Thus, according to a recent survey⁽¹⁾, the energy efficiency of residential buildings in Belgium is lagging behind that in neighbouring countries and is below the average for the EU25. In 2005, residential energy consumption averaged 348 kWh/m² in Belgium, or 72 p.c. above the EU25 average (the consumption figures were 234 kWh/m² in France, 242 kWh/m² in Germany and 181 kWh/m² in the Netherlands). Other factors, such as the average house size or consumption habits may explain the difference in the average consumption of Belgian households compared to their counterparts in neighbouring countries.

According to the HICP weights for the year 2009, which are considered to reflect the actual weight of each expenditure item in household consumption, the weight of energy-related expenditure - including here that relating to transport - is slightly higher in Belgium (10.9 p.c.) than the average for the euro area (9.6 p.c.). It is also slightly above that of France (8.1 p.c.) and the Netherlands (10.2 p.c.), but slightly below the figure for Germany (11.7 p.c.). A breakdown of the HICP weights into the main products shows that the difference lies mainly in the consumption of gas and electricity, and to a lesser extent heating oil, whereas the weight of expenditure on transport fuel is comparable.

Finally, in addition to that of industry, services and households, the overall energy intensity of the economy also depends on that of transport. Some information is available on road transport, which accounted for around

(1) Cf. Mc Kinsey & Company (2009).

CHART 5 FINAL CONSUMPTION AND EXPENDITURE ON ENERGY BY HOUSEHOLDS

Sources: IEA, Eurostat.

(1) Consumption relating to heating, lighting and electrical appliances.

(2) Weight of energy products (electricity, gas, heating oil and transport fuel) in the HICP.

83 p.c. of energy consumption in the transport sector in Belgium in 2007. The energy efficiency of the stock of Belgian vehicles is relatively high, with fuel consumption at 5 to 10 p.c. below the European average, due to the high proportion of diesel engines. Conversely, Belgium tops the ranking in terms of kilometres travelled per passenger. The advantageous system of company cars is probably a factor here. In all, fuel consumption per passenger is one of the highest figures in Europe and it is not declining, in contrast to the European trend.

In conclusion, the economy's characteristics in terms of production and supply, consumption mix and energy intensity depend on the interaction of a range of factors relating to physical and geological conditions, the activities developed, and the choices made by the economic agents – businesses, households – possibly in response to incentives created by the government in order to influence them.

As Belgium now has hardly any usable fossil energy resources left, its domestic energy production is characterized by an important share of nuclear power, while renewable forms of energy are proportionately less developed than in the euro area. However, the supply

facilities, via port infrastructures or gas pipelines, have given industry easy access to energy. Industry has a high energy intensity which is also due largely to specialisation in energy intensive branches of activity. Households also contribute to Belgium's high energy intensity.

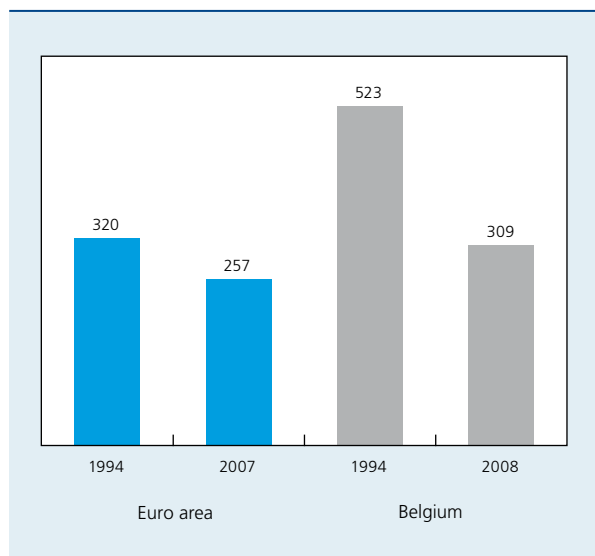
2. Functioning of the energy markets and implications for the pricing of energy products

This chapter describes how the energy product markets work and examines the implications for the pricing of these products. It therefore concerns the initial phase of the possible inflationary impact of energy price fluctuations on the international markets, namely their influence on the prices of energy products. The main energy products in the consumption basket are petroleum products – petrol, diesel and heating oil –, natural gas and electricity.

Petroleum product market

The market in petroleum products features a relatively large number of outlets. Thus, in 2008, Belgium had

CHART 6 NUMBER OF SERVICE STATIONS PER MILLION INHABITANTS



Source: ECB (2010).

309 service stations per million inhabitants. However, that number displays a marked downward trend. In 1994, there were over 500 service stations per million inhabitants. Moreover, this downward trend has been stronger in Belgium than in the euro area as a whole. Nevertheless, in 2008, the number of outlets in Belgium was still well above the average for the euro area, which at that time totalled around 257 service stations per million inhabitants.

In principle, such a large number of outlets for relatively uniform products should imply keen competition. In practice, only a small number of major distribution chains are active, and they tend to have a high degree of vertical integration. The petroleum product market is therefore relatively highly concentrated. Thus, the market share of the three leading distributors was almost 50 p.c. in 2005 in the euro area. In Belgium, the market concentration thus measured was even greater, at just over 70 p.c. In contrast, it was much lower in France, at around 20 p.c., whereas in Germany it was around the average for the euro area.

Against a backdrop of high market concentration, the decline in the number of service stations may appear to be a problem, but that is not necessarily the case, particularly if it is accompanied by economies of scale and efficiency gains which could ultimately benefit the consumer. Countries with a relatively large number of service stations which therefore have a smaller turnover – as is the case in

Belgium, to some extent – in fact tend to have a relatively high petrol price before tax, whereas countries with larger service stations, such as Germany and France, generally have slightly lower prices.

Electricity and gas markets

The situation on the electricity and gas markets is significantly different from that on the petroleum product market, as until recently there were monopolies on those markets. But at the instigation of the EU, they were gradually liberalised and deregulated in the late 1990s and during the last decade.

The liberalisation and deregulation of the electricity and gas sectors is a tricky exercise, given that the optimum degree of deregulation – and the resulting degree of competition – is very specific to these sectors. They are in fact highly capital intensive, requiring long-term investments. The financial commitment is therefore substantial, so that – in a context of volatile energy prices – adequate profitability is a precondition for making such investments. Moreover, it is difficult – and even impossible in the case of electricity – to store these products and the transport and distribution networks play a dominant role, leading to the emergence of “natural monopolies”. Thus, vertical integration can yield efficiency gains.

In that context, the EU decided that the transmission and distribution activities would be separated from the others, although cross-shareholdings were still allowed, at least at first. In June 2009, however, the legislation on the subject was tightened up and the various activities will have to be totally unbundled by March 2011. Moreover, businesses and individuals have been free to choose their electricity and gas supplier from 1 July 2004 and 1 July 2007 respectively. The national sectoral regulators and the national competition authorities are also required to monitor pricing on the non-liberalised segments of these sectors, namely transport and distribution, and ensure that there is effective competition.

The United Kingdom was the first country to liberalise the electricity and gas markets, while on the continent, Germany took the lead, followed by Austria, Spain and the Netherlands. In general, the business market was liberalised before the residential consumer market, in accordance with the European legislation on the subject. In Belgium, liberalisation was completed in July 2003 in Flanders and in January 2007 in Brussels and Wallonia. Belgium is therefore in an intermediate position, and liberalised its market somewhat sooner than other countries such as France.

