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# Impacts of Mining and Quarrying on the Finnish Economy

Olavi Holmijoki

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Cover photo: Rock face in the Päijänne water tunnel. Photo: Erkki Halme and Jari Väätäinen, GTK

**Holmijoki, O. 2010.** Impacts of Mining and Quarrying on the Finnish Economy. *Geological Survey of Finland, Report of Investigation 186,* 73 pages, 48 figures and 4 tables.

The economic interaction between the mining and quarrying industries and their consumer industries in Finland was modelled with the basic-price supply and use tables normally used for the national economy. In the use table, the use of domestic products and imported products were separated. The structures of the supply and use tables complied with the European System of Accounts (ESA 95). In the tables, economic activity was divided into industry classes in accordance with the EU-standard NACE Rev. 1.1, and economic interaction was divided into product categories in accordance with the EU product classification standard CPA2002.

The economic interaction of the mining and quarrying industries and their consumer industries was analyzed via impact analyses of basic volume and price changes based on national economic input-output analyses. A basic volume change refers to a market situation where an industry increases the production volume of its own main products and by-products so that the industry's direct, annual production value rises by 10 million. A basic price change refers to a market situation where the price of a domestic product increases so that the direct annual value of supply of the product rises by 10 million. The result of the impact analysis is the total impact, i.e. the direct and indirect impacts, of the basic volume and price changes on all industry classes and product categories in the operating environment.

In the report, the impact analyses of the basic volume changes were calculated for the mining and quarrying industry classes (103 Extraction and agglomeration of peat, 13 Mining of metal ores and 14 Other mining and quarrying) and also for the consumer industries (40 Electricity, gas, steam and hot water supply, 23 Manufacture of coke, refined petroleum products and nuclear fuel, 27 Manufacture of basic metals, 21 Manufacture of pulp, paper and paper products, 24 Manufacture of chemicals and chemical products, 26 Manufacture of non-metallic mineral products and 45 Construction) in the operating environments for the years 1995–2005, forming a total of 110 individual impact analyses. In the same way, the impact analyses of the basic price changes were calculated for the main products of the aforementioned industries, in other words the domestic product categories 103, 13, 14, 40, 23, 27, 21, 24, 26 and 45, in the operating environments for the years 1995–2005, forming a second set of 110 individual impact analyses.

The source data and the results were presented as time series on a time scale that begins in 1995 and ends in 2008. The source data also include information from the years 2006–2008, although the latest available operating environment that has been analysed was from the year 2005. The impact-analysis results provide information about the economic cause-effect relationships between the mining and quarrying industries and their consumer industries and about the employment impacts for the years 1995–2005. From the source-data time series, it is possible to estimate the development of the economic cause-effect relationships and the employment impacts for the years 2006–2008.

The impact-analysis results can be used both in corporate, strategic decision-making processes and in political decision-making.

Keywords (GeoRef Thesaurus, AGI): mining industry, mining, economics, economic impact, production, consumption, employment, Finland

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**Holmijoki, O. 2010.** Impacts of Mining and Quarrying on the Finnish Economy. *Geologian tutkimuskeskus, Tutkimusraportti 186,* 73 sivua, 48 kuvaa ja 4 taulukkoa.

Kaivostoiminnan ja louhinnan toimialojen ja niiden asiakastoimialojen välinen taloudellinen vuorovaikutus on mallinnettu kansantaloudesta tutulla perushintaisella tarjontataulukolla ja perushintaisella käyttötaulukolla, jossa kotimaisten tuotteiden ja tuontituotteiden käyttö on eritelty toisistaan. Tarjonta- ja käyttötaulukoiden rakenne noudattaa Euroopan kansantalouden tilinpitojärjestelmää EKT 1995. Tarjonta- ja käyttötaulukoissa koko taloudellinen toiminta on jaettu toimialaluokkiin TOL2002-luokituksen mukaisesti ja taloudellinen vuorovaikutus tuoteluokkiin CPA2002-tuoteluokituksen mukaisesti.

Kaivostoiminnan ja louhinnan toimialojen ja niiden asiakastoimialojen välistä taloudellista vuorovaikutusta on analysoitu kansantalouden panos-tuotosanalyyseistä johdetuilla määrän perusmuutoksen ja hinnan perusmuutoksen vaikutusanalyyseilla. Määrän perusmuutoksella tarkoitetaan markkinatilannetta, jossa toimiala lisää omien pää- ja sivutuotteidensa tuotantomäärää siten, että toimialan välitön vuotuinen tuotannon arvo nousee 10 milj. euroa. Hinnan perusmuutoksella tarkoitetaan markkinatilannetta, jossa kotimaisen tuotteen hinta kasvaa siten, että tuotteen välitön vuotuinen tarjonnan arvo nousee 10 milj. euroa. Vaikutusanalyysin tuloksena saadaan tuotantomäärän tai hinnan perusmuutoksen kokonaisvaikutukset eli välittömät ja välilliset vaikutukset toimintaympäristön kaikkiin toimiala- ja tuoteluokkiin.

Raportissa on laskettu tuotteen määrän perusmuutoksen vaikutusanalyysit kaivostoiminnan ja louhinnan toimialaluokille 103 Turpeen nosto ja muokkaus, 13 Metallimalmien louhinta ja 14 Muu mineraalien kaivu sekä asiakastoimialoille 40 Sähkö-, kaasu- ja lämpöhuolto, 23 Koksin, öljytuotteiden ja ydinpolttoaineen valmistus, 27 Metallien jalostus, 21 Massan, paperin ja paperituotteiden valmistus, 24 Kemikaalien, kemiallisten tuotteiden ja tekokuitujen valmistus, 26 Ei-metallisten mineraalituotteiden valmistus ja 45 Rakentaminen vuosien 1995–2005 toimintaympäristöissä, yhteensä 110 yksittäistä vaikutusanalyysiä. Vastaavasti tuotteen hinnan perusmuutoksen vaikutusanalyysit on laskettu näiden toimialojen päätuotteille eli kotimaisille tuoteluokille 103, 13, 14, 40, 23, 27, 21, 24, 26 ja 45 niin ikään vuosien 1995–2005 toimintaympäristöissä, yhteensä toiset 110 yksittäistä vaikutusanalyysiä.

Vaikutusanalyysien lähtöaineostot ja tulokset on esitetty aikasarjoina aika-asteikolla, joka alkaa vuodesta 1995 ja päättyy vuoteen 2008. Lähtöaineistosta on esitetty tietoja myös vuosilta 2006–2008, vaikka tuorein saatavissa ollut ja analysoitu toimintaympäristö oli vuodelta 2005. Vaikutusanalyysien tulokset antavat tietoa kaivostoiminnan ja louhinnan toimialojen ja niiden asiakastoimialojen välisistä taloudellisista syy-seuraussuhteista ja työllisyysvaikutuksista vuosilta 1995–2005. Lähtöaineiston aikasarjoista on mahdollista arvioida taloudellisten syy-seuraussuhteiden ja työllisyysvaikutusten kehittymistä vuosina 2006–2008.

Vaikutusanalyysien tuloksia voidaan hyödyntää sekä yritystoiminnan strategisissa päätöksentekoprosesseissa että poliittisessa päätöksenteossa.

Asiasanat (Geosanasto, GTK): kaivosteollisuus, louhinta, talous, taloudellinen vaikutus, tuotanto, kulutus, työllisyys, Suomi

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# 1 INTRODUCTION

This report is the second of the two reports the author has produced for the project 'Mineral Raw-Material Flows and Sustainable Utilisation' (MIRA project), which is part of GTK's geological resource accounting research programme. The first report 'Money Flows of Mining and Quarrying in Finland' (Holmijoki 2010) describes the present state of mining and quarrying in Finland, while the focus in this second report is on the analysis of the current situation. The reports draw on the author's previous experience in the processing of statistical material and the mathematical modelling and analysis of an economic operating environment (Holmijoki 2002, 2005, 2007, Holmijoki et al. 2007).

## 1.1 Starting point and objective

The examination of mineral raw-material flows required the modelling and analysis of the commercial cash flows relating to them.

The aim was to examine the economic causation in the relationship between the mining and quarrying industries and their consumer industries when there are changes in the production volumes of the industries concerned or in the prices of their main products on the product markets.

## 1.2 Implementation

An operating-environment evaluation method developed on the basis of economic input-output theory was used for the modelling and analysis of the mining and quarrying operating environment.

A basic-price supply and a basic-price use table with additional segments covering use of the labour force were used for the modelling of the operating environment. By November 2009, Statistics Finland had published supply and use tables for 1995–2005 (the manuscript was ready December 2009). The operating environments covered 59 industry classes and 59 domestic and foreign product categories. These industry classes and product categories included the industry classes and product categories for mining and quarrying and the industry classes and product categories for their consumer industries.

The analysis of the operating environment involved the examination of the direct and indirect impacts of changes in production volumes taking place in mining and quarrying industries and their consumer industries on all industry classes and product categories in the operating environment. The analysis also involved examination of the direct and indirect impacts of changes in the prices of domestic mining and quarrying products on the product markets and in the prices of domestic main products in the consumer industries on all industry classes and product categories in the operating environment.

During the publishing procedure (December 2009–September 2010) Statistics Finland has published supply and use tables for 2006 and 2007 and updated supply and use tables for 2003–2005. These publications and updates do not include in impact analyses of the basic changes in volumes and prices. According to the check calculations, these new statistical data have very small influence on the impact analyses. Chapters 2.2 and 3.4 include new statistical data for 2006–2008 published by March 2010.

# 2 OPERATING ENVIRONMENT OF THE MINING AND QUARRYING INDUSTRIES

## 2.1 Modelling the operating environment

The operating environment for mining and quarrying was modelled using the operating-environment tables. The operating-environment tables refer to the basic-price supply table and the basic-price use table that are in accordance with national accounts and contain the additional segments on use of the labour force. The structure of the operating-environment tables is in accordance with the European System of Accounts 1995 (Eurostat 1996). In the operating-environment tables, all economic activities are divided into industry categories, as laid down in the NACE classification, and all economic interaction is divided into product categories, as laid down in the CPA product classification.

The operating-environment tables are shown in Figure 1. The basic-price supply table links domestic production with the output of different industries and the supply of domestic products. The basic-price use table links the output of different industries with the intermediate consumption of domestic and foreign products, value added and use of the labour force. The supply of domestic and foreign products is linked with the final uses of the products and products destined for intermediate consumption. Final uses refers to consumption, capital formation and exports.

Operating-environment tables can be examined from the viewpoint of industries representing the macro economy and/or enterprises or establishments representing the micro economy (Figure 2 shows the situation for mining and quarrying). A gradual transfer from the macro-economic to the micro-economic level - and vice versa - is essential for outlining the entity of industries, enterprises and establishments. The examination levels from macro-economics to micro-economics are:

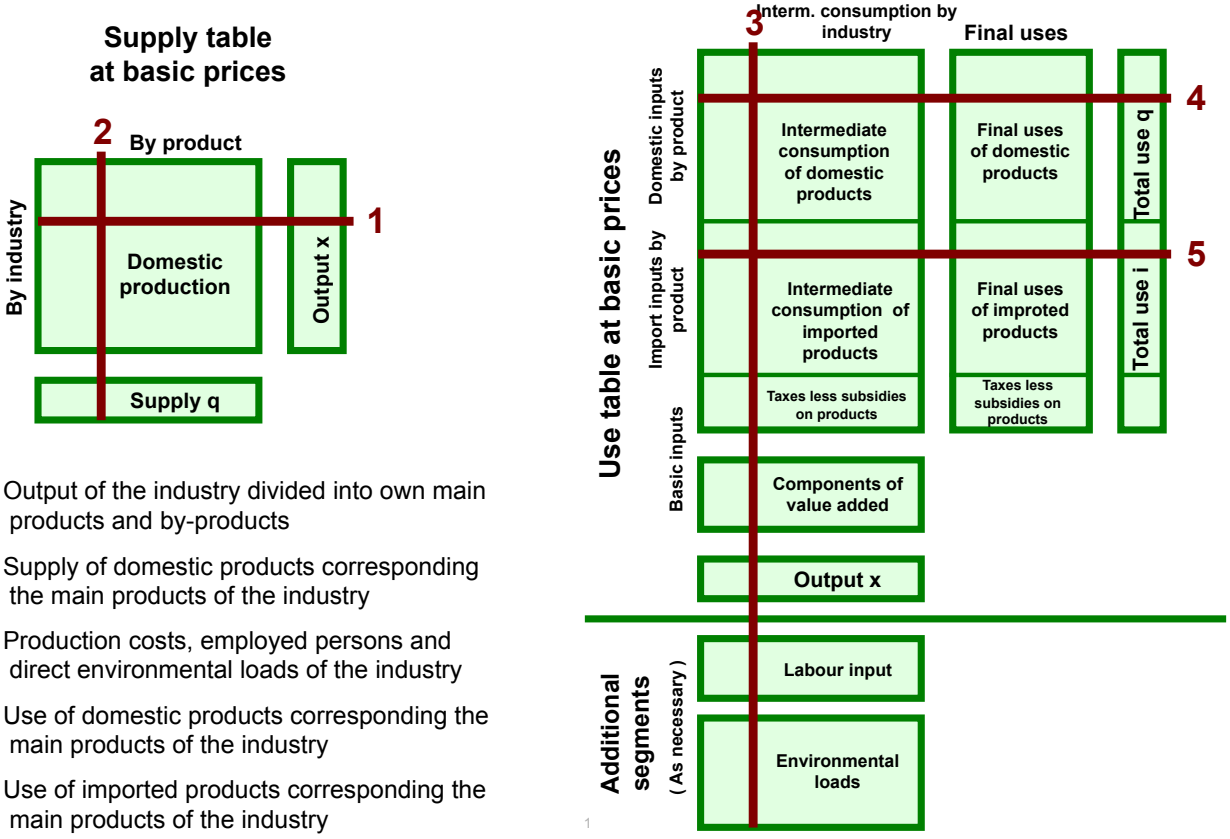


Figure 1. Tables on the operating environment. The enterprises are divided into establishments, and the establishments are placed in the operating-environment tables according to industry and the main product of the establishment. An industry is the sum of the economic activities of the establishments producing the same main product. Different additional segments can be incorporated into a basic-price use table, as necessary (for example segments indicating environmental loads by industry).

Interaction between industries (macro-economic levels)
- Level 1: General national economic level
- Level 2: More detailed examination of selected industry classes and product categories

Interaction between establishments and between establishments and industries (micro-economic levels)
- Level 3: More detailed examination of selected establishments
- Level 4: More detailed examination of the internal functions of selected establishments

Table 1a lists the industry classes and Table 1b lists the product categories for the operating environment at general national economic level. If necessary, the industry classification can be at the level of individual establishments and the product classification at the level of the products created by individual establishments. The mining and quarrying industries at general national economic level are shown in Chapter 2.2, and the product markets of the product categories connected with them, in Chapter 2.3.

In Finland, mining and quarrying (industry class C according to classification standard NACE Rev. 1.1 / TOL 2002) contains, at general national economic level, the following industries: 10 (Mining of coal and lignite, extraction of peat), 13 (Mining of metal ores) and 14 (Other mining and quarrying). As there is no mining of coal or lignite in Finland, industry 10 only contains the sub-industry 103 (Extraction and agglomeration of peat). Other mining and quarrying is further divided into sub-industries 141 (Quarrying of rockstone), 142 (Quarrying of sand and clay) and 143+145 (Mining of chemical and fertilizer minerals, other mining and quarrying n.e.c.).

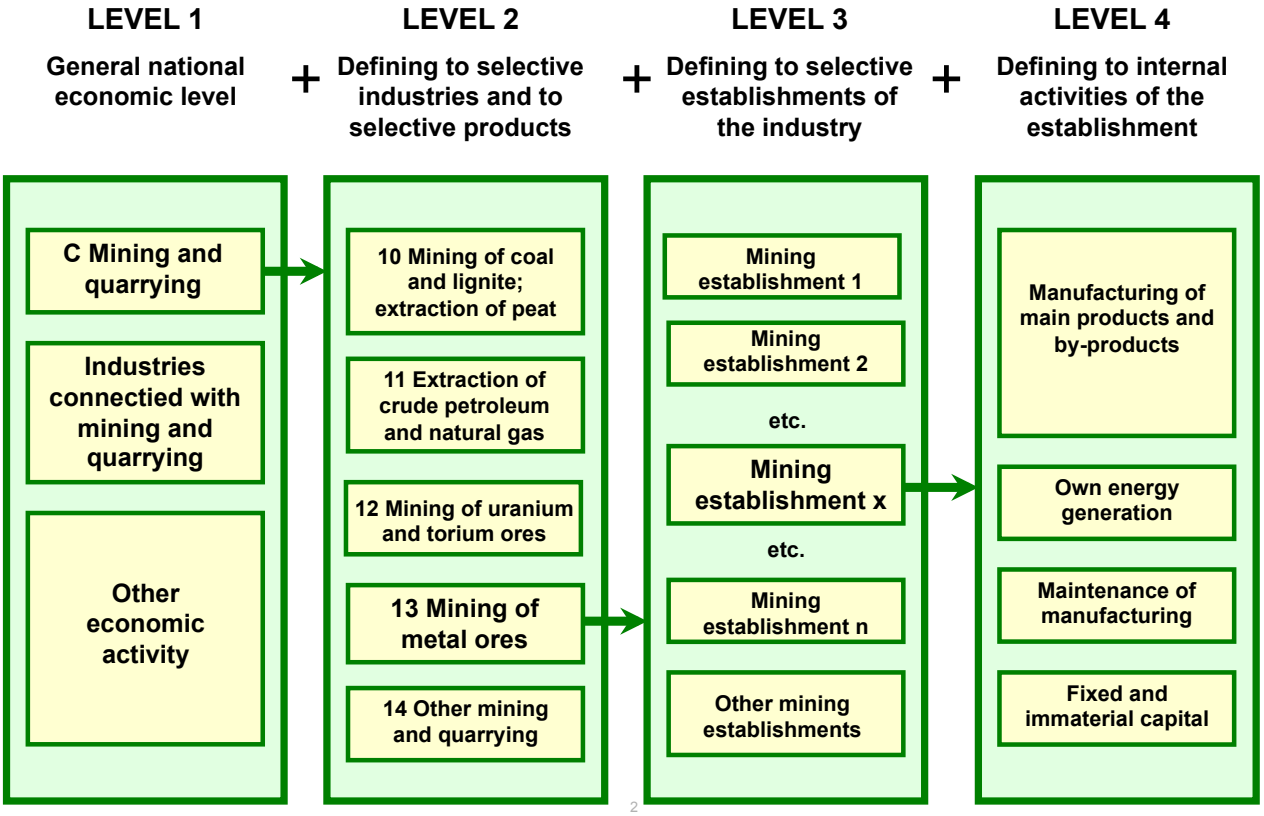


Figure 2. Outlining the overall picture in the modelling of mining and quarrying and its operating environment. An example of the gradual refining of mining and quarrying from macroeconomic level 1 to microeconomic level 4. All industry classes are domestic classes. Product categories are divided into domestic and foreign-product categories. At levels 2 and 3, the refining can be carried out in many different ways: 1) by refining industry classes and product categories of level 1; 2) by regional division of industry classes and product categories of level 1; 3) by dividing industry classes of level 1 by production technology; 4) by dividing industry classes of level 1 by enterprise size; and/or 5) putting the establishments of a specific enterprise into industry classes. This report is at general national economic level, which means the industry and product classification used in Tables 1a and 1b.

Table 1a. Key economic parameters for industry classes for the operating environment in 2005. The general national economic level. "Mining and quarrying (industry class C)" covers industry classes 10, 11, 12, 13 and 14. As there is no production of coal or lignite in Finland, industry class 10 is referred to in this report as "103 Extraction and agglomeration of peat". Source: Statistics Finland, Supply and use tables for the national economy.

| Code | Industries (NACE Rev 1.1 / TOL2002) | Year 2005 Output | Value added | Gross margin | Employed persons |
|---|---|---|---|---|---|
| | | € million at current prices | | | 1,000 persons |
| 01 | Agriculture, hunting and related service activities | 4,559 | 1,661 | 1,179 | 99.3 |
| 02 | Forestry, logging and related service activities | 3,114 | 2,058 | 1,667 | 21.9 |
| 05 | Fishing, operating of fish hatcheries and fish farms; service activities incidental to fishing | 138 | 70 | 57 | 2.0 |
| **10** | **Mining of coal and lignite; extraction of peat** | **284** | **101** | **57** | **2.1** |
| **11** | **Extraction of crude petroleum and natural gas; incidental service activities** | **0** | **0** | **0** | **0.0** |
| **12** | **Mining of uranium and thorium ores** | **0** | **0** | **0** | **0.0** |
| **13** | **Mining of metal ores** | **152** | **66** | **37** | **0.6** |
| **14** | **Other mining and quarrying** | **696** | **203** | **103** | **3.1** |
| 15 | Manufacture of food products and beverages | 8,619 | 2,350 | 906 | 39.4 |
| 16 | Manufacture of tobacco products | 0 | 0 | 0 | 0.0 |
| 17 | Manufacture of textiles | 669 | 275 | 95 | 6.6 |
| 18 | Manufacture of wearing apparel; dressing and dyeing of fur | 410 | 174 | 52 | 6.3 |
| 19 | Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear | 199 | 80 | 23 | 2.5 |
| 20 | Manufacture of wood and of products of wood and cork, except furniture | 5,837 | 1,361 | 406 | 29.9 |
| **21** | **Manufacture of pulp, paper and paper products** | **12,530** | **3,565** | **1,834** | **32.7** |
| 22 | Publishing, printing and reproduction of recorded media | 4,452 | 1,881 | 673 | 32.1 |
| **23** | **Manufacture of coke, refined petroleum products and nuclear fuels** | **5,661** | **694** | **561** | **2.4** |
| **24** | **Manufacture of chemicals and chemical products** | **6,428** | **1,984** | **1,096** | **18.3** |
| 25 | Manufacture of rubber and plastic products | 2,746 | 1,048 | 403 | 16.6 |
| **26** | **Manufacture of other non-metallic mineral products** | **2,707** | **1,103** | **471** | **16.8** |
| **27** | **Manufacture of basic metals** | **9,090** | **1,765** | **966** | **16.5** |
| 28 | Manufacture of fabricated metal products, except machinery and equipment | 5,879 | 2,352 | 794 | 46.6 |
| 29 | Manufacture of machinery and equipment n.e.c. | 12,417 | 3,829 | 1,113 | 63.3 |
| 30 | Manufacture of office machinery and computers | 80 | 20 | 8 | 0.4 |
| 31 | Manufacture of electrical machinery and apparatus n.e.c. | 3,378 | 1,107 | 430 | 16.3 |
| 32 | Manufacture of radio, television and communication equipment and apparatus | 17,345 | 5,816 | 3,732 | 36.0 |
| 33 | Manufacture of medical, precision and optical instruments, watches and clocks | 1,871 | 800 | 302 | 11.7 |
| 34 | Manufacture of motor vehicles, trailers and semi-trailers | 1,581 | 362 | 101 | 7.1 |
| 35 | Manufacture of other transport equipment | 2,109 | 695 | 184 | 13.8 |
| 36 | Manufacture of furniture; manufacturing n.e.c. | 1,753 | 639 | 192 | 16.5 |
| 37 | Recycling | 297 | 83 | 50 | 0.9 |
| **40** | **Electricity, gas, steam and hot water supply** | **5,155** | **2,628** | **1,966** | **13.2** |
| 41 | Collection, purification and distribution of water | 432 | 272 | 187 | 2.5 |
| **45** | **Construction** | **24,128** | **9,127** | **3,829** | **165.7** |
| 50 | Sale, maintenance and repair of motor vehicles; sales of automotive fuel | 4,765 | 2,629 | 1,295 | 52.0 |
| 51 | Wholesale trade and commission trade, except of motor vehicles and motorcycles | 14,275 | 6,577 | 2,489 | 101.1 |
| 52 | Retail trade, except of motor vehicles; repair of personal and household goods | 8,796 | 4,986 | 1,845 | 156.3 |
| 55 | Hotels and restaurants | 5,453 | 2,271 | 669 | 77.3 |
| 60 | Land transport; transport via pipelines | 7,425 | 3,904 | 1,764 | 83.0 |
| 61 | Water transport | 2,201 | 904 | 449 | 10.6 |
| 62 | Air transport | 1,961 | 742 | 456 | 4.9 |
| 63 | Supporting and auxiliary transport activities; activities of travel agencies | 7,981 | 3,240 | 2,099 | 28.2 |
| 64 | Post and telecommunications | 8,034 | 3,037 | 1,567 | 46.3 |
| 65 | Financial intermediation, except insurance and pension funding | 3,930 | 2,416 | 1,168 | 25.7 |
| 66 | Insurance and pension funding, except compulsory social security | 1,318 | 562 | 129 | 8.9 |
| 67 | Activities auxiliary to financial intermediation | 998 | 412 | 210 | 4.1 |
| 70 | Real estate activities | 22,993 | 15,290 | 14,198 | 38.7 |
| 71 | Renting of machinery and equipment without operator and of personal and household goods | 965 | 477 | 348 | 4.8 |
| 72 | Computer and related activities | 5,184 | 2,892 | 810 | 46.8 |
| 73 | Research and development | 1,254 | 743 | -14 | 16.5 |
| 74 | Other business activities | 11,953 | 6,740 | 1,920 | 148.9 |
| 75 | Public administration and defence; compulsory social security | 12,781 | 6,924 | 831 | 174.9 |
| 80 | Education | 9,470 | 6,753 | 645 | 160.6 |
| 85 | Health and social work | 17,241 | 11,876 | 1,439 | 335.5 |
| 90 | Sewage and refuse disposal, sanitation and similar activities | 1,194 | 574 | 348 | 7.1 |
| 91 | Activities of membership organisation n.e.c. | 2,544 | 1,417 | 144 | 39.7 |
| 92 | Recreational, cultural and sporting activities | 4,688 | 2,428 | 850 | 51.2 |
| 93 | Other service activities | 1,012 | 575 | 387 | 15.1 |
| 95 | Private households with employed persons | 122 | 122 | 0 | 7.9 |
| | **Total economy** | **303,254** | **136,660** | **59,520** | **2,389.2** |

Table 1b. Key economic parameters for product categories for the operating environment in 2005. The general national economic level. "Products from mining and quarrying (product category C)" covers product categories 10, 11, 12, 13 and 14. As there is no production of coal or lignite in Finland, the domestic product category 10 is referred to in this report as "103 Peat". Source: Statistics Finland, Supply and use tables for the national economy.

| Code | Product catigories (CPA2002 / KTTL) | Year 2005 Domestic supply | Imports | Exports | Domestic consump. |
|---|---|---|---|---|---|
| | | € million at current prices | | | |
| 01 | Products of agriculture, hunting and related services | 4,267 | 824 | 319 | 4,771 |
| 02 | Products of forestry, logging and related services | 3,059 | 651 | 47 | 3,663 |
| 05 | Fish and other fishing products; services incidental of fishing | 144 | 66 | 4 | 205 |
| **10** | **Coal and lignite; peat** | **260** | **330** | **11** | **579** |
| **11** | **Crude petroleum and natural gas; incidental services** | **0** | **3,798** | **0** | **3,798** |
| **12** | **Uranium and thorium ores** | **0** | **0** | **0** | **0** |
| **13** | **Metal ores** | **142** | **1,116** | **23** | **1,235** |
| **14** | **Other mining and quarrying products** | **798** | **240** | **92** | **946** |
| 15 | Food products and beverages | 8,148 | 1,951 | 1,007 | 9,092 |
| 16 | Tobacco products | 0 | 127 | 0 | 127 |
| 17 | Textiles | 636 | 690 | 340 | 986 |
| 18 | Wearing apparel; furs | 379 | 1,021 | 246 | 1,153 |
| 19 | Leather and leather products | 196 | 337 | 104 | 429 |
| 20 | Wood and products of wood and cork (except furniture) | 5,700 | 461 | 2,489 | 3,672 |
| **21** | **Pulp, paper and paper products** | **11,686** | **712** | **8,257** | **4,141** |
| 22 | Printed matter and recorded media | 3,148 | 230 | 318 | 3,060 |
| **23** | **Coke, refined petroleum products and nuclear fuel** | **5,455** | **2,181** | **2,318** | **5,317** |
| **24** | **Chemicals, chemical products and man-made fibres** | **6,089** | **5,544** | **3,548** | **8,084** |
| 25 | Rubber and plastic products | 2,497 | 1,071 | 1,125 | 2,443 |
| **26** | **Other non-metallic mineral products** | **2,386** | **504** | **644** | **2,246** |
| **27** | **Basic metals** | **8,872** | **3,265** | **5,291** | **6,846** |
| 28 | Fabricated metal products, except machinery and equipment | 5,669 | 1,138 | 1,159 | 5,648 |
| 29 | Machinery and equipment n.e.c. | 11,052 | 4,479 | 6,301 | 9,230 |
| 30 | Office machinery and computers | 149 | 1,790 | 142 | 1,797 |
| 31 | Electrical machinery and apparatus n.e.c. | 3,756 | 2,324 | 2,607 | 3,472 |
| 32 | Radio, television and communication equipment and apparatus | 11,614 | 5,032 | 9,668 | 6,978 |
| 33 | Medical, precision and optical instruments, watches and clocks | 1,755 | 1,134 | 1,383 | 1,506 |
| 34 | Motor vehicles, trailers and semi-trailers | 1,962 | 4,495 | 1,633 | 4,825 |
| 35 | Other transport equipment | 2,025 | 786 | 643 | 2,168 |
| 36 | Furniture; other manufactured goods n.e.c. | 1,635 | 779 | 393 | 2,022 |
| 37 | Secondary raw materials | 175 | 0 | 0 | 175 |
| **40** | **Electrical energy, gas, steam and hot water** | **4,553** | **457** | **25** | **4,986** |
| 41 | Collected and purified water, distribution services of water | 406 | 0 | 0 | 406 |
| **45** | **Construction work** | **24,320** | **0** | **0** | **24,320** |
| 50 | Trade, maintenance and repair services of motor vehicles; retail sale of automotive fuel | 4,715 | 0 | 77 | 4,638 |
| 51 | Wholesale trade and commission trade services, except of motor vehicles and motorcycles | 16,005 | 569 | 1,433 | 15,141 |
| 52 | Retail trade services, except of motor vehicles; repair services of personal and household goods | 8,925 | 0 | 0 | 8,925 |
| 55 | Hotel and restaurant services | 5,943 | 734 | 76 | 6,600 |
| 60 | Land transport; transport via pipeline services | 7,378 | 130 | 647 | 6,860 |
| 61 | Water transport services | 1,583 | 644 | 1,030 | 1,197 |
| 62 | Air transport services | 1,692 | 316 | 661 | 1,347 |
| 63 | Supporting and auxiliary transport services; travel agency services | 8,302 | 588 | 505 | 8,385 |
| 64 | Post and telecommunication services | 7,810 | 524 | 330 | 8,004 |
| 65 | Financial intermediation services, except insurance and pension funding services | 3,787 | 258 | 76 | 3,969 |
| 66 | Insurance and pension funding services, except compulsory social security services | 1,196 | 89 | 82 | 1,203 |
| 67 | Services auxiliary to financial intermediation | 997 | 3 | 24 | 976 |
| 70 | Real estate services | 25,413 | 0 | 0 | 25,413 |
| 71 | Renting services of machinery and equipment without operator and of personal and household goods | 1,532 | 369 | 23 | 1,878 |
| 72 | Computer and related services | 6,395 | 933 | 1,270 | 6,059 |
| 73 | Research and development services | 4,391 | 1,773 | 3,167 | 2,997 |
| 74 | Other business services | 17,062 | 3,567 | 3,100 | 17,530 |
| 75 | Public administration and defence services; compulsory social security services | 11,490 | 114 | 43 | 11,561 |
| 80 | Education services | 9,617 | 5 | 3 | 9,619 |
| 85 | Health and social work services | 17,289 | 3 | 1 | 17,291 |
| 90 | Sewage and refuse disposal services, sanitation and similar services | 1,193 | 3 | 1 | 1,195 |
| 91 | Membership organisation services n.e.c. | 2,036 | 0 | 0 | 2,036 |
| 92 | Recreational, cultural and sporting services | 4,436 | 168 | 58 | 4,545 |
| 93 | Other services | 1,016 | 0 | 0 | 1,016 |
| 95 | Private households with employed persons | 122 | 0 | 0 | 122 |
| | **Total supply / Total uses** | **303,254** | **58,323** | **62,745** | **298,832** |

Figure 2 shows an example of a gradually more detailed examination of the mining and quarrying industries. The operating-environment tables can be used as such to describe the structure of an enterprise's business environment. The enterprise 'only' needs to be able to place its own establishments, products, consumers and product suppliers in the industry classes and product categories of the operating-environment tables. An enterprise's operating environment is a combination of the macro-economic and micro-economic examination levels.

The modelling of the operating environment results in numerical data describing the 'business as usual' state of the national economy in a given year at the industry and product classification level selected for a basic-price supply and use table. Annual numerical data at the general national economic level for Finland is directly available from the website of Statistics Finland. The data is available for each year since 1995.

An enterprise operating in the EU can, when modelling its operating environment and producing numerical data, focus directly on the industry classes and product categories that it is interested in. This is because numerical data at the general national economic level is available for all the established EU countries from 1995. This means that the operations of an enterprise in any EU country can be examined. The countries to be examined are linked via their imports and exports.

### 2.2 Mining and quarrying industries in the operating-environment tables

Chapter 2.2 presents the mining and quarrying industries at the general national economic level in accordance with TOL 2002 classification standard. Key economic parameters for the mining and quarrying industries for the period 2000–2006/2008 are shown in Tables 2a, 2b, 2c and 2d. The figures and tables in Chapter 2.2 have been taken almost unchanged from the publication 'Money flows of Mining and Quarrying in Finland' (Holmijoki 2010).

The operating-environment tables cover the period 1995–2006. In the figures and tables of Chapter 2.2, the author has estimated the most important economic parameters for industries 103, 13 and 14 for 2007 and 2008 using regional and industrial statistics on manufacturing. The most important key parameters concerning industry C for 2007 and 2008 are from the national accounts.

The output of an industry is the sum of the products created by the industry at basic prices. The basic price is the price received by the producer from the purchaser minus taxes on products plus subsidies on products. The basic price is equivalent to the concept 'price at the factory gate'. Most of the products are supplied to the product markets or to another establishment of the producer's own enterprise. A small proportion is put into inventories (inventories grow) or taken from inventories (inventories decrease).

The basic-price supply table links domestic production by industry class and product category. Figure 3a shows a breakdown of the output of mining and quarrying industries C, 103, 13 and 14 into production of main products and other products during the period 1995–2006/2008 (line 1 in Figure 1). Figure 3b shows a breakdown of the supply of mining and quarrying products C, 103, 13 and 14 into production in the industry concerned and other industries during the period 1995–2006/2008 (column 2 in Figure 1).

The output of industry C (Mining and quarrying) has been on the increase since 1995. However, the increase is not evenly divided between industries 103, 13 and 14. In relative terms, the strongest increase has been in industry 13 (Mining of metal ores). Between 2000 and 2008, its output grew by about 150%. There was a steady growth in the output of industry 14 (Other mining and quarrying). Between 2000 and 2007, the increase was about 50%. In 2008, the output of industry 14 increased so much that the growth between 2000 and 2008 totalled about 90%. In industry 103 (Extraction and agglomeration of peat), output increased by about 80% between 2000 and 2008. However, in 2004 and 2005, the output remained below 2003 levels.

During the last few years, mining and quarrying industries have concentrated on the production of their main products. Between 2000 and 2005, the proportion accounted for by the main product of the output of the industries in question grew from 76 to 89 per cent (Extraction and agglomeration of peat), from 66 to 88 per cent (Mining of metal ores) and from 83 to 94 per cent (Other mining and quarrying). In the mining of metal ores, products generated by other mining and quarrying are an important by-product.

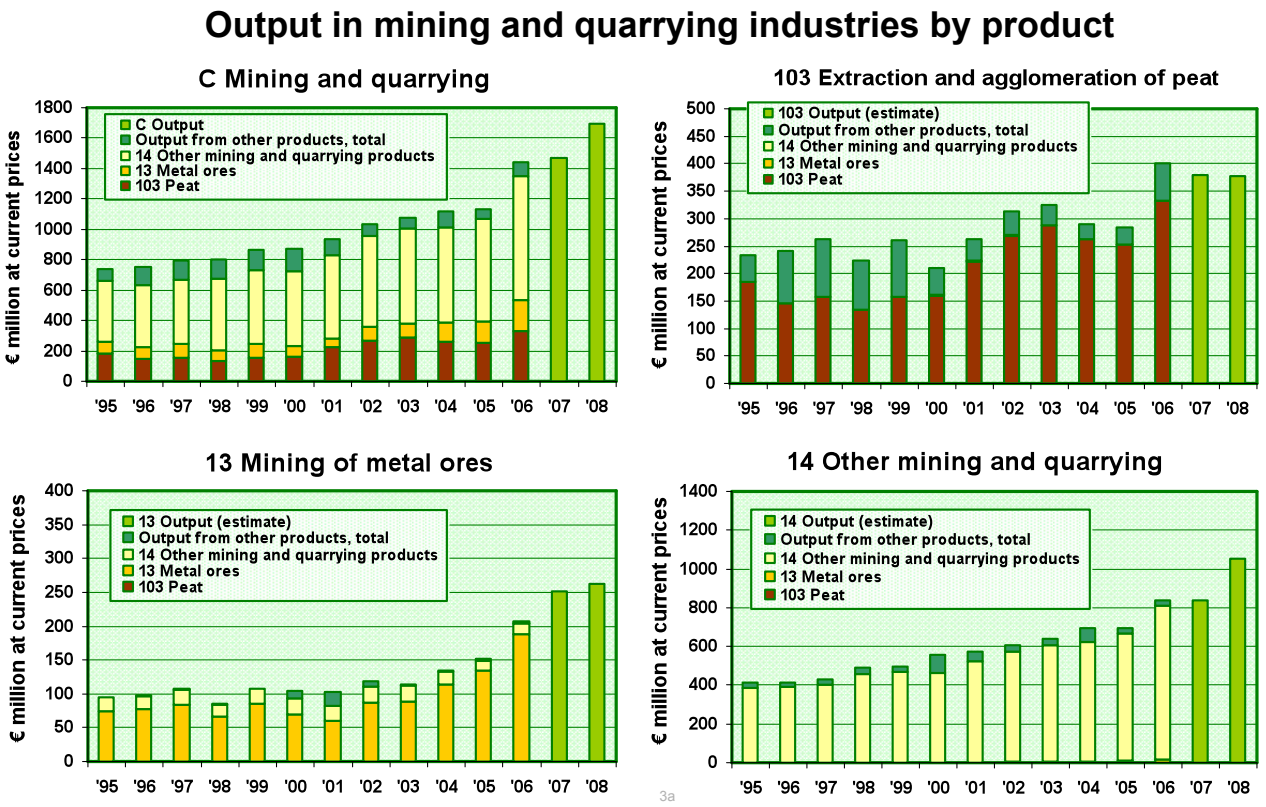


Figure 3a. Tables on the operating environment. Output of Industry C (Mining and quarrying) in 1995–2008 and the breakdown of output of industries C, 103, 13 and 14 into production of main products and other products in 1995–2006. The mining and quarrying industry (class C) is the sum of industries 103, 13 and 14. The author has estimated the values of output for industries 103, 13 and 14 for 2007 and 2008 using the regional and industrial statistics on manufacturing. Sources: Statistics Finland, 1) Supply and use tables for the national economy, 2) National accounts, 3) Regional and industrial statistics on manufacturing.

