2

Mining and quarrying

The activities covered within this chapter relate to mining and quarrying (as covered by NACE Section C). These are subsequently divided into two subchapters, split on the grounds of the type of product being mined: the first covers the extraction activities relating to energy-producing materials (for example, coal, crude petroleum, natural gas or uranium); while the second covers non-energy-producing materials (for example, metal ores, stone, sand, clay, salt, or a range of chemical and fertiliser minerals). Note this chapter only covers extractive activities and that the processing of fuel is covered within Chapter 6, the manufacture of other non-metallic mineral products is covered within Chapter 8, while the network supply and distribution of electricity, gas and steam is included in Chapter 14.

The global mining and quarrying sector is characterised by a relatively small number of international enterprise groups, that operate across the continents – sometimes with only their head office in the EU or another developed economy. These large scale producers are complemented by a large number of smaller enterprises, typically serving a local market in low value, widely available products, often for use in construction. The location of mining and quarrying activity generally reflects the spatial distribution of mineral deposits. However, there can be considerable cost differences between mines, for example, in relation to the depth at which deposits are found, or whether they are on land or at sea. Aside from geographical and geological cost differences, the decision of whether or not to (re-)open a mine may also depend, among others, on global, commodity prices, as well as regulations concerning the environmental impact of mining or the disposal of its waste.

The EU aims to become a low-carbon, energy-efficient economy in the coming years. The integrated energy and climate change policy laid out in December 2008 aims to cut greenhouse gases by 20 %, reduce energy consumption by 20 % through increased energy efficiency and to meet 20 % of the EU's energy needs from renewable sources by 2020 – these goals will have implications on the way extractive activities operate.

Another important aspect in relation to this sector concerns the security of supply for downstream activities. Aside from well-publicised geo-political disputes which have threatened the supply of crude petroleum or natural gas to European markets, there are also a large number of non-energy related minerals, which are often essential for downstream manufacturing activities. There is no indigenous supply for many of these, with the extraction of construction materials being one of the few areas where the EU is largely self-sufficient.

Structural profile

There were 20.7 thousand enterprises operating with mining and quarrying (NACE Section C) as their main activity in the EU-27 in 2006. Together they employed 733.2 thousand persons, equivalent to 0.6 % of the non-financial business economy (NACE Sections C to I and K) workforce, while they generated EUR 88.5 billion of value added (1.6 %). Paid employees made up 97.9 % of all persons employed (which also includes working proprietors and unpaid family workers) within the EU-27's mining and quarrying sector in 2006, well above the non-financial business economy average (86.5 %). Indeed, this proportion rose to 99.6 % for the mining and quarrying of energy producing materials (which was the highest among all industrial NACE subsections), whereas it stood close to the industrial average (94.2 %) for non-energy producing materials (95.4 %).

Table 2.1: Mining and quarrying (NACE Section C)
Structural profile, EU-27, 2006

	Enterprises		Turnover		Value added		Persons employed	
	(thousand)	(% of total)	(EUR million)	(% of total)	(EUR million)	(% of total)	(thousand)	(% of total)
Mining and quarrying	20.7	100.0	235 268	100.0	88 546	100.0	733.2	100.0
Mining and quarrying of energy producing materials	2.4	11.7	185 492	78.8	69 082	78.0	444.6	60.6
Mining and quarrying, except of energy producing materials	18.3	88.3	49 777	21.2	19 464	22.0	288.5	39.3

Source: Eurostat (SBS)

Table 2.2: Mining and quarrying (NACE Section C)
Structural profile: ranking of top five Member States, 2006

	Highest value added (1)			Largest number of persons employed (1)			Most specialised: share in the non-financial business economy (%)	
	Country	(EUR million)	(% of EU-27)	Country	(thousand)	(% of EU-27)	Value added (2)	Persons employed (3)
1	United Kingdom	34 978	39.5	Poland	188.6	24.4	Romania (8.2)	Romania (3.3)
2	Denmark	7 712	8.7	Romania	134.3	17.4	Denmark (6.6)	Poland (2.5)
3	Italy	7 323	8.3	Germany	87.6	11.9	Poland (4.7)	Bulgaria (1.6)
4	Germany	6 473	7.3	United Kingdom	65.6	9.0	Bulgaria (3.8)	Estonia (1.3)
5	Poland	5 745	6.9	Czech Republic	44.4	6.1	United Kingdom (3.3)	Czech Republic (1.3)

(1) Malta, not available; Bulgaria, the Netherlands, Poland and Romania, 2005.
(2) Malta and the Netherlands, not available; Bulgaria, Cyprus, Poland and Romania, 2005.
(3) Malta, not available; Bulgaria, Cyprus, the Netherlands, Poland and Romania, 2005.

Source: Eurostat (SBS)

The vast majority (88.3 %) of the EU-27's mining and quarrying enterprises extracted non-energy producing materials (NACE Subsection CB). However, in economic terms, the relative importance of energy producing materials (NACE Subsection CA) was far greater, accounting for 78.0 % of sectoral value added; in more detail the most important activity (in value added terms) was the extraction of crude petroleum and natural gas (NACE Division 10), which accounted for approximately two thirds (66.9 %) of EU-27 sectoral value added.

It is perhaps therefore not surprising to find that the United Kingdom (with oil and gas fields off its east coast) recorded the highest share (39.5 %) of EU-27 value added within the mining and quarrying sector in 2006. Denmark (predominantly natural gas), Italy (crude petroleum and natural gas), Germany and Poland (both coal and lignite) were also relatively important producers within the EU in value added terms. The Polish mining and quarrying workforce of 188.6 thousand persons was equivalent to almost a quarter (24.4 %, 2005) of the EU-27 total, and was followed by Romania (17.4 %, 2005) and Germany (11.9 %).

The relative importance of the mining and quarrying sector tended to be highest among those countries specialised in the of energy producing materials: the extraction of crude petroleum and natural gas in Romania, Denmark and the United Kingdom, or the mining of coal and lignite in Poland, the Czech Republic, Bulgaria and Romania. This is perhaps not surprising given the geological distribution of natural resources – which were scarce or non-existent in many of the remaining Member States. Bulgaria, Romania and Sweden were specialised in the extraction of metal ores, while Bulgaria, Cyprus, Greece and Portugal recorded some of the highest specialisation ratios with respect to other mining and quarrying.

The enterprise size structure of the mining and quarrying sector would appear to be dominated by large enterprises; however, the overall average is a combination of two extremes. The mining and quarrying of coal and lignite and of metal ores are particularly concentrated in only a few locations and characterised by a high dominance of large enterprises (with 250 or more persons employed); the extraction of crude petroleum and natural gas is also relatively concentrated among large enterprises. Indeed, the mining of coal and lignite and the mining of metal ores were two of only four NACE divisions to report that upwards of 90 % of their EU-27 value added was generated by large enterprises (tobacco manufacturing and post and telecommunications being the others). On the other hand, the local sourcing of many construction materials and a range of chemical and fertiliser minerals are characterised by widespread availability, relatively high transport costs and low barriers to entry, reflected in a higher degree of importance for small and medium-sized enterprises (with less than 250 persons employed).

Large enterprises accounted for 64.3 % of the total value added generated within the EU-27's mining and quarrying sector in 2006, more than 20 percentage points above the non-financial business economy average. In employment terms, the relative importance of large enterprises was even greater, accounting for 68.1 % of the mining and quarrying workforce, compared with an average of 32.6 % for the whole of the non-financial business economy. The fact that the employment share of large enterprises was larger than the

Table 2.3: Mining and quarrying (NACE Section C)
Share of value added and persons employed by enterprise size class, EU-27, 2006 (%)

	Value added		Persons employed	
	Non-financial business economy (1)	Mining and quarrying	Non-financial business economy	Mining and quarrying
1 to 9 persons employed	21.0	11.9	29.7	5.5
10 to 49 persons employed	18.9	9.3	20.7	13.2
50 to 249 persons employed	17.8	14.5	17.0	12.8
250 or more persons employed	42.1	64.3	32.6	68.1

(1) 1 to 9 persons employed and 50 to 249 persons employed, 2005.

Source: Eurostat (SBS)

value added share indicates that large enterprises had a lower apparent labour productivity than small and medium-sized enterprises (with less than 250 persons employed). This is unusual, in that large enterprises generally display a higher productivity; the situation of this sector is due principally to the particularly low labour productivity among the large enterprises in the mining and quarrying of coal and lignite subsector.

Developments in output, costs and prices

The EU-27's mining and quarrying sector is an industry that has been in decline for several decades. The average reduction in output during the period 1997-2007 equated to 2.2 % per annum. This was entirely due to a decrease in mining and quarrying activity for energy producing materials (average decline of 3.2 % per annum), as the EU-27 index of production for mining and quarrying of non-energy producing materials rose, on average, by 2.0 % per annum over the period considered.