Despite liberalisation, competition on the electricity and gas markets remains limited owing to the generally high degree of market concentration. That is the case in Belgium, a country which has a very significant level of concentration on both the wholesale and the retail market. Moreover, many countries still have some form of price regulation on the residential segment of the electricity and gas markets. That is so in large countries such as France, the Netherlands, Italy and Spain. In Belgium, since the liberalisation of the market, the various suppliers have been free to set their gas and electricity tariffs. Germany has also abolished price regulation.

However, this freedom allowing suppliers on the gas and electricity markets to set their prices does not mean that the Belgian authorities or the sectoral regulator have no influence over certain elements of the consumer price. Thus, the legislation specifies that social tariffs must be applied to certain income groups, and imposes certain public service obligations. Moreover, the Commission for Electricity and Gas Regulation (CREG) supervises the management of the gas and electricity transmission networks, and has power to approve the charges for connection to the transmission networks and the charges for use of those networks. In 2008, its powers were extended. The CREG is also responsible for monitoring competition on the unregulated segment of the electricity and gas markets. Thus, its duties include assessing whether the prices offered by electricity or gas companies are objectively justified by their costs. If the CREG considers that not to be the case, it may forward its findings to the Competition Council.

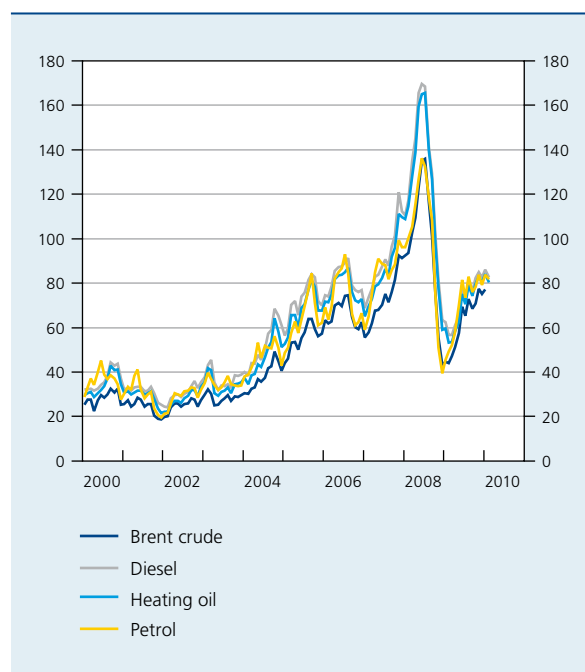
The way in which the energy markets operate naturally has a considerable influence on the pricing of energy products. That pricing is explained in detail below, first for petroleum products and then for natural gas and electricity.

Pricing of petroleum products

In recent years the price of crude oil has fluctuated widely, and that has had a decisive influence on the movement in consumer prices of petroleum products.

Oil price fluctuations are reflected almost immediately in the prices on the international markets in refined petroleum products. However, that does not prevent what are generally short-lived fluctuations in the refining margins, namely the difference between the price of the refined product on the international market and the price of crude oil. In some cases, there are recurring seasonal effects, such as the rise in the price of heating

CHART 7 PRICES OF REFINED PETROLEUM PRODUCTS ON THE INTERNATIONAL MARKETS
(USD per barrel)



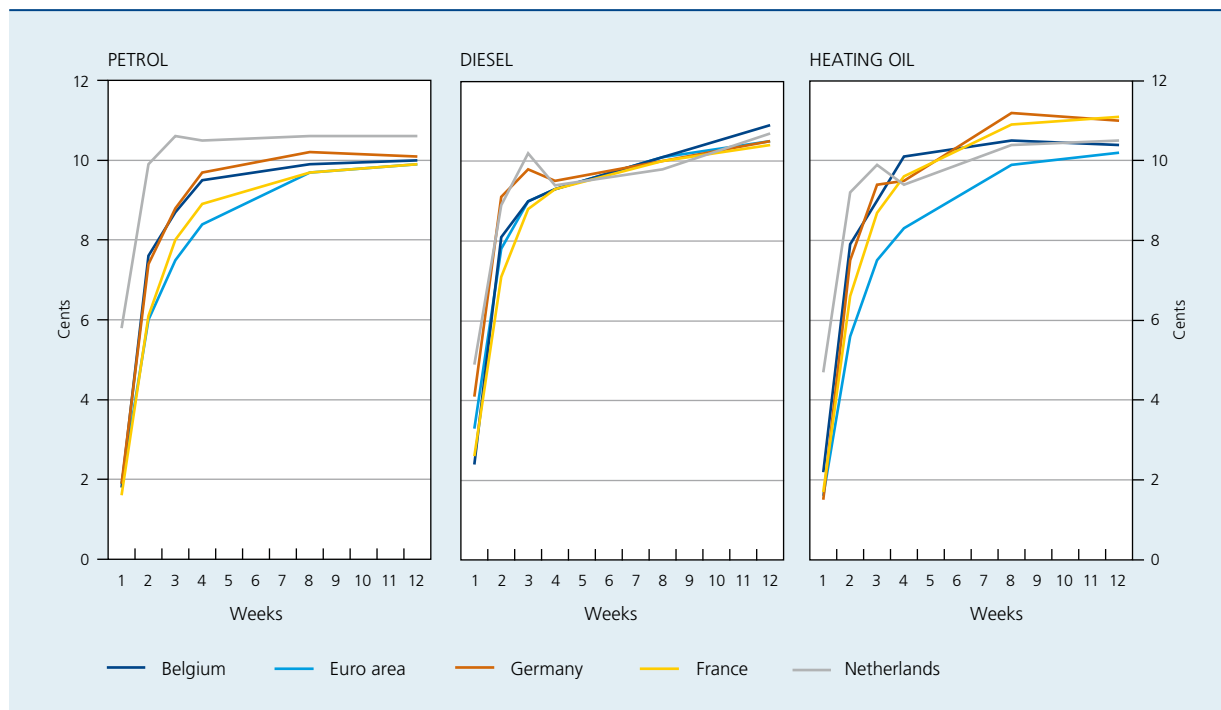
Sources: ECB, Haver Analytics, FPS Economy, SMEs, Self-employed and Energy.

oil in the winter, or an increase in the petrol price during the summer months owing to the “drivers’ season” in the United States. In 2008, the fluctuations in refining margins were very large and persistent, namely upwards for diesel and heating oil and downwards for petrol. The reason is that, owing to the impetus from emerging countries such as China and India, demand not only increased strongly in absolute terms, but there was also a relative shift towards diesel and heating oil, whereas the supply coming from installed refining capacity is highly inelastic. The shifts at the level of relative demand are therefore reflected to a large extent, and certainly in the short term, in the pattern of relative prices of the various refined products.

Changes in consumer prices of petroleum products offer a fairly faithful reflection of the movement in prices of the refined products on the international markets, which are undeniably the main source of price fluctuations. Apart from this volatile component due to imported prices, consumer prices include a gross margin which is relatively constant, incorporating an amount to cover the cost of transporting and distributing the petroleum products, plus excise duty and related charges which vary little on account of their flat-rate structure, and VAT. Excise duty is

CHART 8 TRANSMISSION OF FLUCTUATIONS IN REFINED PETROLEUM PRODUCT PRICES

(impact of a 10 cent per litre increase in the refining price on the consumer price excluding taxes)



Source: ECB (2010).

the main factor accounting for price differentials between the various petroleum products. It is significantly lower for diesel than for petrol, and practically zero in the case of heating oil.