Peat is almost exclusively produced as a main product in its own industry (Figure 3b). Since the year 2000, practically all domestic supplies in product category 13 (Metal ores) have been provided by the industry concerned. Between 1995 and 1999, industry 27 (Manufacture of basic metals) was responsible for about two thirds of the domestic supply in product category 13. Since the year 2000, most of the domestic supply in the product category 14 (Other mining and quarrying) has been provided by the industry concerned.

The enterprises in the industries purchase domestic and foreign products for production from the product markets or their own establishments at the purchaser's price. The purchaser's price covers the basic product price plus trade and transport margins and taxes on products minus subsidies on products. The total purchases of an industry's establishments are equivalent to the economic concept "intermediate consumption at purchaser's price". The concept 'business to business' is a suitable description for the economic activities relating to intermediate consumption. In the operating-environment tables, intermediate consumption at purchaser's price is divided into basic-price consumption of domestic and imported products and taxes on products included in the purchaser's price from which subsidies on products have been deducted.

Industry output minus intermediate consumption at purchaser's price equals value added for the industry. Value added minus compensation of employees equals the operating margin. Compensation of employees includes the wages and salaries paid by an industry to its employees and the related social contributions. Operating margin is equivalent to the identically named business concept.

Operating margin minus the consumption of fixed capital and other taxes on production plus other subsidies on production equals the operating surplus. Consumption of capital is calculated in the same manner as in investment calculations. Consumption of capital is equivalent to the accounting concept 'depreciation'. Operating surplus is equivalent to the business concept 'operating profit'.

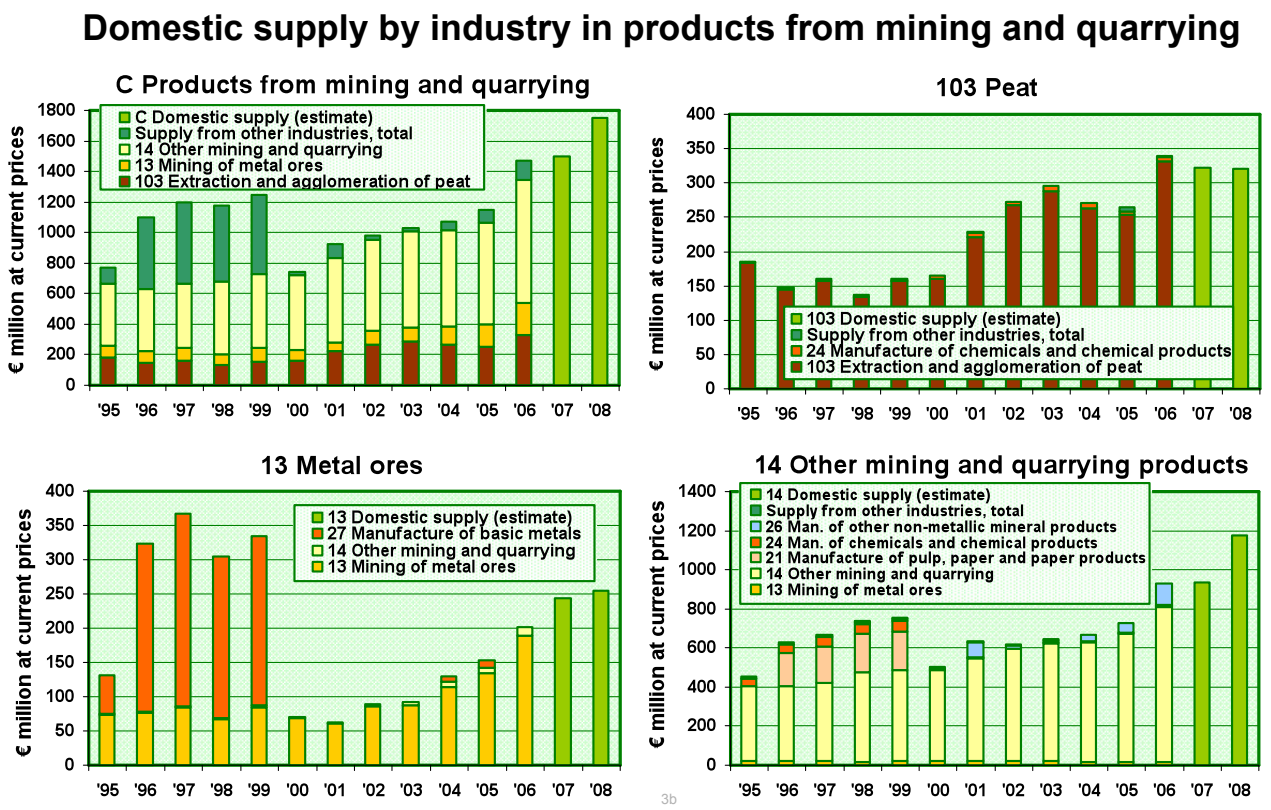


Figure 3b. Tables on operating environment. Breakdown of the domestic supply of mining and quarrying products C (103, 13 and 14) into production in the industry concerned and other industries in 1995–2006. The domestic mining and quarrying product category C is the sum of domestic product categories 103, 13 and 14. The author has estimated the values of domestic supply for 2007 and 2008 using the following principle: the domestic supply of the product category in 2006 per output of the corresponding industry class in 2006 multiplied by the output of the industry class shown in Figure 3a in 2007 or 2008. Source: Statistics Finland, Supply and use tables for the national economy.

The basic-price use table links the output of different industries with the intermediate consumption of domestic and foreign products, value added and the number of employed persons. Figures 4a, 4b, 4c and 4d and Tables 2a, 2b, 2c and 2d show the production costs of industries C, 103, 13 and 14 (column 3 of Figure 1). Figure 5 shows the number of employed persons in the mining and quarrying industries (column 3 in Figure 1).

In industry C (Mining and quarrying), intermediate consumption as a proportion of the industry's output varied between 62 and 69 per cent during the period 2000–2008 (Table 2a). Most of the industry's purchases were from domestic suppliers as purchases of domestic products accounted for 52–57 per cent and purchases of imported products accounted for 7–13 per cent of the industry's output during the period 2000–2006. Taxes on products have accounted for less than 2 per cent of the industry's output.

In industry C (Mining and quarrying), value added increased from EUR 268 million in 2000 to EUR 637 million in 2008. Value added has varied between 31 and 38 per cent of the industry's output. Value added is an accurate way of describing an industry's contribution to the gross domestic product.

Compensation of employees as a proportion of the output of industry C has been on the decline: in 2000 it accounted for 19 per cent, and in 2008, for 14 per cent of the industry's output. The financial performance of industry C has improved as in the year 2000 the operating margin accounted for 12 per cent of its output, while in the year 2008 the corresponding number was 23 per cent.

In industry 103 (Extraction and agglomeration of peat), value added was 34–41% and operating margin 18–27% of the industry's output during the period 2000–2007. In 2008, performance collapsed: value added was 25 per cent, and operating margin was 10 per cent of the output. In industry 13 (Mining of metal ores), the economic situation at the start of the decade was weak. The industry's output increased strongly during the period 2006–2008. Value added varied between 8 and 61 per cent of the industry's output during the period 2000–2008. The operating

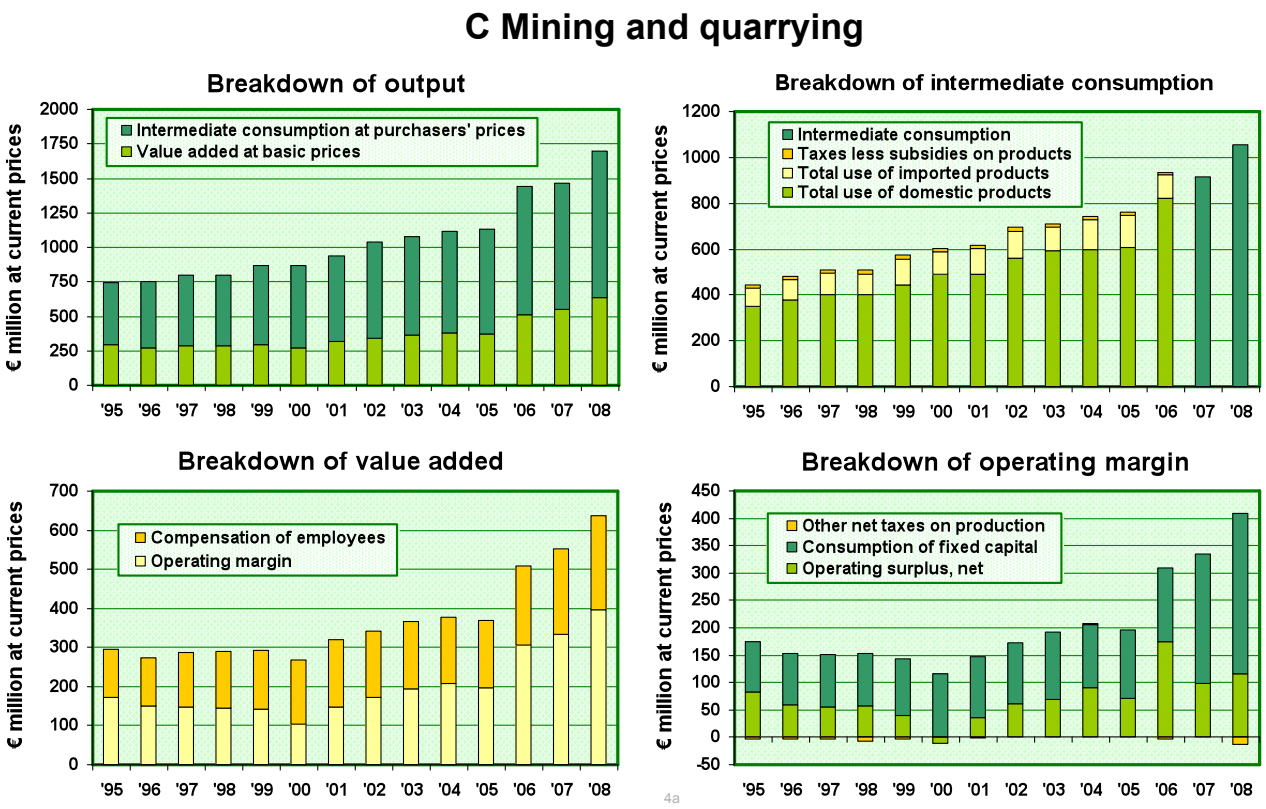


Figure 4a. Tables on the operating environment. Production costs in Industry C (Mining and quarrying) in 1995–2006. The mining and quarrying industry C is the sum of industries 103, 13 and 14. The data for 2007 and 2008 are from the national accounts. Sources: Statistics Finland, 1) Supply and use tables for the national economy, 2) National accounts.

Table 2a. Key economic parameters for mining and quarrying in tables describing the operating environments and national accounts for 2000–2008. Mining and quarrying is the sum of industries 103, 13 and 14. Sources: Statistics Finland, 1) Supply and use tables for the national economy, 2) National accounts.

| | Year | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **C Mining and quarrying** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** |
| | **Values at € million at current prices** | | | | | | | | |
| + C Products from mining and quarrying | 718.4 | 829.3 | 951.6 | 1,005.4 | 1,015.8 | 1,065.9 | 1,347.2 | | |
| + Other output | 152.6 | 108.7 | 85.4 | 72.6 | 102.2 | 66.1 | 95.8 | | |
| **= Output at basic prices** | **871.0** | **938.0** | **1,037.0** | **1,078.0** | **1,118.0** | **1,132.0** | **1,443.0** | **1,468.0** | **1,694.0** |
| **- Intermediate consumption at purchasers' prices** | **603.3** | **617.9** | **694.4** | **712.0** | **742.0** | **762.0** | **935.0** | **917.0** | **1,057.0** |
| Total use of domestic products at basic prices | 488.2 | 489.2 | 561.5 | 594.0 | 600.0 | 605.9 | 820.4 | | |
| Total use of imported products at basic prices | 99.5 | 113.6 | 115.1 | 103.2 | 129.9 | 143.4 | 103.3 | | |
| Taxes less subsidies on products | 15.6 | 15.2 | 17.8 | 14.8 | 12.1 | 12.7 | 11.2 | | |
| **= Value added at basic prices** | **267.7** | **320.1** | **342.6** | **366.0** | **376.0** | **370.0** | **508.0** | **551.0** | **637.0** |
| - Compensation of employees | 163.0 | 173.0 | 170.0 | 173.0 | 168.0 | 173.0 | 201.0 | 217.0 | 240.0 |
| **= Operating margin** | **104.7** | **147.1** | **172.6** | **193.0** | **208.0** | **197.0** | **307.0** | **334.0** | **397.0** |
| - Other net taxes on production | -1.0 | -1.0 | 0.0 | 1.0 | 2.0 | 1.0 | -3.0 | 0.0 | -12.0 |
| - Consumption of fixed capital | 116.0 | 113.0 | 110.0 | 122.0 | 116.0 | 125.0 | 135.0 | 236.0 | 293.0 |
| **= Operating surplus, net** | **-10.0** | **35.0** | **62.0** | **70.0** | **90.0** | **71.0** | **175.0** | **98.0** | **116.0** |
| Employed persons (persons) | 5,800 | 5,900 | 5,900 | 5,800 | 5,500 | 5,800 | 6,400 | 6,200 | 6,500 |
| | **Values as % of output** | | | | | | | | |
| + C Products from mining and quarrying | 82.5 | 88.4 | 91.8 | 93.3 | 90.9 | 94.2 | 93.4 | | |
| + Other output | 17.5 | 11.6 | 8.2 | 6.7 | 9.1 | 5.8 | 6.6 | | |
| **= Output at basic prices** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| **- Intermediate consumption at purchasers' prices** | **69.3** | **65.9** | **67.0** | **66.0** | **66.4** | **67.3** | **64.8** | **62.5** | **62.4** |
| Total use of domestic products at basic prices | 56.1 | 52.1 | 54.2 | 55.1 | 53.7 | 53.5 | 56.9 | | |
| Total use of imported products at basic prices | 11.4 | 12.1 | 11.1 | 9.6 | 11.6 | 12.7 | 7.2 | | |
| Taxes less subsidies on products | 1.8 | 1.6 | 1.7 | 1.4 | 1.1 | 1.1 | 0.8 | | |
| **= Value added at basic prices** | **30.7** | **34.1** | **33.0** | **34.0** | **33.6** | **32.7** | **35.2** | **37.5** | **37.6** |
| - Compensation of employees | 18.7 | 18.4 | 16.4 | 16.0 | 15.0 | 15.3 | 13.9 | 14.8 | 14.2 |
| **= Operating margin** | **12.0** | **15.7** | **16.6** | **17.9** | **18.6** | **17.4** | **21.3** | **22.8** | **23.4** |
| - Other net taxes on production | -0.1 | -0.1 | 0.0 | 0.1 | 0.2 | 0.1 | -0.2 | 0.0 | -0.7 |
| - Consumption of fixed capital | 13.3 | 12.0 | 10.6 | 11.3 | 10.4 | 11.0 | 9.4 | 16.1 | 17.3 |
| **= Operating surplus, net** | **-1.1** | **3.7** | **6.0** | **6.5** | **8.1** | **6.3** | **12.1** | **6.7** | **6.8** |
| Employed persons per output (persons per € million) | 6.7 | 6.3 | 5.7 | 5.4 | 4.9 | 5.1 | 4.4 | 4.2 | 3.8 |

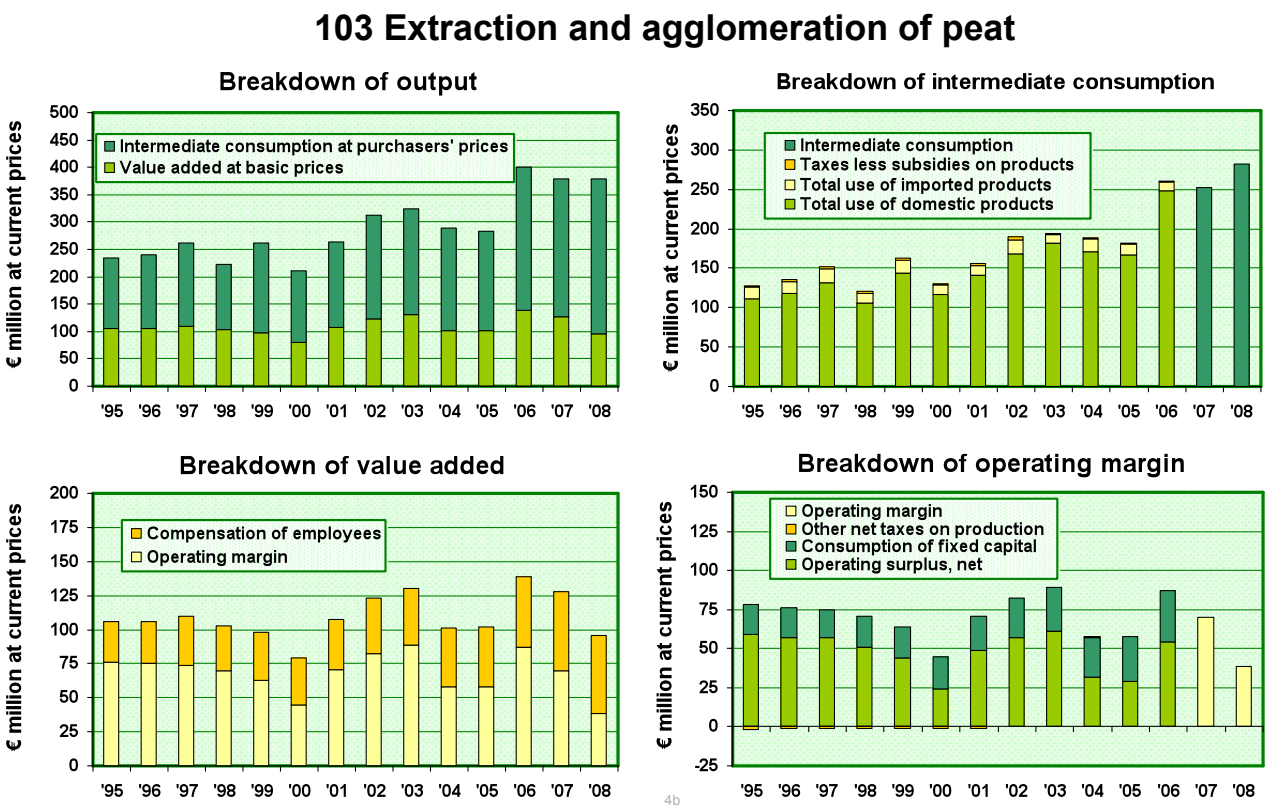


Figure 4b. Tables on the operating environment. Production costs in industry 103 (Extraction and agglomeration of peat) in 1995–2006. The author has estimated the data for 2007 and 2008 using the regional and industrial statistics on manufacturing. Sources: Statistics Finland, 1) Supply and use tables for the national economy, 2) Regional and industrial statistics on manufacturing.

Table 2b. Key economic parameters for industry 103 (Extraction and agglomeration of peat) in tables describing the operating environments for 2000–2006. The author has estimated the data for 2007 and 2008 using the regional and industrial statistics on manufacturing. Sources: Statistics Finland, 1) Supply and use tables for the national economy, 2) Regional and industrial statistics on manufacturing.

| | Year | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **103 Extraction and agglomeration of peat** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** |
| | **Values at € million at current prices** | | | | | | | | |
| + 103 Peat | 159.7 | 221.5 | 268.0 | 287.7 | 262.7 | 253.1 | 332.2 | | |
| + Other output | 50.3 | 41.5 | 45.0 | 36.3 | 27.3 | 30.9 | 67.8 | | |
| **= Output at basic prices** | **210.0** | **263.0** | **313.0** | **324.0** | **290.0** | **284.0** | **400.0** | **379.7** | **378.3** |
| **- Intermediate consumption at purchasers' prices** | **130.5** | **155.8** | **189.7** | **194.0** | **189.0** | **182.0** | **261.0** | **251.9** | **282.5** |
| Total use of domestic products at basic prices | 116.2 | 140.9 | 167.8 | 181.9 | 171.4 | 167.5 | 247.7 | | |
| Total use of imported products at basic prices | 12.6 | 12.8 | 18.1 | 10.2 | 16.0 | 13.1 | 11.7 | | |
| Taxes less subsidies on products | 1.7 | 2.2 | 3.7 | 1.9 | 1.6 | 1.3 | 1.5 | | |
| **= Value added at basic prices** | **79.5** | **107.2** | **123.3** | **130.0** | **101.0** | **102.0** | **139.0** | **127.8** | **95.8** |
| - Compensation of employees | 35.0 | 37.0 | 41.0 | 41.0 | 43.0 | 44.0 | 52.0 | 57.6 | 57.4 |
| **= Operating margin** | **44.5** | **70.2** | **82.3** | **89.0** | **58.0** | **58.0** | **87.0** | **70.1** | **38.4** |
| - Other net taxes on production | -1.0 | -1.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | | |
| - Consumption of fixed capital | 21.0 | 22.0 | 25.0 | 28.0 | 25.0 | 29.0 | 33.0 | | |
| **= Operating surplus, net** | **24.0** | **49.0** | **57.0** | **61.0** | **32.0** | **29.0** | **54.0** | | |
| Employed persons (persons) | 1,900 | 1,900 | 2,000 | 2,000 | 2,000 | 2,100 | 2,300 | 1,810 | 1,610 |
| | **Values as % of output** | | | | | | | | |
| + 103 Peat | 76.0 | 84.2 | 85.6 | 88.8 | 90.6 | 89.1 | 83.1 | | |
| + Other output | 24.0 | 15.8 | 14.4 | 11.2 | 9.4 | 10.9 | 17.0 | | |
| **= Output at basic prices** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| **- Intermediate consumption at purchasers' prices** | **62.1** | **59.3** | **60.6** | **59.9** | **65.2** | **64.1** | **65.3** | **66.4** | **74.7** |
| Total use of domestic products at basic prices | 55.3 | 53.6 | 53.6 | 56.1 | 59.1 | 59.0 | 61.9 | | |
| Total use of imported products at basic prices | 6.0 | 4.9 | 5.8 | 3.1 | 5.5 | 4.6 | 2.9 | | |
| Taxes less subsidies on products | 0.8 | 0.8 | 1.2 | 0.6 | 0.6 | 0.5 | 0.4 | | |
| **= Value added at basic prices** | **37.9** | **40.7** | **39.4** | **40.1** | **34.8** | **35.9** | **34.8** | **33.6** | **25.3** |
| - Compensation of employees | 16.7 | 14.1 | 13.1 | 12.7 | 14.8 | 15.5 | 13.0 | 15.2 | 15.2 |
| **= Operating margin** | **21.2** | **26.7** | **26.3** | **27.5** | **20.0** | **20.4** | **21.8** | **18.5** | **10.2** |
| - Other net taxes on production | -0.5 | -0.4 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | | |
| - Consumption of fixed capital | 10.0 | 8.4 | 8.0 | 8.6 | 8.6 | 10.2 | 8.3 | | |
| **= Operating surplus, net** | **11.4** | **18.6** | **18.2** | **18.8** | **11.0** | **10.2** | **13.5** | | |
| Employed persons per output (persons per € million) | 9.0 | 7.2 | 6.4 | 6.2 | 6.9 | 7.4 | 5.8 | 4.8 | 4.3 |

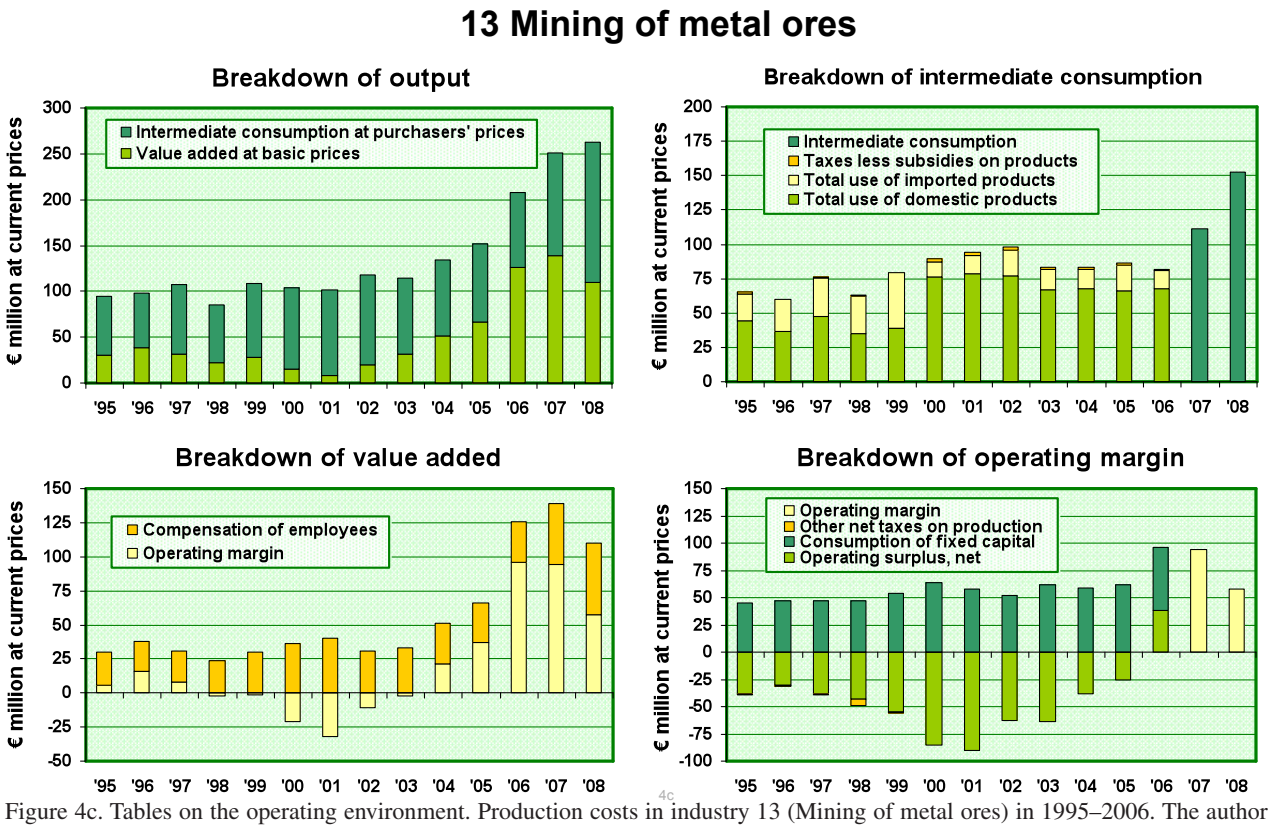


Figure 4c. Tables on the operating environment. Production costs in industry 13 (Mining of metal ores) in 1995–2006. The author has estimated the data for 2007 and 2008 using the regional and industrial statistics on manufacturing. Sources: Statistics Finland, 1) Supply and use tables for the national economy, 2) Regional and industrial statistics on manufacturing.

Table 2c. Key economic parameters for industry 13 (Mining of metal ores) in tables describing the operating environments for 2000–2006. The author has estimated the data for 2007 and 2008 using the regional and industrial statistics on manufacturing. Sources: Statistics Finland, 1) Supply and use tables for the national economy, 2) Regional and industrial statistics on manufacturing.

| | Year | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **13 Mining of metal ores** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** |
| | **Values at € million at current prices** | | | | | | | | |
| + 13 Metal ores | 69.2 | 60.4 | 86.2 | 87.8 | 114.2 | 133.8 | 188.6 | | |
| + 14 Other mining and quarrying products | 23.8 | 21.8 | 24.2 | 24.4 | 18.3 | 14.7 | 16.1 | | |
| + Other output | 11.0 | 19.9 | 7.6 | 1.8 | 1.6 | 3.5 | 3.3 | | |
| **= Output at basic prices** | **104.0** | **102.0** | **118.0** | **114.0** | **134.0** | **152.0** | **208.0** | **250.8** | **262.4** |
| **- Intermediate consumption at purchasers' prices** | **89.3** | **94.2** | **97.7** | **83.0** | **83.0** | **86.0** | **82.0** | **111.6** | **152.2** |
| Total use of domestic products at basic prices | 76.5 | 78.5 | 76.8 | 66.7 | 67.6 | 66.0 | 67.7 | | |
| Total use of imported products at basic prices | 10.3 | 13.7 | 19.2 | 15.1 | 14.4 | 18.7 | 13.3 | | |
| Taxes less subsidies on products | 2.5 | 2.0 | 1.7 | 1.1 | 1.0 | 1.3 | 1.0 | | |
| **= Value added at basic prices** | **14.7** | **7.8** | **20.3** | **31.0** | **51.0** | **66.0** | **126.0** | **139.2** | **110.2** |
| - Compensation of employees | 36.0 | 40.0 | 31.0 | 33.0 | 30.0 | 29.0 | 30.0 | 44.7 | 52.7 |
| **= Operating margin** | **-21.3** | **-32.2** | **-10.7** | **-2.0** | **21.0** | **37.0** | **96.0** | **94.5** | **57.6** |
| - Other net taxes on production | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | |
| - Consumption of fixed capital | 64.0 | 58.0 | 52.0 | 62.0 | 59.0 | 62.0 | 58.0 | | |
| **= Operating surplus, net** | **-85.0** | **-90.0** | **-63.0** | **-64.0** | **-38.0** | **-25.0** | **38.0** | | |
| Employed persons (persons) | 700 | 800 | 600 | 600 | 600 | 600 | 600 | 970 | 1,460 |
| | **Values as % of output** | | | | | | | | |
| + 13 Metal ores | 66.5 | 59.2 | 73.0 | 77.1 | 85.2 | 88.0 | 90.7 | | |
| + 14 Other mining and quarrying products | 22.9 | 21.3 | 20.5 | 21.4 | 13.6 | 9.7 | 7.7 | | |
| + Other output | 10.6 | 19.5 | 6.5 | 1.6 | 1.2 | 2.3 | 1.6 | | |
| **= Output at basic prices** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| **- Intermediate consumption at purchasers' prices** | **85.9** | **92.3** | **82.8** | **72.8** | **61.9** | **56.6** | **39.4** | **44.5** | **58.0** |
| Total use of domestic products at basic prices | 73.5 | 76.9 | 65.1 | 58.5 | 50.5 | 43.4 | 32.6 | | |
| Total use of imported products at basic prices | 9.9 | 13.4 | 16.2 | 13.3 | 10.8 | 12.3 | 6.4 | | |
| Taxes less subsidies on products | 2.4 | 1.9 | 1.5 | 1.0 | 0.7 | 0.8 | 0.5 | | |
| **= Value added at basic prices** | **14.1** | **7.7** | **17.2** | **27.2** | **38.1** | **43.4** | **60.6** | **55.5** | **42.0** |
| - Compensation of employees | 34.6 | 39.2 | 26.3 | 28.9 | 22.4 | 19.1 | 14.4 | 17.8 | 20.1 |
| **= Operating margin** | **-20.5** | **-31.6** | **-9.0** | **-1.8** | **15.7** | **24.3** | **46.2** | **37.7** | **21.9** |
| - Other net taxes on production | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | |
| - Consumption of fixed capital | 61.5 | 56.9 | 44.1 | 54.4 | 44.0 | 40.8 | 27.9 | | |
| **= Operating surplus, net** | **-81.7** | **-88.2** | **-53.4** | **-56.1** | **-28.4** | **-16.4** | **18.3** | | |
| Employed persons per output (persons per € million) | 6.7 | 7.8 | 5.1 | 5.3 | 4.5 | 3.9 | 2.9 | 3.9 | 5.6 |

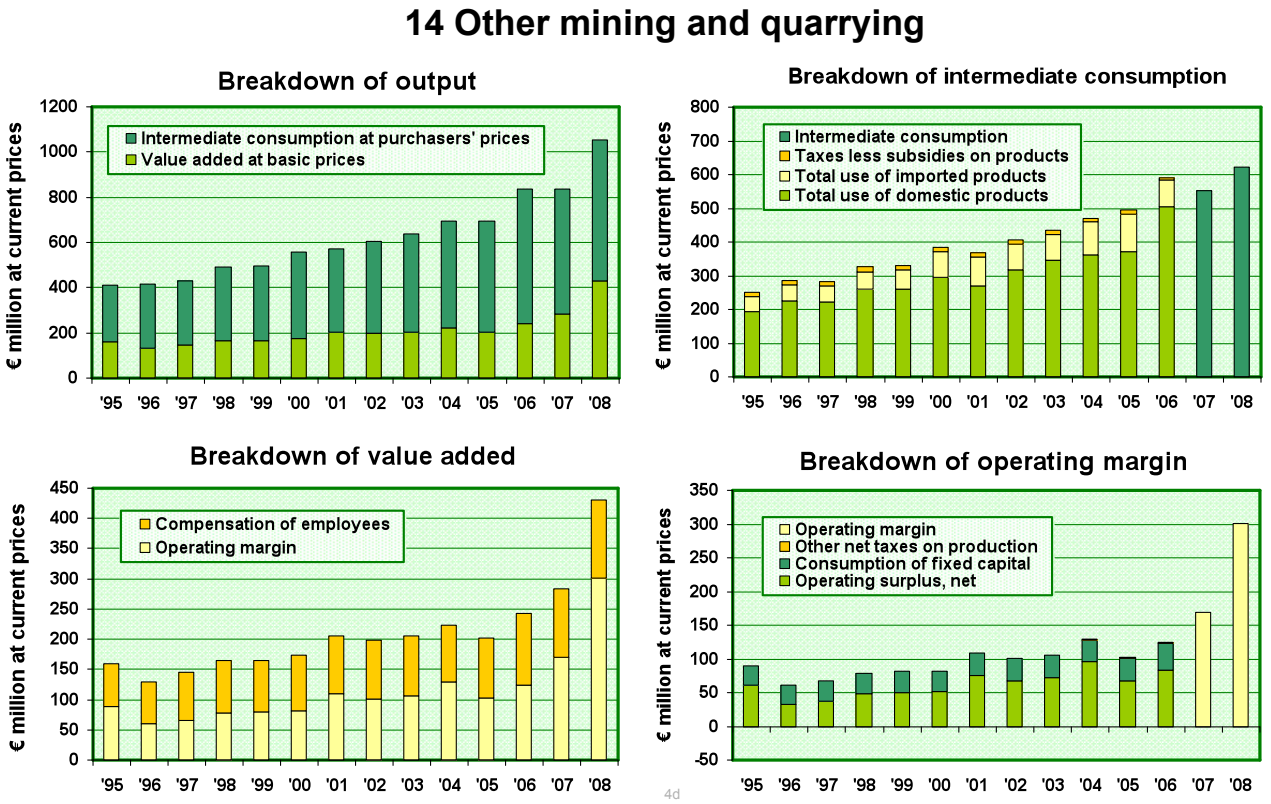


Figure 4d. Tables on the operating environment. Production costs in industry 14 (Other mining and quarrying) in 1995–2006. The author has estimated the data for 2007 and 2008 using the regional and industrial statistics on manufacturing. Sources: Statistics Finland, 1) Supply and use tables for the national economy, 2) Regional and industrial statistics on manufacturing.