Employment losses within the EU-27's mining and quarrying workforce between 1997 and 2007 were substantial, employment falling on average by 5.6 % per annum compared with an average of 1.2 % for industrial activities (NACE Sections C to E). Although the number of persons employed fell every year between 1997 and 2007, the biggest contractions were recorded at the start of the period in 1999 and 2000, when close to 10 % of the mining and quarrying workforce was shed each year.

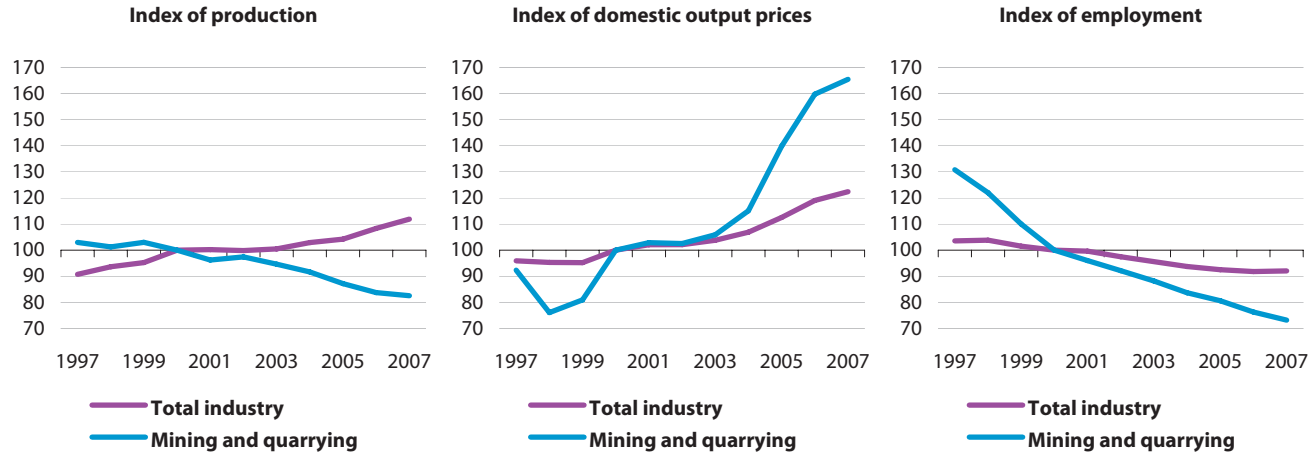
Domestic output prices for the EU-27's mining and quarrying sector show that there was a rapid fall in prices in 1998 (17.6 % compared with the year before). The fluctuating nature of prices was however evident two years later, as EU-27 output prices for mining and quarrying rose by 23.5 % in 2000, followed by a period of relative calm, before prices rose again at a rapid pace between 2004 and 2006, remaining at historically high levels in 2007. The overall output price index for mining and quarrying reflected closely developments in the index for the mining and quarrying of energy producing materials, although towards the end of the time-series there was also evidence of rapidly rising prices for non-energy producing materials (up 8.1 % in 2006); this latter development may be associated with increasing demand for minerals, driven by emerging economies).

Employment characteristics

EU-27 mining and quarrying activities are characterised by a relatively high reliance on full-time, male employment. According to the Labour Force Survey, 97.3 % of those employed in this sector worked on a full-time basis in 2007, the highest full-time employment rate of all the sectoral chapter aggregates used in this publication, and some 11.6 percentage points above the non-financial business economy average (85.7 %). Within the mining of coal and lignite, the full-time employment rate in the EU-27 was 99.0 %, the highest of any NACE division for which data are available, while among the remaining four NACE divisions that are included within the mining and quarrying sector, this proportion never fell lower than 94.6 %.

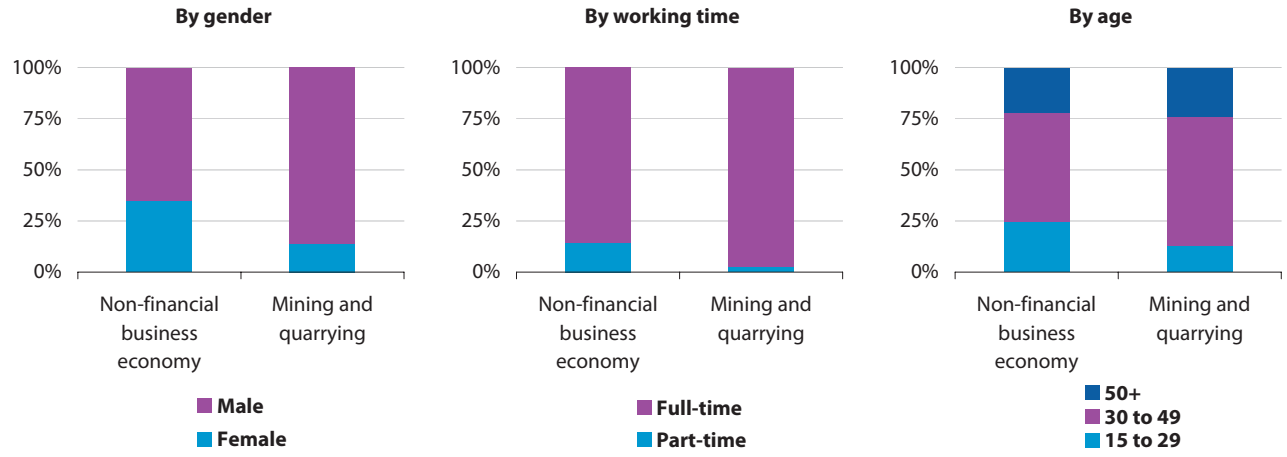
The EU-27's mining and quarrying workforce was predominantly composed of men (86.2 % of the total in 2007), 21.3 percentage points higher than the non-financial business economy average, and the second highest proportion among the chapters within this publication, smaller only than in construction.

Figure 2.1: Mining and quarrying (NACE Section C)
Evolution of main indicators, EU-27 (2000=100)



Source: Eurostat (STS)

Figure 2.2: Mining and quarrying (NACE Section C)
Employment characteristics, 2007



Source: Eurostat (LFS)

In terms of its age profile, the EU-27's mining and quarrying sector is atypical. It had a considerably lower proportion of younger workers, as just 12.9 % of those employed were aged less than 30. This was almost half the average share of this age group across the whole of the non-financial business economy (24.3 %) and was also the lowest proportion recorded for any chapter within this publication. The relative importance of those aged 30 to 49 was, in contrast, very high – representing 63.2 % of those employed within the mining and quarrying workforce – the highest ratio of any chapter, and 9.5 percentage points above the non-financial business economy average. The relative importance of those aged 50 or over in the mining and quarrying workforce (23.9 % of the total) was more in line with the average for the non-financial business economy (which was 2 percentage points less). Although a more detailed analysis reveals that there was a particularly low share of those aged 50 or less working within the mining of coal and lignite sector (17.7 %) – the third lowest share among NACE divisions – behind, only the manufacturing and service activities related to computers.

Table 2.4: Mining and quarrying (NACE Section C)
Expenditure, productivity and profitability, EU-27, 2006

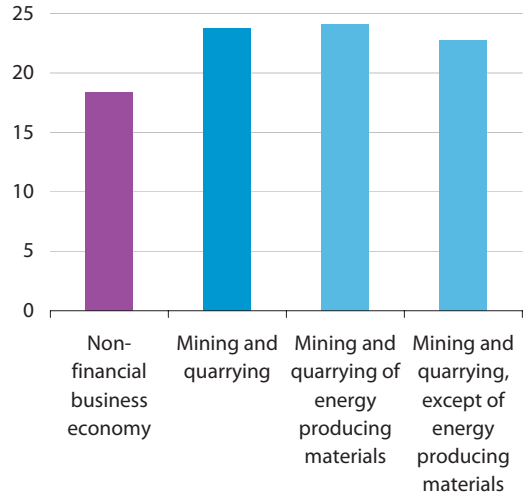
	(EUR million)			(EUR thousand per person)		(%)	
	Personnel costs	Purchases of goods & services	Investment in tangible goods	Apparent labour productivity	Average personnel costs	Wage adjusted labour productivity	Gross operating rate
Mining and quarrying	22 448	146 237	21 062	120.8	31.3	386.3	28.1
Mining and quarrying of energy producing materials	14 144	115 868	16 629	155.4	31.9	486.5	29.6
Mining and quarrying, except of energy producing materials	8 304	30 369	4 433	67.5	30.2	223.5	22.4

Source: Eurostat (SBS)

Expenditure, productivity and profitability

The mining and quarrying sector is generally characterised as a capital-intensive activity performed by large enterprises. This is particularly the case for projects that require exploration and test drilling, in advance of the considerable investment required to establish a new mine or off-shore drilling facility. Opencast (or surface) mines are generally cheaper than deep mines – although they may be rejected in the planning stage due to their effect on local landscapes. All forms of mining and quarrying incur environmental costs, which may relate to the disposal of waste, increased pollution, potential for ground subsidence, or changes to the local supply and quality of water.