Econometric analysis⁽¹⁾ shows that fluctuations in refined petroleum product prices are very quickly passed on in full in consumer prices. Thus, an increase of 10 cents per litre in the refined petrol price on the international market also triggers a 10 cent increase overall in the consumer price in Belgium. In other words, there is full transmission. Furthermore, that transmission takes place very quickly: it is already practically complete after the third week. The situation is similar in other countries, although transmission is slightly slower in the euro area and faster in the Netherlands. For diesel and heating oil, the analysis produces results similar to those for petrol. For these products, too, transmission in Belgium differs little from that in neighbouring countries, but in the case of the euro area it again seems to be slightly slower for heating oil. The reason could be that in some euro area countries the pricing of petroleum products is still regulated. The fact that transmission in Belgium is similar to that in neighbouring countries shows that the programme contract, which fixes the maximum prices of these products in Belgium, has no significant influence on pricing.

Comparison of the level of consumer prices of petroleum products in Belgium with those in the three neighbouring countries shows that the consumer prices excluding taxes of petrol and, to a lesser extent, diesel are slightly higher in Belgium than in Germany and France, but a little lower than prices in the Netherlands. That is probably attributable both to the fact that petrol stations have a larger turnover and that the market is less concentrated in Germany and France. It therefore seems that there is still some scope, albeit small, for reducing the level of petrol and diesel prices in Belgium by keener competition and economies of scale. That looks much less likely in the case of the pre-tax price of heating oil, which is lower in Belgium than in the three neighbouring countries.

The excise duty on petrol is comparable to that in the three neighbouring countries, so that Belgium's relative position hardly changes in a comparison of the prices including taxes for this product. Conversely, the excise on diesel is significantly lower, so that Belgium has the lowest prices including tax, despite a slightly higher pre-tax price. In the case of heating oil, the pre-tax price advantage is amplified after tax, since the level of excise duty is particularly low.

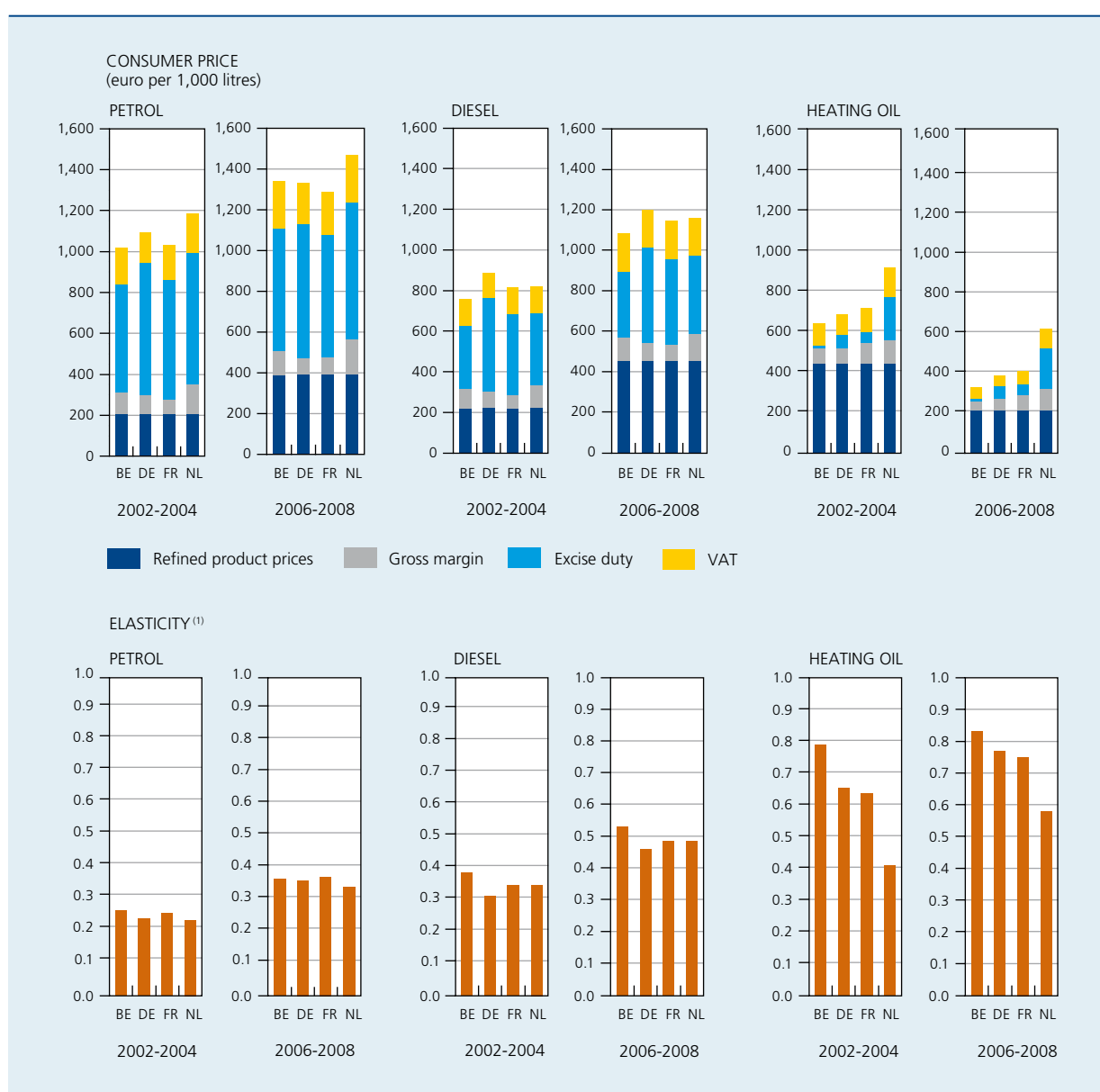
(1) Cf. ECB (2010) for a more detailed presentation of the econometric analysis presented. A more technical account of that analysis is found in Meyler (2009).

Taking account of these structural differences in the respective cost components of consumer prices of petroleum products, the relative weight of refined products in consumer prices also varies, not only between products but also from one country to another. If the gross margin is stable overall and does not fluctuate according to the refined product price, and if the excise duty does not mirror the movement in refined product prices because of its flat-rate structure, the relative weight of refined products also increases as their prices rise. Consequently, the virtually identical transmission to consumer prices of changes in refining prices in absolute terms does not necessarily

result in comparable adjustments to consumer prices expressed in percentage terms. In fact, a percentage change in the price of refined petroleum products will imply a larger percentage change in consumer prices if the weight of refined products in consumer prices is greater, e.g. owing to lower excise duty, a smaller gross margin or a higher price level for the actual refined products.

The elasticity of consumer prices of petroleum products, which measures the relative sensitivity of prices to changes in energy prices on the international markets, is in fact higher for diesel than for petrol, owing to differences in

CHART 9 STRUCTURE OF CONSUMER PRICES OF PETROLEUM PRODUCTS AND THE IMPLICATIONS FOR THEIR ELASTICITY



Sources: ECB (2010), Haver Analytics, NBB.

(1) The elasticities measure the ratio between the percentage change in the consumer price and the percentage change in the prices of refined products. Thus, for example, an elasticity of 0.3 means that a 10 p.c. rise in the price of refining causes a 3 p.c. rise in the consumer price. These are long-term elasticities.