Table 2d. Key economic parameters for industry 14 (Other mining and quarrying) in tables describing the operating environments for 2000–2006. The author has estimated the data for 2007 and 2008 using the regional and industrial statistics on manufacturing. Sources: Statistics Finland, 1) Supply and use tables for the national economy, 2) Regional and industrial statistics on manufacturing.

| | Year | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **14 Other mining and quarrying** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** |
| | **Values at € million at current prices** | | | | | | | | |
| + 14 Other mining and quarrying products | 465.0 | 523.9 | 570.2 | 601.6 | 612.8 | 656.2 | 795.7 | | |
| + 13 Metal ores | 0.7 | 1.7 | 3.0 | 3.9 | 7.9 | 8.1 | 13.7 | | |
| + Other output | 91.3 | 47.4 | 32.8 | 34.5 | 73.3 | 31.7 | 25.6 | | |
| **= Output at basic prices** | **557.0** | **573.0** | **606.0** | **640.0** | **694.0** | **696.0** | **835.0** | **837.6** | **1,053.3** |
| **- Intermediate consumption at purchasers' prices** | **383.5** | **367.9** | **407.0** | **435.0** | **470.0** | **494.0** | **592.0** | **553.5** | **622.3** |
| Total use of domestic products at basic prices | 295.6 | 269.8 | 316.9 | 345.4 | 361.0 | 372.4 | 505.0 | | |
| Total use of imported products at basic prices | 76.6 | 87.0 | 77.8 | 77.8 | 99.5 | 111.6 | 78.3 | | |
| Taxes less subsidies on products | 11.4 | 11.0 | 12.4 | 11.7 | 9.5 | 10.1 | 8.7 | | |
| **= Value added at basic prices** | **173.5** | **205.1** | **199.0** | **205.0** | **224.0** | **202.0** | **243.0** | **284.1** | **431.0** |
| - Compensation of employees | 92.0 | 96.0 | 98.0 | 99.0 | 95.0 | 100.0 | 119.0 | 114.7 | 130.0 |
| **= Operating margin** | **81.5** | **109.1** | **101.0** | **106.0** | **129.0** | **102.0** | **124.0** | **169.4** | **301.0** |
| - Other net taxes on production | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 | 1.0 | 1.0 | | |
| - Consumption of fixed capital | 31.0 | 33.0 | 33.0 | 32.0 | 32.0 | 34.0 | 40.0 | | |
| **= Operating surplus, net** | **51.0** | **76.0** | **68.0** | **73.0** | **96.0** | **67.0** | **83.0** | | |
| Employed persons (persons) | 3,200 | 3,200 | 3,300 | 3,200 | 2,900 | 3,100 | 3,500 | 3,420 | 3,420 |
| | **Values as % of output** | | | | | | | | |
| + 14 Other mining and quarrying products | 83.5 | 91.4 | 94.1 | 94.0 | 88.3 | 94.3 | 95.3 | | |
| + 13 Metal ores | 0.1 | 0.3 | 0.5 | 0.6 | 1.1 | 1.2 | 1.6 | | |
| + Other output | 16.4 | 8.3 | 5.4 | 5.4 | 10.6 | 4.6 | 3.1 | | |
| **= Output at basic prices** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| **- Intermediate consumption at purchasers' prices** | **68.9** | **64.2** | **67.2** | **68.0** | **67.7** | **71.0** | **70.9** | **66.1** | **59.1** |
| Total use of domestic products at basic prices | 53.1 | 47.1 | 52.3 | 54.0 | 52.0 | 53.5 | 60.5 | | |
| Total use of imported products at basic prices | 13.7 | 15.2 | 12.8 | 12.2 | 14.3 | 16.0 | 9.4 | | |
| Taxes less subsidies on products | 2.0 | 1.9 | 2.0 | 1.8 | 1.4 | 1.4 | 1.0 | | |
| **= Value added at basic prices** | **31.1** | **35.8** | **32.8** | **32.0** | **32.3** | **29.0** | **29.1** | **33.9** | **40.9** |
| - Compensation of employees | 16.5 | 16.8 | 16.2 | 15.5 | 13.7 | 14.4 | 14.3 | 13.7 | 12.3 |
| **= Operating margin** | **14.6** | **19.0** | **16.7** | **16.6** | **18.6** | **14.7** | **14.9** | **20.2** | **28.6** |
| - Other net taxes on production | 0.0 | 0.0 | 0.0 | 0.2 | 0.1 | 0.1 | 0.1 | | |
| - Consumption of fixed capital | 5.6 | 5.8 | 5.4 | 5.0 | 4.6 | 4.9 | 4.8 | | |
| **= Operating surplus, net** | **9.2** | **13.3** | **11.2** | **11.4** | **13.8** | **9.6** | **9.9** | | |
| Employed persons per output (persons per € million) | 5.7 | 5.6 | 5.4 | 5.0 | 4.2 | 4.5 | 4.2 | 4.1 | 3.3 |

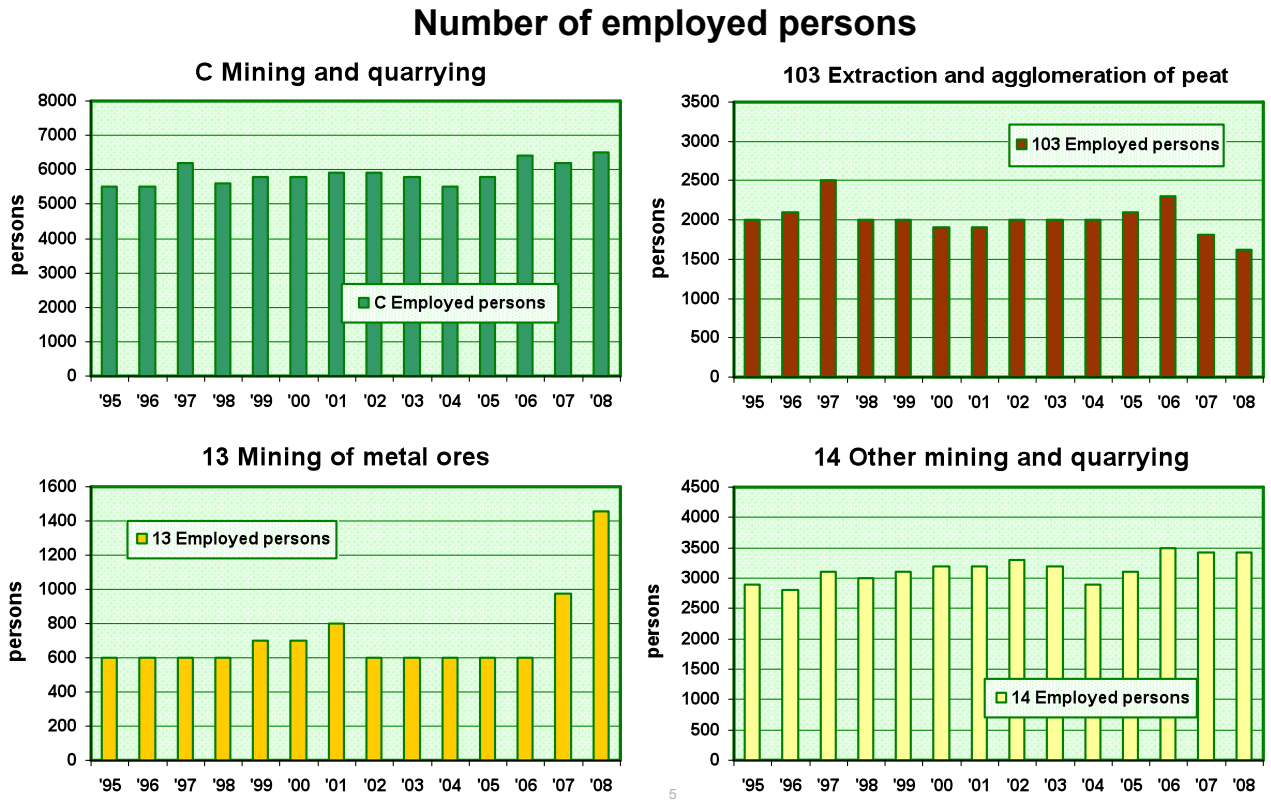


Figure 5. Tables on the operating environment. The number of employed persons in mining and quarrying C in 1995–2008 and the number of employed persons in industries 103, 13 and 14 in 1995–2006. The mining and quarrying industry C is the sum of industries 103, 13 and 14. The author has estimated the data for industries 103, 13 and 14 for 2007 and 2008 using the regional and industrial statistics on manufacturing. Sources: Statistics Finland, 1) Supply and use tables for the national economy, 2) National accounts, 3) Regional and industrial statistics on manufacturing.

margin for industry 13 was negative during the period 1998–2003. The operating margin accounted for between –32 and +46% of the output during the period 2000–2008. The industry's performance weakened between 2007 and 2008. The financial situation for industry 14 remained steady until 2007. Between 2000 and 2007, value added accounted for between 29 and 36% of the industry's output, while the operating margin accounted for between 15 and 20 per cent of output. In 2008, the industry's value added accounted for 41 per cent and the operating margin for 29 per cent of the output.

Mining and quarrying employed 6,500 persons in 2008, and, according to the figures for 2006–2008, the number of employed persons in the industry is on the increase (Table 2a). There was a slight decrease in the number of employed persons in the extraction and agglomeration of peat during the period 2006–2008, while the number of employed persons in the mining of metal ores increased substantially during the same period.

### 2.3 Product markets for mining and quarrying products

The concepts relating to product markets are shown in Figure 6. Total supply is made up of domestic production and imports. In business terms, total uses is made up of exports and domestic consumption and in national economic terms, of final uses and intermediate consumption. When product markets are modelled on a product-specific basis, the assumption is that total supply and total uses are of equal size. For this reason, domestic consumption can be calculated using the formula 'domestic production plus imports minus exports'. In operatingenvironment tables, product markets are expressed in basic prices and in current prices.

The arrows in Figure 6 describe the interaction between supply and use. A total of eight components are needed for each product to describe the interaction between supply and use: four for a domestic product and the same number for an imported product. There are large product-specific differences in the links between supply and use. However, irrespective of the product category, re-exports are usually of little significance (shown with a broken line in Figure 6).

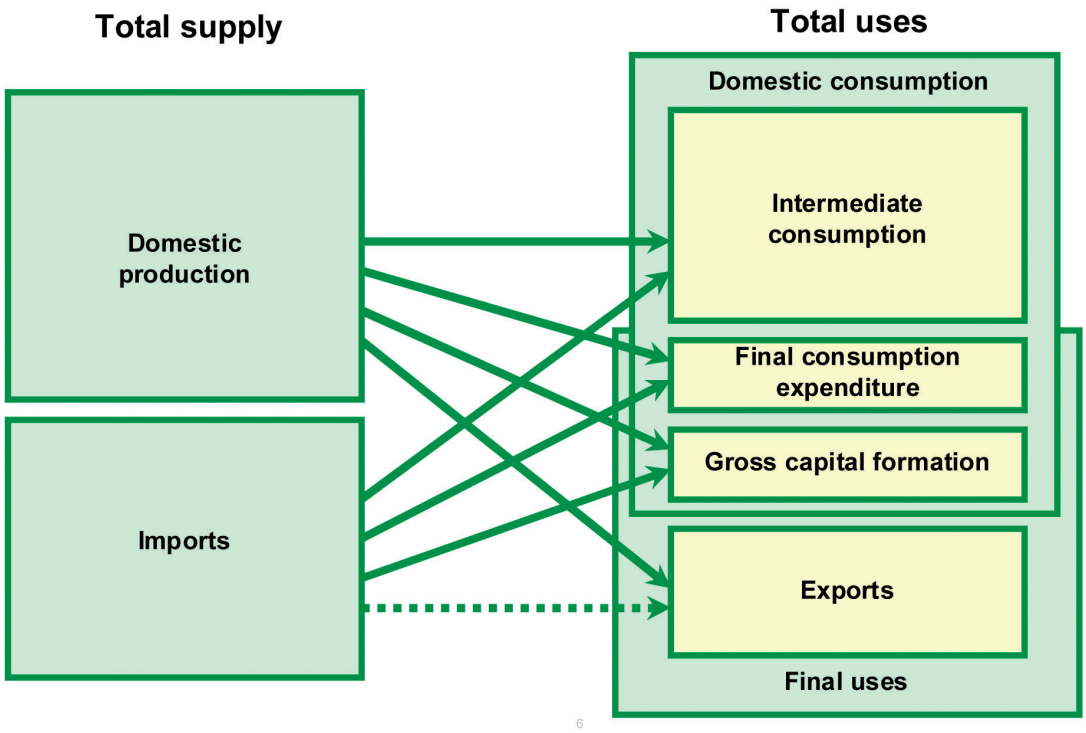


Figure 6. Product market concepts in the operating-environment tables. Product balance sheet (total supply = total uses) applies to each domestic and foreign product category in the operating environment when the values of the product categories are expressed in basic prices.

Product markets for the products generated by mining and quarrying at general national economic level are shown in accordance with CPA2002 classification standard (Table 1b). This study also covers the mining and quarrying products that are not produced in Finland. The Figures 7a–10b in Chapter 2.3 have been taken almost unchanged from the publication 'Money flows of Mining and Quarrying in Finland' (Holmijoki 2010).

The monetary value of the domestic production and consumption of mining and quarrying products and their imports and exports are shown in Figure 7a, while Figure 7b shows them as proportions of the total value of domestic production and consumption and all Finnish imports and exports. Total supply by product category is shown in Figure 8a and total uses by product category, in Figure 8b. Domestic consumption by product category (domestic and imported products) is shown in Figure 8b.

In 2005 in supply and use tables (the latest year for which supply and use tables are available), domestic production in product category 10 totalled EUR 260 million, in product category 13, EUR 150 million, and in product category 14, EUR 730 million. In 2005, (according to supply and use tables) imports in product category 10 totalled EUR 390 million, in product category 11, EUR 3,900 million, in product category 13, EUR 1,120 million, and in product category 14, EUR 240 million. Imports accounted for a substantial proportion of the total supply on the mining and quarrying product markets.

In 2008, imports of crude petroleum and natural gas totalled EUR 6,600 million, imports of metal ores and concentrates, EUR 2,000 million, imports of coal and lignite, EUR 690 million, and imports of other mining and quarrying products, EUR 270 million. In 2008, imports of mining and quarrying products totalled EUR 9,500 million, which accounted for 13 per cent of the value of all imports. The value of imports has been boosted by a strong increase in the unit prices of mining and quarrying products. In 2008, exports of mining and quarrying products totalled EUR 140 million, which accounted for 0.2 per cent of the value of all exports. Of the exports, EUR 120 million were other mining and quarrying products.

As exports from Finland are made up of domestic production (re-exports are of little significance), the domestic consumption of domestic products is domestic production minus exports. Domestic

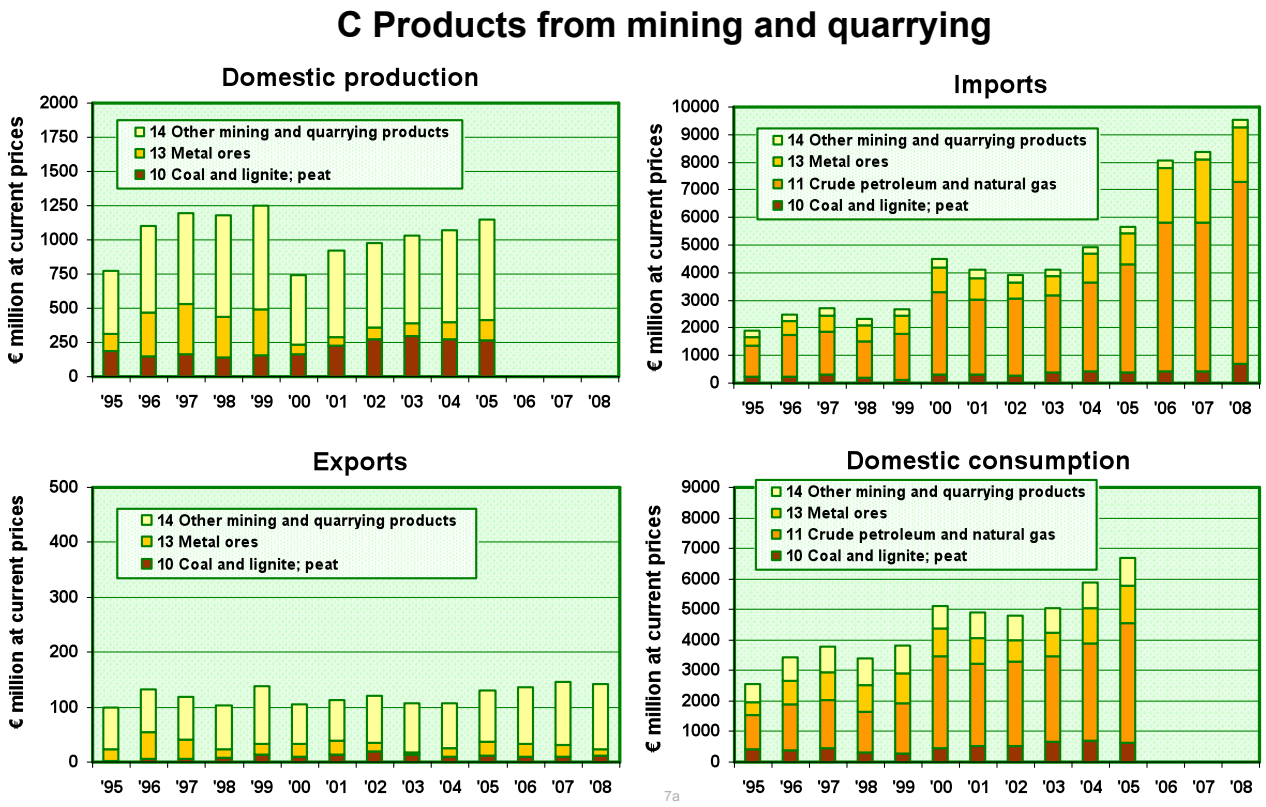


Figure 7a. Tables on the operating environment. Domestic production and domestic consumption at current prices in 1995–2005, and imports and exports at current prices in 1995–2008 in the mining and quarrying product categories 10, 11, 13 and 14. Sources: 1) Statistics Finland, Supply and use tables for the national economy, 2) National Board of Customs.

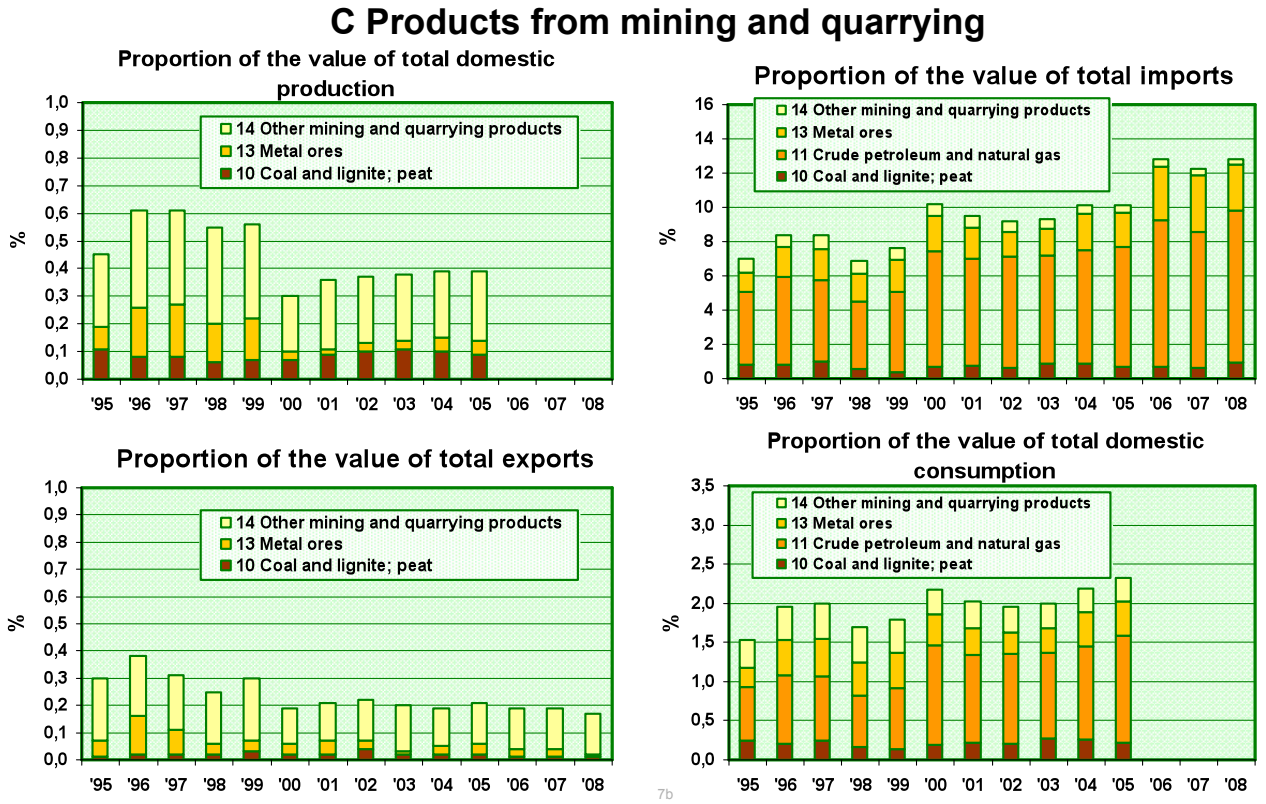


Figure 7b. Tables on the operating environment. Mining and quarrying products as a proportion of the total value of domestic production, the total value of imports and exports and the total value of domestic consumption of the products. The proportions of the domestic values are based on the values given in the sources. Sources: 1) Statistics Finland, Supply and use tables for the national economy, 2) National Board of Customs.

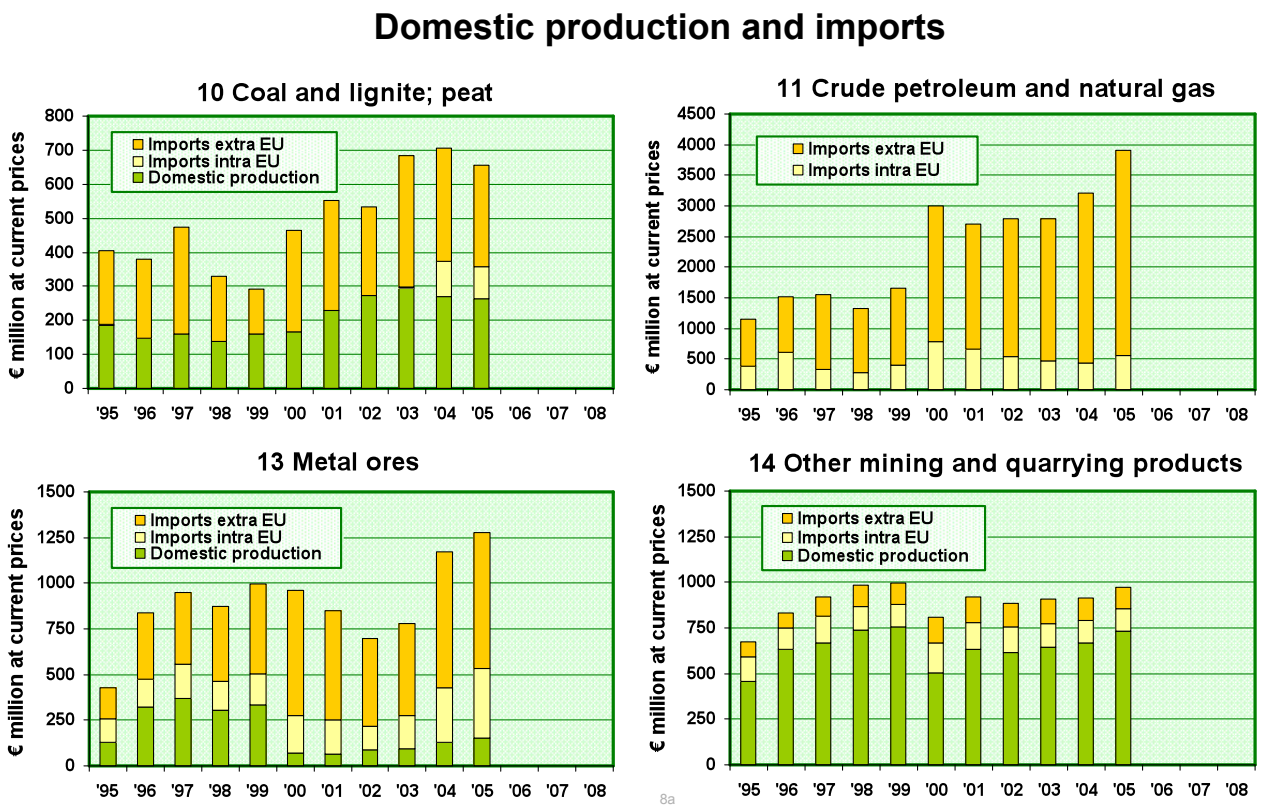


Figure 8a. Tables on the operating environment. Total supply of mining and quarrying product categories 10, 11, 13 and 14 at basic prices and at current prices in 1995–2005. Breakdown into domestic and imported products. Source: Statistics Finland, Supply and use tables for the national economy.

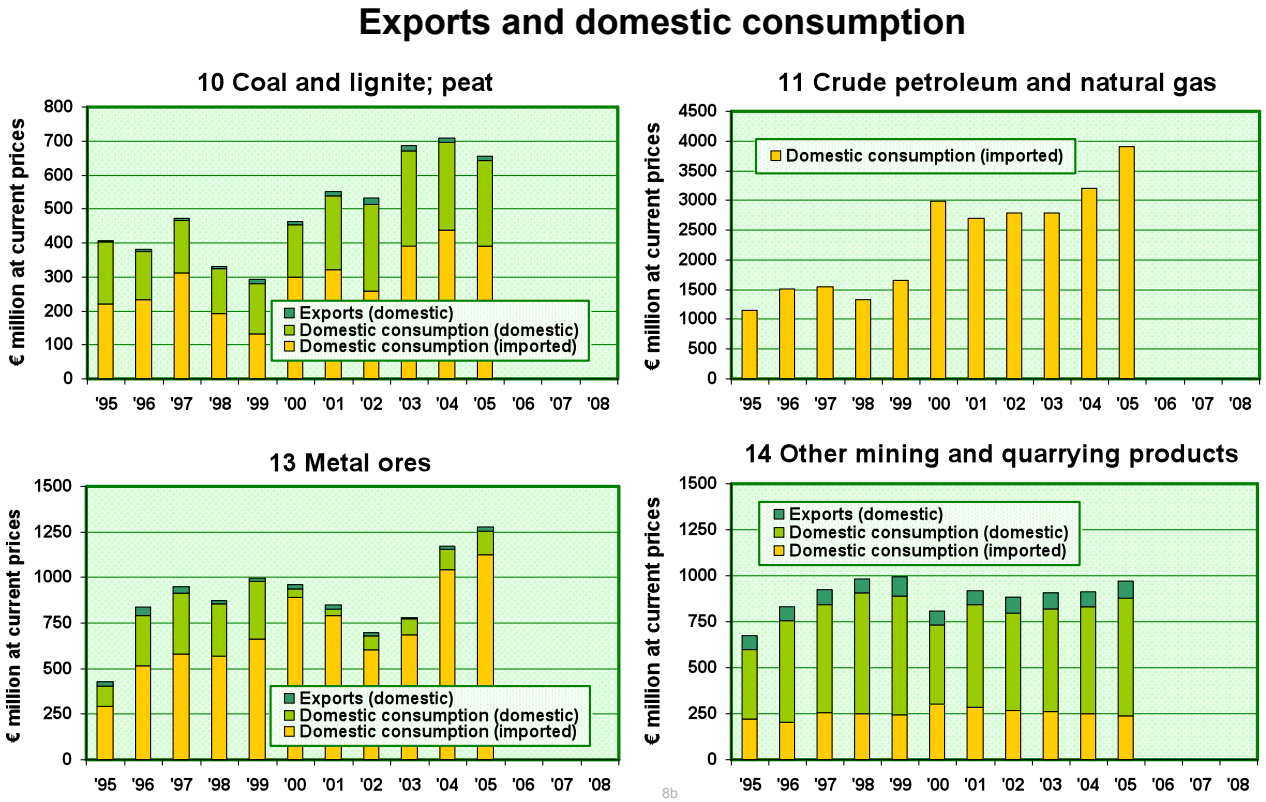


Figure 8b. Tables on the operating environment. Total uses of mining and quarrying product categories 10, 11, 13 and 14 at basic prices and at current prices in 1995–2005. Breakdown between the domestic consumption of domestic and imported products. Source: Statistics Finland, Supply and use tables for the national economy.

consumption of imported products is the same as imports to Finland. Even though almost all domestic production is consumed on the domestic market, only in product category 14 do domestic products account for a larger proportion of domestic consumption than imports.

Domestic consumption by product category is divided among intermediate consumption, final consumption expenditure and gross capital formation. Gross capital formation also includes changes in inventories. In the mining and quarrying product categories, domestic consumption is practically the same as intermediate consumption; in other words, consumption accounts for a negligible proportion of the total, and changes in inventories as part of gross capital formation are small.

Intermediate consumption of mining and quarrying product categories during the period 1995–2005 is shown in Figures 9a, 9b, 9c and 9d. According to the Figures 9a–9d, the industries accounting for the largest proportion of consumption of mining and quarrying products are:

- 10 Coal, lignite and peat
  -- 40 Electricity, gas, steam and hot water supply
- 11 Crude petroleum and natural gas
  -- 23 Manufacture of coke, refined petroleum products and nuclear fuel
- 13 Metal ores
  -- 27 Manufacture of basic metalsa
- 14 Other mining and quarrying products
  -- 21 Manufacture of pulp, paper and paper products
  -- 24 Manufacture of chemicals and chemical products
  -- 26 Manufacture of other non-metallic mineral products
  -- 45 Construction

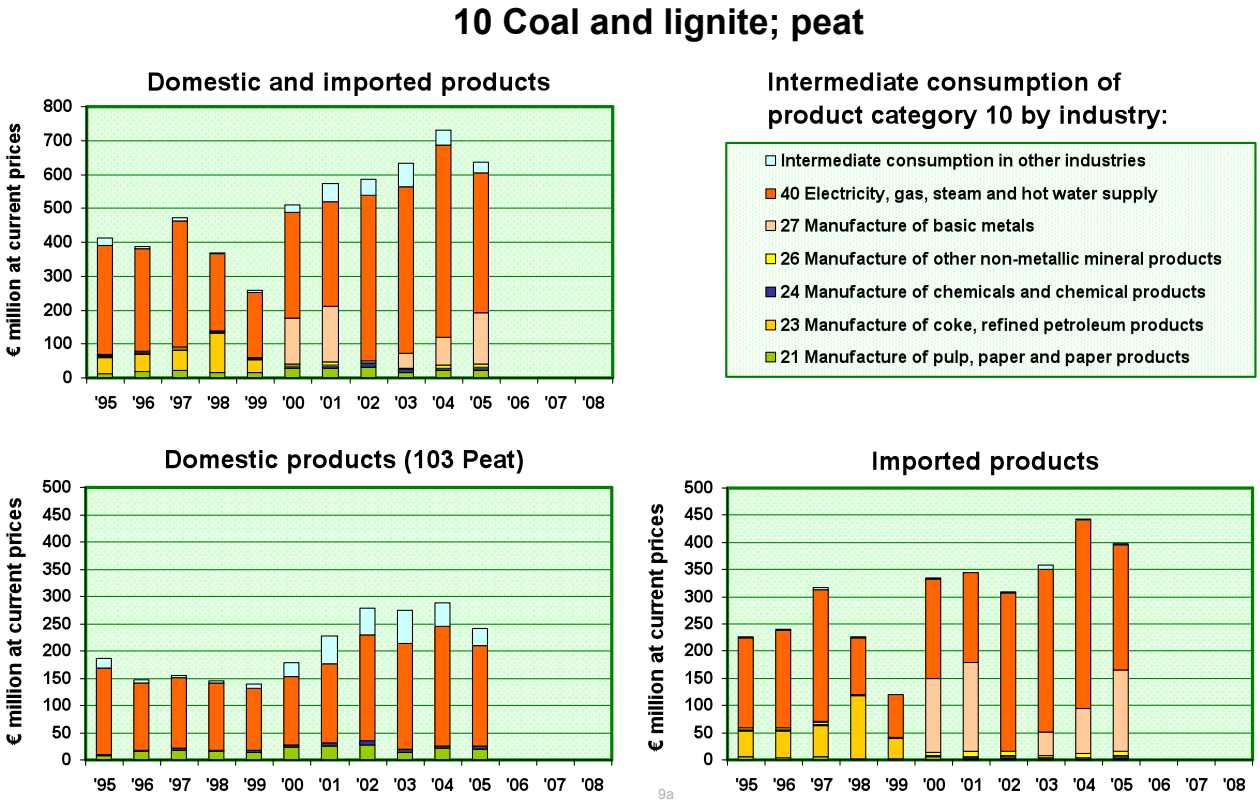


Figure 9a. Tables on the operating environment. Intermediate consumption of product category 10 (Coal and lignite; peat) at basic prices and at current prices by consumer industry in 1995–2005. Peat is the domestic product, while coal accounts for most of the imports. Source: Statistics Finland, Supply and use tables for the national economy.

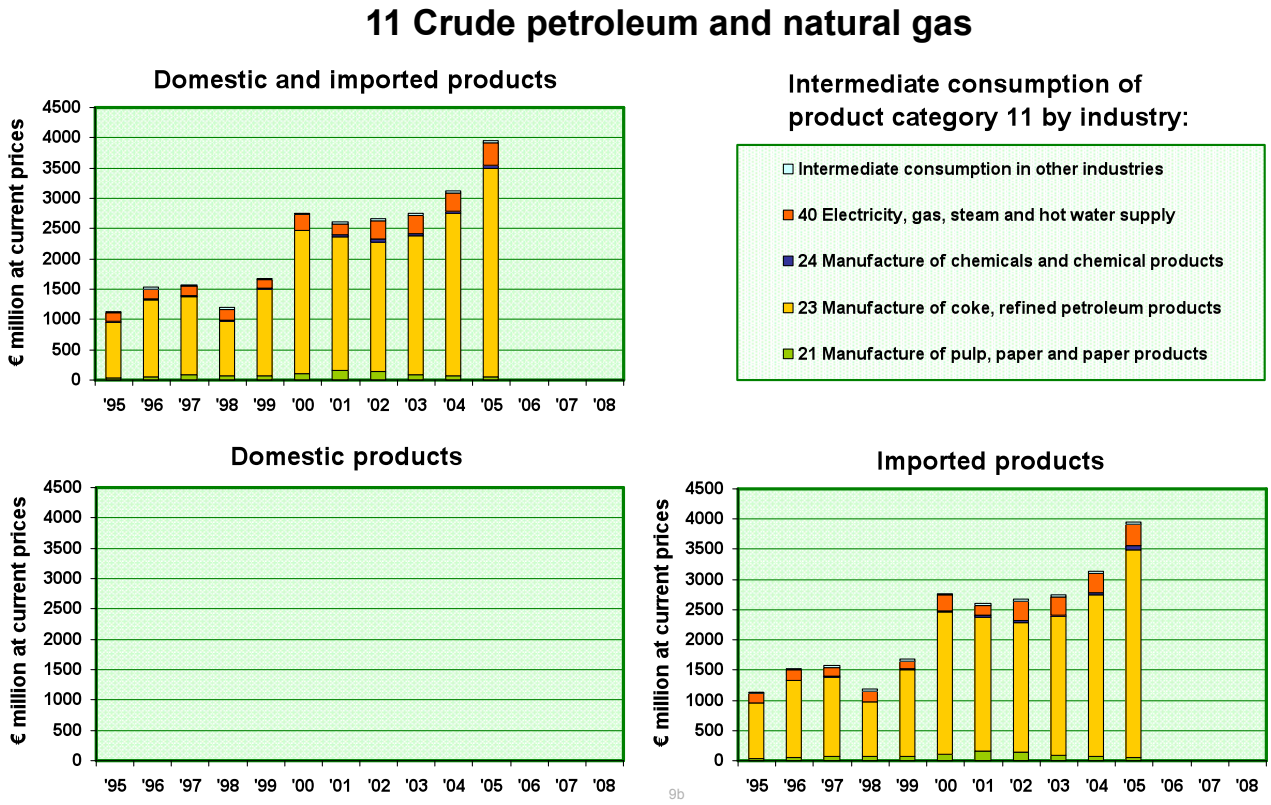


Figure 9b. Tables on the operating environment. Intermediate consumption of product category 11 (Crude petroleum and natural gas) at basic prices and at current prices by consumer industry in 1995–2005. There is no domestic production in category 11. Source: Statistics Finland, Supply and use tables for the national economy.

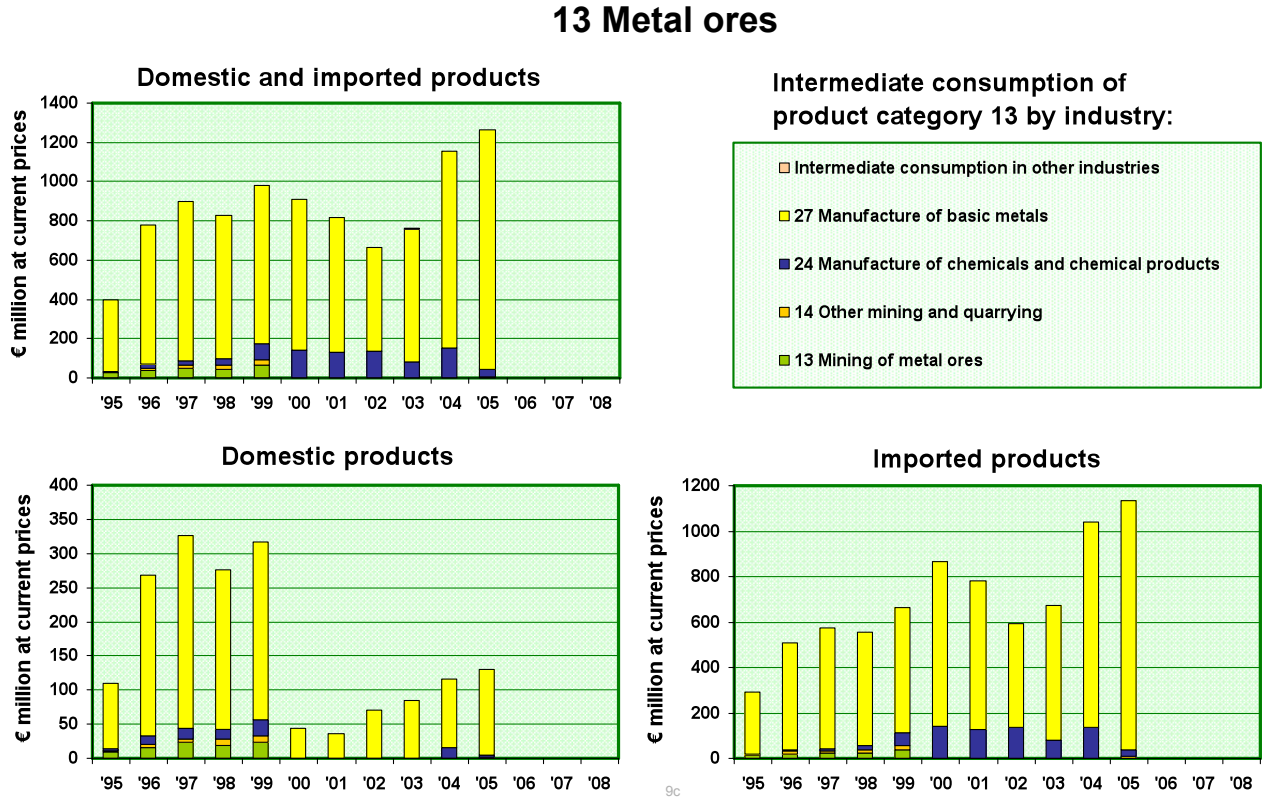


Figure 9c. Tables on the operating environment. Intermediate consumption of product category 13 (Metal ores) at basic prices and at current prices by consumer industry in 1995–2005. Breakdown between the consumption of domestic and imported products. Source: Statistics Finland, Supply and use tables for the national economy.

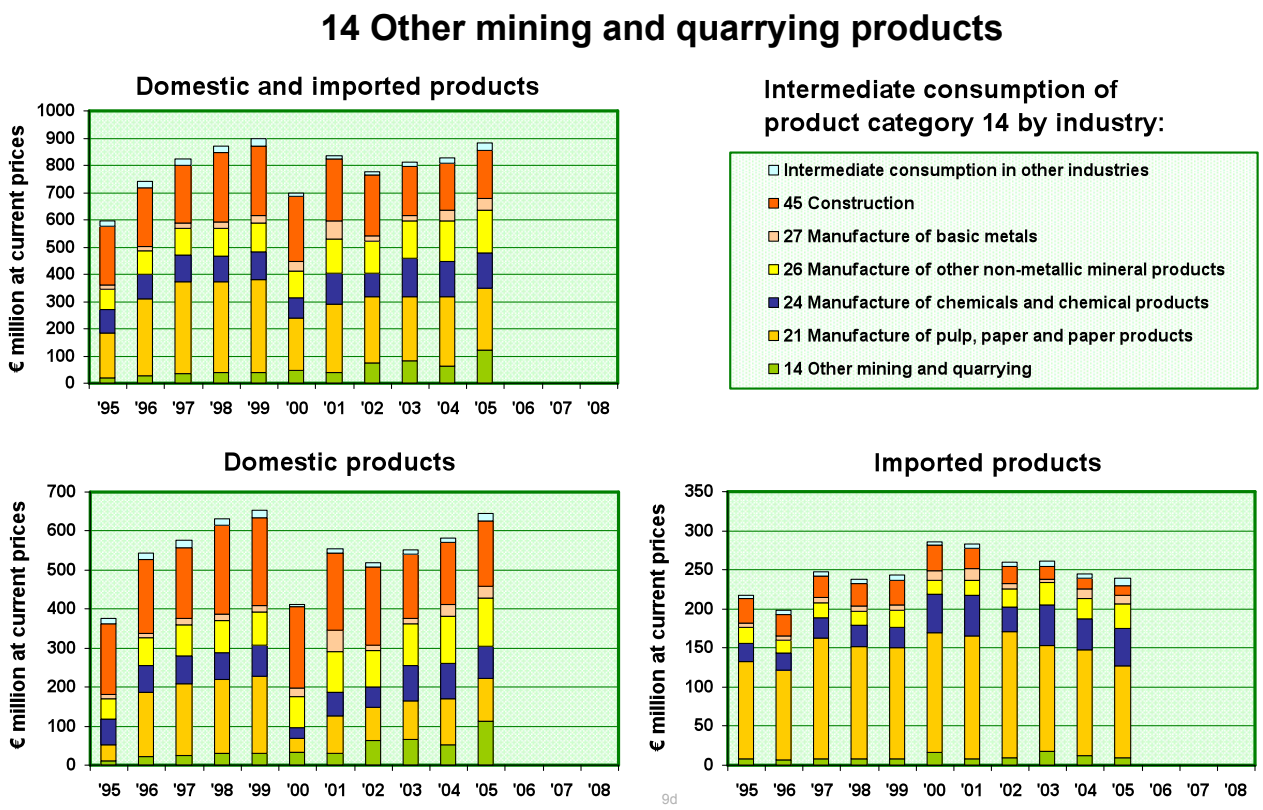


Figure 9d. Tables on the operating environment. Intermediate consumption of product category 14 (Other mining and quarrying products) at basic prices and at current prices by consumer industry in 1995–2005. Breakdown between the consumption of domestic and imported products. Source: Statistics Finland, Supply and use tables for the national economy.