Figure 2.3: Mining and quarrying (NACE Section C)
Investment rate, EU-27, 2006 (%)



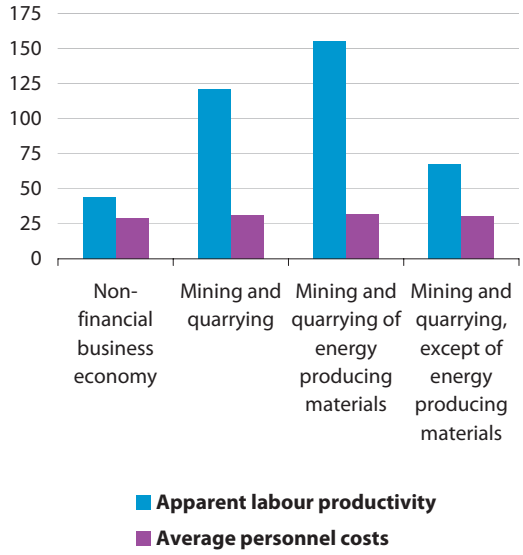
Source: Eurostat (SBS)

The level of tangible investment made by the mining and quarrying sector in 2006 reached EUR 21.1 billion in the EU-27, equivalent to 2.0 % of all tangible investment made in the non-financial business economy. The investment rate shows the ratio between investment and value added: in 2006 this was 23.8 % for the EU-27's mining and quarrying sector, approximately 30 % above the non-financial business economy average (18.4 %).

As regards operating expenditure, the share of personnel costs was relatively low in the EU-27's mining and quarrying sector, at 13.3 % in 2006 (compared with a non-financial business economy average of 16.1 %). This was particularly the case for the extraction of crude petroleum and natural gas, where personnel costs accounted for 5.8 % of total operating expenditure in 2006 – the second lowest figure among all NACE divisions in the non-financial business economy, behind the related downstream manufacturing activity of coke, refined petroleum products and nuclear fuel. In contrast, the mining and quarrying of non-energy producing materials was more labour-intensive.

The apparent labour productivity of the EU-27's mining and quarrying sector in 2006 was EUR 120.8 thousand per person employed. This was almost four times as high as the non-financial business economy average of EUR 43.5 thousand per person employed and was the second highest level of productivity among the chapter headings used in this publication (behind electricity, gas, steam and hot water supply). The aggregate figure for the whole of the mining and quarrying sector was skewed by very high productivity levels for the extraction of crude petroleum and natural gas (EUR 370.0 thousand per person employed in

Figure 2.4: Mining and quarrying (NACE Section C)
Labour output and costs, EU-27, 2006
(EUR thousand per capita)



Source: Eurostat (SBS)

2005), while labour productivity for the mining of metal ores (EUR 109.7 thousand per person employed in 2006) was also considerably above the non-financial business economy average.

Average personnel costs within the EU-27's mining and quarrying sector were EUR 31.3 thousand per employee in 2006, somewhat higher than the non-financial business economy average of EUR 28.8 thousand, but 7.1 % lower than the average for all industrial activities. Personnel costs per employee peaked at an estimated EUR 40.0 thousand per employee for the extraction of crude petroleum and natural gas in 2005, while the remaining three activities for which data are available (at the level of NACE divisions covered within this chapter (no information available for the mining of uranium and thorium ores) all reported average personnel costs close to the non-financial business economy average.

The wage adjusted labour productivity ratio combines the two previous ratios, and shows the extent to which value added per person employed covers average personnel costs per employee. In the EU-27's mining and quarrying sector in 2006, this ratio was 386.3 %, the highest among all the chapter headings used in this publication. Of the five NACE divisions that make up the mining and quarrying sector, this ratio peaked at an estimated 900 % for the extraction of crude petroleum and natural gas in 2005, while value added covered personnel costs by more than four times for the mining of metal ores in 2006. The mining of coal and lignite was the only activity to record a wage adjusted labour productivity ratio (115.0 % in 2005) that was below the EU-27 average for the whole of the non-financial business economy (again no information available for the mining of uranium and thorium ores).

The gross operating rate (the relation between the gross operating surplus and turnover) is one measure of profitability; it stood at 28.1 % for the EU-27's mining and quarrying sector in 2006, more than twice non-financial business economy average (10.8 %) – and the highest level of profitability (using this measure) among any of the chapter headings used in this publication. Profitability was particularly high for the mining of metal ores (48.9 %), which recorded the highest gross operating rate among all of the NACE divisions within the non-financial business economy, while the rate for the extraction of crude petroleum and natural gas was third highest (31.2 %).

External trade

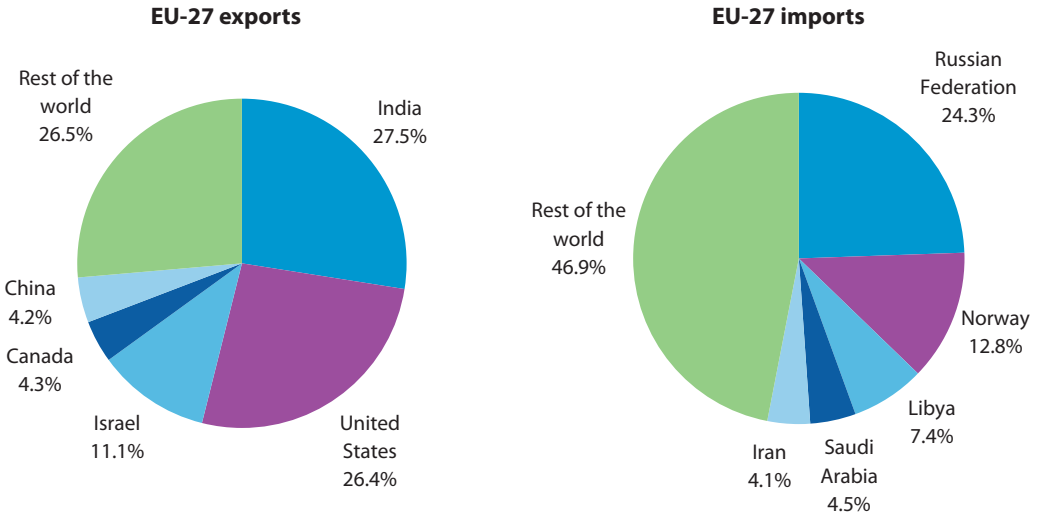
With a lack of natural resources (and therefore output), it is not surprising to find the EU-27 exports a relatively small amount of mining and quarrying products (CPA Section C). In 2007, these goods accounted for 1.7 % of total industrial (CPA Sections C to E) exports, of which the majority (62.1 %) were other mining and quarrying products (CPA Division 14).

Table 2.5: Products from mining and quarrying (CPA Section C)
External trade, EU-27, 2007

	Value (EUR million)			Share of industrial exports (%)	Share of industrial imports (%)
	Extra-EU exports	Extra-EU imports	Trade balance		
Products from mining and quarrying	20 001	293 763	-273 762	1.7	22.1
Coal and lignite; peat; crude petroleum and natural gas; uranium and thorium	6 434	259 316	-252 882	0.6	19.5
Metal ores and other mining and quarrying products	13 566	34 446	-20 880	1.2	2.6

Source: Eurostat (Comext)

Figure 2.5: Products from mining and quarrying (CPA Section C)
Main trading partners, EU-27, 2007 (% share of exports/imports in value terms)



Source: Eurostat (Comext)

The EU is highly dependent on non-member countries for its supplies of mining and quarrying products, and imports of these products accounted for 22.1 % of all industrial (CPA Sections C to E) imports in 2007, when a trade deficit of EUR 273.8 billion was recorded. The overwhelming majority (83.6 %) of the EU-27's imports of mining and quarrying were of crude petroleum and natural gas (CPA Division 11).

The increasing reliance on imports continued a long-established trend, and the EU-27 trade deficit for mining and quarrying products more than doubled in the five years from 2002 to 2007. To put this deficit into perspective, it was more than four times as high as the next largest deficit among the chapter headings used in this publication (recorded for electrical and optical equipment). The reliance on external providers is also confirmed by analysing the ratio of intra-EU to extra-EU imports for the 27 Member States, which stood at 23.7 % for mining and quarrying products in 2007 – the only industrial chapter within this publication where imports from non-member countries exceeded imports from other Member States.

Russia was the main origin of EU-27 mining and quarrying imports in 2007, accounting for almost one quarter (24.3 %) of the total – a share that was almost twice that recorded for the second largest supplier, Norway (12.8 %). The remaining countries that supplied mining and quarrying products to the EU-27 were largely dominated by oil-producing countries, such as Libya, Saudi Arabia or Iran, while Brazil, South Africa, Chile, Canada, Australia and Russia were among the most important suppliers of non-energy producing products.