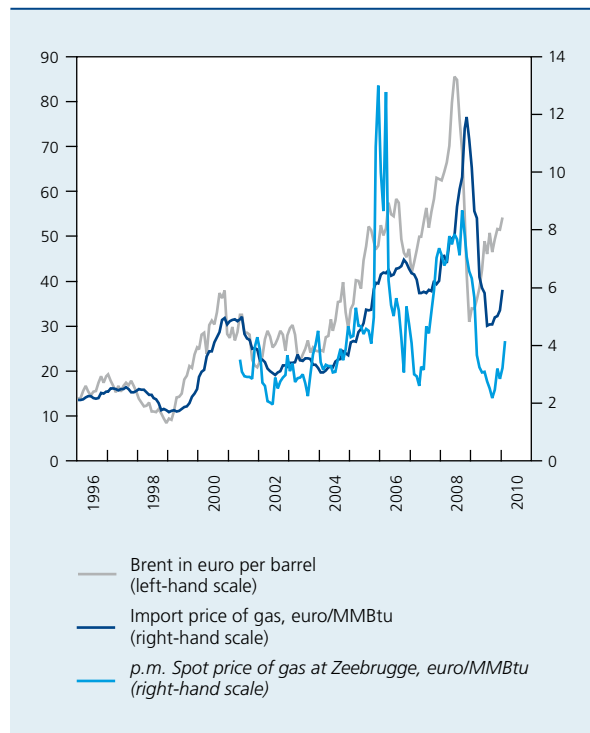
the excise duty and related taxes applicable to these two products. The excise duty on heating oil is much lower than that on diesel, which implies that the former product is even more sensitive to price changes. Moreover, it is evident that the elasticities of petroleum products in general were systematically greater during the period 2006-2008, when oil prices were high, than during 2002-2004 when oil prices were lower. Finally, the elasticity of consumer prices of diesel and heating oil is greater in Belgium than in neighbouring countries, since the level of excise duty on these products and the gross margin for heating oil are lower in Belgium. The relatively low prices of diesel and heating oil after tax may also encourage consumption of these products in Belgium, so that – despite their more moderate price – their weight in the consumption basket is greater than in neighbouring countries. This last factor further augments the already high sensitivity of inflation in Belgium to fluctuations in the prices of energy products on the international markets. Adjusting indirect taxation in Belgium, e.g. by increasing the excise duty on diesel and heating oil, would reduce the sensitivity of inflation to variations in petroleum product prices, because the duty would automatically reduce the elasticity of consumer prices and steer the consumption profile in line with the cost of those products.

Pricing of natural gas

As in the case of petroleum products, the crude oil price is the main factor determining consumer prices of natural gas. The movement in the crude oil price is in fact a key determinant of import prices of natural gas, even though there is a time lag of several months. It is normal practice for long-term contracts to link the gas price explicitly to the prices of petroleum products. Nonetheless, a wholesale market in gas has gradually been established, where prices are set independently according to specific supply and demand conditions on the gas market. As is evident from the movement in the spot price of gas at Zeebrugge, those prices are more volatile in the short term than the oil price, as natural gas is much harder to store, so that fluctuations in supply and demand have a greater influence on prices. Longer term movements in this specific gas price are more closely linked to changes in petroleum product prices, even though the gas price has recently appeared to diverge from the crude oil price and adopt a downward trend. Many observers explain this as being due to certain excess supply on the gas market, but it remains to be seen whether that will persist.

Changes in the import price of natural gas seem to be the main factor behind the movement in consumer prices of this product. That impression is borne out by econometric

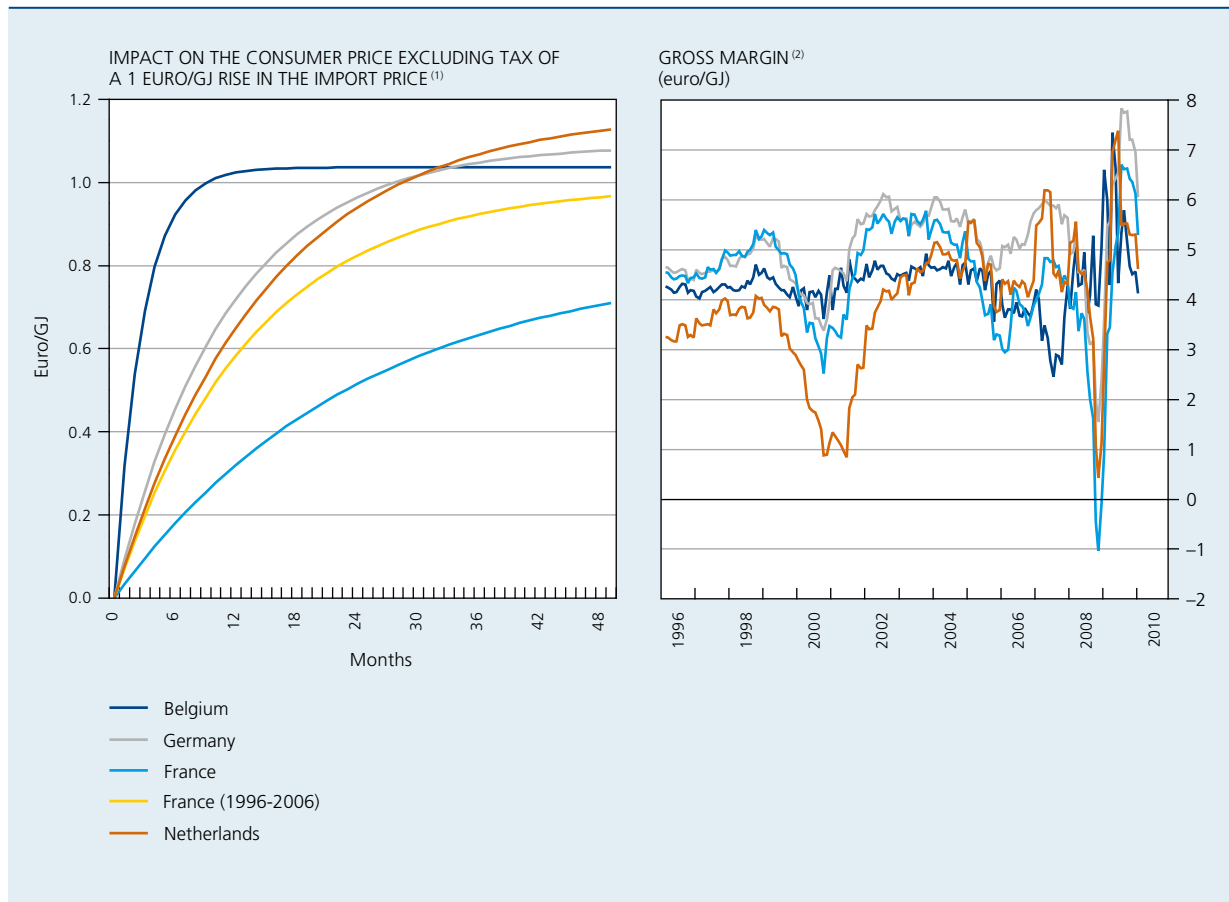
CHART 10 CRUDE OIL PRICE AND IMPORT PRICE OF NATURAL GAS



Sources: ECB, Haver Analytics, FPS Economy, SMEs, Self-employed and Energy.

analysis in which an error correction model is used to estimate both the long-term ratio between the import price and the consumer price, and the speed of adjustment to that link⁽¹⁾. In Belgium, a one euro per gigajoule increase in the import price of natural gas eventually leads to an increase in the pre-tax consumer price of around one euro per gigajoule. However, the transmission is slower than in the case of petroleum products. Around half of the transmission occurs after two months, and the process is more or less complete after six months. As well as this delayed impact on the consumer, the import price of gas takes around four months to respond to the movement in the crude oil price. Unlike in the case of petroleum products, transmission in Belgium is very different from that in neighbouring countries. In particular, it differs from that in Germany and the Netherlands, not so much by its overall scale – which is slightly greater in the countries mentioned – as by the fact that it is considerably faster. Thus, in Germany and the Netherlands, it

(1) The monthly level of consumer prices in Belgium was obtained as follows: the half-yearly data on price levels obtained from the Eurostat energy data bank for the period 1996-2006 were converted to monthly figures on the basis of the monthly changes in consumer prices of gas recorded in the HICP, with the proviso that for the period prior to 2007, the figures recorded in the HICP were recalculated using the acquisition method. This yielded a homogenous time series for Belgium which is entirely comparable in methodological terms to the recording of prices in neighbouring countries. This series was extrapolated on the basis of the HICP for the period after 2006. For more details on these two data sources and the differences between the payments approach and the acquisition method, see Cornille (2009).