Figures 10a and 10b show the industries using domestic and foreign mining and quarrying products. The figures show the breakdown of the output for each industry into intermediate consumption and value added and the total amount of domestic and foreign mining and quarrying products directly used by each industry. Figures 10a and 10b present mining and quarrying product markets from the viewpoint of consumer industries, whereas Figures 9a–9d show them from the viewpoint of producer industries.

Figures 10a and 10b show how the output of the consumer industry (intermediate consumption at purchaser's price plus value added at basic prices) and the mining and quarrying products directly used by the industry depend on each other. The value of product categories 10 and 11 used by industry 40 (Electricity, gas, steam and hot water supply) in 2005 accounted for 15 per cent of the industry's output. In industry 23 (Manufacture of coke, refined petroleum products and nuclear fuel), the purchases of product category 11 accounted for 61 per cent of the industry's output in 2005. In industry 27 (Manufacture of basic metals), purchases of mining and quarrying products accounted for 16 per cent of the industry's output in 2005. Imports of metal ores and concentrates accounted for most of this total.

In 2005, the manufacture of pulp, paper and paper products used products belonging to product categories 10, 11 and 14 to the value of EUR 311 million, which was 2.5 per cent of the industry's output. In 2005, the manufacture of chemicals and chemical products used products belonging to product categories 11, 13 and 14 to the value of EUR 232 million, which was 3.6 per cent of the industry's output. EUR 179 million's worth of mineral and quarrying products were used in the manufacture of other non-metallic mineral products in 2005; products belonging to category 14 accounted for most of this total, which represented 6.6 per cent of the industry's output. Product category-14 products (mainly gravel, sand and crushed aggregate) to the value of EUR 179 million were used in construction in 2005. This was 0.9 per cent of the industry's output.

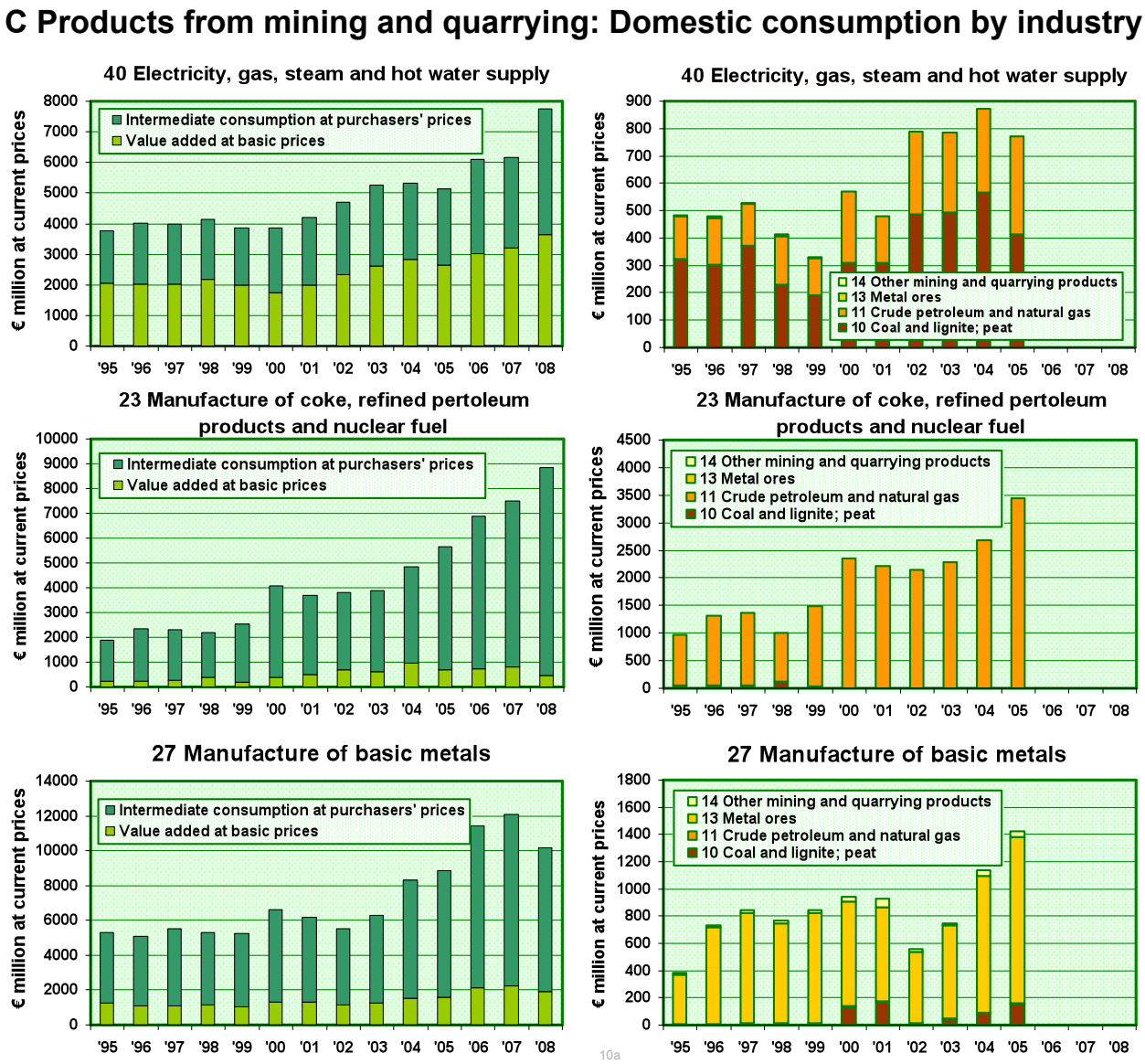


Figure 10a. The consumption of domestic and foreign mining and quarrying products. Breakdown of the output of industries 40, 23 and 27 into intermediate consumption and value added in 1995–2008. The author has estimated the values of intermediate consumption and value added of industry 40 in 2006–2008 using the regional and industrial statistics on manufacturing. Mining and quarrying products directly used by industries 40, 23 and 27 – domestic production plus imports – in 1995–2005. Sources: Statistics Finland, 1) Supply and use tables for the national economy, 2) National accounts, 3) Regional and industrial statistics on manufacturing.

When the diagrams for the period 2002–2005 in Figures 10a and 10b are examined, it becomes clear that consumption of mining and quarrying products as a proportion of the industry's output has only increased in industry 27 (Manufacture of basic metals), and even in this case the increase in the proportion is a result of higher unit prices for metal ores and concentrates. In other consumer industries, the relative proportions of the output have remained unchanged or decreased. In practice, this means that consumption of mining and quarrying products will only increase if a larger proportion of the growth in production volumes comes from the consumer industries.

# C Products from mining and quarrying; Domestic consumption by industry

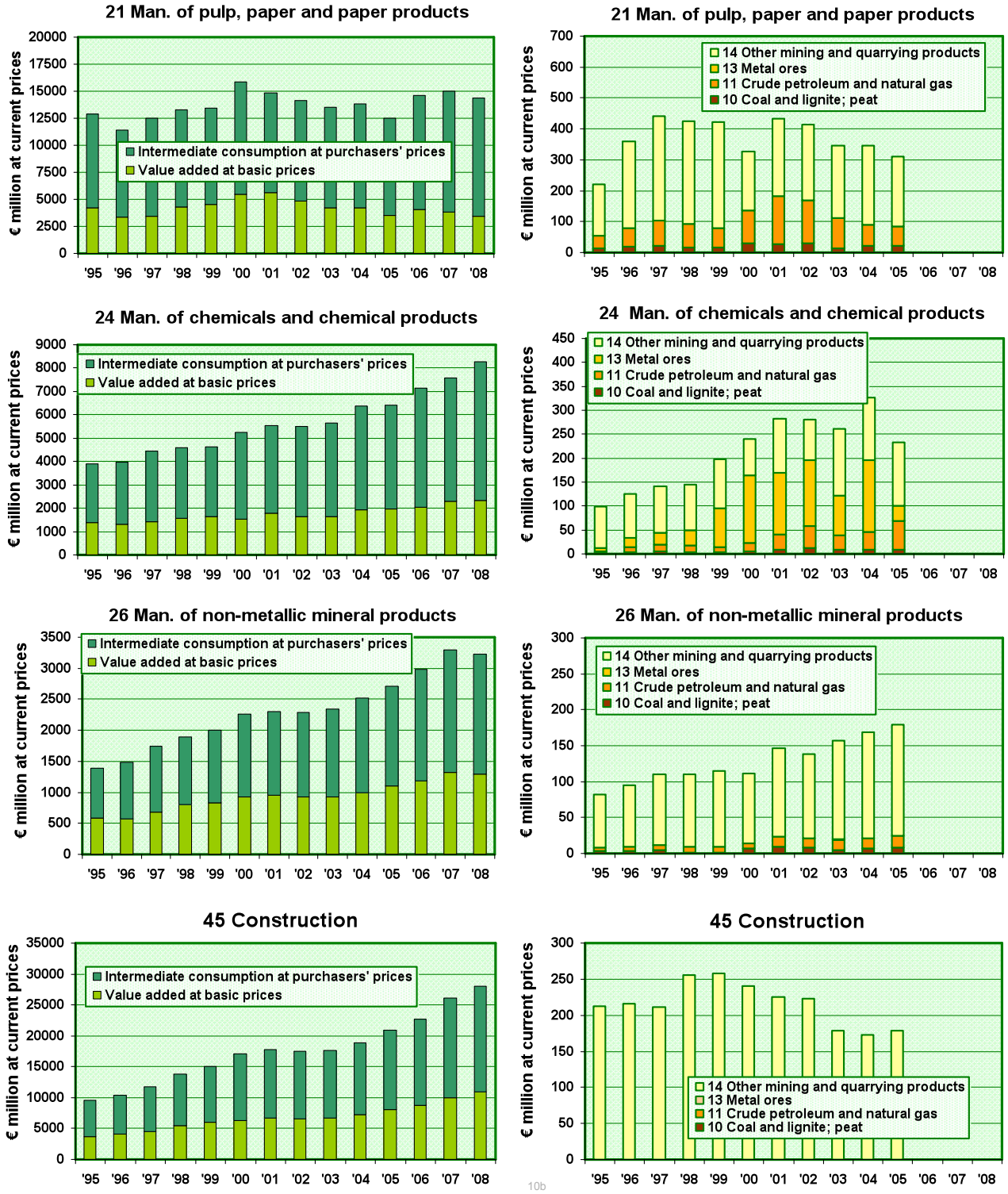


Figure 10b. The consumption of domestic and foreign mining and quarrying products. Breakdown of the output of industries 21, 24, 26 and 45 into intermediate consumption and value added in 1995–2008. The mining and quarrying products directly used by industries 21, 24, 26 and 45 – domestic production plus imports – in 1995–2005. Sources: Statistics Finland, 1) Supply and use tables for the national economy, 2) National accounts.

# 3 CALCULATIONS ON THE ECONOMIC IMPACTS OF THE MINING AND QUARRYING INDUSTRIES AND THEIR CONSUMER INDUSTRIES

The value of the industry class or the product category may change as a result of changes in production volumes or changes in the product unit price (Figure 11). The processes for calculating the impacts of changes in production values on the industry classes and product categories for the operating environment are described in Chapter 3.1. The results of the calculations concerning mining and quarrying are described in Chapter 3.2, and those concerning consumer industries, in Chapter 3.3. Impact analyses for basic changes are generalised and combined in Chapter 3.4.

The calculations are based on a method for evaluating the operating environment developed by the author (Holmijoki 2002, 2005, 2007, Holmijoki et al. 2002, 2007). The opportunities provided by the evaluation method are presented in Chapter 3.5.

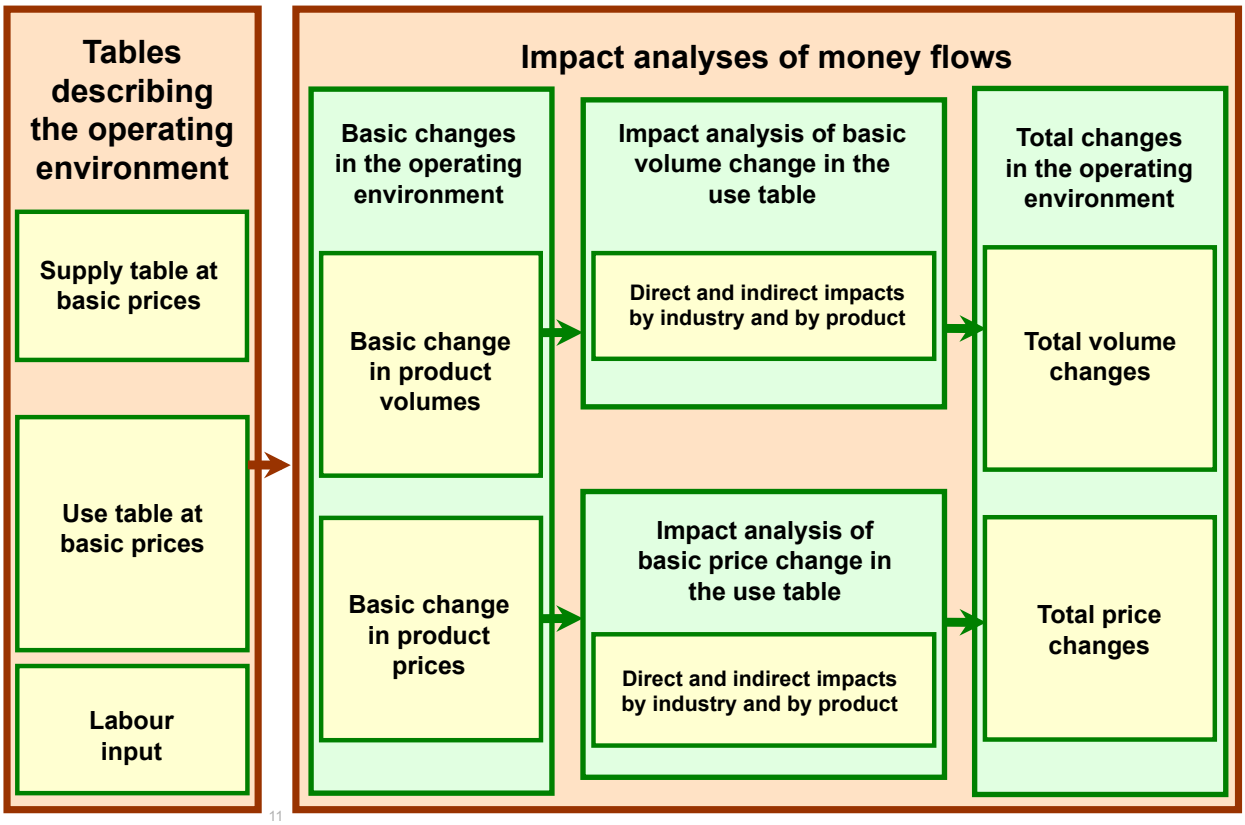


Figure 11. Analysing the money flows of the operating environment. Impact analyses of the basic changes in product volumes and prices.

## 3.1 Impact analyses of the basic changes in volumes and prices

The operatingenvironment tables for the selected year (basic-price supply and use tables) are used as the initial data for the calculations. Output is the most important key indicator for an industry class. Annual supply or use is the most important key indicator for a product category. The analysis concerns yearly changes in the output of an industry class and the supply or use of a product category and it concerns how changes in industry classes and product categories are linked to each other through product purchases and deliveries. In order to facilitate the analysis, it is assumed that industry classes and product categories are homogenous. The interaction between industry classes and product categories is based on average yearly production costs and average yearly production and market shares. On the product markets, this average state of interaction is called 'business as usual'.

The impact analysis of the basic change in production volumes is based on classic input-output theory in a symmetric 'industry x industry' input-output table. In a basic-price use table, the calculation process is as follows:

1) A basic change of EUR 10 million in production volume takes place in industry i. Industry i increases the production of its own main products and by-products in the operating environment for a selected year so that its direct yearly output increases by EUR 10 million at current prices. Industry i keeps its production structure unchanged. Industry i delivers its products directly for export or for other final uses. Product prices on the product markets remain unchanged.
2) The direct increase in the output of industry i creates, in accordance with the cost structure of industry i, demand for domestic and foreign products and a higher value added for the industry. The breakdown of value added between labour costs, operating surplus and other value-added components depends on the situation at the establishments in industry i (including such factors as the capacity utilisation rate).
3) The industries in the operating environment respond to the increase in demand for domestic products by manufacturing the products in question in proportion to their market shares.
4) An increase in production volumes creates, in accordance with the cost structures of the industries, demand for domestic and foreign products and a higher value added for the industries.
5) Items 3 and 4 are repeated alternately until the increase in demand is small enough. Demand drops at each round as only the demand for domestic products generates more domestic production.
6) Finally, the increases in output for the industries in the operating environment are added together. This results in the total impact of a basic change in direct output of EUR 10 million resulting from changes in production volumes in industry i on all industry classes and product categories in the operating environment for the selected year.

The impact analysis for the basic volume change goes backwards in the processing chain. The result of the impact analysis is the breakdown of the total change in the industries' output into total change in the industry in question and other industries. The total change in output comprises the direct economic activities resulting from the basic change in volume in the industry in question and in the final uses of domestic products and the operating environment of the economic activities indirectly resulting from basic changes in volume in all industries. The total changes in the use of products are divided into changes in the final uses and intermediate consumption of domestic products and changes in the intermediate consumption of imported products. The total change in output is equal to the total change in the intermediate consumption and final uses of domestic products. The change in the final uses of domestic products is equal to the value of basic change in volumes. The total impacts of basic volume change on the gross domestic product are divided between the total change in value added and the total change in taxes on products connected with intermediate consumption. Finally, the breakdown of the total impacts of basic volume change on employed persons into the change in the industry in question and other industries is presented.

The impact analysis of the basic change in prices is based on classic input-output theory in a symmetric 'product x product' input-output table. In the basic-price use table, the calculation process is as follows:

1) A basic price change of EUR 10 million takes place in the domestic product category i. The price of the domestic product i on the product market changes in the operating environment for the selected year so that the direct yearly value of the product i increases by EUR 10 million at current prices. Only the prices of domestic products on the product markets change; the prices of imported products and the production volumes of all products remain unchanged. Industries producing the product i enter the direct change in the sales price in their operating surplus in proportion to their market shares.
2) The direct change in the price of the domestic product i is divided in proportion to the use in different consumer groups in exports, in other final uses and in the intermediate consumption of the industries. The operating profits of the industries remain unchanged, and they transfer the increases in the purchase prices of the product i to the sales prices of their own products.
3) The increase in the sales price of domestic products generates an equal increase in purchase prices in exports, other final uses and the intermediate consumption of the industries.
4) The operating profits of the industries remain unchanged, and they transfer the increases in the product purchase prices to the sales prices of their own products.
5) Items 3 and 4 are repeated alternately until the price increase is small enough. The price increase slows down at each round as only the change in the prices of products destined for intermediate consumption in the industries generates price pressures in domestic products.
6) Finally, the changes in the prices of domestic products in all product categories in the operating environment are added together. This results in an total impact of the direct basic price change of EUR 10 million caused by changes in the price of product i in all industry classes and domestic product categories in the operating environment for the selected year.

The impact analysis of a basic price change goes forward in the processing chain. The result of the impact analysis is the breakdown of the total change in the value of the industries' output into value change in the industry in question and other industries. The total change includes the direct change caused by a basic price change in the output of the producer industries and in domestic product purchases of the consumer industries and the resulting indirect price changes in the domestic product purchases for all industries in the operating environment. Total changes in product use are broken down into changes in the value of domestic products in exports, in other final uses and in intermediate consumption. The total value change in product use is equal to the total value change in the industries' output. The change in the value of domestic products in exports and other final uses is equal to the value of the basic price change. The total value changes in the product category corresponding to the basic price change are broken down into changes in exports, in other final uses and in intermediate consumption. There is no change in import prices in this impact analysis. The change in the gross domestic product is equal to the change in value of the final uses of domestic products; in other words, it is equal to the basic price change. Finally, the total impacts of the basic price change on the value of domestic production are shown by product category. The total change in production value is equal to the total change in the value of consumption.

This report presents calculations of impact analyses concerning the basic change in production volumes in the mining and quarrying industry classes 103, 13 and 14 and consumer industries 40, 23, 27, 21, 24, 26 and 45 in the operating environments during the period 1995–2005. There is a total of 110 impact analyses (3 + 7 industry classes in 11 different operating environments). Likewise, the impact analyses concerning the basic change in product prices have been calculated for domestic product categories 103, 13, 14, 40, 23, 27, 21, 24, 26 and 45 in the operating environments during the period 1995–2005. Here, too, there are 110 impact analyses (3 + 7 product categories in 11 different operating environments). Each impact analysis provides details of the total impacts of the basic change in the production volumes or prices, in other words the direct and indirect impacts on all industry classes and product categories in the operating environment. The results of the impact analyses are presented in Chapters 3.2 and 3.3.

### 3.2 Basic changes in mining and quarrying industries and product categories

Basic volume changes are examined separately for each mining and quarrying industry class (103, 13 and 14). Basic price changes are examined separately for each domestic mining and quarrying product category (103, 13 and 14). The results of the impact analyses of basic volume and price changes in the operating environments for the period 1995–2005 are shown as time series in Figures 12–17, while a summary is shown in Figures 18 and 19. The initial data for the calculations is shown in Section 2 above.

The total impact of the basic volume and price change of EUR 10 million on the industry classes and product categories in the operating environment is shown at current prices. However, the total employment impacts are given as the number of employed persons. It follows from the theory used in the calculations that the total impacts divided by the basic change, in this case EUR 10 million, are constant, regardless of the size of the basic change. These constants are the total impact coefficients. This makes the impact analyses of the basic change presented here universally applicable. This fact is used in the generalisation of basic changes in Chapter 3.4.

Figure 12 shows the total impacts of the basic change in production volumes in industry 103 (Extraction and agglomeration of peat) on the output of the industry in question and other industries and on the consumption of domestic and imported products, the impacts on the gross domestic product and the impacts on employment in the operating environments for the period 1995–2005. In 1995, the total impacts of basic volume change on the output of the industries in the operating environment and on domestic supply amounted to EUR 17 million and in 2005, it was EUR 20 million. In 1995, coefficient for the overall impact of the basic change on the industries' output was 1.7, and in 2005, it was 2.0. There was a slight increase in the total impacts between 1995 and 2005. The total impact of the basic change on the gross domestic product was about EUR 8.5 million during the period 1995–2005. The total impact of the basic change on the consumption of imported products during the period 1995–2005 was between EUR 1.2 and 1.7 million. In 2005, the total employment impact of the basic volume change was 140 persons, compared with 190 persons in 1997. The trend was downwards during the period 1995–2005.

Figure 13 shows the total impacts of the basic price change in the domestic product category 103 (Peat) on the output of the industry in question and other industries and on the consumption of domestic products, the impacts on product category 103 and the impacts on the value of domestic production by product category in the operating environments during the period 1995–2005. The total change in the industries' output varied between EUR 29 and 36 million during the period 1995–2005. This is the basic price change in product category 103 multiplied by 2.9–3.6. It follows from the theory based on national accounts used here that the change in GDP is equal to the basic change. Likewise, it follows from the theory used that the change in the value of the products destined for export and other final uses is equal to the basic change. The biggest increases were in the value of products destined for intermediate consumption (EUR 19–26 million). This is explained by the fact that peat is at the start of the processing chain and that the exports and other final uses of peat are only on a small scale. The increase in the price of domestic peat created pressure to increase prices in product categories 21 (Pulp, paper and paper products), 40 (Electricity, gas, steam and hot water supply) and 70 (Real-estate activities).

Figure 14 shows the total impacts of the basic change in production volumes in industry 13 (Mining of metal ores) in the operating environments during the period 1995–2005. The total impacts of the basic volume change on the output of the industries in the operating environment varied between EUR 16 and 18 million at current prices between 1995 and 1999. In 2000 and 2001, the total impacts reached EUR 22 million from which they declined steadily to EUR 17 million in 2005. The total impact of the basic change on the gross domestic product in 2005 was EUR 7.5 million, compared with only EUR 5 million in 1999. The total impact of the basic change on the consumption of imported products varied between EUR 2.5 and 5.0 million during the period 1995–2005. In 2005, the total employment impact of the basic volume change was 82 persons, compared with 166 persons in 2001. There was a steep downwards trend during the period 2001–2005.

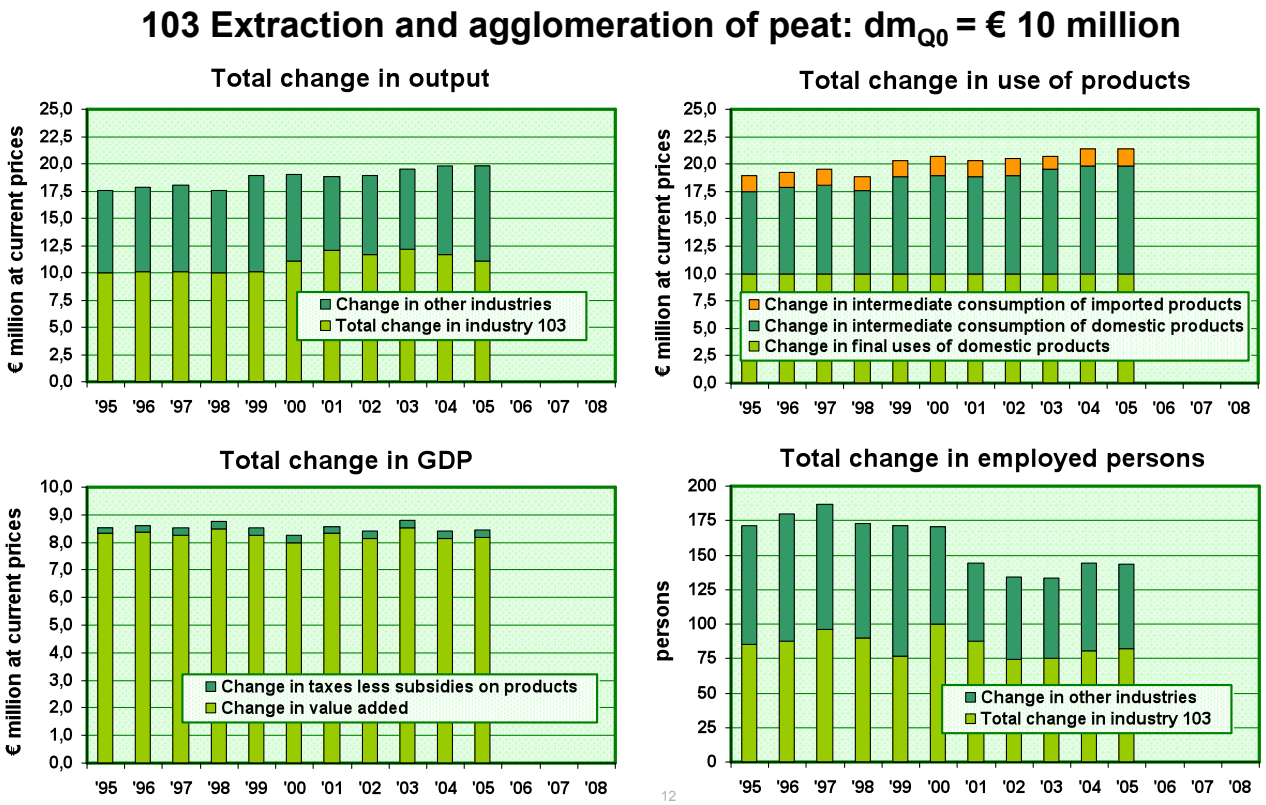


Figure 12. Industry 103 will increase the production of its main products and by-products so that the direct yearly value of the output will rise by EUR 10 million. The total impacts of the increase in production volume on output of the industry in question and other industries and on use of domestic and imported products, the impacts on GDP and the impacts on employment in the operating environments for 1995–2005. The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million.

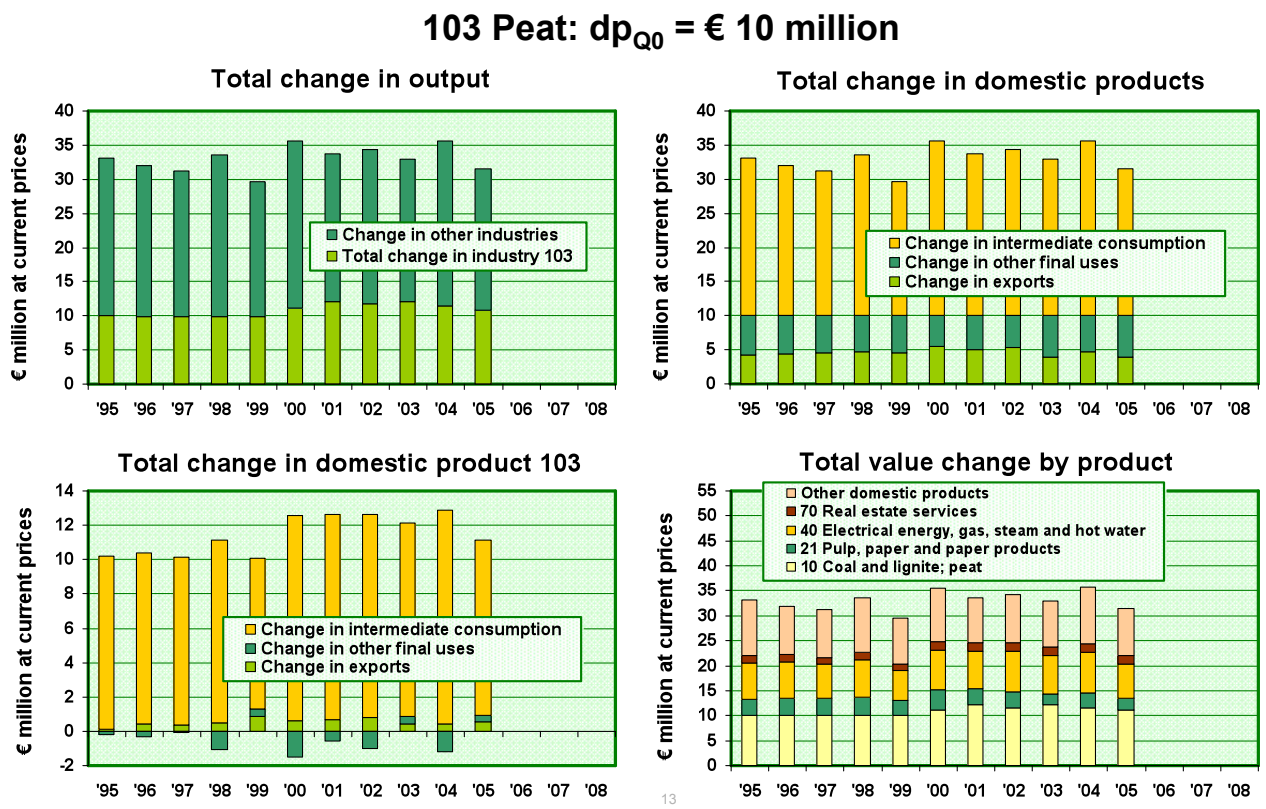


Figure 13. The price of the domestic product category 103 on the product market will increase so that the direct yearly value of the production will rise by EUR 10 million. The total impacts of the change in the value of production on output of the industry in question and other industries, the impacts on all domestic products and on domestic product category 103 by way of using and the impacts on the value of domestic production by product in the operating environments for 1995–2005. The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million.

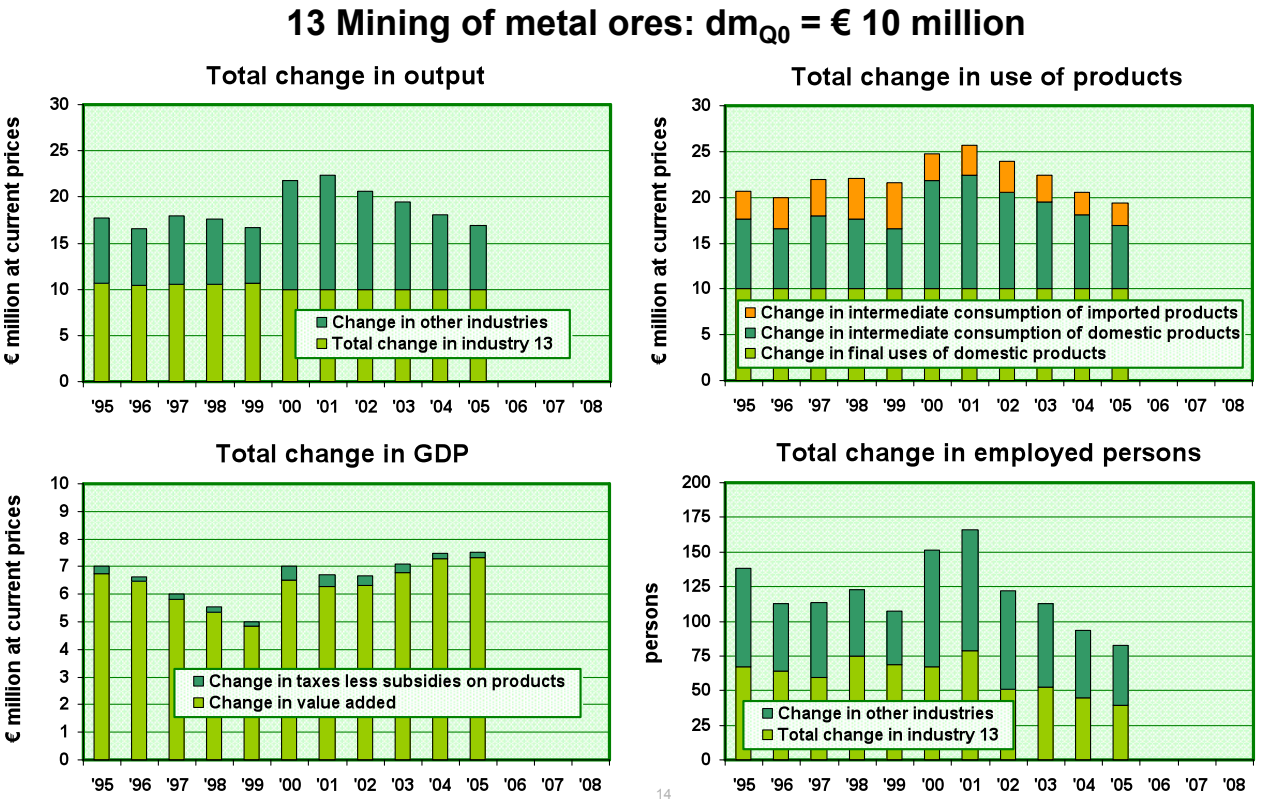


Figure 14. Industry 13 will increase the production of its main products and by-products so that the direct yearly value of the output will rise by EUR 10 million. The total impacts of the increase in production volume on output of the industry in question and other industries and on use of domestic and imported products, the impacts on GDP and the impacts on employment in the operating environments for 1995–2005. The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million.

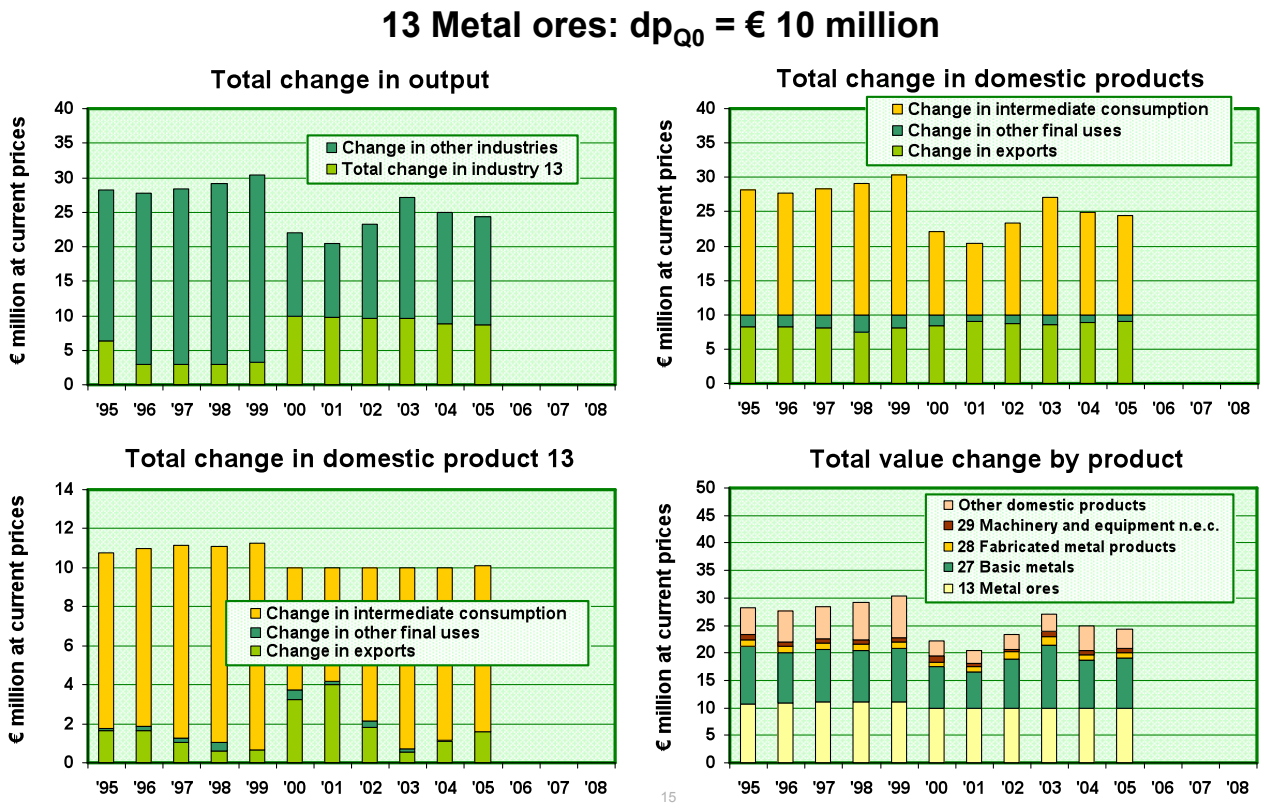


Figure 15. The price of the domestic product category 13 on the product market will increase so that the direct yearly value of the production will rise by EUR 10 million. The total impacts of the change in the value of production on output of the industry in question and other industries, the impacts on all domestic products and on domestic product category 13 by way of using and the impacts on the value of domestic production by product in the operating environments for 1995–2005. The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million.