In terms of world trade, Denmark was the only Member State where exports of mining and quarrying products were valued higher than imports, with a cover ratio of 345.2 % in 2007; the next highest ratio being recorded for the United Kingdom (82.0 %). The United Kingdom posted the highest level of mining and quarrying exports in 2007 (EUR 26.1 billion), which equated to 36.3 % of the total exports made by the 27 Member States. Note that the relatively high external trade figures for Belgium and the Netherlands reflect the role played by main sea ports in these countries (in particular, the Amsterdam-Rotterdam-Antwerp (ARA) region), where bunker facilities allow the temporary storage of mining and quarrying products before they are distributed across mainland Europe.

2.1: Extraction of energy producing materials

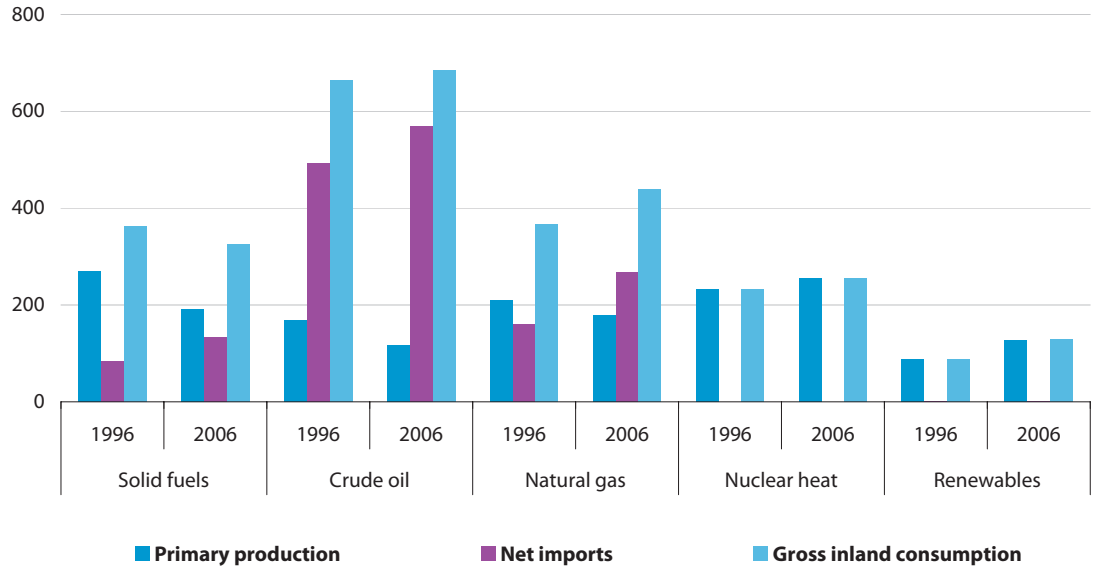
This subchapter looks in more detail at the mining of coal and lignite and the extraction of peat (NACE Division 10), hereafter referred to as the mining of coal and lignite; the extraction of crude petroleum and natural gas (NACE Division 11), as well as the mining of uranium and thorium ores (NACE Division 12) – official statistics for the latter are scarce as the activity does not exist in the vast majority of Member States and is often subject to statistical confidentiality where it does exist.

The vast majority of hard coal and lignite that is extracted within the EU is consumed as a transformation input, mostly in conventional thermal power stations, or alternatively transformed in coke oven plants. Crude petroleum is also used as a transformation input, principally in power stations or refineries (see Chapter 6 for more details of fuel processing activities).

The EU's coal mining activity has been in decline for over two decades (aside from breaks in series resulting from German reunification or the adhesion of some Member States). The extraction of crude petroleum and natural gas has also seen a downturn in activity since its production peaked in 1999. This pattern of falling production reflects, at least to some degree, the running down of natural reserves and higher costs associated with extracting increasingly scarce supplies. This may have been accelerated through continued competition from cheaper imports and the substitution of fossil fuels within the energy mix by renewables and cleaner technologies that promote reduced emissions. On the other hand, the significant increases in global prices for oil and gas in recent years are likely to have improved the economic viability of existing (and potentially new) gas, oil and coal fields, although prices have since fallen considerably since their peak levels in 2008.

Eurostat's energy statistics show a decline in the EU-27's primary production of solid fuels (on average by 3.4 % per annum between 1996 and 2006), crude petroleum (-3.6 % per annum) and natural gas (-1.6 % per annum). During the same period, EU-27 gross inland consumption increased, on average, by 0.7 % per annum. This imbalance between supply and demand was resolved through increased primary production of nuclear heat and renewables, and more significantly, through further reliance on imports – in particular, those of natural gas. There has been a gradual switch in the EU-27's energy mix during the period from 1996 to 2006, with the consumption of solid fuels falling, that of crude petroleum and nuclear heat increasing slightly, while the relative importance of natural gas and renewables grew at the fastest pace.

Figure 2.6: Mining and quarrying of energy producing materials
Main indicators for selected products, EU-27 (million toe)



Source: Eurostat (Energy statistics (ES) - quantities)

Table 2.6: Mining and quarrying of energy producing materials (NACE Subsection CA)
Structural profile, EU-27, 2006 (1)

	Enterprises (thousand)	Turnover (EUR million)	Value added (EUR million)	Persons employed (thousand)	Share in total (%)	
					Value added	Persons employed
Mining and quarrying of energy producing materials	2.4	185 492	69 082	444.6	100.0	100.0
Mining of coal and lignite; extraction of peat (2)	1.5	16 540	9 758	305.7	14.8	68.8
Mining and agglomeration of hard coal	0.3	10 754	6 665	214.4	9.6	48.2
Mining and agglomeration of lignite	0.1	4 449	2 653	79.3	3.8	17.8
Extraction and agglomeration of peat (2)	1.1	1 181	412	12.1	0.6	2.7
Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying (3)	1.0	168 825	59 223	150.0	85.7	31.5
Extraction of crude petroleum and natural gas (4)	0.3	157 479	51 925	84.3	78.7	19.0
Service activities incidental to oil and gas extraction, excluding surveying	0.6	11 347	5 000	50.0	7.2	11.2

(1) Mining of uranium and thorium ores, not available.
(2) Turnover and value added, 2005.
(3) Number of persons employed, rounded estimate based on non-confidential data, 2005.
(4) Value added, 2005.

Source: Eurostat (SBS)

Table 2.7: Mining and quarrying of energy producing materials (NACE Subsection CA)
Structural profile: ranking of top five Member States in terms of value added and persons employed, 2006

	Highest value added (1)			Largest number of persons employed (2)			Most specialised: share in non-financial business economy (%) (3)	
	Country	(EUR million)	(% of EU-27)	Country	(thousand)	(% of EU-27)	Country	Value added
1	United Kingdom	32 464	47.0	Poland	152.2	31.9	Romania	7.5
2	Denmark	7 589	11.0	Romania	106.0	22.2	Denmark	6.5
3	Italy	5 471	8.2	Germany	53.1	11.9	Poland	3.3
4	Netherlands	5 443	7.9	Czech Republic	38.0	8.6	United Kingdom	3.0
5	Germany	4 148	6.1	United Kingdom	36.1	8.1	Czech Republic	1.9

(1) Malta, not available; Belgium, Bulgaria, Greece, the Netherlands, Poland, Romania and Slovenia, 2005.
(2) Malta and Slovenia, not available; Belgium, Bulgaria, Greece, the Netherlands, Poland and Romania, 2005.
(3) Malta and the Netherlands, not available; Belgium, Bulgaria, Greece, Cyprus, Poland, Romania and Slovenia, 2005.