CHART 11 TRANSMISSION OF FLUCTUATIONS IN THE IMPORT PRICE OF NATURAL GAS


Sources: Haver Analytics, NBB.

(1) Estimated for the period 1996-2010, unless otherwise stated.

(2) Difference between the consumer price excluding tax and the import price.

is more than six months before half of the transmission has taken place, and two years before it is complete. In France, the transmission is even slower and is also very incomplete, especially during the period 1996-2010. The reason is that, during the last few years in particular, the upward influence of the import price of gas in France was only very partially reflected in consumer prices. During 1996-2006, transmission in France corresponded more closely to that in Germany and the Netherlands. There is nothing surprising about the speed of transmission in Belgium since consumer prices of gas, like electricity prices, are adjusted monthly on the basis of tariff-setting formulas, and changes in energy commodity prices are a key factor in that regard. Prices are adjusted far less frequently in neighbouring countries, probably because of the existence of different price regulation mechanisms in France and the Netherlands. In Germany, however, there is no such mechanism. This price regulation may also be the reason why transmission has been so incomplete

in France, especially during the recent upward trend in 2008.

Of course, these differences in the scale and speed of transmission have considerable implications for the movement in the gross margin. In Belgium, the margin remains fairly stable, as one would expect, whereas in the other countries it exhibits marked, and relatively persistent, fluctuations: downwards during the phase of rising import prices – in 2000, 2005 and 2008 –, followed by a recovery, and then upwards when import prices were falling. The particularly limited transmission to consumer prices in France during the latest upward phase actually gave rise to a negative gross margin between late 2008 and early 2009.

In Belgium, the gross margin seems to have increased somewhat recently, and since 2007 has been more volatile than previously. However, that may be because the

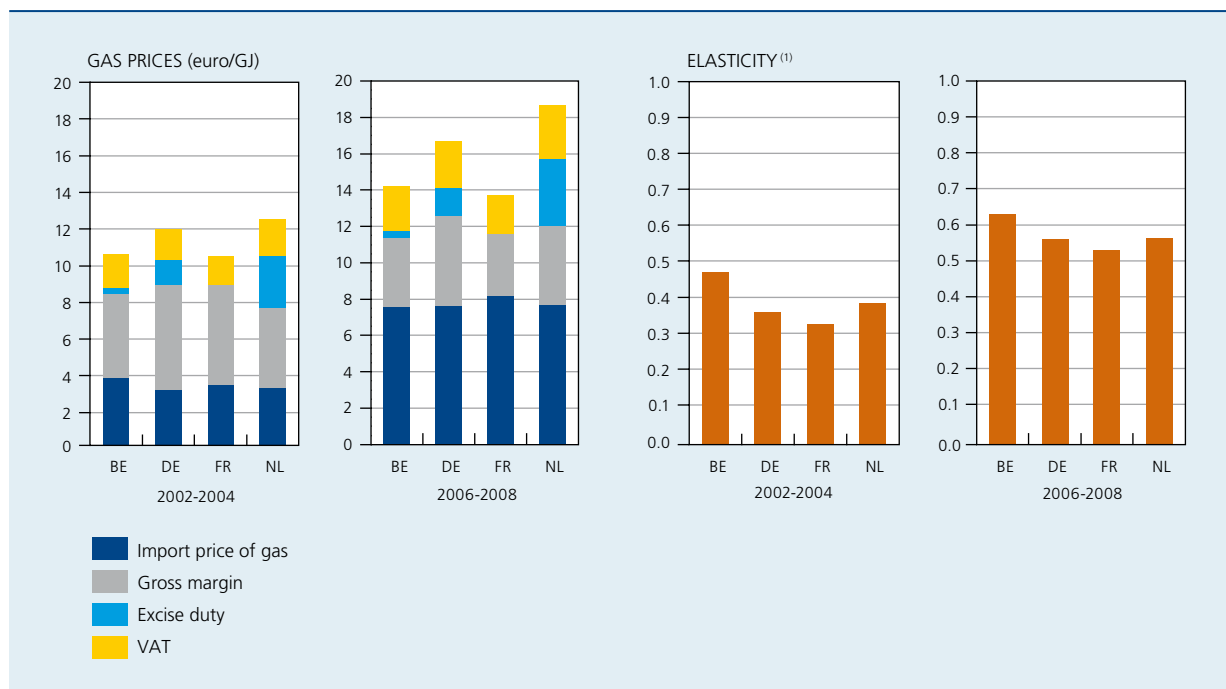
import price used does not reflect the replacement of Belgium's contract with Algeria by a contract with Qatar. The price agreed in the latter contract has not in fact been disclosed. Belgian gas suppliers specifically refer to the conclusion of this new contract as the reason for both the introduction, in January 2007, of the Zeebrugge Hub spot price for gas in the tariff-setting formulas, and the October 2007 increase in the constant used in the energy cost reference index. Since these factors, which have influenced the recorded movement in consumer prices, cannot be taken into account in import prices, it is logical to find a slightly larger and more volatile margin in the recent period. The increase in the network tariffs in 2008 and 2009 may also have made some contribution to the increase in the gross margin in recent years. In the absence of specific data on the import price, the analysis cannot determine to what extent the pricing adjustments made in 2007 – the introduction of the Zeebrugge Hub and the increase in the constant – are justified.

As in the case of petroleum products, the elasticity of consumer prices of natural gas shows a positive correlation with the level of the import price, since the relative weight of this cost factor increases if the import price is higher. That elasticity was therefore also greater for the period 2006-2008 than for 2002-2004. Moreover,

the gross margin is relatively small in Belgium – like in the Netherlands – and the excise duty on natural gas is low, especially in comparison with Germany and the Netherlands, but not compared to France. If these factors are explicitly taken into account, it is Belgium that has the highest elasticity of consumer prices of natural gas. Germany and the Netherlands are in an intermediate position in that regard, while the lowest elasticity is found in France, because of an apparently incomplete transmission.