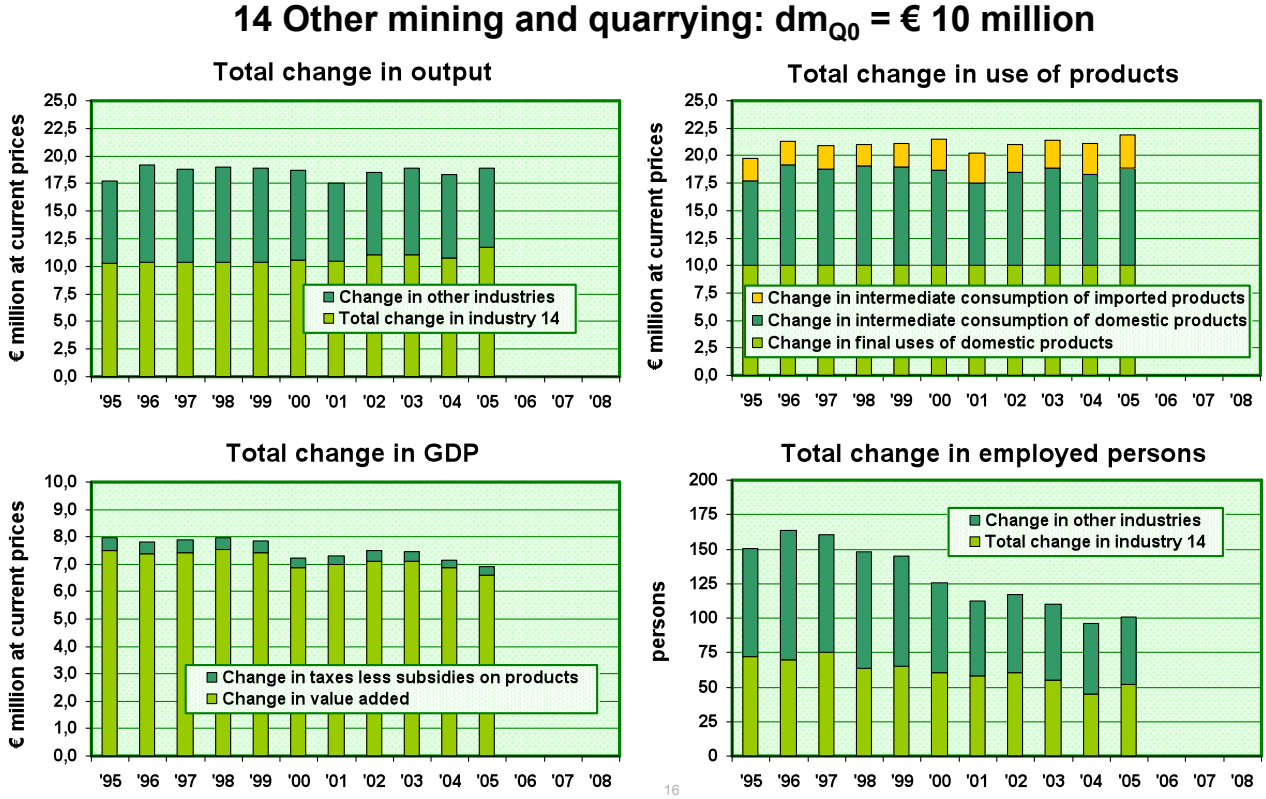


Figure 16. Industry 14 will increase the production of its main products and by-products so that the direct yearly value of the output will rise by EUR 10 million. The total impacts of the increase in production volume on output of the industry in question and other industries and on use of domestic and imported products, the impacts on GDP and the impacts on employment in the operating environments for 1995–2005. The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million.

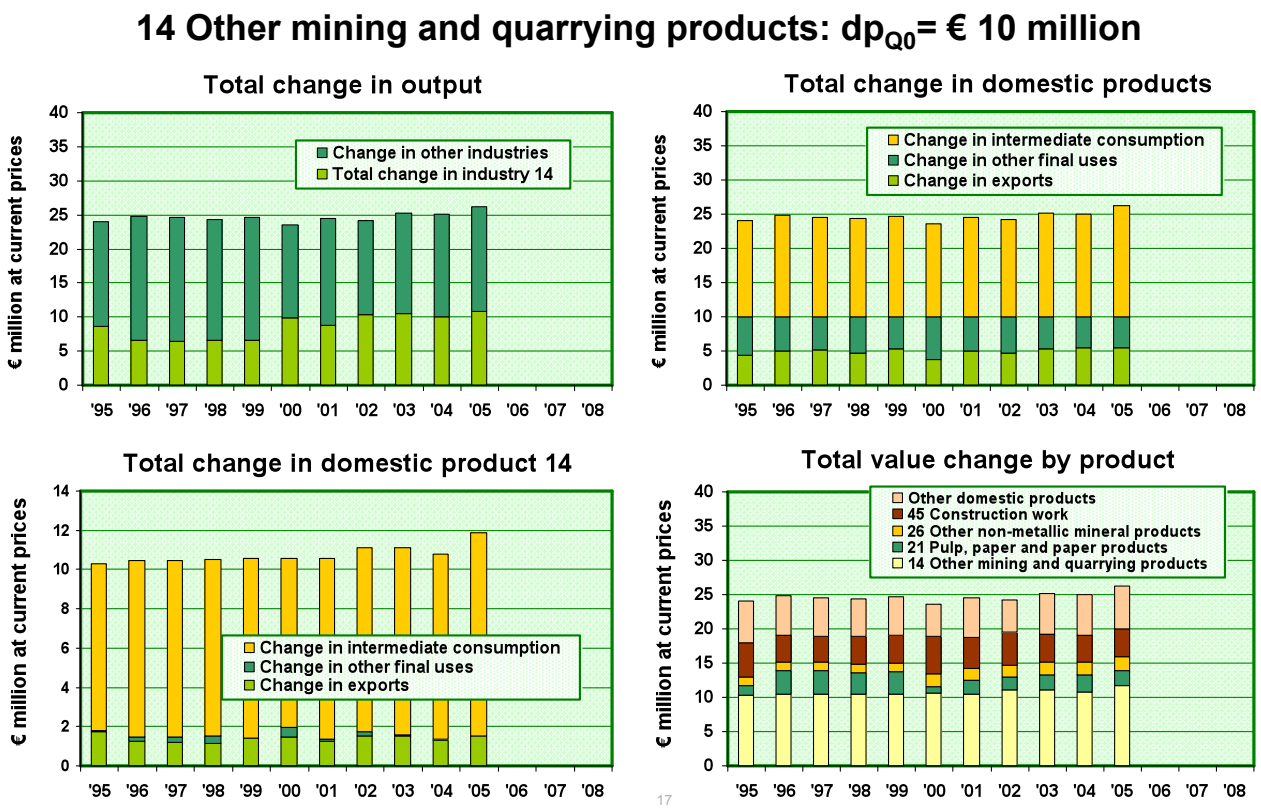


Figure 17. The price of the domestic product category 14 on the product market will increase so that the direct yearly value of the production will rise by EUR 10 million. The total impacts of the change in the value of production on output of the industry in question and other industries, the impacts on all domestic products and on domestic product category 14 by way of using and the impacts on the value of domestic production by product in the operating environments for 1995–2005. The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million.

Figure 15 shows the total impacts of the basic price change in the domestic product category 13 (Metal ores) in the operating environments during the period 1995–2005. The total change in the industries' output varied between EUR 27 and 30 million during the period 1995–1999 and between EUR 20 and 27 million during the period 2000–2005. During the period 1995–2005, the total change in the value of export products was EUR 7–8 million and that in other final uses was EUR 2–3 million. The value of the products destined for intermediate consumption increased by between EUR 10 and 20 million. Increases in the price of domestic metal ores generated pressure to increase prices in product categories 27 (Basic metals), 28 (Fabricated metal products) and 29 (Machinery and equipment).

Figure 16 shows the total impacts of the basic change in production volumes in industry 14 (Other mining and quarrying) in the operating environments during the period 1995–2005. The total impacts of the basic volume change on the output of the industries in the operating environment remained steady during the period 1995–2005 (about EUR 18 million at current prices, which is 1.8 times greater than the basic change). The impact of the basic change on the gross domestic product has been on a steady decline, falling from EUR 8 to 7 million between 1995 and 2005. The total impact of the basic change on the consumption of imported products varied between EUR 2.0 and 3.0 million during the period 1995–2005. In 2005, the total employment impact of the basic volume change was 100 persons, compared with 163 persons in 1996. The trend was clearly downwards during the period 1995–2005.

Figure 17 shows the total impacts of the basic price change in the domestic product category 14 (Other mining and quarrying products) in the operating environments during the period 1995–2005. The total change in the industries' output varied between EUR 24 and 27 million during the period 1995–2005. This is the basic price change in product category 14 multiplied by between 2.4 and 2.7. The value of the products destined for intermediate consumption increased by between EUR 14 and 17 million. Increases in prices in the domestic product category 14 generated pressure to increase prices in product categories 21 (Pulp, paper and paper products), 26 (Other non-metallic mineral products) and 45 (Construction).

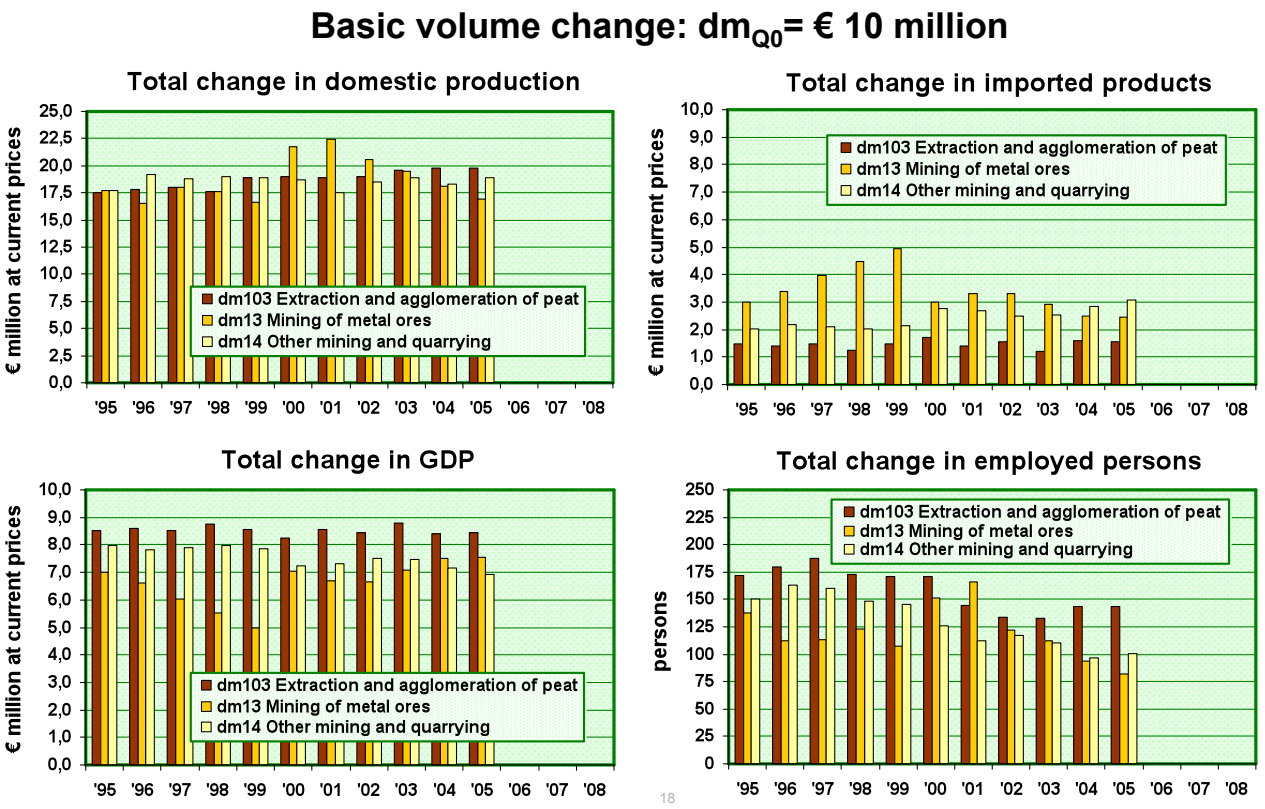


Figure 18. Summary of the impact analyses of the EUR 10 million basic volume changes in mining and quarrying industries 103 (Extraction and agglomeration of peat), 13 (Mining of metal ores) and 14 (Other mining and quarrying). The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million. Summary of Figures 12, 14 and 16.

The basic volume change of EUR 10 million in the mining and quarrying industries 103, 13 and 14 resulted in an total change of between EUR 17 and 20 million in the output in the operating environments during the period 1995–2005 (Figure 18). Total impacts have been between 1.7 and 2.0 times greater than the basic change. There was a slight increase in the total impacts of peat extraction and agglomeration between 1995 and 2005. There was an increase in the mining of metal ores between 1995 and 2001, followed by a decrease until 2005. In other mining and quarrying, the total impacts on output have remained unchanged. During the period 1995–2005, the coefficient for the total impact on the consumption of imported products was 0.12–0.17 (industry 103), 0.25–0.5 (industry 13) and 0.2–0.3 (industry 14).

There were significant differences in the impacts of the basic volume change of EUR 10 million in the mining and quarrying industries 103, 13 and 14 on the gross domestic product (Figure 18). In industry 103, the change in GDP in the operating environments during the period 1995–2005 was constant (basic change multiplied by about 0.85). In industry 13, the total impact coefficient for the impact of basic volume change on GDP was 0.7 (in 1995) and 0.75 (in 2005), even though in 1999, it was only 0.5. In industry 14, the change in GDP in 1995 was the basic change multiplied by 0.8. Since then, there has been a steady decline: in 2005, the change was basic change multiplied by 0.7.

There were clear differences in the employment impacts for the mining and quarrying industries (Figure 18). The total impact coefficient gives the total employment impacts when calculated per basic change. In industry 103 the total employment impact coefficient of the basic change in 1997 was 19 persons/EUR million, and in 2005, 14 persons/EUR million. In industry 13, the total impact coefficient in 2001 was 17 persons/EUR million, and in 2005, 8 persons/EUR million. In industry 14, the total impact coefficient in 1996 was 16 persons/EUR million, and in 2005, 10 persons/EUR million.

The basic price change of EUR 10 million in the domestic mining and quarrying category 103 resulted in a total average output change of between EUR 30 and 35 million in the operating environments during the period 1995–2005 (Figure 19). The total impact coefficients were between 3.0 and 3.5. The basic price change in the product categories 13 and 14 resulted in a total, average output change of between EUR 23 and

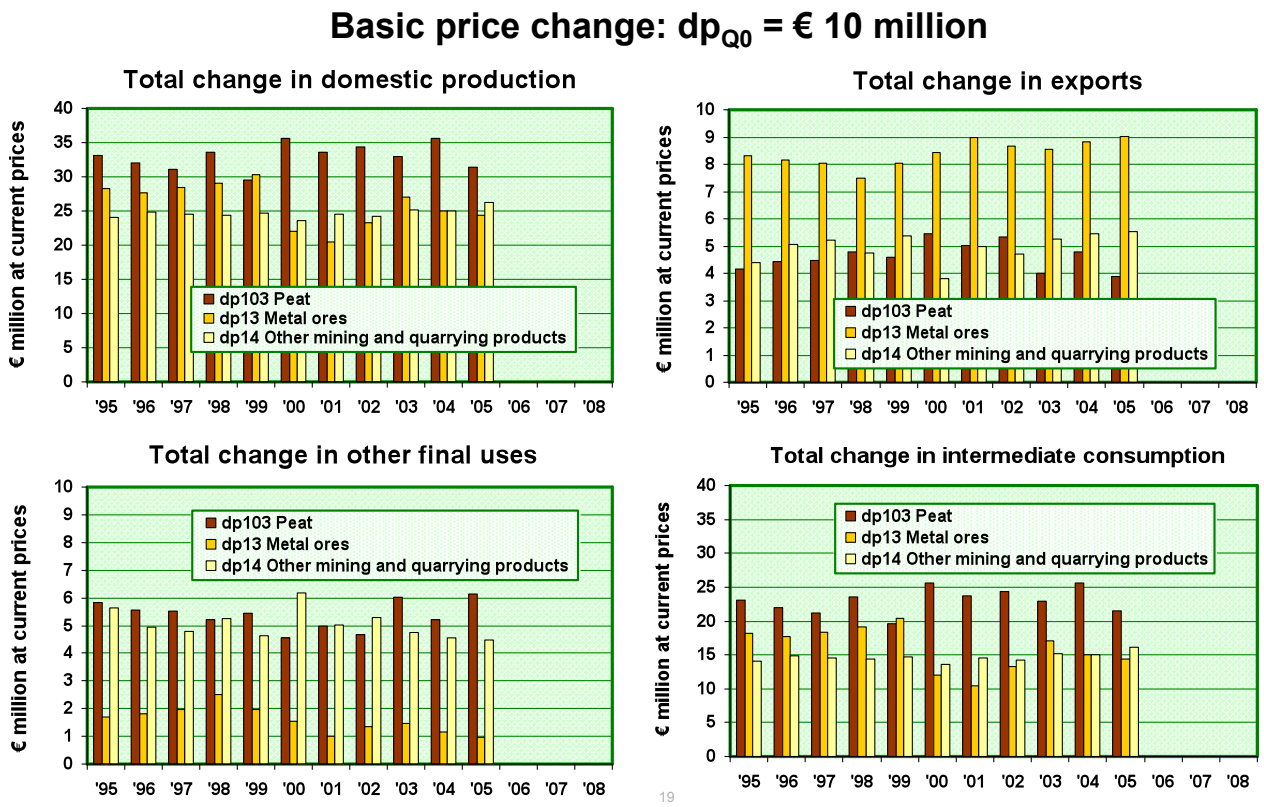


Figure 19. Summary of the impact analyses of the EUR 10 million basic price changes in the domestic mining and quarrying product categories 103 (Peat), 13 (Metal ores) and 14 (Other mining and quarrying products). The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million. Summary of Figures 13, 15 and 17.

27 million in the operating environments during the period 1995–2005. Total impact coefficients were between 2.3 and 2.7. The impact on the gross domestic product was always equal to the basic price change. There were no impacts on imports or employment as the calculations were made on the assumption that the volumes of domestic and foreign products and the salaries, wages and numbers of employees remain unchanged. It was assumed that only the prices of domestic products and the operating surpluses of the industries would change.

A basic price change in the product categories 103 (Peat), 13 (Metal ores) and 14 (Other mining and quarrying products) caused price pressures on domestic products. The price pressure on export products caused by peat, metal ores and other mining and quarrying products in 2005 was the basic change multiplied by 0.39, 0.90 and 0.55, respectively. In 2005, product categories 103, 13 and 14 resulted in a price pressure of basic change multiplied by 0.61, 0.10 and 0.45, respectively, in other final uses (including consumption, capital formation and change in inventories). However, the biggest price pressures concerned products destined for intermediate consumption. In 2005, product categories 103, 13 and 14 generated price pressures that were, respectively, 2.15, 1.44 and 1.62 times higher than the basic change. Price pressures in the operating environments during the period 1995–2004 were very similar.

### 3.3 Basic changes in the industries and product categories of the consumer industries

Chapter 3.3 examines seven consumer industries of mining and quarrying. The most important information displayed in the 1995–2005 operating-environment tables for each industry class and the product category of its main product is shown first. The initial data is supplemented with information from national accounts covering the period 2006–2008 or data calculated by the author on the basis of the national accounts and the regional and industrial statistics on manufacturing. Following this, the total impacts of the increase in production volumes of the industry are shown in the same manner as in industries 103, 13

and 14 above. The total impacts of the increase in production volumes in the industry on the domestic and foreign product categories of mining and quarrying (10, 11, 13 and 14) are shown separately. Finally, the total impacts of the basic price change in the domestic product category corresponding to the main product of the industry are presented in the same manner as in product categories 103, 13 and 14 above.

As in Chapter 3.2 above, all total impacts of the basic volume and price changes of EUR 10 million relating to consumer industries on the industry and product categories in the operating environment are shown at current prices. However, the total employment impacts are given as the number of persons employed. It follows from the theory used in the calculations that the total impacts divided by the basic change, in this case EUR 10 million, are constant, regardless of the size of the basic change. These constants are the total impact coefficients. This makes the impact analyses of the basic changes presented here universally applicable.

Each consumer industry is shown in the same manner using charts. At the end of the chapter, there is a summary of the impact analyses of the basic volume and price changes relating to the consumer industries.

The output of industry 40 (Electricity, gas, steam and hot water supply) at basic price, intermediate consumption at purchaser's price, value added at basic price and the number of employed persons during the period 1995–2008 are shown in Figure 20a. Figure 20b shows the total supply and uses of product category 40 (Electricity, gas, steam and hot water) at basic price and the proportions of the value of the domestic production and consumption, and imports and exports during the period 1995–2005.

Figure 21a shows the total impacts of the increase in production volumes in industry 40 on the output of the industry in question and other industries and on the use of domestic and imported products, the impacts on the gross domestic product and the impacts on employment in the operating environments during the period 1995–2005. Figure 21b shows the total impacts of the increase in production volumes on mining and quarrying product categories 10, 11, 13 and 14.

Figure 22 shows the total impacts of the basic price change in the domestic product category 40 on the output of the industry in question and other industries, the impacts on all domestic products and on domestic product category 40 by way of using and the impacts on the value of domestic production by product in the operating environments during the period 1995–2005.

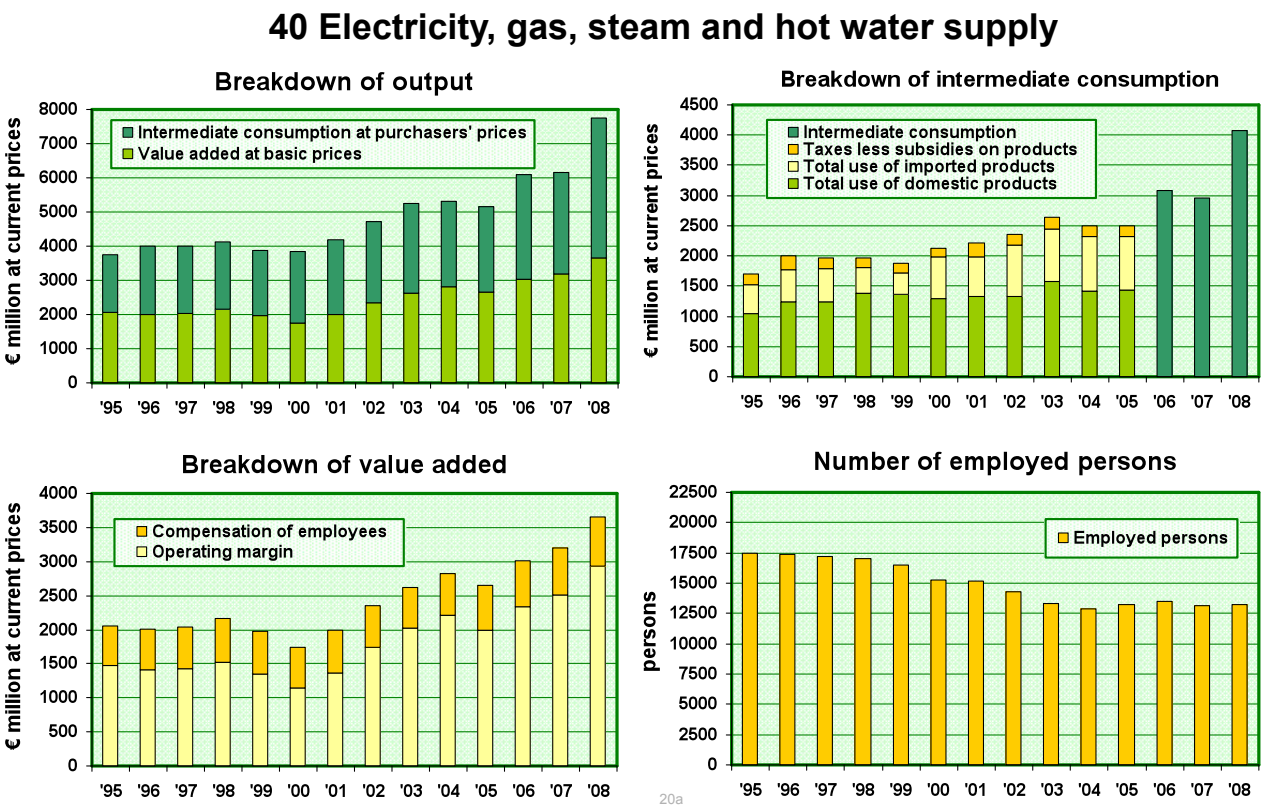


Figure 20a. Tables on the operating environment. The output of Industry 40 (Electricity, gas, steam and hot water supply) at basic prices, intermediate consumption at purchase prices, value added at basic prices and the number of employed persons in 1995–2005. The author has estimated the data for 2006–2008 using the national accounts and the regional and industrial statistics on manufacturing. Sources: Statistics Finland, 1) Supply and use tables for the national economy, 2) National accounts, 3) Regional and industrial statistics on manufacturing.

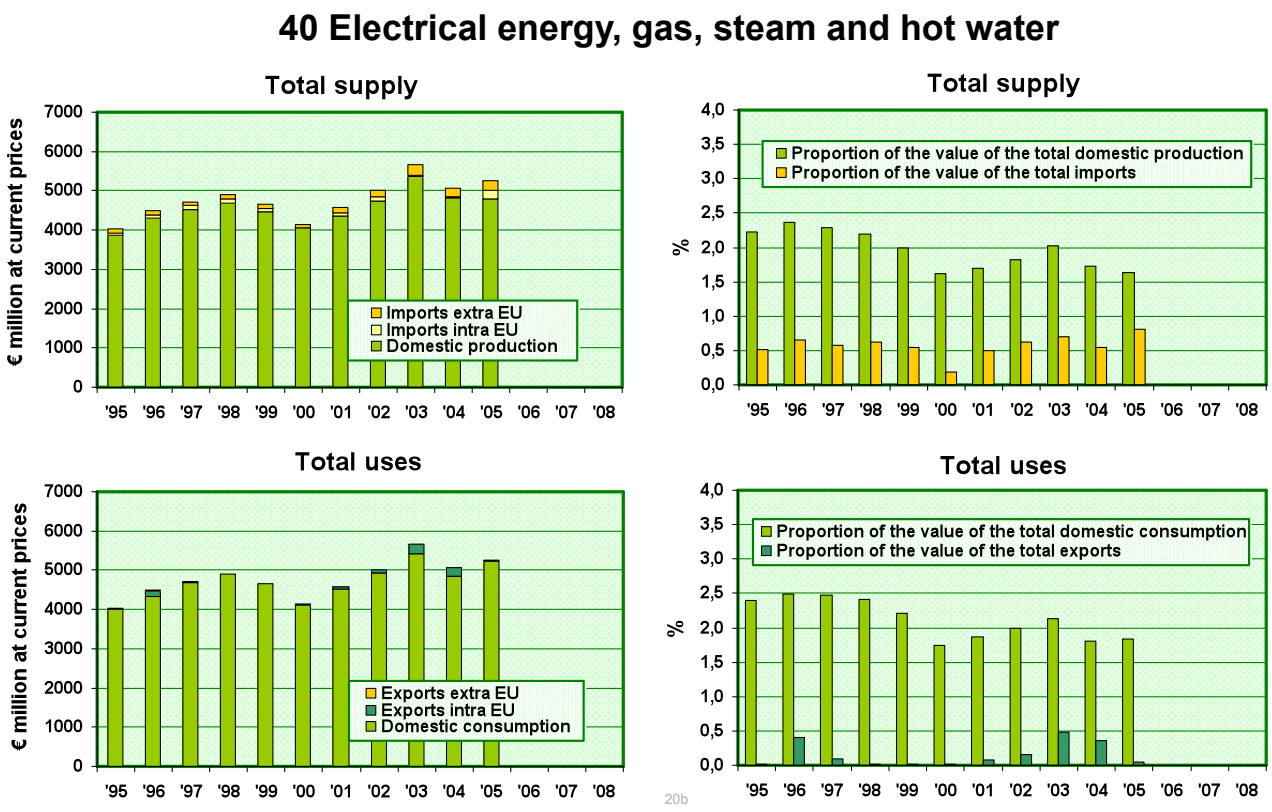


Figure 20b. Tables on the operating environment. Total supply and uses of product category 40 (Electricity, gas, steam and hot water) at basic prices and its proportion of the value of domestic production, imports, exports and domestic consumption in 1995–2005. The proportions of the domestic values have been calculated using the information contained in the initial data. Source: Statistics Finland, Supply and use tables for the national economy.

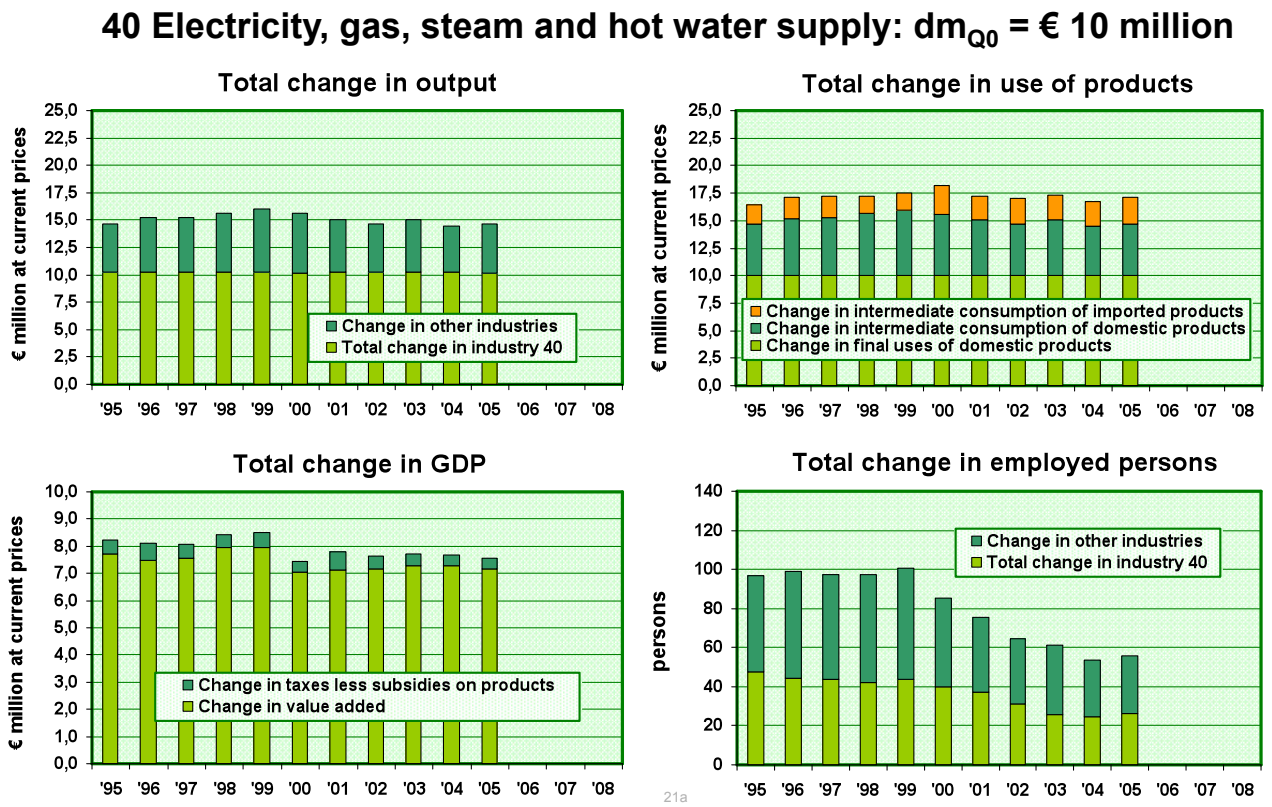


Figure 21a. Industry 40 will increase the production of its main products and by-products so that the direct yearly value of the output will rise by EUR 10 million. The total impacts of the increase in production volumes on output of the industry in question and other industries and on use of domestic and imported products, the impacts on GDP and the impacts on employment in the operating environments for 1995–2005. The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million.

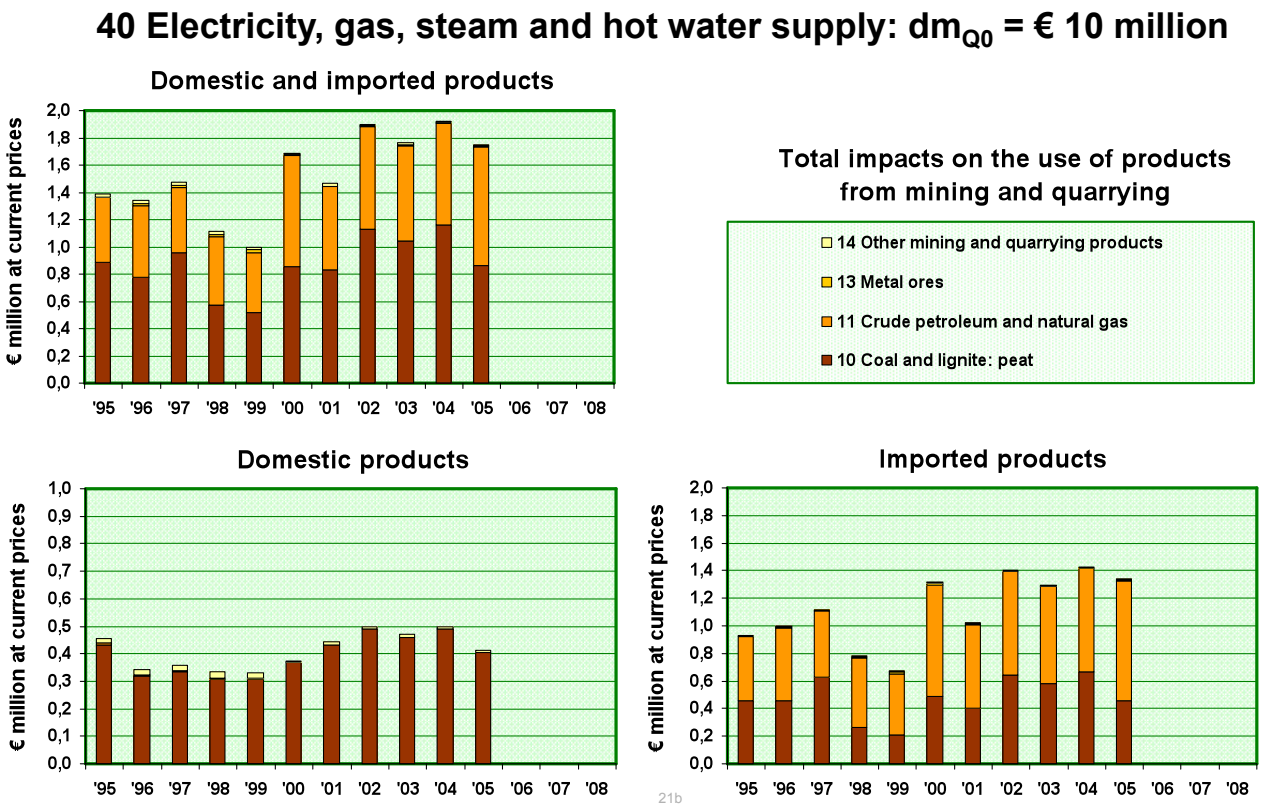


Figure 21b. Industry 40 will increase the production of its main products and by-products so that the direct yearly value of the output will rise by EUR 10 million. The total impacts of the increase in production volumes on mining and quarrying product categories 10, 11, 13 and 14 in the operating environments for 1995–2005. The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million.

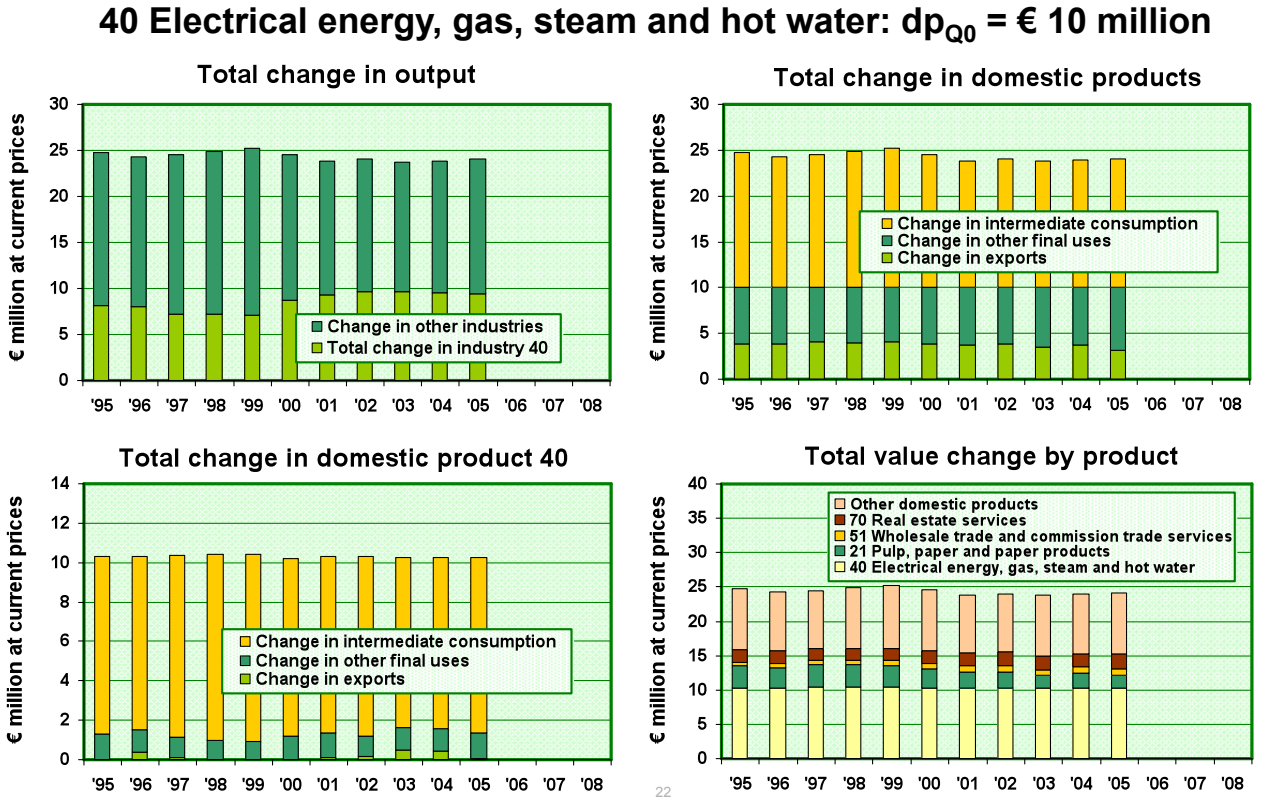


Figure 22. The price of the domestic product category 40 on the product market will increase so that the direct yearly value of production will rise by EUR 10 million. The total impacts of the change in value of production on output of the industry in question and other industries, the impacts on all domestic products and on domestic product category 40 by way of using and the impacts on the value of domestic production by product in the operating environments for 1995–2005. The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million.