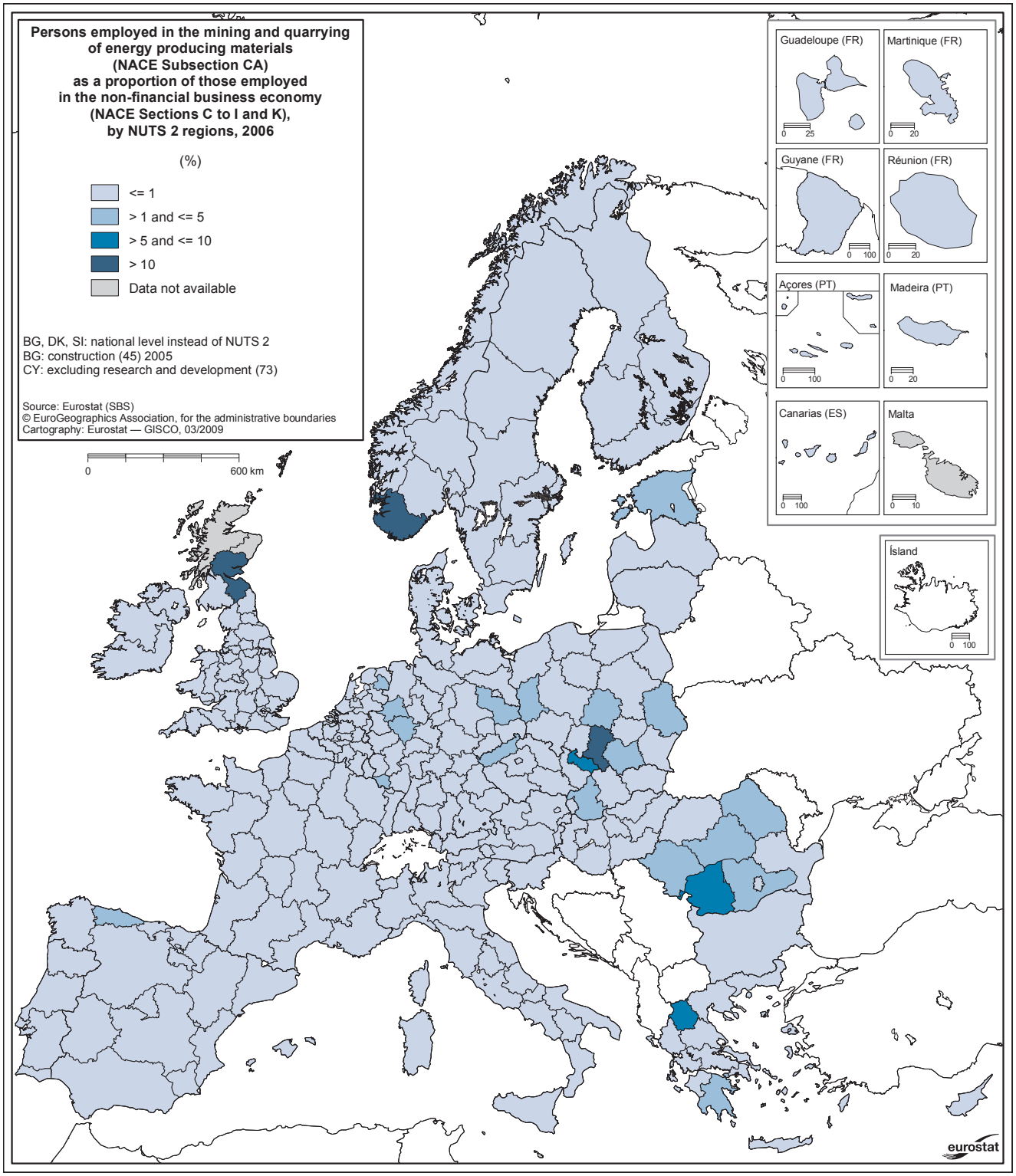
Source: Eurostat (SBS)

Structural profile

The mining and quarrying of energy producing materials (NACE Subsection CA) was the main activity of 2.4 thousand enterprises in the EU-27 in 2006. Together they generated EUR 69.1 billion of value added and employed some 444.6 thousand persons. In relative terms, the mining and quarrying of energy producing materials sector accounted for 1.2 % of the value added in the EU-27's non-financial business economy, but accounted for just 0.3 % of its workforce; relative to mining and quarrying (NACE Section C) the mining and quarrying of energy producing materials accounted for 78.0 % of value added and 60.6 % of the workforce.

The most important (in value added terms) subsector was clearly the extraction of crude petroleum and natural gas (NACE Group 11.1), which accounted for 78.7 % of the EU-27 total. None of the remaining NACE groups recorded a share in excess of 10 %, the next highest being a 9.6 % share registered for the mining and agglomeration of hard coal (NACE Group 10.1). In employment

Map 2.1: Mining and quarrying of energy producing materials (NACE Subsection CA)
Persons employed in the mining and quarrying of energy producing materials (NACE Subsection CA) as a proportion of those employed in the non-financial business economy (NACE Sections C to I and K) (%)



Source: Eurostat (SBS)

terms these figures were reversed, as only 19.0 % of the mining and quarrying of energy producing materials workforce were employed extracting crude petroleum and natural gas, while almost half (48.2 %) worked in the mining and agglomeration of hard coal.

In relative terms, Romania (2005) and Denmark were the most specialised Member States, as the mining and quarrying of energy producing materials accounted for 7.5 % and 6.5 % of the total value added generated within their respective non-financial business economies. However, almost half (47.0 %) of the EU-27's value added for mining and quarrying of energy producing materials was generated in the United Kingdom in 2006, while Denmark had the second highest share of EU-27 output (11.0 %); both of these countries were specialised in the extraction of crude petroleum and natural gas. The leading coal and lignite producers within the EU were Poland, Germany and the Czech Republic.

Together, Poland and Romania employed more than half of the EU-27's mining and quarrying of energy producing materials workforce (31.9 % and 22.2 % respectively in 2005). The map shows a few, often isolated regions, where this sector accounted for a relatively important share of the non-financial business economy workforce. The concentration of energy reserves within particular regions is such that upwards of 10 % of the non-financial business economy workforce in Eastern Scotland (the United Kingdom), Śląskie (Poland) and Agder og Rogaland (Norway) were employed within the mining and quarrying of energy producing materials sector in 2006 (compared with an EU-27 average of 0.3 %), while several regions in Romania and the Czech Republic were also particularly specialised in these activities.

EU-27 output from the mining and quarrying of energy producing materials fell on average by 3.2 % per annum in the ten years to 2007, while employment fell by 6.8 % per annum; this continued a pattern of steadily falling output and steeper reductions in employment. The decline in output was particularly marked for the mining of coal and lignite (4.9 % per annum in the ten years to 2007), while the corresponding figure for the extraction of crude petroleum and natural gas was -2.8 % per annum.

In contrast, the development of domestic output prices in the EU was less stable, particularly for the extraction of crude petroleum and natural gas for which prices increased strongly in 1999 and 2000, fell slightly for two years, and then increased rapidly through to 2007. Indeed, the increase in the output price for the extraction of crude petroleum and natural gas since 2000 was the second highest recorded among all the NACE divisions within the industrial economy, as prices almost doubled in this seven-year period, rising on average by 10.0 % per annum. Output prices for the mining and quarrying of coal and lignite followed a similar path, although changes were less volatile and often occurred a year after those witnessed for crude petroleum and natural gas extraction (possibly reflecting a substitution effect); the average increase was 5.5 % per annum between 2000 and 2007.

Focus on crude petroleum prices and reserves

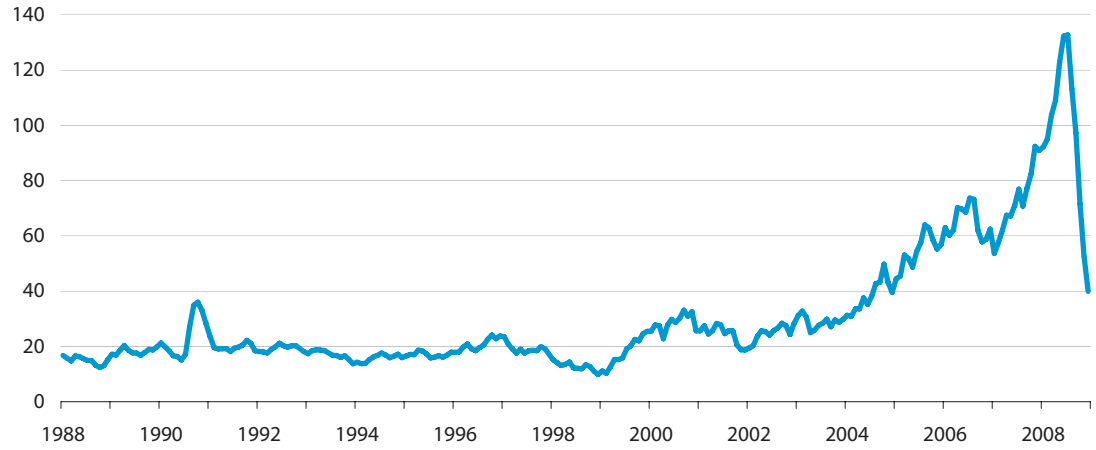
As noted above, one of the most visible characteristics of the energy-producing sector is the volatility in the price of oil, which rose from USD 18.7 in December 2001 to a high of more than USD 130 per barrel (of Brent crude) in July 2008. At the time of writing, the price had dropped dramatically to around USD 40 a barrel by December 2008. High oil prices have an impact on the price of substitutes, notably natural gas, and also feed into the price of other products that either use considerable amounts of energy or energy products as raw materials in their manufacturing processes.

The BP Statistical Review of World Energy notes that 'proved reserves are generally taken to be those quantities that geological and engineering information indicates with reasonable certainty can be recovered in the future from known reservoirs under existing economic and operating conditions'. The ratio of reserves to production provides confirmation of the dwindling stock of oil reserves in the EU and Norway, which – under current conditions – are likely to dry up by approximately 2015. The estimates suggest that by 2050, on a global level, unless there is a dramatic reduction in the rate at which crude petroleum is consumed, there will be little or no oil left, unless fresh reserves are discovered and be exploited).