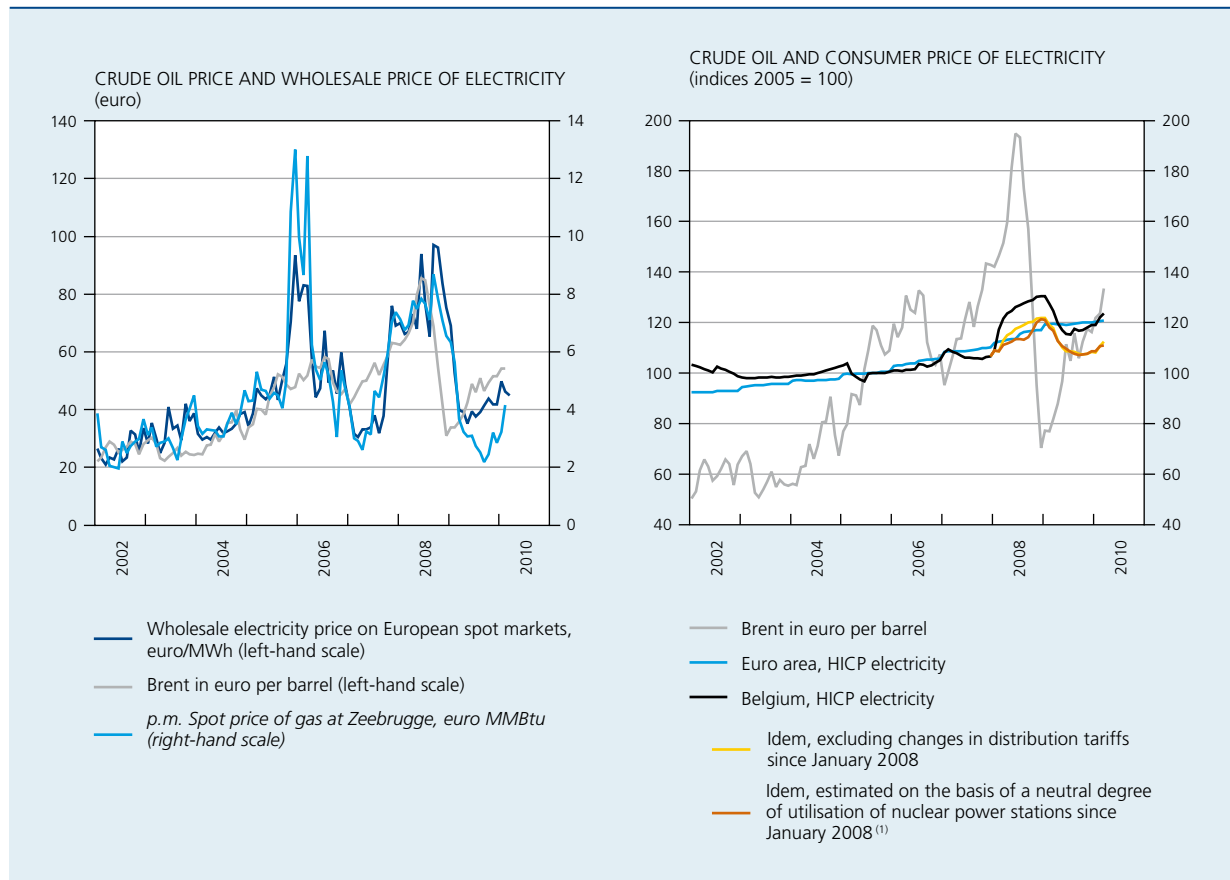
The elasticities examined here apply in the long term, i.e. after complete transmission. The differences found in this context are attributable largely to factors capable of objective assessment, such as the level of excise duty and the gross margin, and are not due to differences in the overall scale of transmission, except in the case of France. They therefore do not reflect fundamental distortions in pricing in Belgium. It therefore seems that higher volatility of consumer prices of natural gas in Belgium is justifiable but could be corrected, as in the case of diesel and heating oil, by increasing the excise duty on natural gas. The impact of that higher elasticity on recent movements in natural gas prices and inflation may prove relatively significant, in view of the scale of the energy price fluctuations on the international markets in recent years.

CHART 12 STRUCTURE OF CONSUMER PRICES OF NATURAL GAS AND IMPLICATIONS FOR THEIR ELASTICITY



Sources: Haver Analytics, NBB.

(1) The elasticities measure the ratio between percentage changes in consumer prices and percentage changes in import prices. Thus, for example, an elasticity of 0.5 means that a 10 p.c. increase in the import price causes a 5 p.c. increase in the consumer price. These are long-term elasticities.

CHART 13 TRANSMISSION OF FLUCTUATIONS IN COMMODITY PRICES TO THE PRICE OF ELECTRICITY


Sources: ECB (2010), NBB.

(1) In the formula for the tariff indexation parameters the variable which represents the degree of utilisation of nuclear power stations is held at 1 from January 2008.

In addition, prices in Belgium are adjusted considerably faster than in neighbouring countries. In 2008-2009, the speed of transmission undoubtedly played a major role. Thus, the upward phase was passed on almost in full in Belgium, as was the downward phase which followed. In contrast, in the neighbouring countries, the upward phase – which was significantly more gradual – was interrupted since natural gas prices on the international markets have since begun falling again. The principle of passing on changes to the consumer is not in doubt, certainly not in regard to lasting changes, because it is a key signal encouraging consumers to make more rational use of energy. However, it is questionable whether the immediate transmission to the consumer of every change in the international price of natural gas is appropriate. Consumers are probably less able to withstand that volatility than gas suppliers, who are now assured of a relatively stable gross margin.

Electricity pricing

The wholesale price of electricity displays a strong correlation with the movement in energy commodity prices, such as the price of Brent oil, but particularly the import price of gas. That seems entirely logical, since electricity prices on a competitive market should in theory correspond to the marginal production cost of the marginal electricity generating station, and the latter is often gas-powered.

On the other hand, consumer prices of electricity seem to have a lower correlation with the development in energy commodity prices. That is partly because production costs other than the cost of the energy commodity are considerably higher than in the case of gas and petroleum products. Other factors which weaken this link are the level of network costs, the variety of energy inputs used, and price regulation in certain countries. In future, however, the link could become clearer if the trend towards an increase in the percentage of electricity traded on the stock markets continues, and if – as is beginning to

happen in Belgium – more suppliers offer industrial and even residential consumers tariffs which are indexed to wholesale prices.

In all, the pricing mechanism on the residential segment seems to be based on average costs rather than marginal costs, and that probably reflects to some extent the consumers' preference for less volatile and more predictable prices. Nonetheless, the great complexity of electricity production makes it more difficult to analyse than the production of gas and petroleum products.

In regard to consumer prices of electricity in Belgium, the rise recorded in 2008 – in contrast to what was seen in the euro area – is attributable mainly to an increase in transport and distribution tariffs, combined with an increase in the indexation parameter which reflects the energy cost, principally following the increase in the cost of commodities and a fall in the degree of utilisation of nuclear power stations⁽¹⁾. It is also this indexation parameter that accounts for the fall in electricity prices recorded in Belgium since the beginning of 2009. So, electricity prices are more sensitive to developments in energy commodity prices than in the euro area. These developments are examined in greater depth in the article entitled "The increased volatility of electricity prices for Belgian households: an analysis based on the specific characteristics of pricing by Belgian electricity suppliers", also published in the present review.

3. Impact of crude oil price fluctuations on inflation and activity

Taking account of the prominence of energy products in both the production process and consumption patterns, fluctuations in crude oil prices may have a considerable impact on inflation and economic activity. That impact is described below, first from a conceptual angle and then using an econometric simulation.