The output of industry 23 (Manufacture of coke, refined petroleum products and nuclear fuel) at basic price, intermediate consumption at purchaser's price, value added at basic price and the number of employed persons during the period 1995–2008 are shown in Figure 23a. Figure 23b shows the total supply and uses of product category 23 (Coke, refined petroleum products and nuclear fuel) at basic price and the proportions of the value of domestic production and consumption, and imports and exports during the period 1995–2005.

Figure 24a shows the total impacts of the increase in production volumes in industry 23 on the output of the industry in question and other industries and on the use of domestic and imported products, the impacts on the gross domestic product and the impacts on employment in the operating environments during the period 1995–2005. Figure 24b shows the total impacts of the increase in production volumes on mining and quarrying product categories 10, 11, 13 and 14.

Figure 25 shows the total impacts of the basic price change in the domestic product category 23 on the output of the industry in question and other industries, the impacts on all domestic products and on domestic product category 23 by way of using and the impacts on the value of domestic production by product in the operating environments during the period 1995–2005.

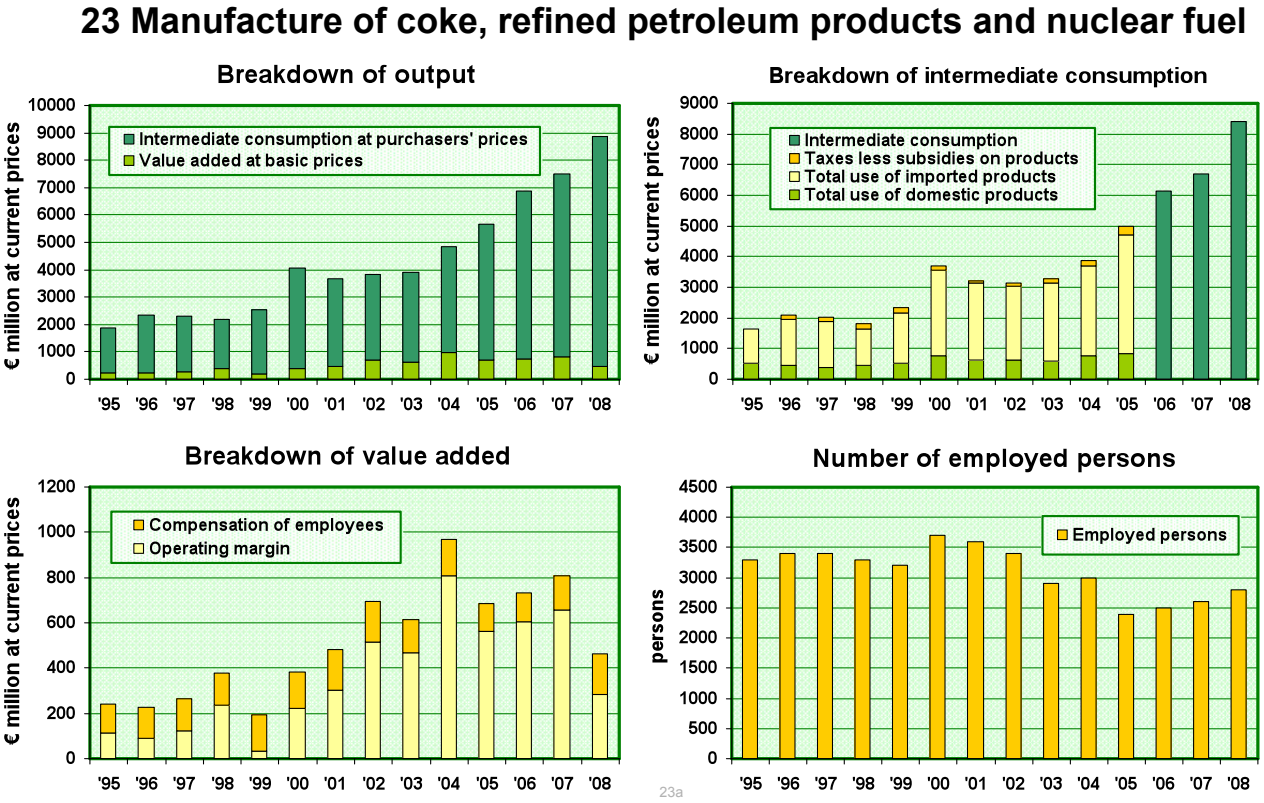


Figure 23a. Tables on the operating environment. The output of Industry 23 (Manufacture of coke, refined petroleum products and nuclear fuel) at basic prices, intermediate consumption at purchase prices, value added at basic prices and the number of employed persons in 1995–2005. The data for 2006–2008 are from the national accounts. Sources: Statistics Finland, 1) Supply and use tables for the national economy, 2) National accounts.

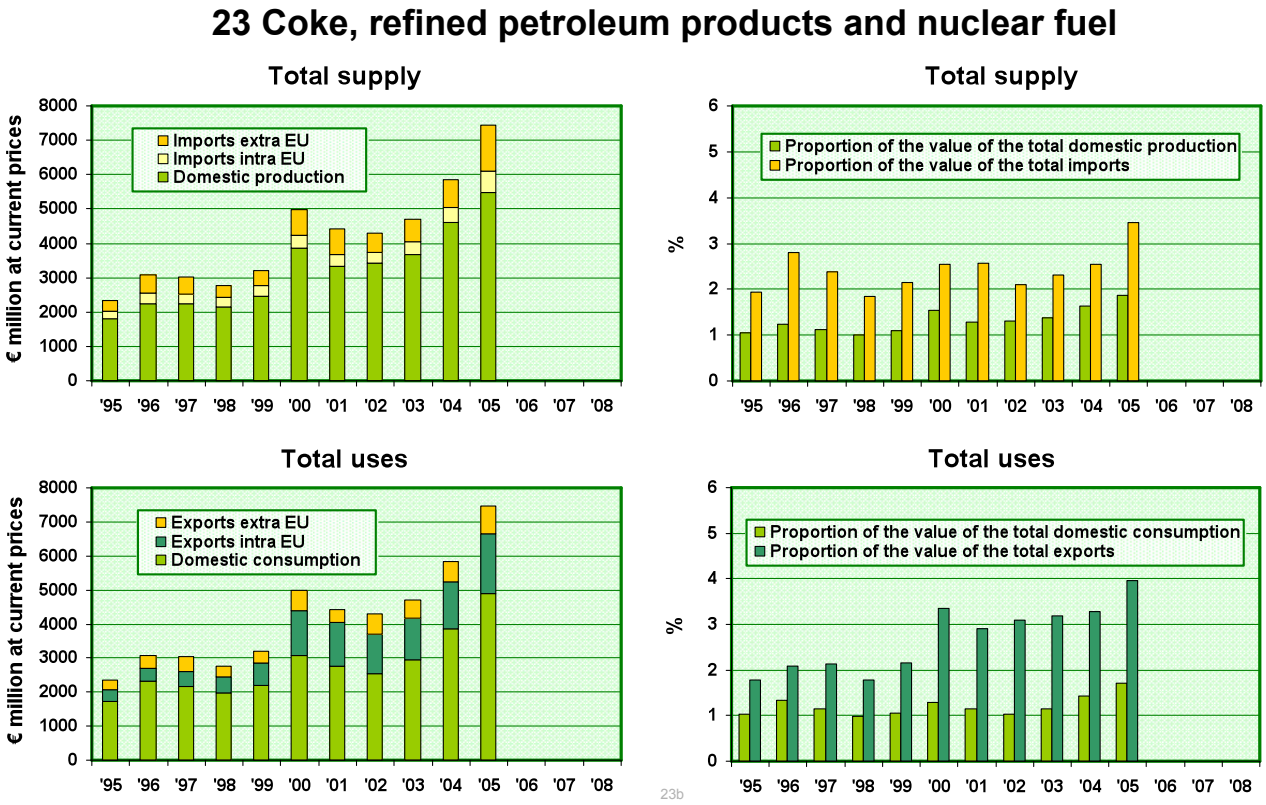


Figure 23b. Tables on the operating environment. Total supply and uses of product category 23 (Coke, refined petroleum products and nuclear fuel) at basic prices and its proportion of the value of domestic production, imports, exports and domestic consumption in 1995–2005. The proportions of the domestic values have been calculated using the information contained in the initial data. Source: Statistics Finland, Supply and use tables for the national economy.

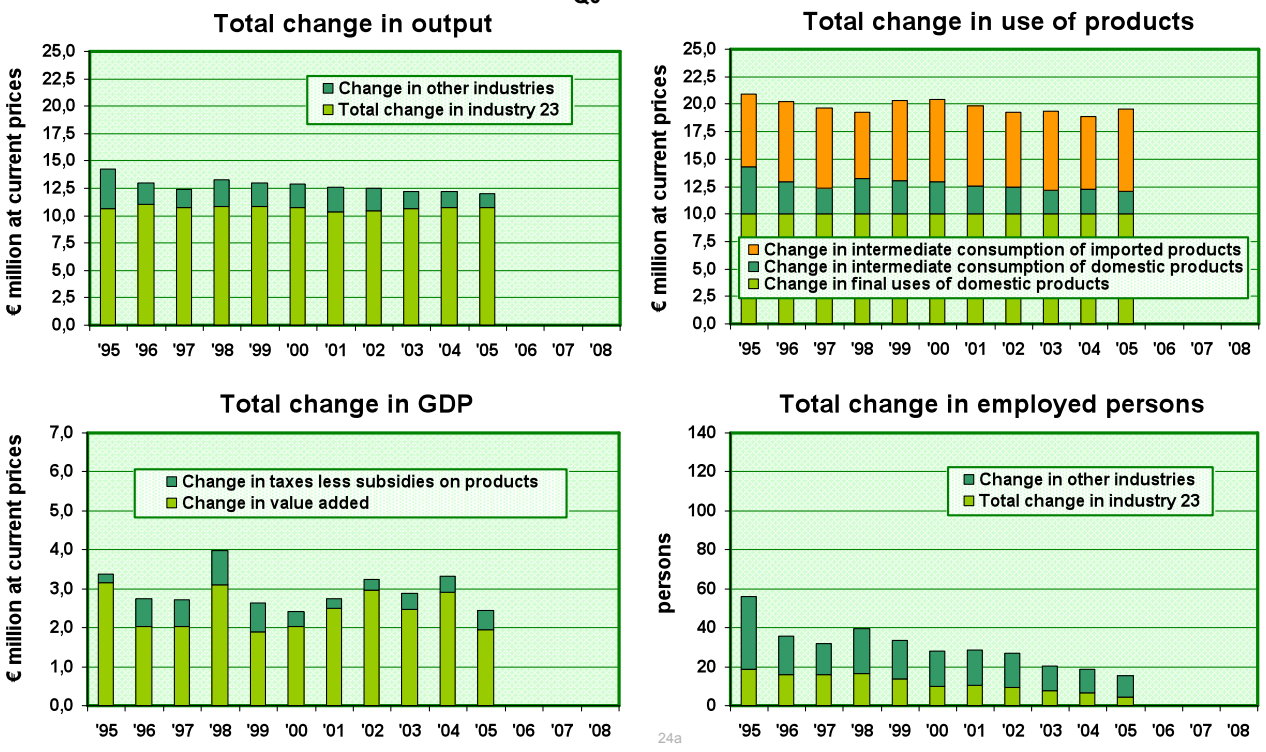


Figure 24a. Industry 23 will increase the production of its main products and by-products so that the direct yearly value of output will rise by EUR 10 million. The total impacts of the increase in production volumes on output of the industry in question and other industries and on use of domestic and imported products, the impacts on GDP and the impacts on employment in the operating environments for 1995–2005. The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million.

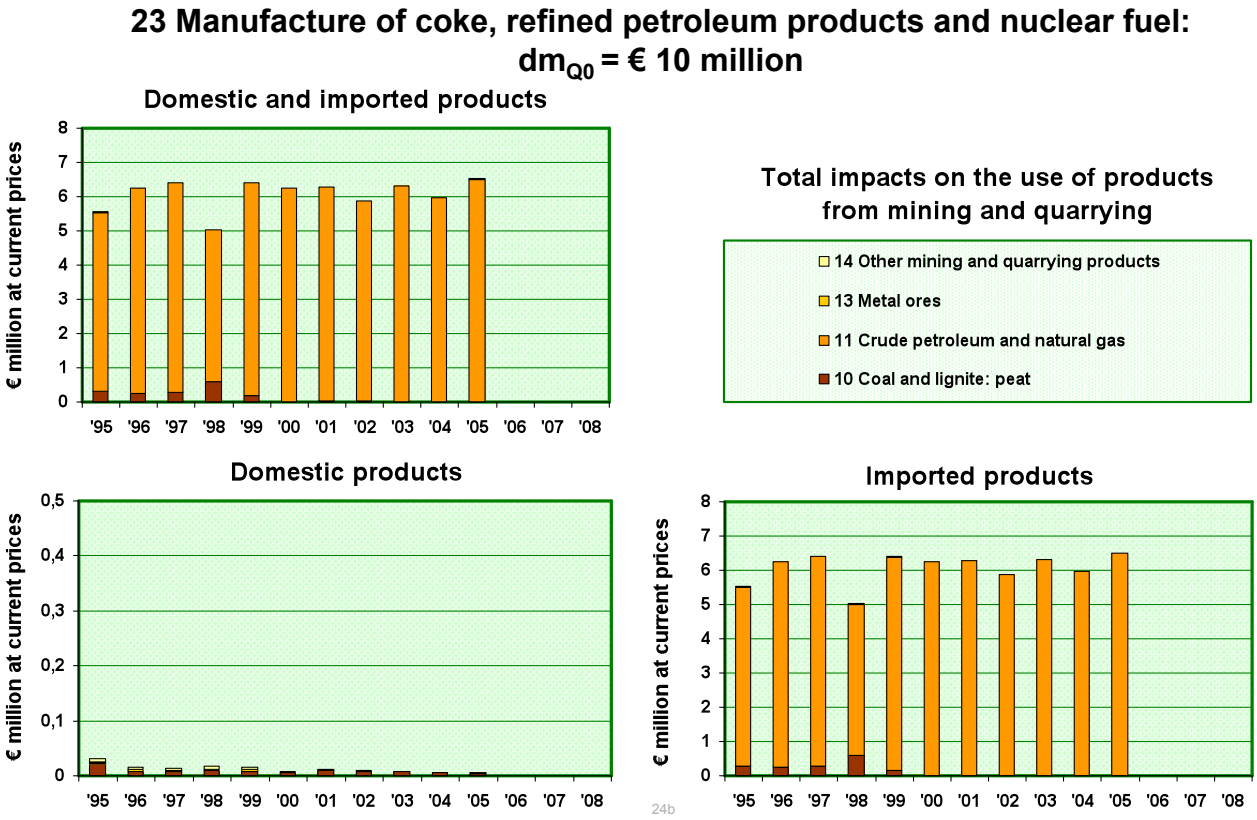


Figure 24b. Industry 23 will increase the production of its main products and by-products so that the direct yearly value of output will rise by EUR 10 million. The total impacts of the increase in production volumes on mining and quarrying product categories 10, 11, 13 and 14 in the operating environments for 1995–2005. The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million.

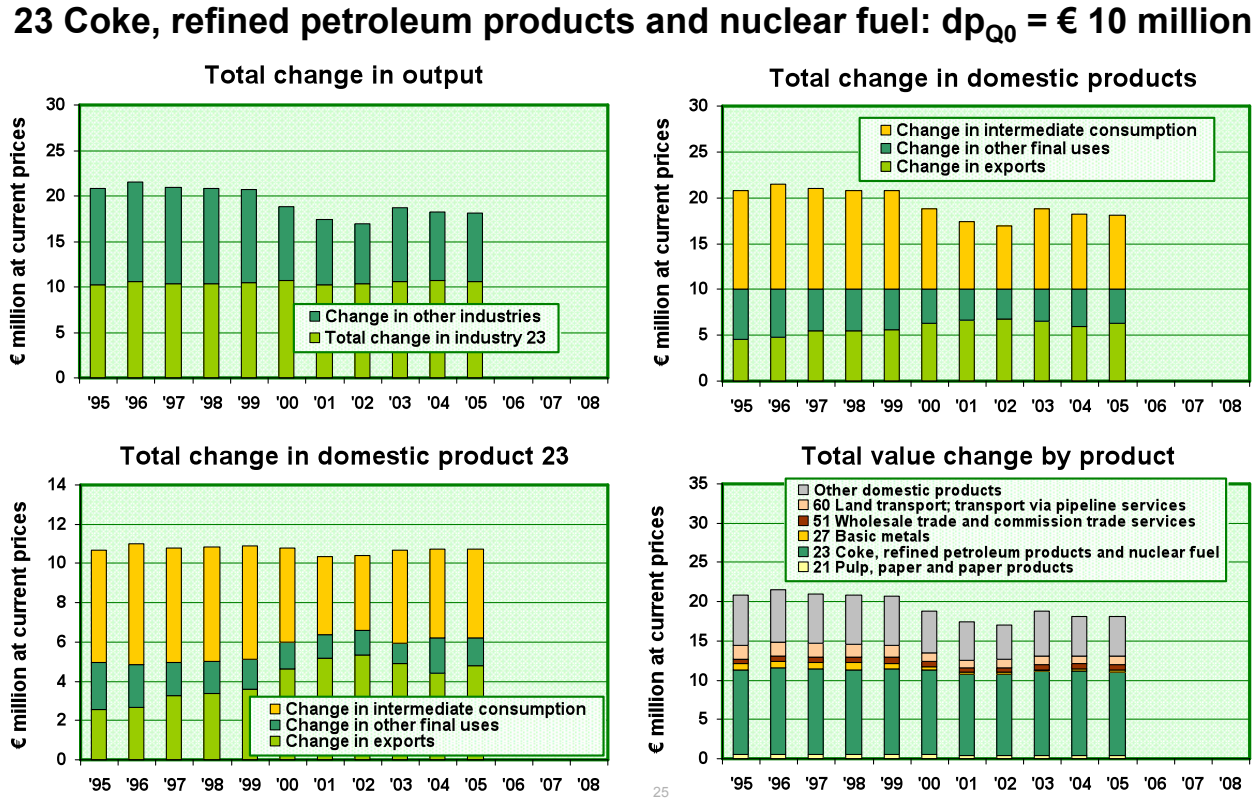


Figure 25. The price of the domestic product category 23 on the product market will increase so that the direct yearly value of production will rise by EUR 10 million. The total impacts of the change in production value on output of the industry in question and other industries, the impacts on all domestic products and on domestic product category 23 by way of using and the impacts on the value of domestic production by product in the operating environments for 1995–2005. The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million.

The output of industry 27 (Manufacture of basic metals) at basic price, intermediate consumption at purchaser's price, value added at basic price and the number of employed persons during the period 1995–2008 are shown in Figure 26a. Figure 26b shows the total supply and uses of product category 27 (Basic metals) at basic price and the proportions of the value of domestic production and consumption, and imports and exports during the period 1995–2005.

Figure 27a shows the total impacts of the increase in production volumes in industry 27 on the output of the industry in question and other industries and on the use of domestic and imported products, the impacts on the gross domestic product and the impacts on employment in the operating environments during the period 1995–2005. Figure 27b shows the total impacts of the increase in production volumes on mining and quarrying product categories 10, 11, 13 and 14.

Figure 28 shows the total impacts of the basic price change in the domestic product category 27 on the output of the industry in question and other industries, the impacts on all domestic products and on domestic product category 27 by way of using and the impacts on the value of domestic production by product in the operating environments during the period 1995–2005.

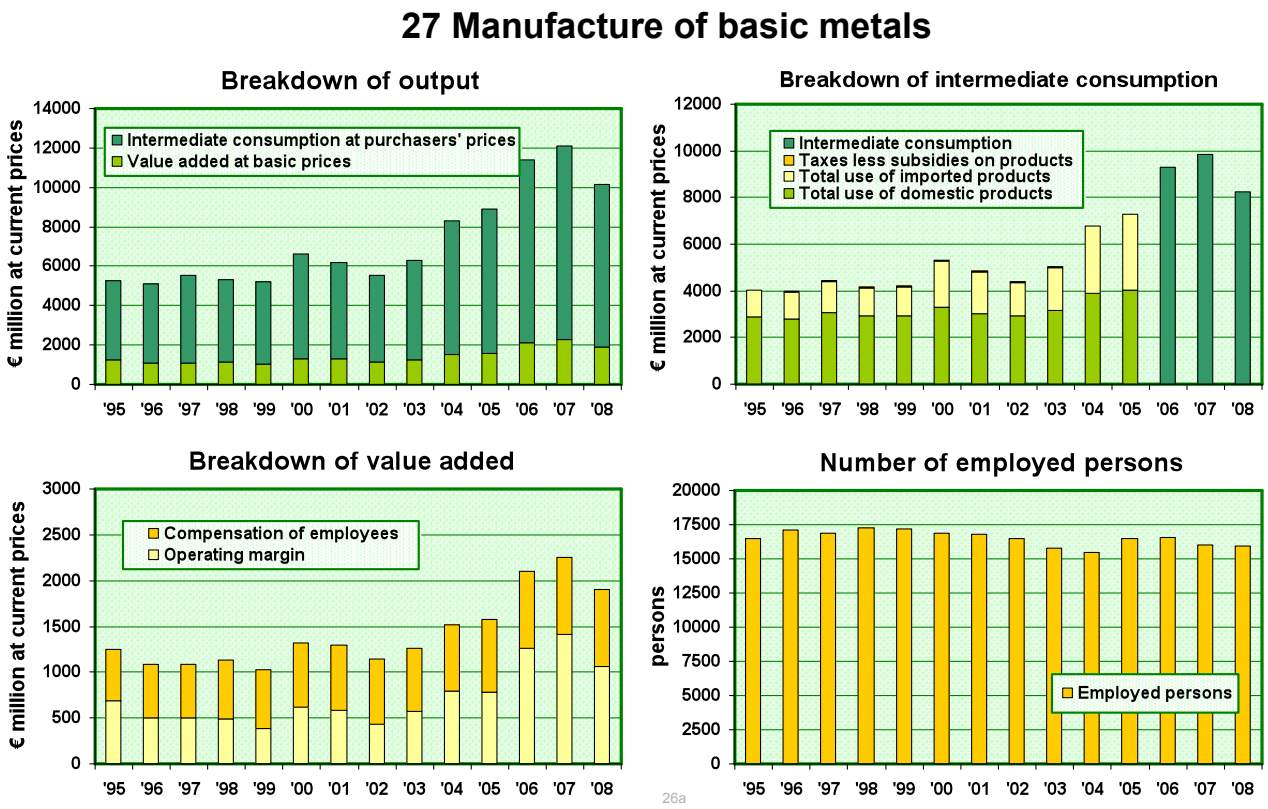


Figure 26a. Tables on the operating environment. The output of Industry 27 (Manufacture of basic metals) at basic prices, intermediate consumption at purchase prices, value added at basic prices and the number of employed persons in 1995–2005. The data for 2006–2008 are from the national accounts. Sources: Statistics Finland, 1) Supply and use tables for the national economy, 2) National accounts.

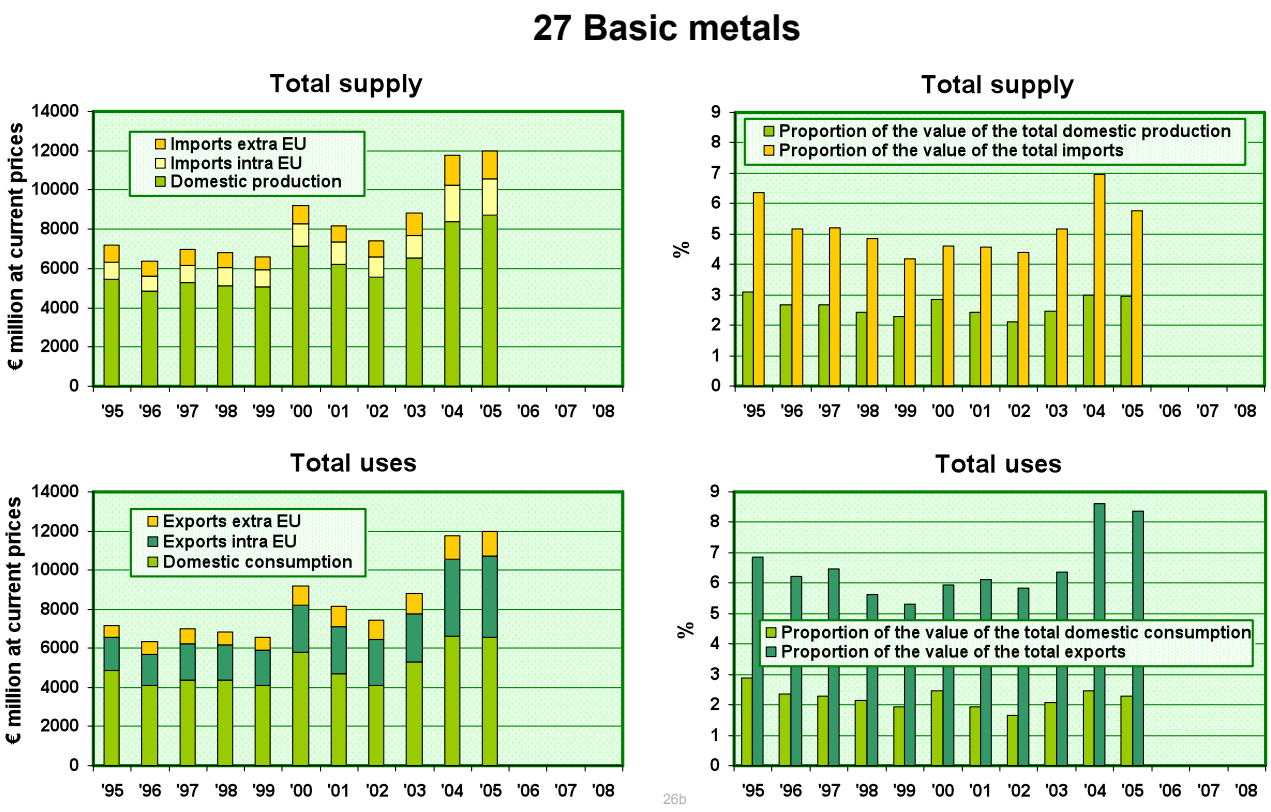


Figure 26b. Tables on the operating environment. Total supply and uses of product category 27 (Basic metals) at basic prices and its proportion of the value of domestic production, imports, exports and domestic consumption in 1995–2005. The proportions of the domestic values have been calculated using the information contained in the initial data. Source: Statistics Finland, Supply and use tables for the national economy.

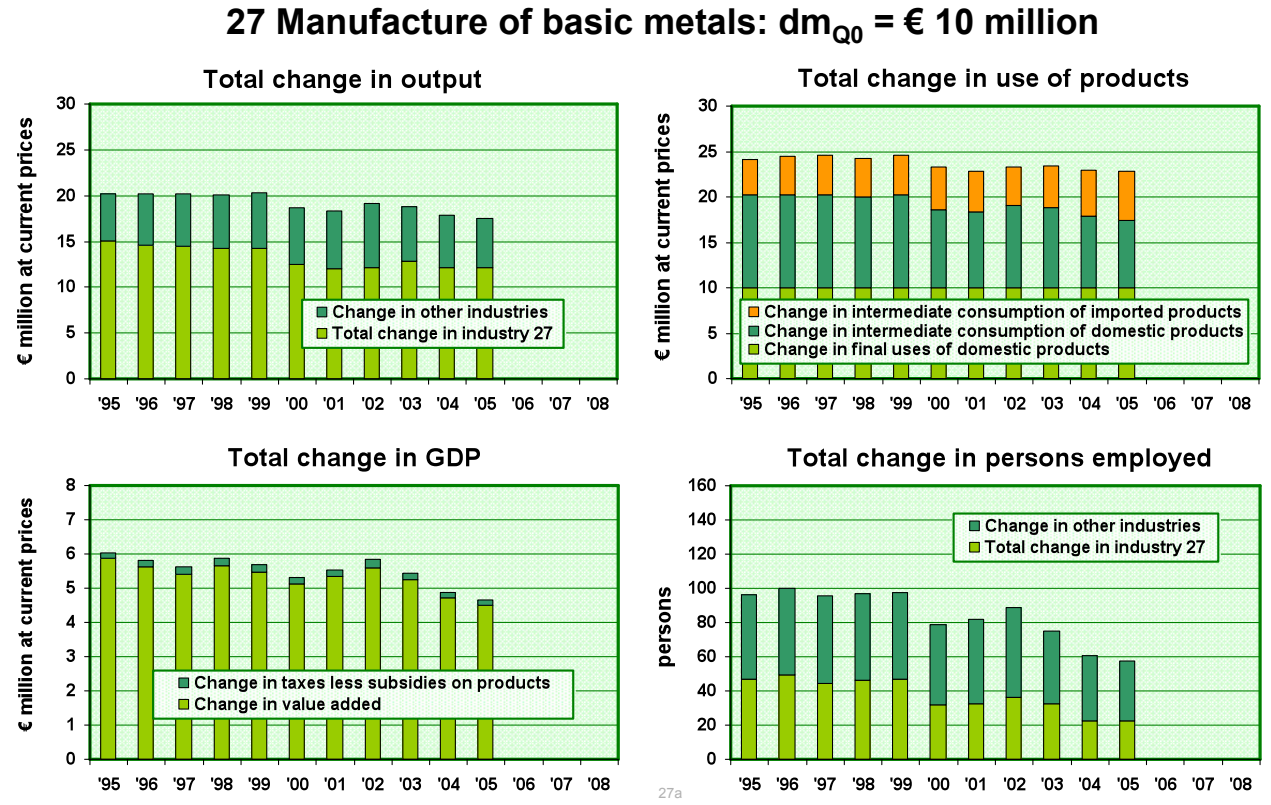


Figure 27a. Industry 27 will increase the production of its main products and by-products so that the direct yearly value of output will rise by EUR 10 million. The total impacts of the increase in production volumes on output of the industry in question and other industries and on use of domestic and imported products, the impacts on GDP and the impacts on employment in the operating environments for 1995–2005. The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million.

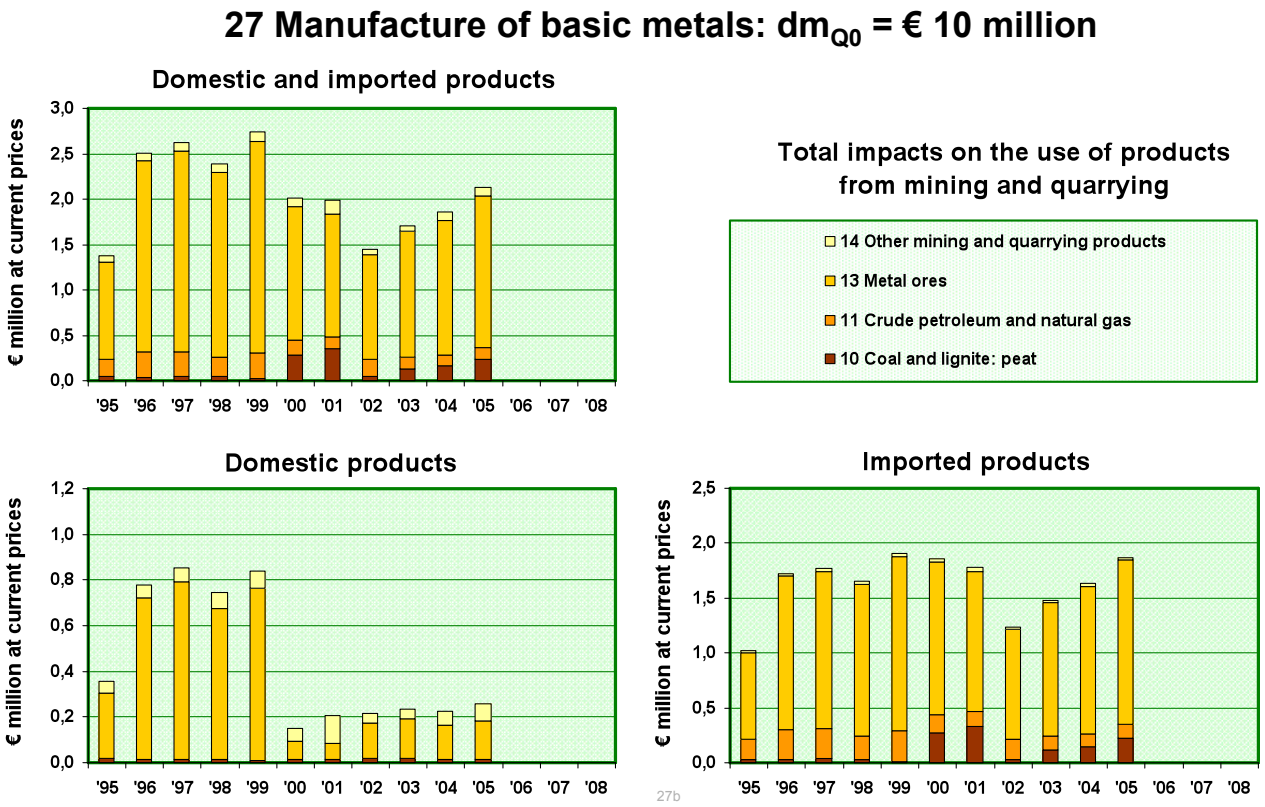


Figure 27b. Industry 27 will increase the production of its main products and by-products so that the direct yearly value of output will rise by EUR 10 million. The total impacts of the increase in production volumes on mining and quarrying product categories 10, 11, 13 and 14 in the operating environments for 1995–2005. The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million.

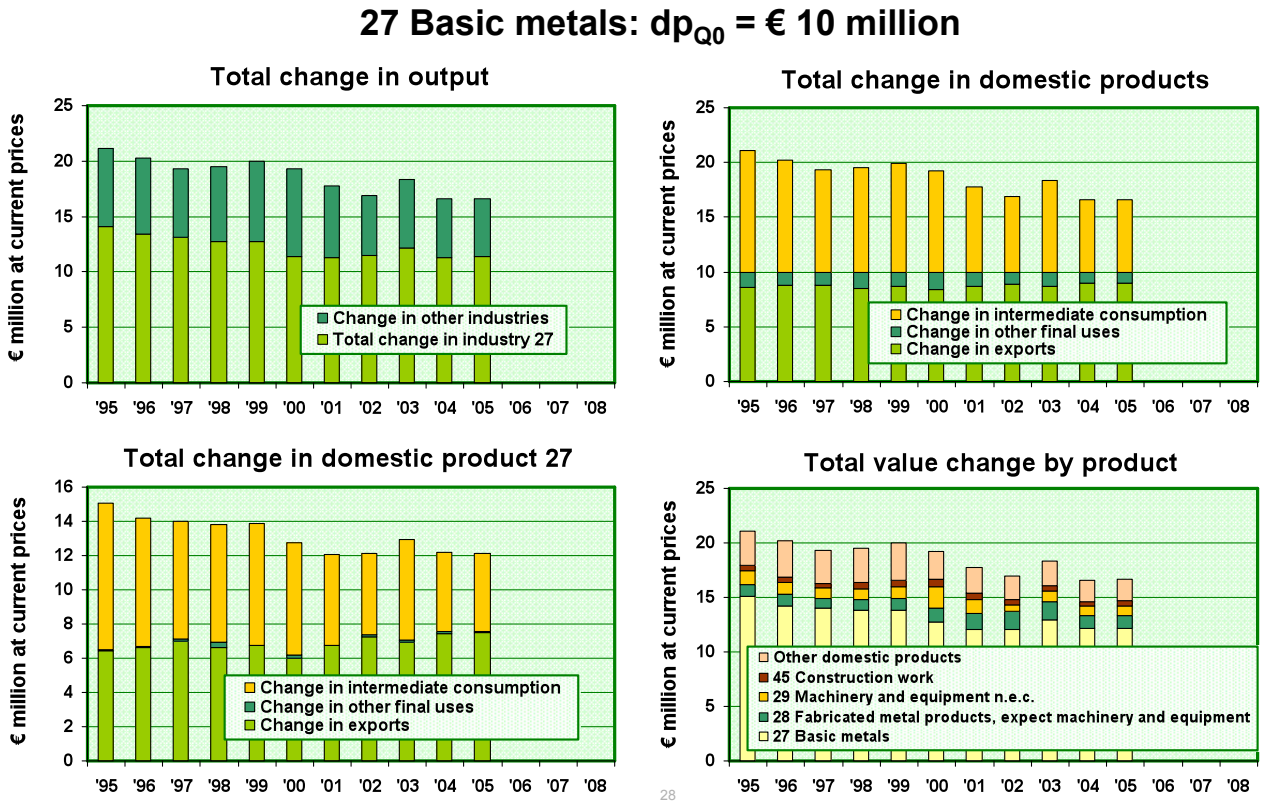


Figure 28. The price of the domestic product category 27 on the product market will increase so that the direct yearly value of production will rise by EUR 10 million. The total impacts of the change in production value on output of the industry in question and other industries, the impacts on all domestic products and on domestic product category 27 by way of using and the impacts on the value of domestic production by product in the operating environments for 1995–2005. The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million.

The output of industry 21 (Manufacture of pulp, paper and paper products) at basic price, intermediate consumption at purchaser's price, value added at basic price and the number of employed persons during the period 1995–2008 are shown in Figure 29a. Figure 29b shows the total supply and uses of product category 21 (Pulp, paper and paper products) at basic price and the proportions of the value of domestic production and consumption, and imports and exports during the period 1995–2005.

Figure 30a shows the total impacts of the increase in production volumes in industry 21 on the output of the industry in question and other industries and on the use of domestic and imported products, the impacts on the gross domestic product and the impacts on employment in the operating environments during the period 1995–2005. Figure 30b shows the total impacts of the increase in production volumes on mining and quarrying product categories 10, 11, 13 and 14.

Figure 31 shows the total impacts of the basic price change in the domestic product category 21 on the output of the industry in question and other industries, the impacts on all domestic products and on domestic product category 21 by way of using and the impacts on the value of domestic production by product in the operating environments during the period 1995–2005.