Expenditure and productivity

The mining and quarrying of energy producing materials is a particularly capital-intensive activity, accounting for 1.6 % of the EU-27's non-financial business economy investment in 2006 (compared with its 0.3 % share of the workforce). Personnel costs accounted for a 10.9 % share of total operating expenditure, compared with an average of 16.1 % for the whole of the non-financial business economy.

Figure 2.7: Mining and quarrying of energy producing materials
Brent spot price FOB (USD/barrel), monthly average



Source: Energy Information Administration (United States), http://tonto.eia.doe.gov/dnav/pet/hist/rbrteM.htm

Table 2.8: Mining and quarrying of energy producing materials
Production and proved reserves of oil, 2007 (1)

	Production (million barrels/day)	Proved reserves (billion barrels) (2)	R/P ratio (years) (3)
EU and Norway (DK, IT, RO, UK, NO)	4.7	14.2	8.2
Central & Eastern Europe, Eurasia	13.1	129.5	27.1
Middle East	25.2	755.3	82.2
North America	13.7	69.3	13.9
South and Central America	6.6	111.2	45.9
Africa	10.3	117.5	31.2
Asia Pacific	7.9	40.8	14.2
World	81.5	1 237.9	41.6

(1) Oil includes gas condensate and natural gas liquids as well as crude oil.
(2) As of end 2007.
(3) Ratio of reserves divided by production.

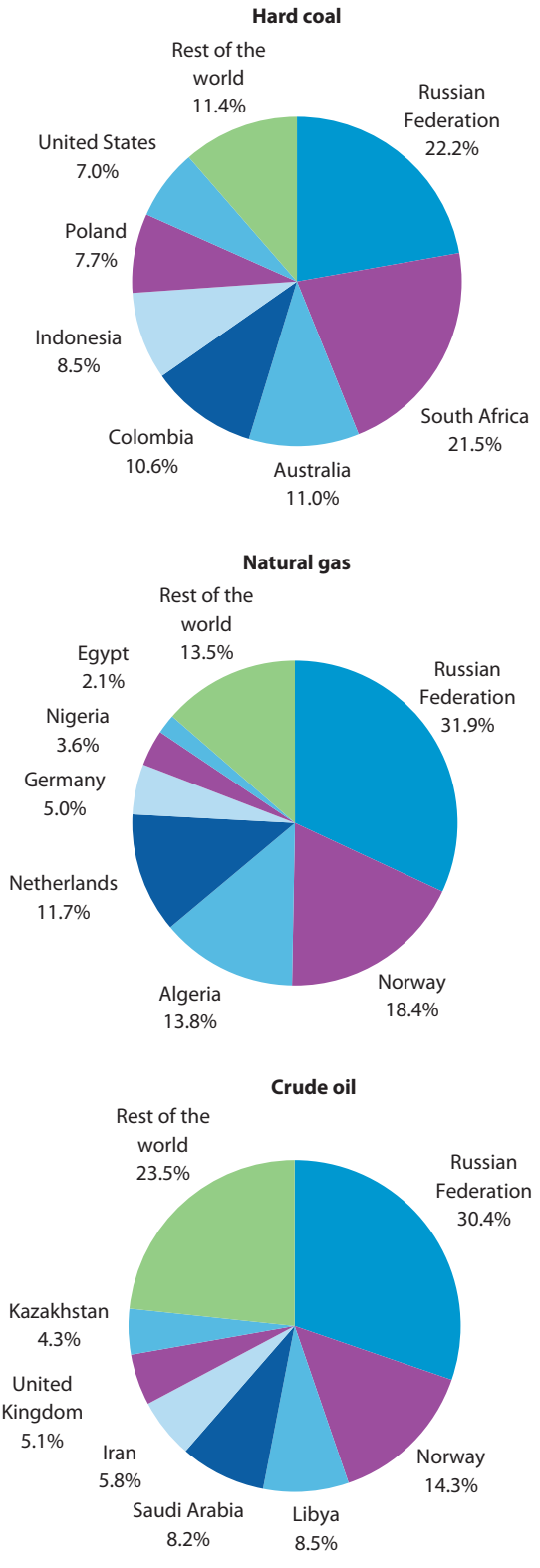
Source: BP Statistical Review of World Energy June 2008

The mining and quarrying of energy producing materials sector recorded, by far, the highest level of productivity among any of the NACE subsections within the non-financial business economy, as each person employed generated an average of EUR 155.4 thousand of value added. In contrast, average personnel costs were EUR 31.9 thousand per employee, which was only 10.8 % above the non-financial business economy average. The resulting wage adjusted labour productivity ratio of 486.5 % was also the highest of all industrial NACE subsections – and was more than twice the next highest ratio, recorded for the mining and quarrying of non-energy producing materials (see the next subchapter).

The highly capital-intensive and productive nature of this sector can be wholly attributed to the performance of the extraction of crude petroleum and natural gas subsector, where apparent labour productivity reached EUR 370.0 thousand per person employed in 2005 and the investment rate was 25.1 % in 2006. In contrast, both the apparent labour productivity (EUR 30.0 thousand per person employed) and investment rate (16.7 %) of the mining of coal and lignite subsector were below the non-financial business economy average in 2005.

Almost half (49.7 %) of the EU-27's investment within the mining and quarrying of energy producing materials sector in 2006 was accounted for by the United Kingdom. In Slovakia, the mining and quarrying of energy producing materials sector accounted for 6.3 % of all investment made within the non-financial business economy in 2006. This relative share was somewhat higher than in the United Kingdom (5.3 %), while Romania, Denmark and Poland also recorded a particularly high propensity to invest in these activities.

Figure 2.8: Mining and quarrying of energy producing materials
Sum of EU-27 Member States: origin of imports, 2006 (%)



Source: Eurostat (Energy statistics (ES) - quantities)

Focus on imports of energy products

With increasing demand on imports from non-member countries, the Russian Federation has gradually become the most important supplier of a range of energy products to the EU. In 2006, the Russian Federation provided 31.9 % of natural gas imports, 30.4 % of crude petroleum imports and 22.2 % of hard coal imports; all figures are in volume terms (as measured by tonnes of oil equivalents). Aside from the Russian Federation, which is endowed with a full range of energy resources, the origin of imports is generally quite diverse. For example, more than one fifth of the coal imported by the Member States originated from South Africa, while large volumes of coal were also imported from as far as Australia, Colombia or Indonesia. Around one fifth of the imports of crude petroleum that are made by the Member States originated from the North Sea reserves that are shared between Norway and the United Kingdom, while a fairly large proportion of EU imports come from OPEC countries (that include Libya, Saudi Arabia and Iran).

2.2: Non-energy mining and quarrying

This subchapter covers both underground and open-cast mining of ferrous and non-ferrous metal ores (NACE Division 13), as well as the mining and quarrying of other non-energy producing materials (NACE Division 14), including a variety of materials traditionally used for construction purposes (such as sand, clay or stone), as well as the extraction of salt and a range of other chemical and fertiliser minerals. Together these NACE divisions make up NACE Subsection CB, referred to hereafter as the non-energy mining and quarrying sector.

In November 2008 the European Commission [1] published a raw materials initiative, stating that access to and the affordability of many raw materials is likely to play an important role in determining the competitiveness and future growth prospects of the EU economy. As with many energy producing materials, the EU is also highly dependent on a range of strategically important non-energy minerals and ores that are imported from a range of countries, in particular: China, the Russian Federation, Australia and a range of countries in Africa and South America.

The EU is particularly dependent on imports of metallic minerals. While some of these metals are needed only in tiny quantities, they can be essential for the production of technologically sophisticated products, in particular, new areas of development related to environmental technologies (for example, hydrogen-fuel based cars require platinum-based catalysts and electric-hybrid cars need lithium batteries). A range of European manufacturing activities, most notably the chemicals, motor vehicles, aerospace, machinery and equipment sectors all depend on supplies of raw materials such as these. Aside from these technologically-driven uses, industrial and construction minerals are often further processed in downstream sectors, for example, the manufacture of glass, concrete, or agricultural chemicals, as well as being used directly within the construction sector. The EU is self-sufficient in most construction minerals, in particular aggregates, and is also a leading producer of feldspar, gypsum, potash and natural stone.

Structural profile

There were about 18.3 thousand enterprises with non-energy mining and quarrying (NACE Subsection CB) as their main activity in the EU-27 in 2006, and they generated EUR 19.5 billion of value added and employed 288.5 thousand persons. Non-energy mining and quarrying is a relatively small industrial activity, accounting for just 0.3 % of the value added generated within the EU-27's non-financial business economy (NACE Sections C to I and K) or 0.2 % of its workforce. Relative to mining and quarrying (NACE Section C) as a whole, non-energy mining and quarrying accounted for 22.0 % of value added and 39.3 % of the workforce.