Conceptual framework

From a theoretical point of view, an oil price shock feeds into inflation by various channels, and the effects are not felt simultaneously. A distinction is generally made between direct effects (impact on energy product prices as such) and indirect effects reflecting the pass-through of firms' increased production costs in the prices of non-energy goods and services. The indirect effects vary according to the energy content of those other goods and services: for example, they will be greater in the case of chemicals or transport services, which

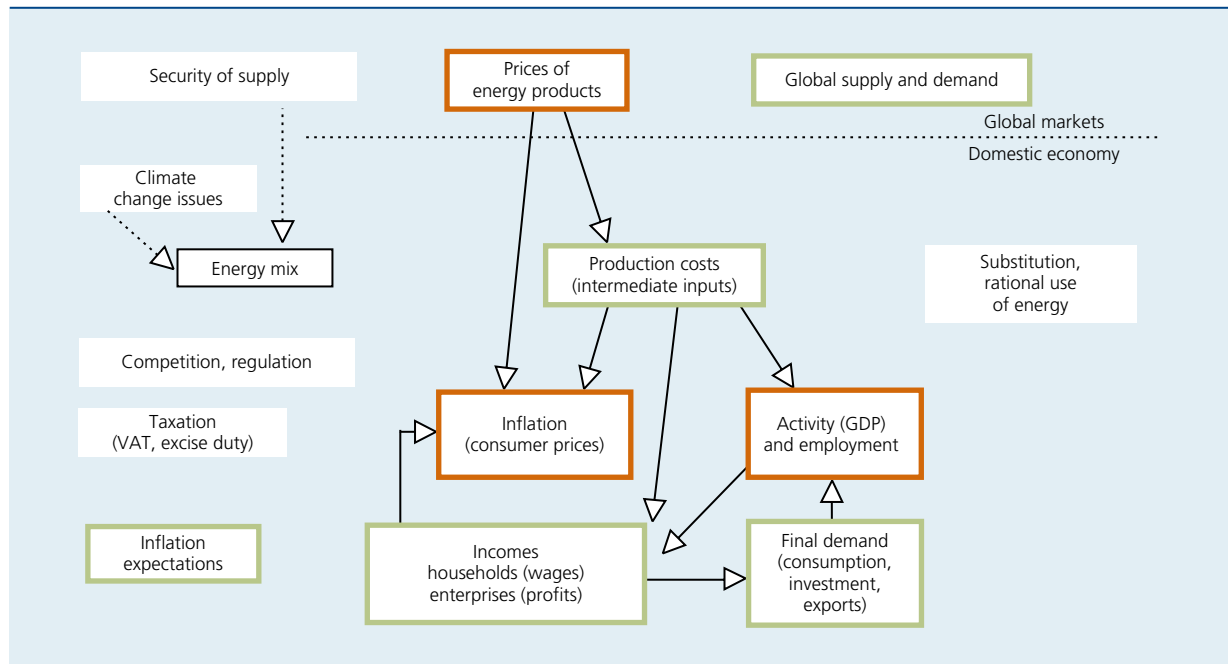
have a substantial energy content, than for other goods or services. These direct and indirect effects are called "first-round" effects because they raise the prices of these goods without affecting the underlying dynamics of inflation as a whole. Conversely, the "second-round" effects which generally do not appear immediately, are seen when the economic agents adapt their behaviour in terms of pricing and wage-setting to safeguard their profits or wages in real terms. In so doing, they amplify the initial increase in inflation. That effect is more marked if inflation expectations are revised upwards; it is therefore essential for monetary policy to have a credible medium-term price stability objective.

A shock affecting oil prices may have numerous consequences in terms of economic activity, depending in particular on the way in which the initial shock is passed on in other prices. It is usual to identify three channels for transmission to activity: the terms of trade effect, the supply effect and the demand effect. The terms of trade effect is due to the rise in the price of imports in relation to the price of exports, since most developed economies are net importers of energy. It makes the economy poorer. Unless it is offset by a decline in savings, it tends to depress domestic demand. The demand effect is connected with the impact of the rise in energy prices on inflation, as the higher prices reduce the disposable income of households and hence their consumption expenditure. The supply effect has to do with the importance of energy as an intermediate input necessary for the production of other goods and services. In the short term, firms react to an increase in their production costs by raising their selling prices or cutting their margins; in the medium and long term, firms may try to reduce their use of more expensive energy, e.g. by rationalising usage. In general, they cut their level of production (especially if demand is falling), and that leads, *ceteris paribus*, to a reduction in investment, employment and wages.

Many factors interfere in this process: the nature of the oil price shock – caused by supply or demand – its persistence, the energy intensity of production and consumption methods, and the energy mix. The functioning of the energy markets, and particularly the degree of competition and regulation, affect pricing on that market. Finally, the taxes and excise duty which governments levy on the products affect the prices set, and tax incentives may modify the energy "basket" of households and firms.

(1) The use of nuclear generating capacity influences the pricing as follows: the lower the rate of use, the more the gas price is taken into account in the pricing formula. In 2008, when gas prices were rising steeply, major work was in progress in the nuclear power stations. As those power stations came back into use, the effects of the rise in this factor diminished, while gas prices declined, like those of the other energy inputs.

CHART 14 TRANSMISSION OF ENERGY PRICES TO INFLATION AND ACTIVITY



Source: NBB.

Econometric simulation

In connection with the Structural Issues Report 2010 mentioned above, econometric simulations were carried out to assess the impact of an oil price shock on inflation and activity in the euro area countries. These simulations were based on national structural models used by central banks for the purpose of the Eurosystem's macroeconomic projection exercises. The exercise entailed simulating the effect of a permanent 10 p.c. increase in the dollar price of crude oil. The basis used for the simulations was harmonised as far as possible: it was assumed that exchange rates were unaffected, monetary and fiscal policies remained unchanged, and the economic impact was confined to each country. This last assumption means that, for a given country, external demand will not be affected by any decline in consumption in other countries, but only by a loss of competitiveness on the part of domestic exporters owing to the increased cost of energy inputs. Competitors' export prices were assumed to remain unchanged, causing the influence of that channel to be overestimated. Despite the efforts to achieve harmonisation, it is necessary to bear in mind that there are still differences between the national models used for this exercise. The results must therefore be interpreted with caution.

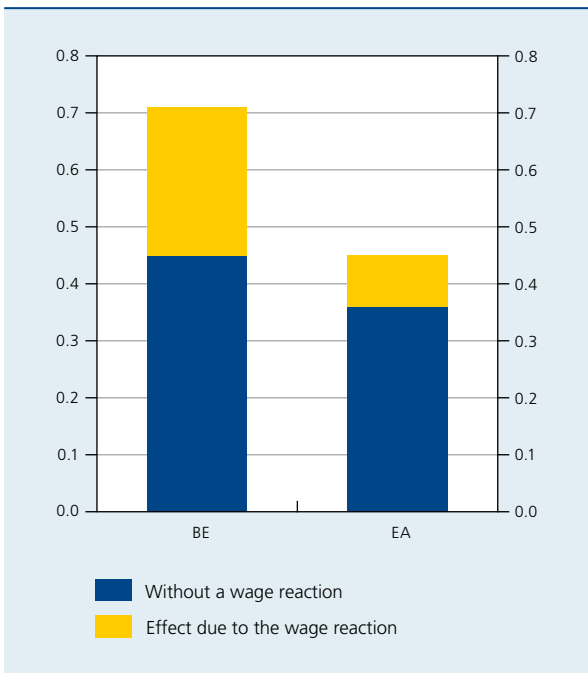
Taking account of the secondary effects via labour costs, a 10 p.c. increase in the oil price would increase the HICP over three years by 0.71 percentage point in Belgium and 0.45 percentage point in the euro area. The inflationary effect of an oil price shock is greater in Belgium for two reasons. First, the direct first-round effect on energy product consumer prices is higher. That stronger direct effect is in line with the finding set out above whereby the elasticity of consumer prices of energy products in Belgium, in response to a movement in international energy prices, is greater than in the rest of the euro area or in the three neighbouring countries. Moreover, that effect is reinforced by the fact that, in Belgium, energy products hold a more important position in the consumption basket and therefore have a higher weight in the HICP. Second, in view of the existence of wage indexation in Belgium, the risk of second-round effects and their scale are greater than in other euro area countries. The effects attributable to the reaction by wages are greater because, owing to the indexation mechanism, nominal hourly wages react almost immediately to the initial shock, even though part of the initial shock is neutralised by the use of the health index as the reference for indexation.