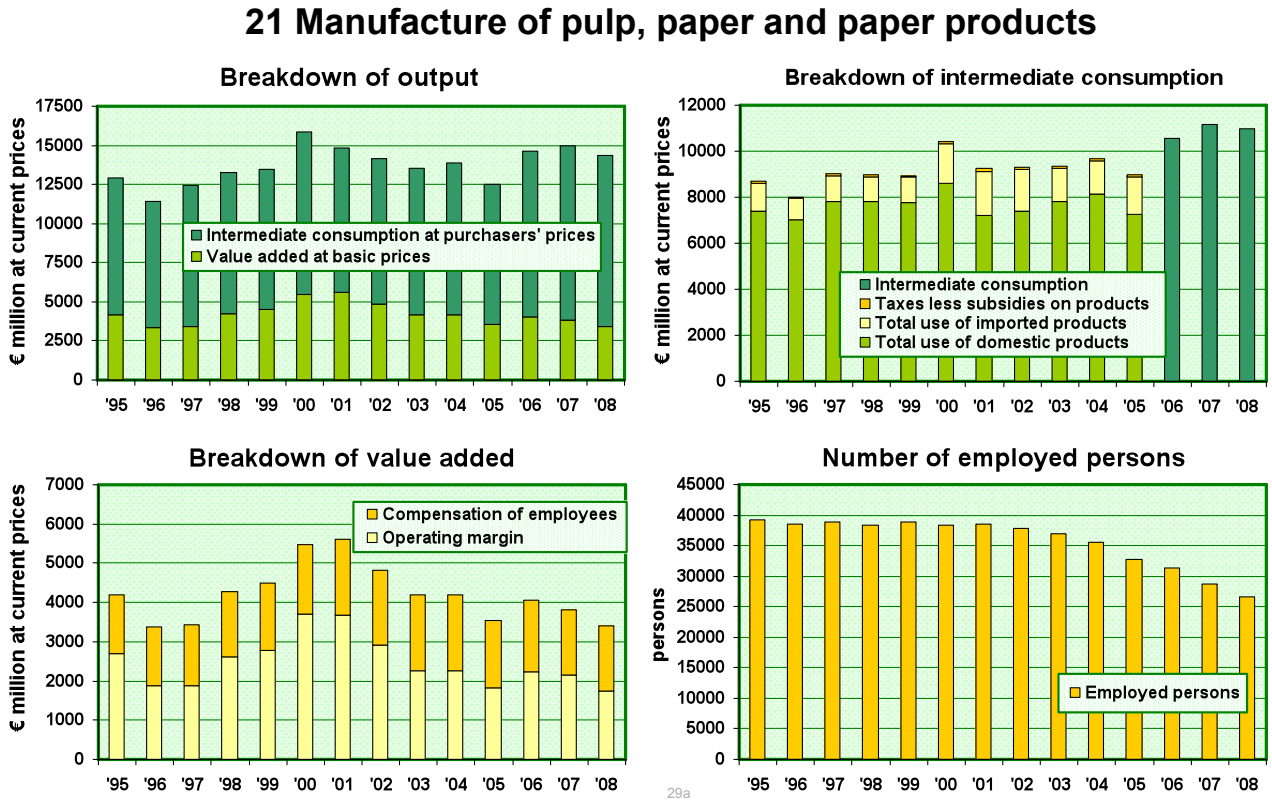


Figure 29a. Tables on the operating environment. The output of Industry 21 (Manufacture of pulp, paper and paper products) at basic prices, intermediate consumption at purchase prices, value added at basic prices and the number of employed persons in 1995–2005. The data for 2006–2008 are from the national accounts. Sources: Statistics Finland, 1) Supply and use tables for the national economy, 2) National accounts.

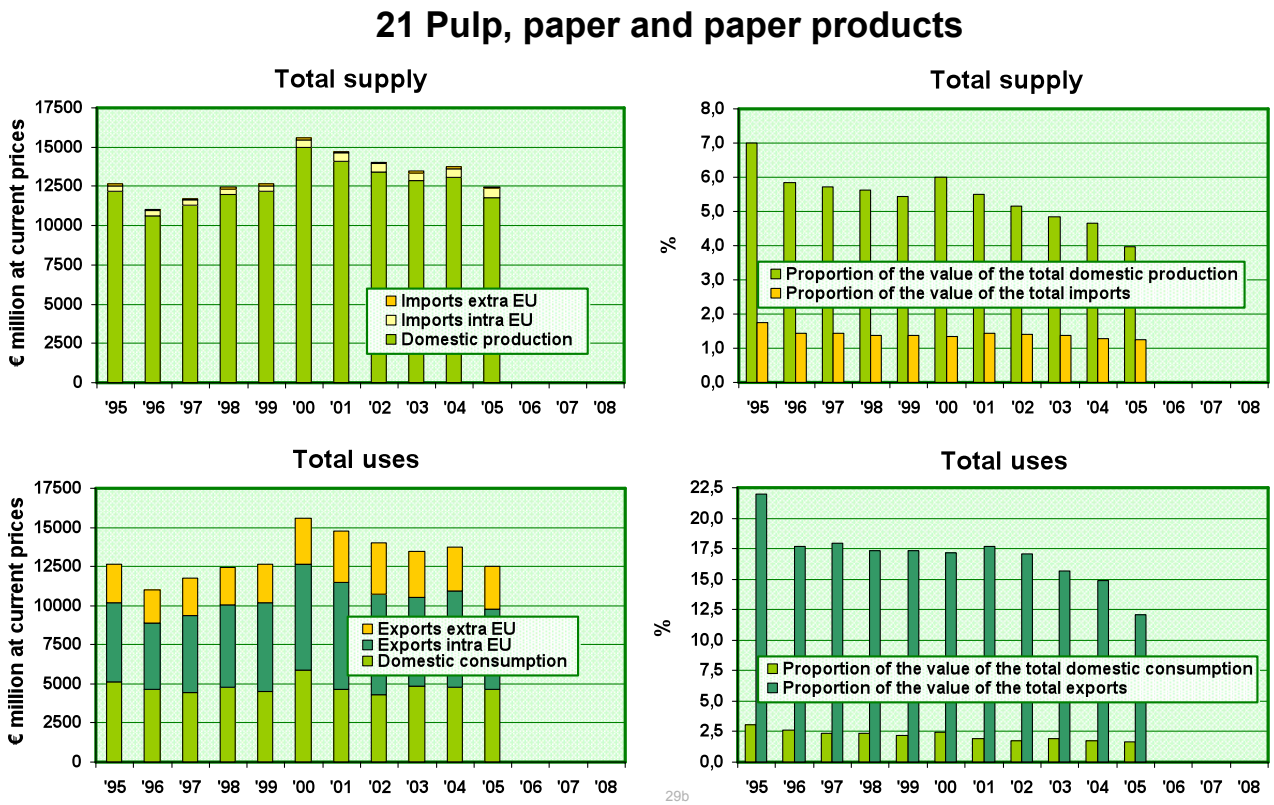


Figure 29b. Tables on the operating environment. Total supply and uses of product category 21 (Pulp, paper and paper products) at basic prices and its proportion of the value of domestic production, imports, exports and domestic consumption in 1995–2005. The proportions of domestic values have been calculated using the information contained in the initial data. Source: Statistics Finland, Supply and use tables for the national economy.

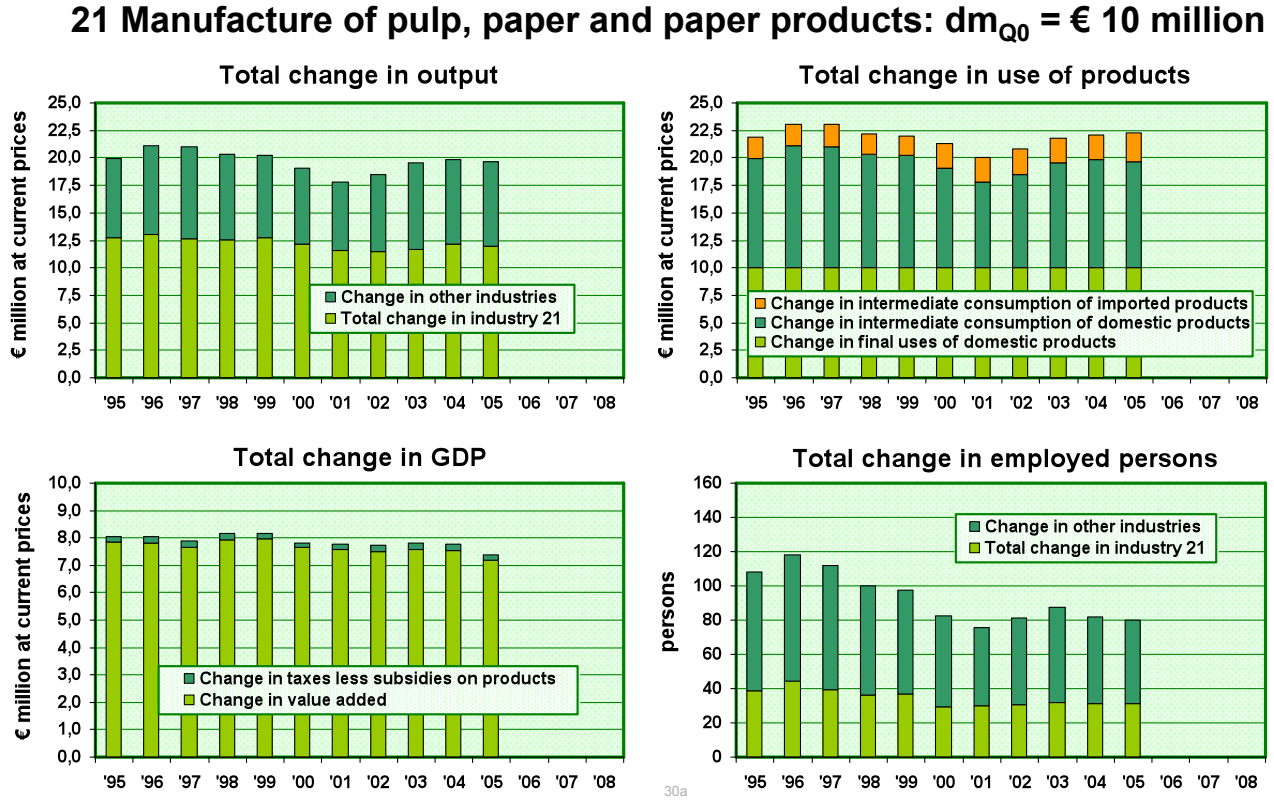


Figure 30a. Industry 21 will increase the production of its main products and by-products so that the direct yearly value of output will rise by EUR 10 million. The total impacts of the increase in production volumes on output of the industry in question and other industries and on use of domestic and imported products, the impacts on GDP and the impacts on employment in the operating environments for 1995–2005. The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million.

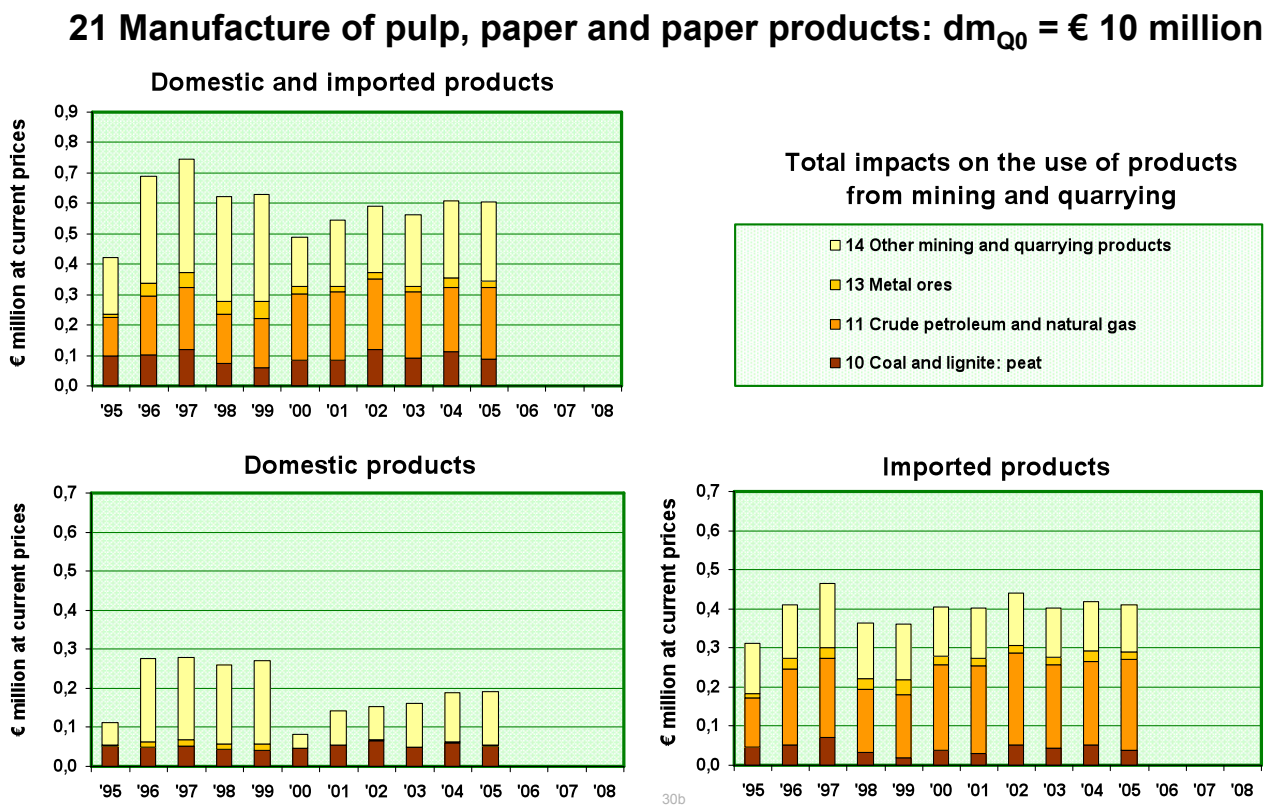


Figure 30b. Industry 21 will increase the production of its main products and by-products so that the direct yearly value of output will rise by EUR 10 million. The total impacts of the increase in production volumes on mining and quarrying product categories 10, 11, 13 and 14 in the operating environments for 1995–2005. The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million.

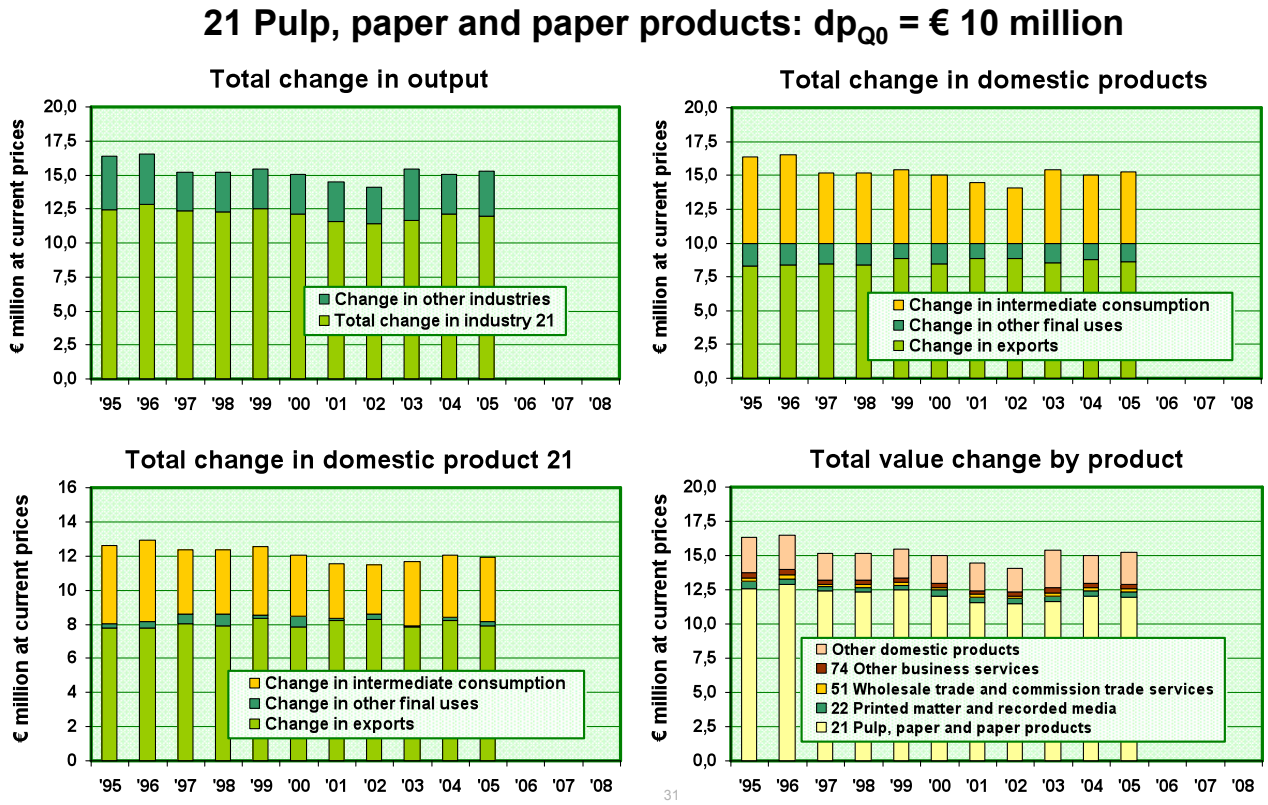


Figure 31. The price of the domestic product category 21 on the product market will increase so that the direct yearly value of production will rise by EUR 10 million. The total impacts of the change in the value of production on output of the industry in question and other industries, the impacts on all domestic products and on domestic product category 21 by way of using and the impacts on the value of domestic production by product in the operating environments for 1995–2005. The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million.

The output of industry 24 (Manufacture of chemicals and chemical products) at basic price, intermediate consumption at purchaser's price, value added at basic price and the number of employed persons during the period 1995–2008 are shown in Figure 32a. Figure 29b shows the total supply and uses of product category 24 (Chemicals, chemical products and man-made fibres) at basic price and the proportions of the value of domestic production and consumption, and imports and exports during the period 1995–2005.

Figure 33a shows the total impacts of the increase in production volumes in industry 24 on the output of the industry in question and other industries and on the use of domestic and imported products, the impacts on the gross domestic product and the impacts on employment in the operating environments during the period 1995–2005. Figure 33b shows the total impacts of the increase in production volumes on mining and quarrying product categories 10, 11, 13 and 14.

Figure 34 shows the total impacts of the basic price change in the domestic product category 24 on the output of the industry in question and other industries, the impacts on all domestic products and on domestic product category 24 by way of using and the impacts on the value of domestic production by product in the operating environments during the period 1995–2005.

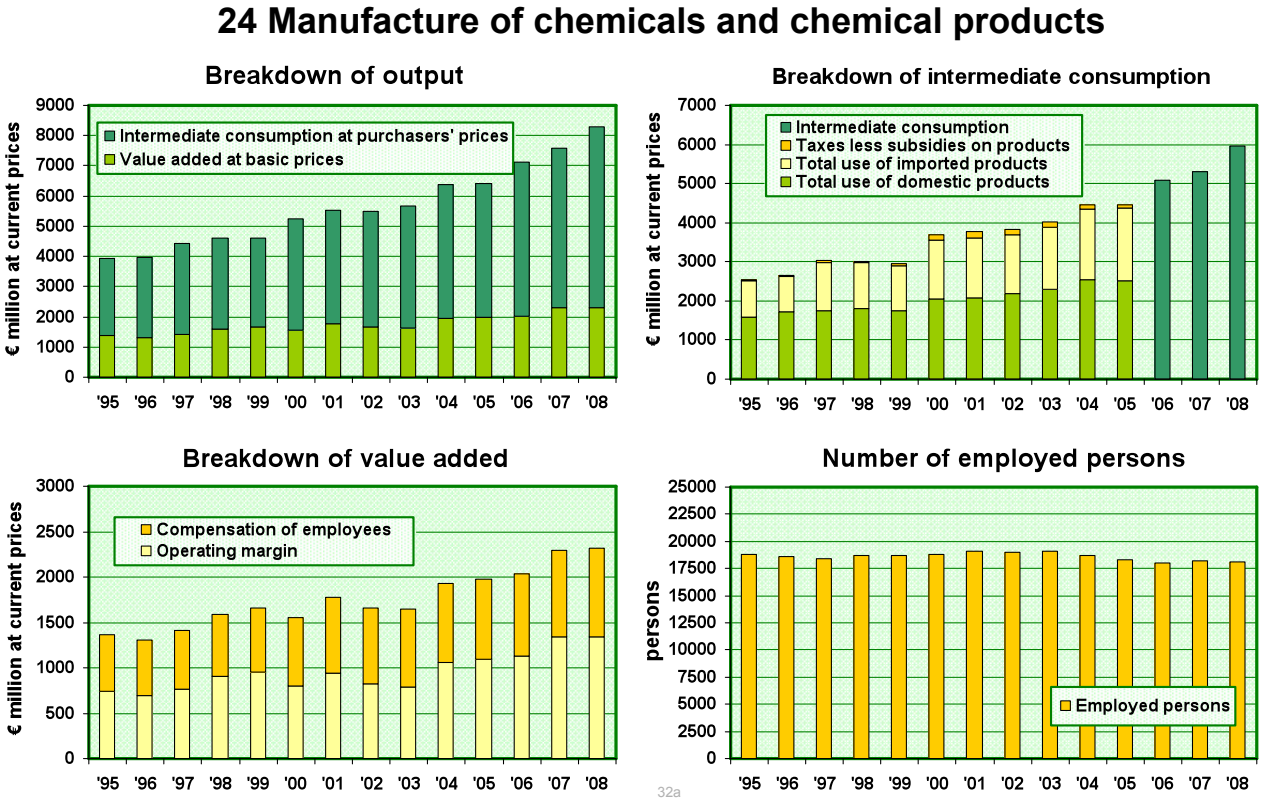


Figure 32a. Tables on the operating environment. The output of Industry 24 (Manufacture of chemicals and chemical products) at basic prices, intermediate consumption at purchase prices, value added at basic prices and the number of employed persons in 1995–2005. The data for 2006–2008 are from the national accounts. Sources: Statistics Finland, 1) Supply and use tables for the national economy, 2) National accounts.

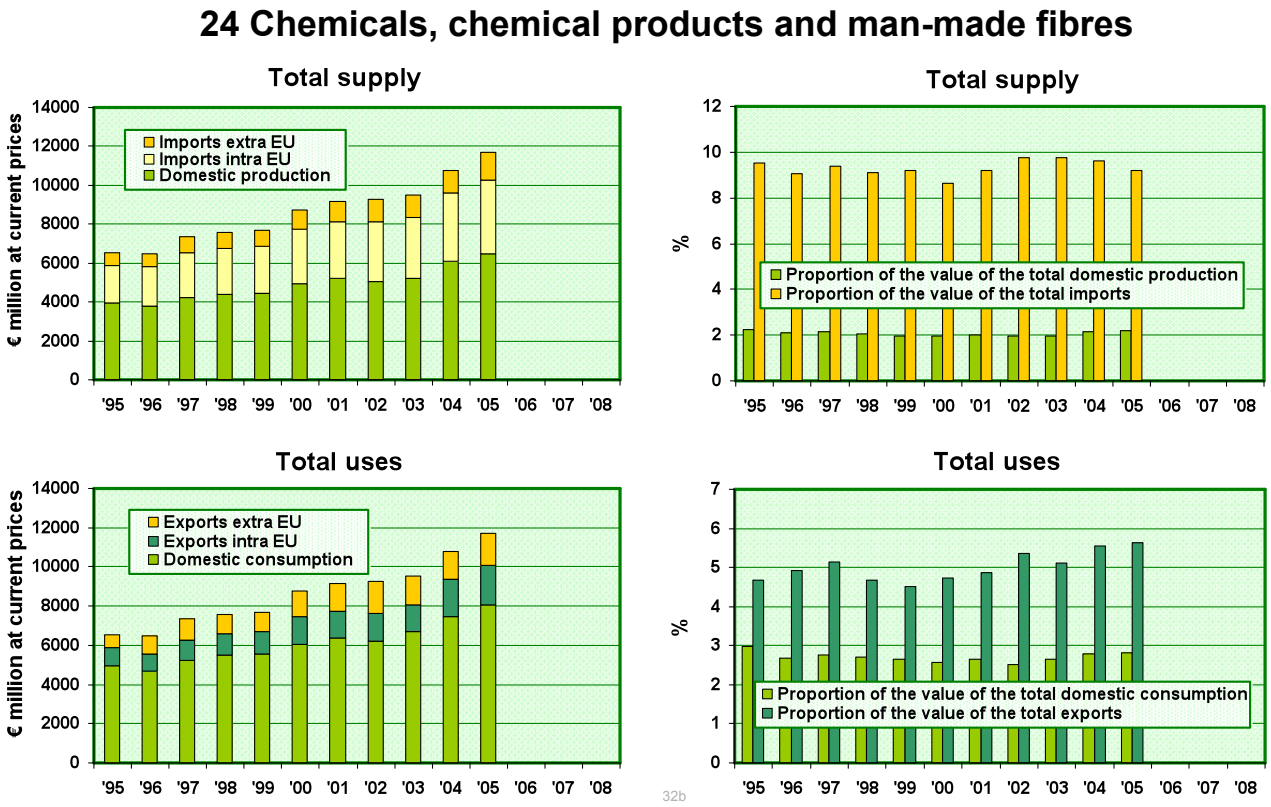


Figure 32b. Tables on the operating environment. Total supply and uses of product category 24 (Chemicals, chemical products and man-made fibres) at basic prices and its proportion of the value of domestic production, imports, exports and domestic consumption in 1995–2005. The proportions of the domestic values have been calculated using the information contained in the initial data. Source: Statistics Finland, Supply and use tables for the national economy.

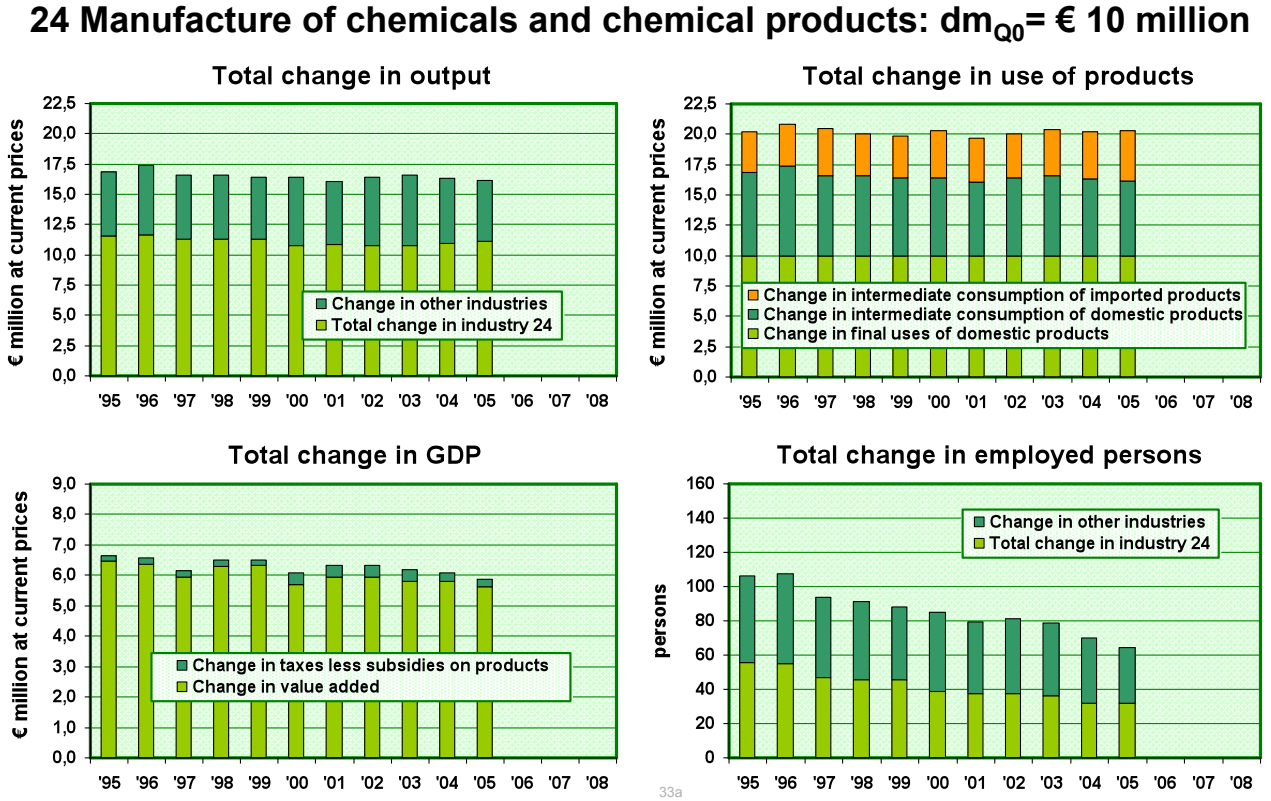


Figure 33a. Industry 24 will increase the production of its main products and by-products so that the direct yearly value of output will rise by EUR 10 million. The total impacts of the increase in production volumes on output of the industry in question and other industries and on use of domestic and imported products, the impacts on GDP and the impacts on employment in the operating environments for 1995–2005. The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million.

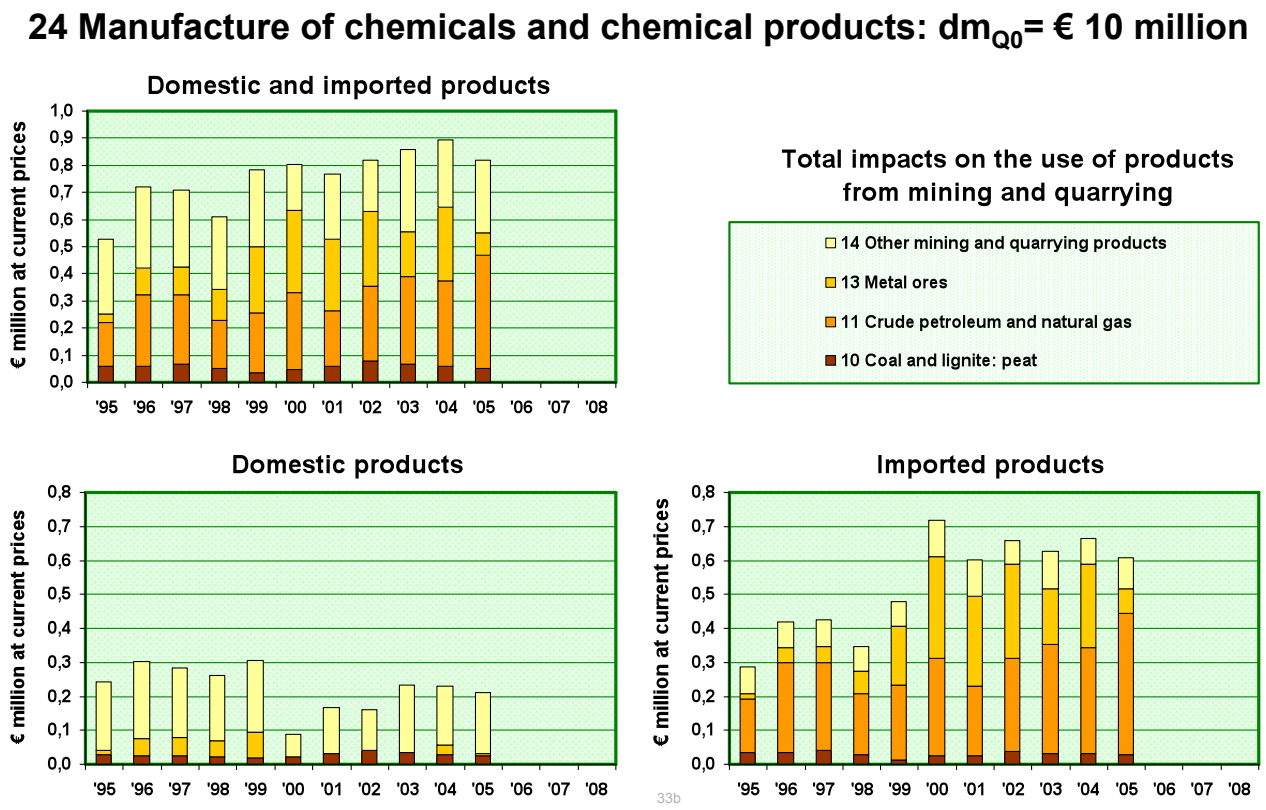


Figure 33b. Industry 24 will increase the production of its main products and by-products so that the direct yearly value of output will rise by EUR 10 million. The total impacts of the increase in production volumes on mining and quarrying product categories 10, 11, 13 and 14 in the operating environments for 1995–2005. The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million.

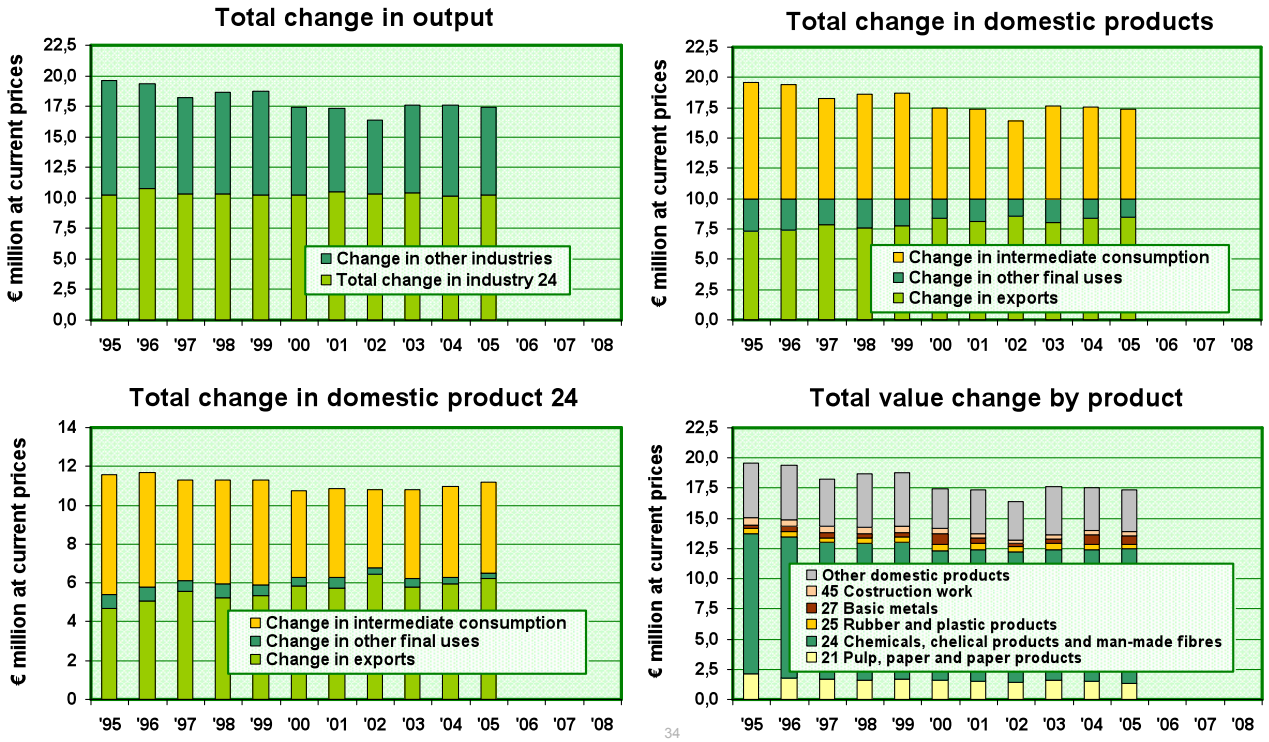


Figure 34. The price of the domestic product category 24 on the product market will increase so that the direct yearly value of production will rise by EUR 10 million. The total impacts of the change in production value on output of the industry in question and other industries, the impacts on all domestic products and on domestic product category 24 by way of using and the impacts on the value of domestic production by product in the operating environments for 1995–2005. The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million.

The output of industry 26 (Manufacture of other non-metallic mineral products) at basic price, intermediate consumption at purchaser's price, value added at basic price and the number of employed persons during the period 1995–2008 are shown in Figure 35a. Figure 35b shows the total supply and uses of product category 26 (Other non-metallic mineral products) at basic price and the proportions of the value of domestic production and consumption, and imports and exports during the period 1995–2005.

Figure 36a shows the total impacts of the increase in production volumes in industry 26 on the output of the industry in question and other industries and on the use of domestic and imported products, the impacts on the gross domestic product and the impacts on employment in the operating environments during the period 1995–2005. Figure 36b shows the total impacts of the increase in production volumes on mining and quarrying product categories 10, 11, 13 and 14.

Figure 37 shows the total impacts of the basic price change in the domestic product category 26 on the output of the industry in question and other industries, the impacts on all domestic products and on domestic product category 23 by way of using and the impacts on the value of domestic production by product in the operating environments during the period 1995–2005.

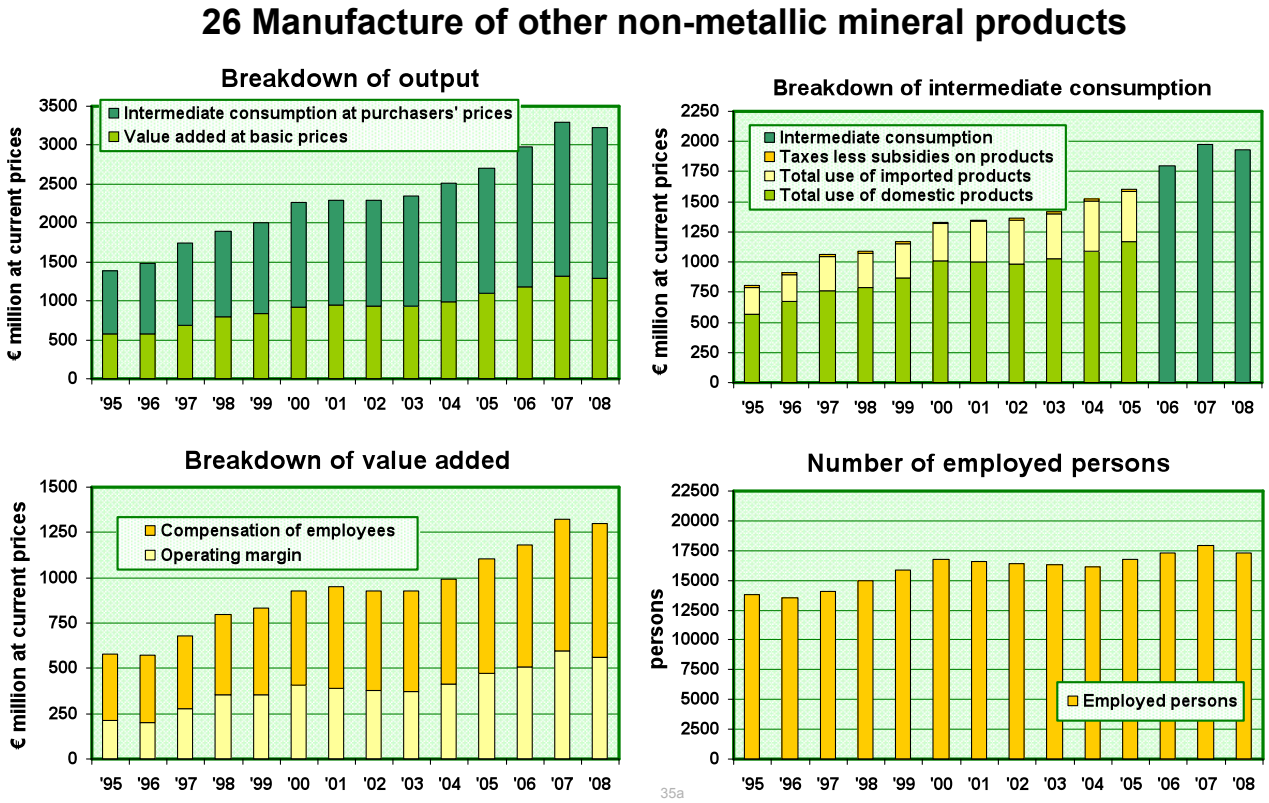


Figure 35a. Tables on the operating environment. The output of Industry 26 (Manufacture of other non-metallic mineral products) at basic prices, intermediate consumption at purchase prices, value added at basic prices and the number of employed persons in 1995–2005. The data for 2006–2008 are from the national accounts. Sources: Statistics Finland, 1) Supply and use tables for the national economy, 2) National accounts.