The enterprise size structure of the non-energy mining and quarrying sector is the average of two extremes. Overall, it is dominated by locally-based, small and medium-sized enterprises that operate principally within the other mining and quarrying subsector (NACE Division 14), while there were just 0.3 thousand enterprises active within the mining of metal ores (NACE Division 13) in the EU-27 in 2006. The difference in the number of enterprises was a factor of 55 in favour of other mining and quarrying subsector, while the corresponding ratio for value added suggested that other mining and quarrying activities were 2.9 times as large. At the more detailed level of NACE groups, the quarrying of sand and clay (NACE Group 14.2) was clearly the largest activity covered by this subchapter, accounting for close to half of all enterprises (52.5 %), value added (48.8 %), investment in tangible goods (51.4 %) and employment (48.5 %).

There were seven principal producers of non-energy mining and quarrying products within the EU-27; the six largest Member States (in terms of population) and Sweden. Each of these generated between 9.5 % and 12.9 % of the EU-27's value added in this sector (Polish data are for 2005), with the highest level recorded in the United Kingdom (EUR 2.5 billion). Bulgaria, Poland (both 2005), Sweden, Ireland, Portugal and Romania were clearly the most specialised Member States in value added terms – each of these countries reported that their non-energy mining and quarrying sector contributed at least twice the EU-27 average share to value added within their respective non-financial business economies.

(1) COM(2008) 699.

Table 2.9: Mining and quarrying, except of energy producing materials (NACE Subsection CB) Structural profile, EU-27, 2006

	Enterprises (thousand)	Turnover (EUR million)	Value added (EUR million)	Persons employed (thousand)	Share in total (%)	
					Value added	Persons employed
Mining and quarrying, except of energy producing materials	18.3	49 777	19 464	288.5	100.0	100.0
Mining of metal ores	0.3	7 786	4 993	45.5	25.7	15.8
Mining of iron ores	0.0	:	:	4.3	:	:
Mining of non-ferrous metal ores (1)	0.3	4 031	2 387	41.2	14.0	14.3
Other mining and quarrying	18.0	41 991	14 471	243.1	74.3	84.3
Quarrying of stone	6.5	8 644	3 251	70.5	16.7	24.4
Quarrying of sand and clay	9.6	28 200	9 500	140.0	48.8	48.5
Mining of chemical and fertilizer minerals (2)	0.2	954	292	6.5	1.7	2.2
Production of salt	0.6	1 827	665	11.2	3.4	3.9
Other mining and quarrying n.e.c.	1.0	2 582	817	12.9	4.2	4.5

(1) Turnover and value added, 2005.
(2) Turnover, value added and the number of persons employed, 2005.

Source: Eurostat (SBS)

Table 2.10: Mining and quarrying, except of energy producing materials (NACE Subsection CB) Structural profile: ranking of top five Member States in terms of value added and persons employed, 2006

	Highest value added (1)			Largest number of persons employed (2)			Most specialised: share in non-financial business economy (%) (3)	
	Country	(EUR million)	(% of EU-27)	Country	(thou-sand)	(% of EU-27)	Country	Value added
1	United Kingdom	2 514	12.9	Poland	36.4	12.3	Bulgaria	2.3
2	Germany	2 325	11.9	Germany	34.5	12.0	Poland	1.4
3	France	2 076	10.7	United Kingdom	29.6	10.2	Sweden	1.1
4	Spain	1 868	10.0	Italy	29.1	10.1	Ireland	1.0
5	Italy	1 853	9.6	Spain	28.9	10.0	Portugal	0.9

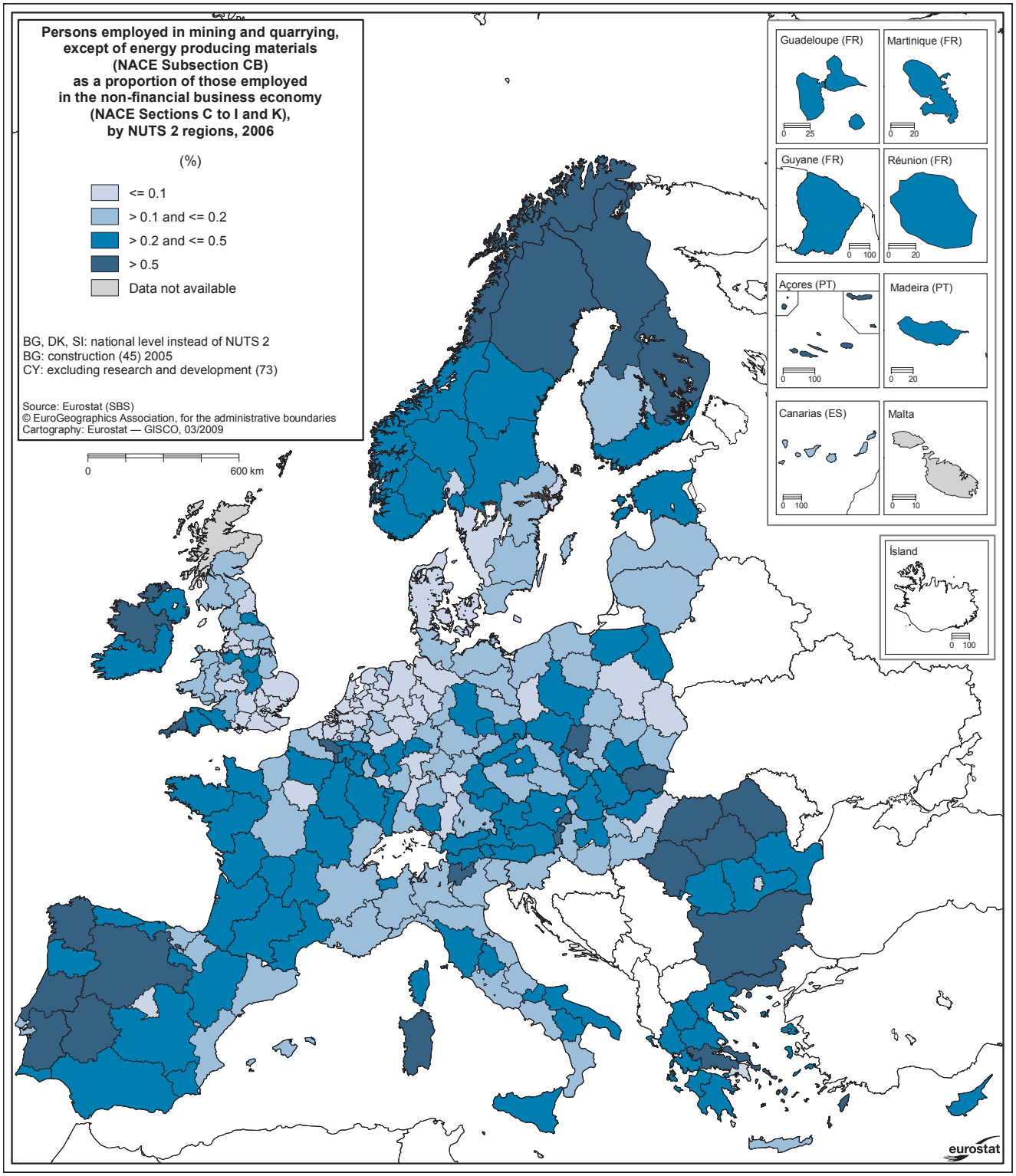
(1) Malta, not available; Belgium, Bulgaria, Greece, the Netherlands, Poland, Romania and Slovenia, 2005.
(2) Malta and Slovenia, not available; Belgium, Bulgaria, Greece, the Netherlands, Poland and Romania, 2005.
(3) Malta and the Netherlands, not available; Belgium, Bulgaria, Greece, Cyprus, Poland, Romania and Slovenia, 2005.

Source: Eurostat (SBS)

In employment terms, the Polish workforce of 36.4 thousand (again for 2005) was equivalent to 12.3 % of the EU-27 total and was followed by Germany (12.0 %), whilst Romania (also 2005) as well as the United Kingdom, Italy, Spain and France each had between 28.0 thousand and 30.0 thousand persons employed in the sector. Employment in the non-energy mining and quarrying sector was also relatively high in Sweden, where it stood at 8.1 thousand persons in 2006. The regional specialisation of non-energy mining and quarrying activities, based on the non-financial business economy employment share of this sector, is shown in the map. Relatively high shares were recorded for several regions on the periphery of the EU, notably Övre Norrland in northern Sweden (where 4.0 % of the non-financial business economy workforce was employed in non-energy mining and quarrying activities), northern regions of Finland, several regions in Bulgaria, Greece and Romania, central and southern Portugal, as well as Cornwall and Devon in the United Kingdom.

The last decade has seen almost continual growth for the EU-27 index of production for non-energy mining and quarrying, averaging 2.1 % per annum during the ten years to 2007, and only interrupted by a 2.3 % reduction in 2001. The performance of the overall index is closely tied to the evolution of output from the mining of stone and the mining of sand and clay. In contrast, the index of production for the mining of metal ores resembles more closely that for energy producing materials (see previous subchapter), with output falling.