Regarding the impact on activity, a 10 p.c. rise in oil prices would reduce the level of GDP in Belgium by 0.46 percentage point over three years. The scale of the negative

CHART 15

IMPACT ON THE HICP OF A 10 P.C. INCREASE IN THE PRICE OF CRUDE OIL

(cumulative percentage differential after three years compared to the basic scenario with no oil shock)



Sources : ECB (2010), NBB for Belgium.

impact on activity would be greater than in the euro area, where it is estimated at 0.24 percentage point.

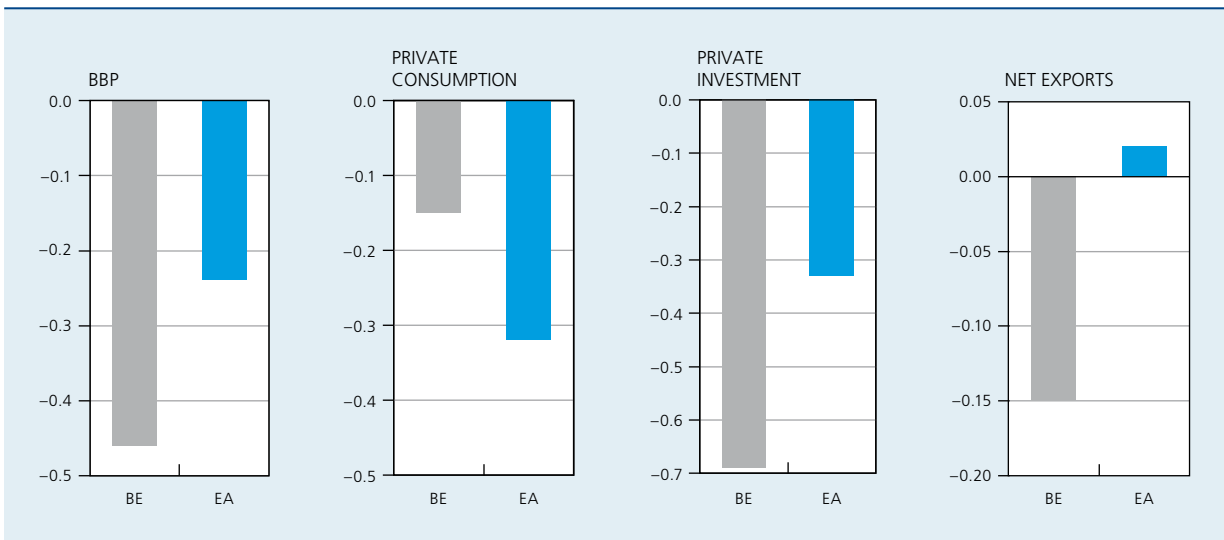
For Belgium, the effect on activity is due largely to net exports, following a very marked negative response by exports, whereas imports show a smaller decline. Owing to the indexation mechanism, a price-wage spiral is triggered, causing a deterioration in competitiveness. The negative reaction of investment is also stronger in Belgium than in the euro area, as production and business investment in Belgium have a higher energy content than elsewhere, and business competitiveness worsens. Conversely, the fall in private consumption is small in Belgium compared to the euro area, as indexation limits the decline in real wages.

The scenario adopted in this simulation is based on a simplified view of the system of wage-setting in Belgium : it disregards the fact that the wage norm fixed by the interprofessional agreements refers to forecasts for the evolution in labour costs in neighbouring countries. If the need arises, it is possible to adjust for any derailment in the recorded movements in labour costs compared to neighbouring countries. That mechanism enables the social partners to limit the negative effects of oil shocks on inflation and activity. In fact, a simulation based on the assumption that labour costs are unaffected by the increase in oil prices shows that the effect on inflation and activity is significantly attenuated in Belgium. Thus, the impact on inflation with no wage reaction comes to 0.45 percentage point, compared to 0.71 with a wage reaction, and the negative impact on economic activity is 0.37 percentage point, against 0.46.

CHART 16

IMPACT ON ECONOMIC ACTIVITY OF A 10 P.C. INCREASE IN THE PRICE OF CRUDE OIL

(cumulative percentage differential after three years compared to the basic scenario with no oil shock ; differential in percentage points for the contribution of net exports to the change in GDP)



Sources : ECB (2010), NBB for Belgium.

Conclusion

Compared to other euro area countries, Belgium is relatively sensitive to oil price shocks in terms of both inflation and economic activity. That sensitivity is due primarily to the relatively high energy intensity resulting in part from a specific industrial structure in that area, namely the over-representation of energy intensive branches of activity, such as metallurgy, chemicals and non-metallic minerals, and specialisation in the initial product processing stages in those branches of activity. In addition, the consumption of energy products by Belgian households is also higher than in the euro area. Since Belgium no longer has any fossil fuels, and renewable energy is not yet well developed there, it has a high degree of energy dependency on other countries. The management and, if possible, reduction of the energy intensity of both the production process and consumption habits therefore present a major challenge, not only for environmental reasons, but also for macroeconomic reasons, as demonstrated in this analysis.

The Belgian economy's greater vulnerability to oil price shocks is augmented by a range of other factors. Some of them concern the functioning of the energy markets and the pricing of energy products, while others relate to the functioning of the product and labour markets in Belgium.

The first range of factors include the low level of excise duty and related taxes on diesel, natural gas and

particularly heating oil. Consumer prices of these energy products are consequently more sensitive to fluctuations in the crude oil price in Belgium. Also, the consumer price of gas and electricity reacts much faster than in neighbouring countries to fluctuations in prices on the international energy markets. That is due to the mechanism whereby consumer prices are adjusted monthly via tariff-setting formulas based partly on the movement in the price of energy commodities; that practice is unique in Europe. Thus, the suppliers' gross margin is largely stabilised, and the uncertainty associated with energy price volatility mainly affects the consumer. In other euro area countries, prices are adjusted less frequently and in some cases they are still subject to some form of regulation. More generally, despite liberalisation, the effective degree of competition on the gas and electricity markets is still very low, both in Belgium and in the other euro area countries.

Moreover, the indexation applied in Belgium, not only to wages but also to certain prices, heightens the economy's sensitivity to oil price shocks, even though the use of the health index partly neutralises the initial shock. Owing to indexation, there are second-round effects on inflation, and economic activity suffers a stronger negative impact via a significant fall in exports due to the loss of competitiveness, even though private consumption is relatively well protected. However, that additional negative impact can be curbed by constant monitoring of Belgian competitiveness, in accordance with the 1996 law on the promotion of employment and the safeguarding of competitiveness.

Bibliography

ECB (2010), *Energy markets and the euro area macroeconomy*, Structural Issues Report.

Cornille D. (2009), *Pricing methodology: What is the reason for the greater volatility of consumer prices of gas and electricity in Belgium?*, NBB, Economic Review, 4.

Mc Kinsey & Company (2009), *Pathways to world-class energy efficiency in Belgium*, study commissioned by the Federation of Enterprises in Belgium (FEB/VBO).

Meyler A. (2009), *The pass through of oil prices into euro area consumer liquid fuel prices in an environment of high and volatile oil prices*, Energy Economics, 31, pp. 867-881.