Map 2.2: Mining and quarrying, except of energy producing materials (NACE Subsection CB)
Persons employed in mining and quarrying, except of energy producing materials (NACE CB)
as a proportion of those employed in the non-financial business economy (NACE Sections C to I and K) (%)



Source: Eurostat (SBS)

Table 2.11: Mining and quarrying, except of energy producing materials (NACE Subsection CB)
Expenditure, productivity and profitability, EU-27, 2006

	(EUR million)			(EUR thousand per person)	
	Personnel costs	Purchases of goods & services	Investment in tangible goods	Apparent labour productivity	Average personnel costs
Mining and quarrying, except of energy producing materials	8 304	30 369	4 433	67.5	30.2
Mining of metal ores	1 186	3 143	1 043	109.7	26.6
Other mining and quarrying	7 117	27 226	3 390	59.5	30.9

Source: Eurostat (SBS)

The EU-27 employment index for non-energy mining and quarrying fell in each of the last nine years, with reductions averaging 2.7 % per annum. More detailed information (available since 2000) shows that the largest reductions in employment were recorded for the mining of metal ores (averaging -14.6 % per annum between 2000 and 2007 – equivalent to an overall fall of more than 60 %). During the same period, the employment index for other mining and quarrying fell to a low in 2004, since when three consecutive increases were registered.

Other mining and quarrying experienced uninterrupted domestic output price growth in the EU-27, averaging 2.7 % per annum in the ten years to 2007. Prices generally rose at a fairly uniform pace, although there was a high increase of 6.5 % in 2002 and some evidence of accelerating price growth in 2006 and 2007 (as year-on-year increases of 3.0 % and 3.8 % were registered). A shorter time-series is available for the mining of metal ores, with price fluctuations considerably greater. This reflected contract negotiations between iron ore mining and steel making enterprises, as well as rising global demand for metals in general, driven by unprecedented demand from rapidly emerging economies, such as China, Brazil and India. EU-27 output prices for metal ores stood almost 160 % higher in 2007 than they were in 2000 – by far the biggest increase across any of the NACE divisions within the industrial economy.

Expenditure and productivity

The EU-27's non-energy mining and quarrying sector recorded an investment rate (the ratio of investment to value added) of 22.8 % in 2006, somewhat higher than the average for the whole of the non-financial business economy (18.4 %). The capital-intensive nature of this activity is evident when looking at its share of total investment within the non-financial business economy (0.4 %), which was almost twice as high as its share of the non-financial business economy workforce (0.2 %).

Nevertheless, personnel costs accounted for a relatively high proportion (21.5 %) of total operating expenditure in the EU-27's non-energy mining and quarrying sector in 2006, compared with an average of 16.1 % for the whole of the non-financial business economy. This relatively high share was based on average personnel costs of EUR 30.2 thousand per employee, slightly above the non-financial business economy average of EUR 28.8 thousand per employee.

In contrast, the EU-27's non-energy mining and quarrying sector recorded an apparent labour productivity of EUR 67.5 thousand per person employed in 2006, which was 55 % higher than the non-financial business economy average (EUR 43.5 thousand per person employed). Combining these two ratios into the wage adjusted labour productivity ratio shows the relationship between value added and personnel costs per head, and indicates that value added per person employed in the EU-27's non-energy mining and quarrying sector was equivalent to 223.5 % of the average personnel costs in 2006, significantly higher than the non-financial business economy average (151.1 %).

Among the NACE groups that make-up the non-energy mining and quarrying sector, the most capital intensive and productive activity was the mining of iron ores subsector. The quarrying of sand and clay was the only other activity to record labour productivity above the sectoral average, while the mining of non-ferrous metals was the only other activity to report a wage adjusted labour productivity ratio above the sectoral average (resulting from average personnel costs that were less than two thirds the non-financial business economy average).

The highest level of wage adjusted labour productivity within the non-energy mining and quarrying sector was recorded in Sweden (384.5 %) – a country specialised in the mining of iron ores – where apparent labour productivity was close to four times the average personnel costs. Only Slovakia and Romania (2005) recorded wage adjusted labour productivity ratios in the non-energy mining and quarrying sector that were below the average ratio for the non-financial business economy [2].

(2) Belgium, Bulgaria, Greece, Cyprus, Poland and Romania, 2005; Ireland, Malta, the Netherlands and Slovenia, not available.

Table 2.12: Mining and quarrying (NACE Section C)
Main indicators, 2006 (1)

	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	IT	CY	LV	LT
Enterprises	0.2	0.3	0.3	0.2	1.9	0.1	0.1	0.7	2.7	2.8	3.4	0.1	0.1	0.1
Persons employed	3.4	29.8	44.4	4.1	87.6	5.4	6.2	13.5	38.6	33.0	42.4	0.6	2.9	3.5
Turnover	974	795	2 984	8 907	14 367	209	2 370	1 712	5 653	10 991	58 647	82	99	187
Production	976	772	2 855	8 836	13 146	212	2 364	1 697	5 750	10 394	58 961	81	99	194
Purch. of goods & serv.	605	446	1 849	1 196	9 998	105	1 179	792	3 579	7 533	51 850	38	63	90
Value added	345	378	1 468	7 712	6 473	94	1 167	951	2 500	4 612	7 323	43	42	99
Personnel costs	148	149	653	227	4 256	55	326	541	1 267	1 661	1 813	16	18	30
Average personnel costs	46.7	5.0	14.8	55.6	49.4	10.3	52.8	42.0	33.9	50.6	48.1	29.9	6.2	8.6
Gross operating surplus	197	228	814	7 485	2 217	38	841	410	1 233	2 951	5 510	27	24	70
Gross investment	48	150	274	988	1 234	33	133	129	600	885	1 737	6	20	22
Apparent labour prod.	102.6	12.7	33.0	1 872.2	73.9	17.5	188.0	70.5	64.7	139.7	172.6	74.8	14.7	28.7
Wage adj. labour prod.	219.6	251.0	222.9	3 368.3	149.6	169.0	356.1	167.8	190.7	275.9	358.4	250.3	237.1	333.1
Gross operating rate	20.2	28.7	27.3	84.0	15.4	18.3	35.5	23.9	21.8	26.8	9.4	33.1	24.7	37.2
Investment rate	14.0	39.6	18.7	12.8	19.1	35.6	11.4	13.5	24.0	19.2	23.7	13.4	48.3	22.2
	LU	**HU**	**MT**	**NL**	**AT**	**PL**	**PT**	**RO**	**SI**	**SK**	**FI**	**SE**	**UK**	**NO**
Enterprises	0.0	0.4	:	0.2	0.4	1.2	1.6	0.7	0.1	0.1	1.0	0.7	1.3	0.8
Persons employed	0.3	5.6	:	8.7	6.0	188.6	14.1	134.3	3.8	8.8	3.6	8.8	65.6	33.7
Turnover	71	463	:	25 410	2 045	8 477	1 291	4 864	253	349	1 070	2 961	71 375	86 040
Production	69	468	:	10 381	1 916	8 957	1 289	4 799	251	337	999	2 969	66 125	88 200
Purch. of goods & serv.	37	404	:	17 801	1 081	3 356	655	2 726	131	184	701	1 239	33 205	33 954
Value added	33	156	:	5 701	936	5 745	678	2 303	122	187	415	1 776	34 978	43 653
Personnel costs	14	69	:	526	304	3 113	230	1 064	100	75	138	428	4 925	4 354
Average personnel costs	42.5	12.8	:	60.6	52.3	16.6	17.0	7.9	26.8	8.5	40.5	54.5	76.1	129.9
Gross operating surplus	20	86	:	5 175	632	2 632	448	1 239	22	112	277	1 333	30 053	39 299
Gross investment	7	85	:	1 053	288	855	161	663	28	690	120	716	8 779	11 756
Apparent labour prod.	102.6	27.8	:	652.5	155.5	30.5	48.1	17.2	32.1	21.1	114.9	201.1	532.9	1 293.5
Wage adj. labour prod.	241.7	217.6	:	1 077.0	297.1	183.2	283.4	216.2	119.7	249.9	283.9	368.9	700.0	995.9
Gross operating rate	27.9	18.6	:	20.4	30.9	31.0	34.7	25.5	8.6	32.1	25.9	45.0	42.1	45.7
Investment rate	21.8	54.8	:	18.5	30.8	14.9	23.8	28.8	22.6	369.3	28.8	40.3	25.1	26.9

(1) Bulgaria, Netherlands, Poland and Romania, 2005; unless otherwise stated, values refer to EUR million; number of enterprises and number of persons employed are given in thousands; average personnel costs and apparent labour productivity are given in EUR thousand per person; wage adjusted labour productivity, gross operating rate and investment are ratios expressed as percentages.

Source: Eurostat (SBS)