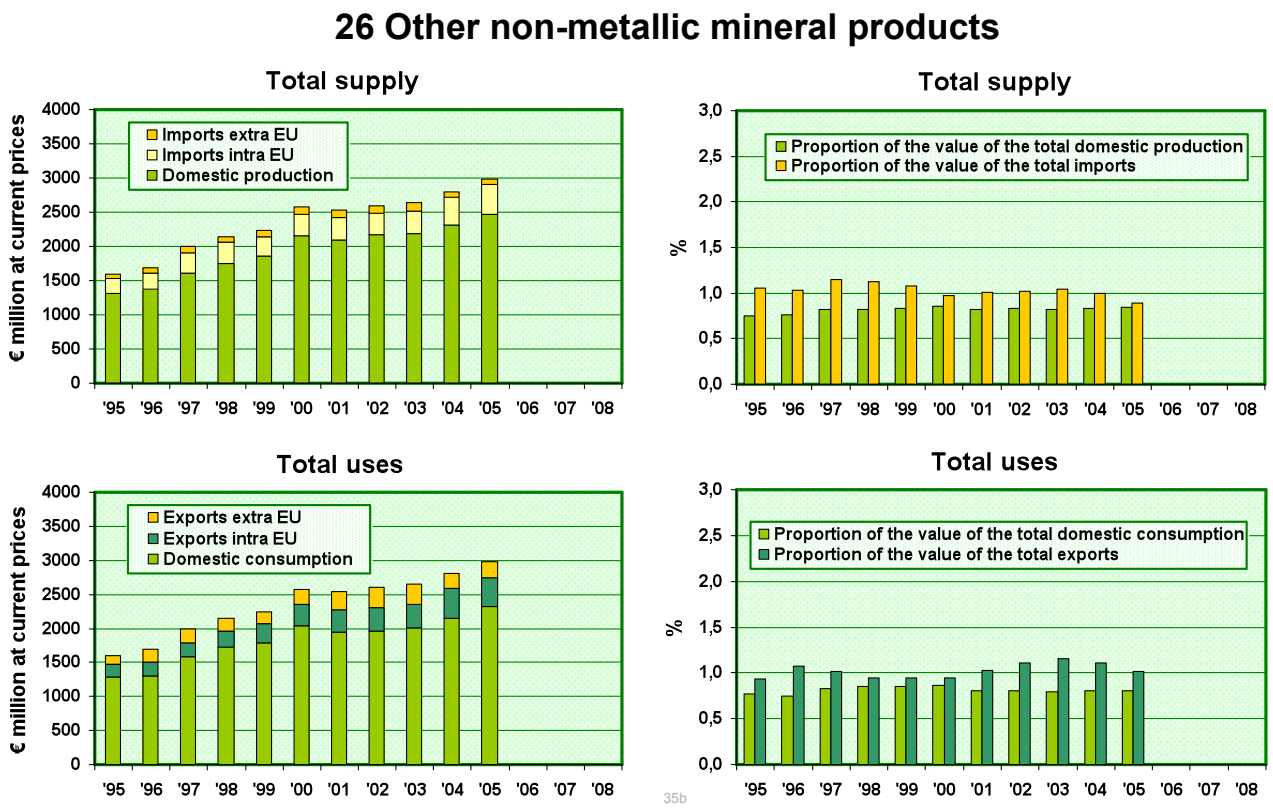


Figure 35b. Tables on the operating environment. Total supply and uses of product category 26 (Other non-metallic mineral products) at basic prices and its proportion of the value of domestic production, imports, exports and domestic consumption in 1995–2005. The proportions of the domestic values have been calculated using the information contained in the initial data. Source: Statistics Finland, Supply and use tables for the national economy.

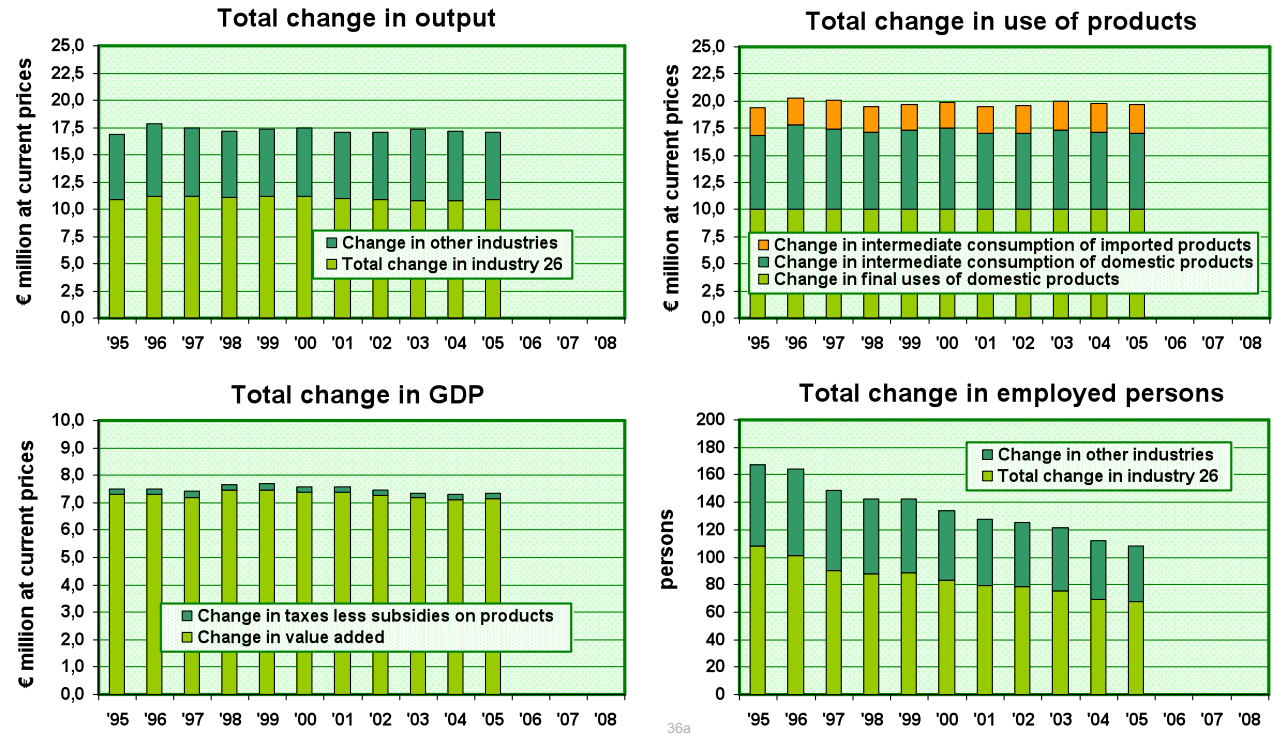


Figure 36a. Industry 26 will increase the production of its main products and by-products so that the direct yearly value of output will rise by EUR 10 million. The total impacts of the increase in production volumes on the output of the industry in question and other industries and on use of domestic and imported products, the impacts on GDP and the impacts on employment for the operating environments of 1995–2005. The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million.

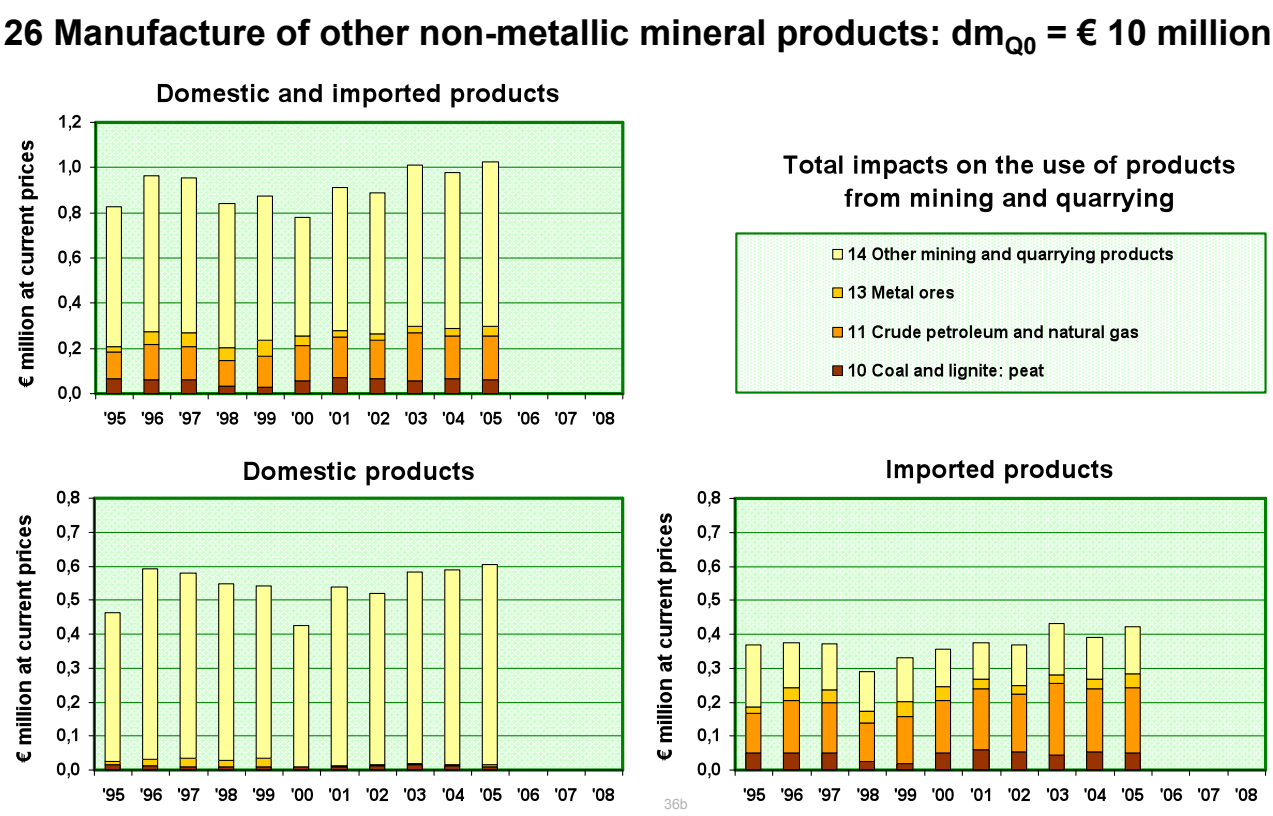


Figure 36b. Industry 26 will increase the production of its main products and by-products so that the direct yearly value of output will rise by EUR 10million. The total impacts of the increase in production volumes on mining and quarrying product categories 10, 11, 13 and 14 in the operating environments for 1995–2005. The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million.

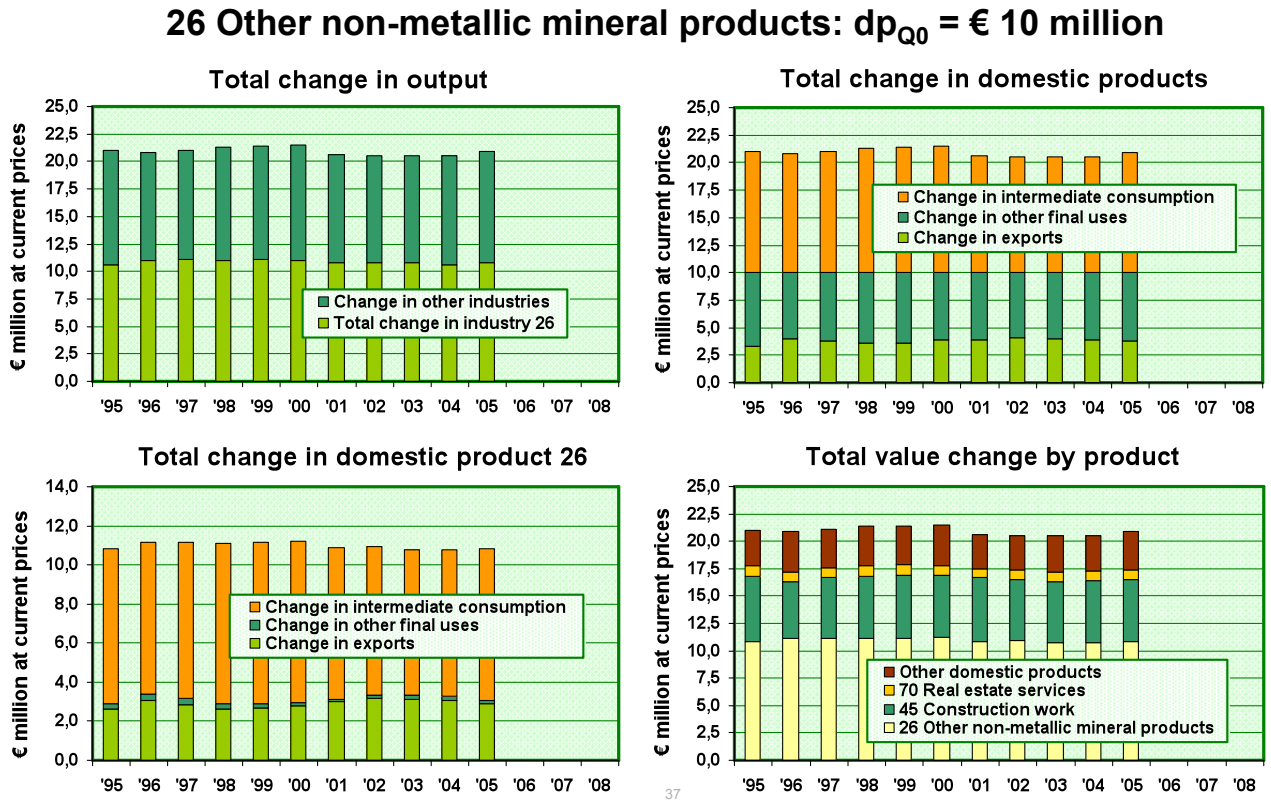


Figure 37. The price of the domestic product category 26 on the product market will increase so that the direct yearly value of production will rise by EUR 10 million. The total impacts of the change in production value on output of the industry in question and other industries, the impacts on all domestic products and on domestic product category 26 by way of using and the impacts on the value of domestic production by product in the operating environments for 1995–2005. The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million.

The output of industry 45 (Construction) at basic price, intermediate consumption at purchaser's price, value added at basic price and the number of employed persons during the period 1995–2008 are shown in Figure 38a. Figure 38b shows the total supply and uses of product category 45 (Construction work) at basic price and proportions of the value of domestic production and consumption, and imports and exports during the period 1995–2005.

Figure 39a shows the total impacts of the increase in production volumes in industry 45 on the output of the industry in question and other industries and on the use of domestic and imported products, the impacts on the gross domestic product and the impacts on employment in the operating environments during the period 1995–2005. Figure 39b shows the total impacts of the increase in production volumes on mining and quarrying product categories 10, 11, 13 and 14.

Figure 40 shows the total impacts of the basic price change in the domestic product category 45 on the output of the industry in question and other industries, the impacts on all domestic products and on domestic product category 23 by way of using and the impacts on the value of domestic production by product in the operating environments during the period 1995–2005.

Construction at construction sites has been taken into account in the calculations. Funding of the construction and its impacts on the prices of domestic products has not been taken into account in the calculations.

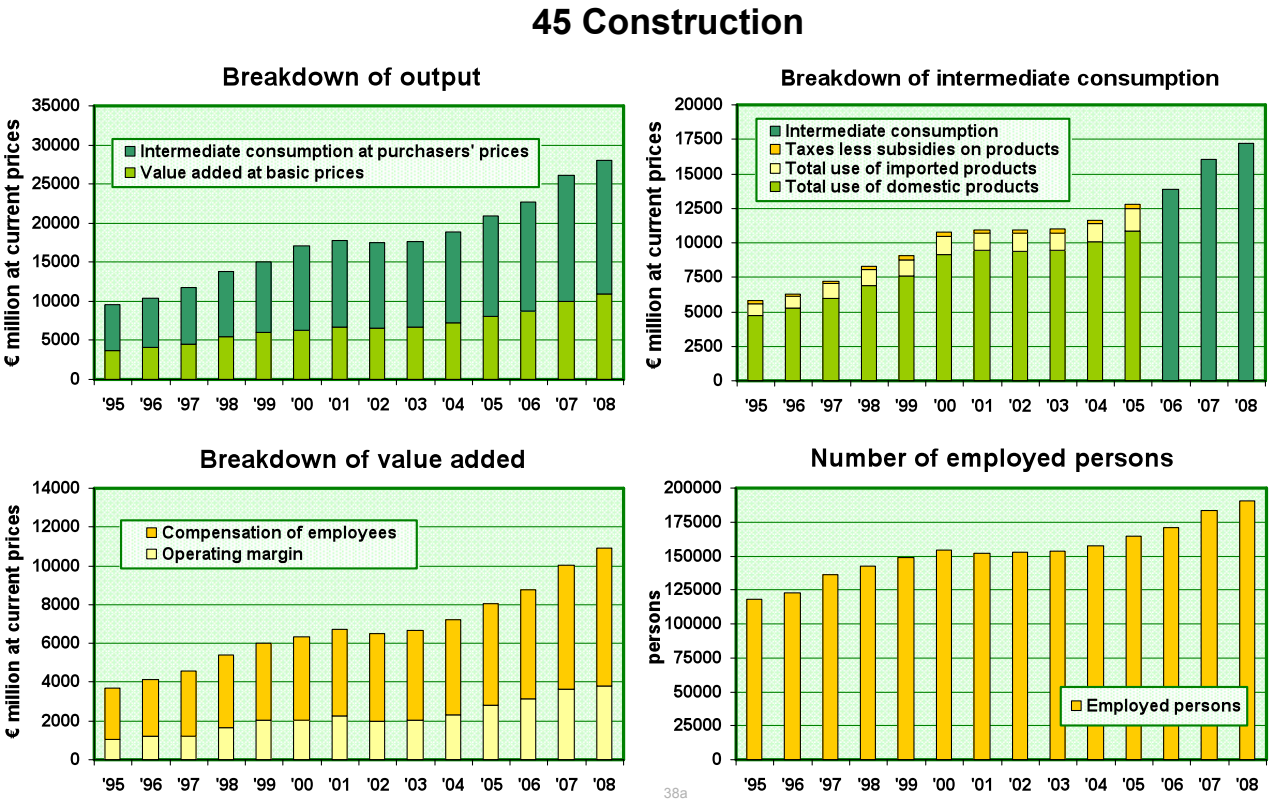


Figure 38a. Tables on the operating environment. The output of Industry 45 (Construction) at basic prices, intermediate consumption at purchase prices, value added at basic prices and the number of employed persons in 1995–2005. The data for 2006–2008 are from the national accounts. Sources: Statistics Finland, 1) Supply and use tables for the national economy, 2) National accounts.

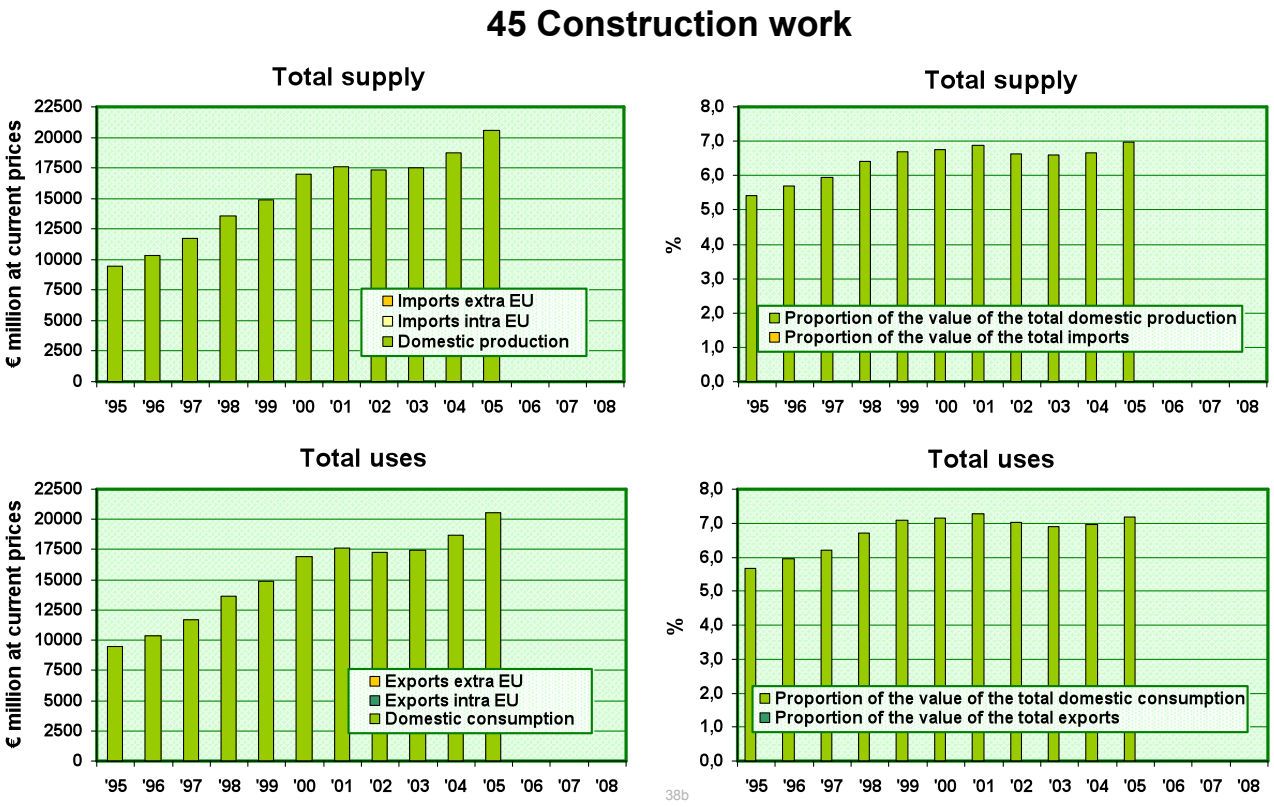


Figure 38b. Tables on the operating environment. Total supply and uses of product category 45 (Construction work) at basic prices and its proportion of the value of domestic production, imports, exports and domestic consumption in 1995–2005. The proportions of the domestic values have been calculated using the information contained in the initial data. Source: Statistics Finland, Supply and use tables for the national economy.

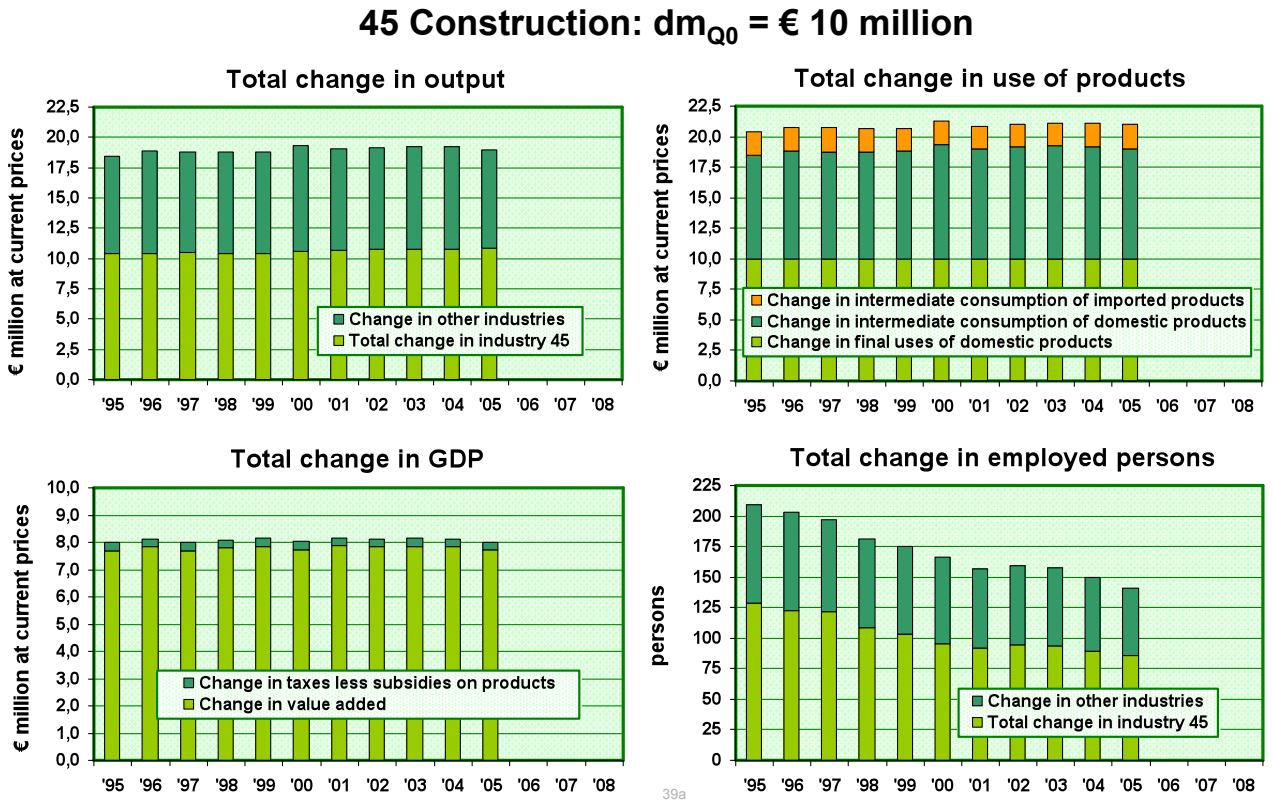


Figure 39a. Industry 45 will increase the production of its main products and by-products so that the direct yearly value of output will rise by EUR 10million. The total impacts of the increase in production volumes on the output of the industry in question and other industries and on use of domestic and imported products, the impacts on GDP and the impacts on employment in the operating environments for 1995–2005. The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million.

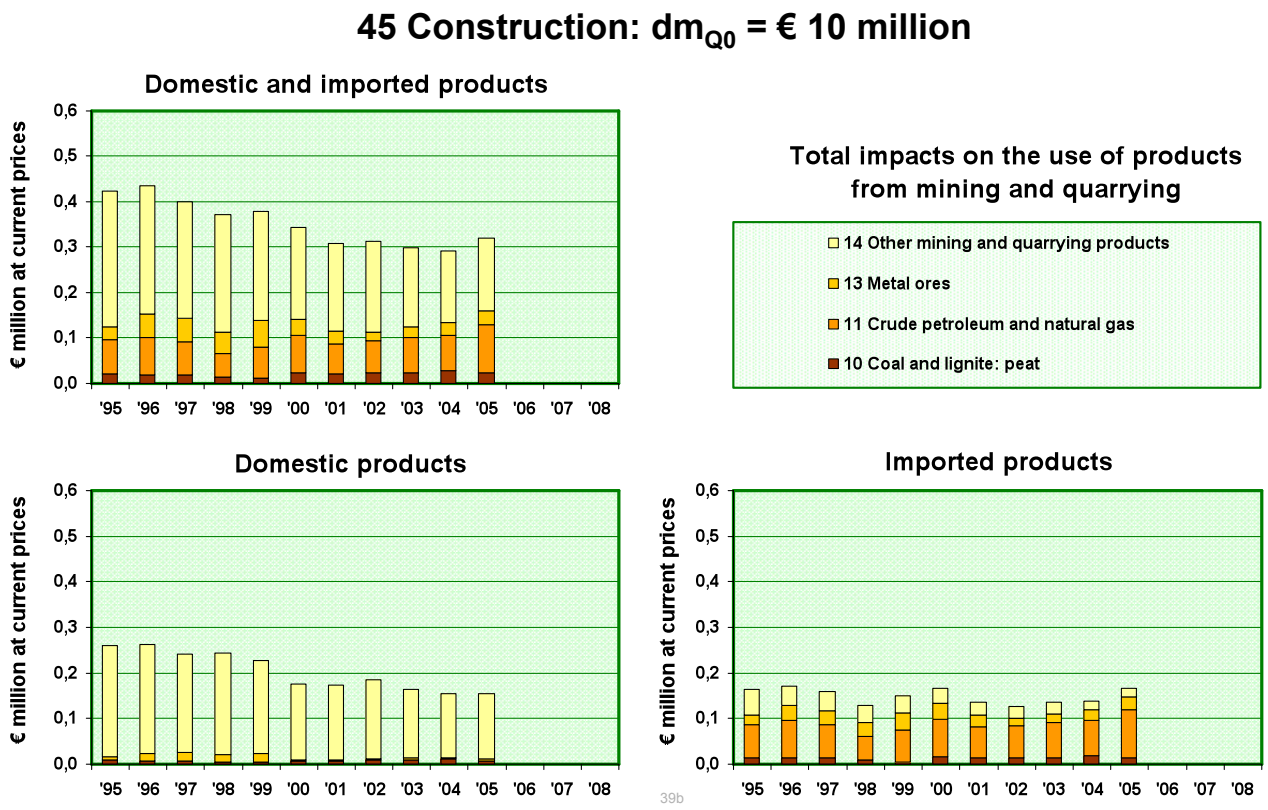


Figure 39b. Industry 45 will increase the production of its main products and by-products so that the direct yearly value of output will rise by EUR 10 million. The total impacts of the increase in production volumes on mining and quarrying product categories 10, 11, 13 and 14 in the operating environments for 1995–2005. The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million.

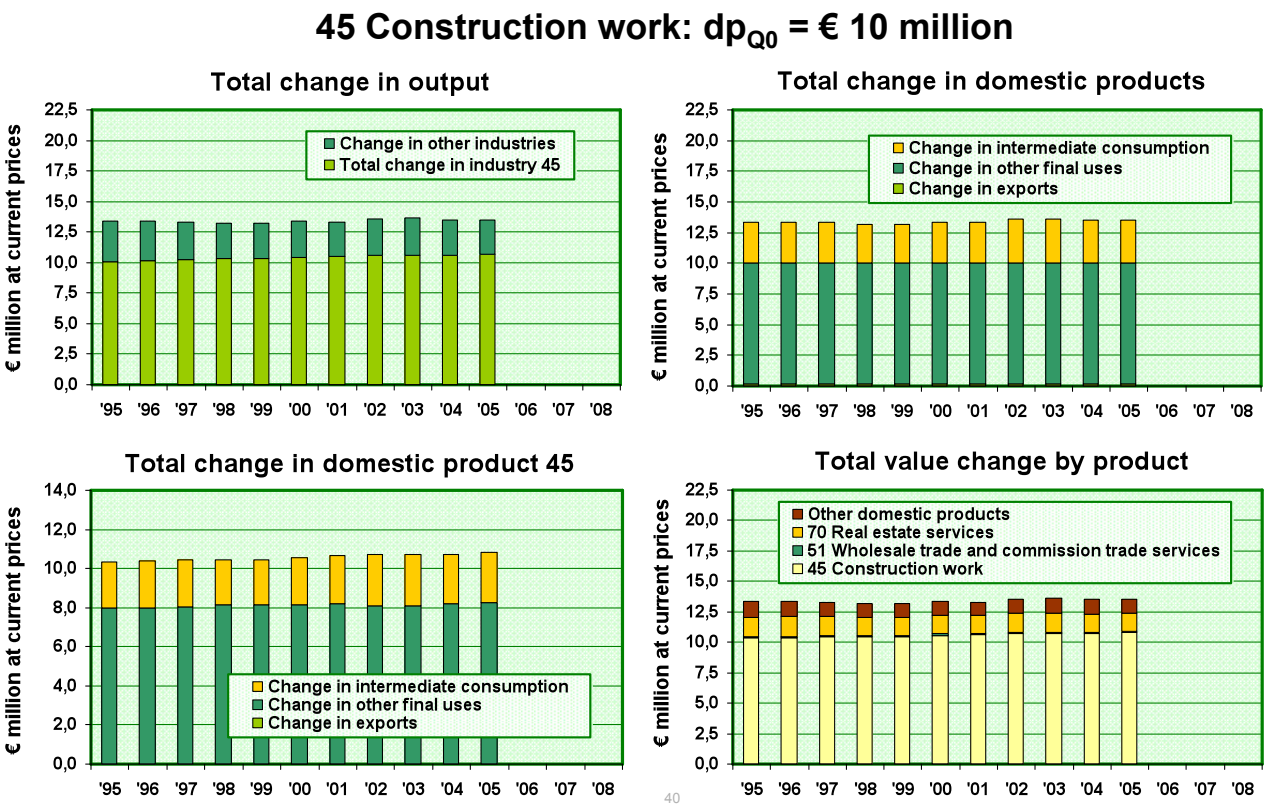


Figure 40. The price of the domestic product category 45 on the product market will increase so that the direct yearly value of production will rise by EUR 10 million. The total impacts of the change in production value on output of the industry in question and other industries, the impacts on all domestic products and on domestic product category 45 by way of using and the impacts on the value of domestic production by product in the operating environments for 1995–2005. The total impact coefficient can be calculated by dividing the numerical value shown in the figure by EUR 10 million.

A summary of the total impacts of the basic volume changes in the mining and quarrying consumer industries in the operating environments during the period 1995–2005 is shown in Figures 41a, 41b and 41c.

In 2005, coefficient for the total impact of the change in the consumer industry's production volumes on the industries' output and the supply of domestic products varied between about 2.0 (industry 21) and about 1.2 (industry 23). The industries 21, 23 and 40 experienced a slight drop at the turn of the century, but in other industries the total change in the output in relation to the basic change remained largely constant in the operating environments during the period 1995–2005.

The impact of the changes in the consumer industries' production volumes on imports was biggest in industry 23. The coefficient of the total impact on imports in 2005 was 0.75. Manufacture of basic metals came second (0.55). In other consumer industries, the import requirement was basic change multiplied by 0.20–0.40 in the operating environments during the period 1995–2005.

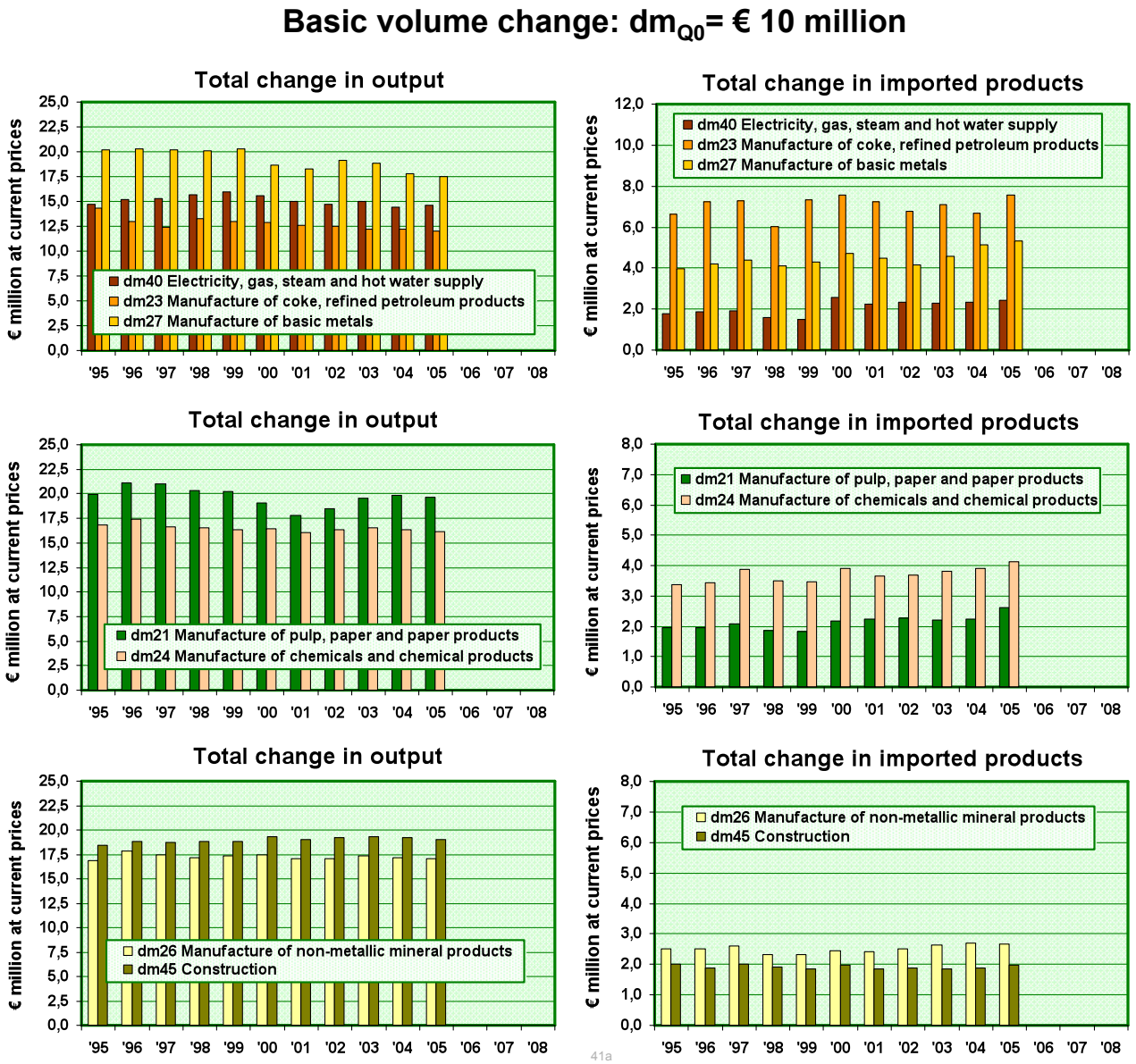


Figure 41a. Summary of the impact analyses of EUR 10 million basic volume changes in the mining and quarrying consumer industries 40, 23, 27, 21, 24, 26 and 45. Total change in output and in the number of imported products. The total impact coefficient can be calculated by dividing the column height by the basic change (EUR 10 million). Summary of Figures 21a, 24a, 27a, 30a, 33a, 36a and 39a.

In industries 40, 21, 26 and 45, the impact of the change in the consumer industries' production volumes on the gross domestic product in the operating environments during the period 1995–2005 was basic change multiplied by 0.7–0.8. The coefficient for total impact on the gross domestic product was as follows: 0.6–0.7 (industry 24), 0.45–0.6 (industry 27) and 0.25–0.35 (industry 23). The modest impact for industries 23 and 27 on the GDP is explained by the large amount of imported raw materials required in their production.

The consumer industry where changes in production volumes had the greatest impact on employment was industry 45 (Construction). In 1995, the total impact coefficient was 21 persons/EUR million and in 2005, 14 persons/EUR million. Industry 26 came second. In 1995, its employment impact was 17 persons/EUR million and in 2005, 11 persons/EUR million. In 2005, the employment impact in industries 21, 24, 27 and 40 was 6–8 persons/EUR million, and in industry 23, less than two persons/EUR million.

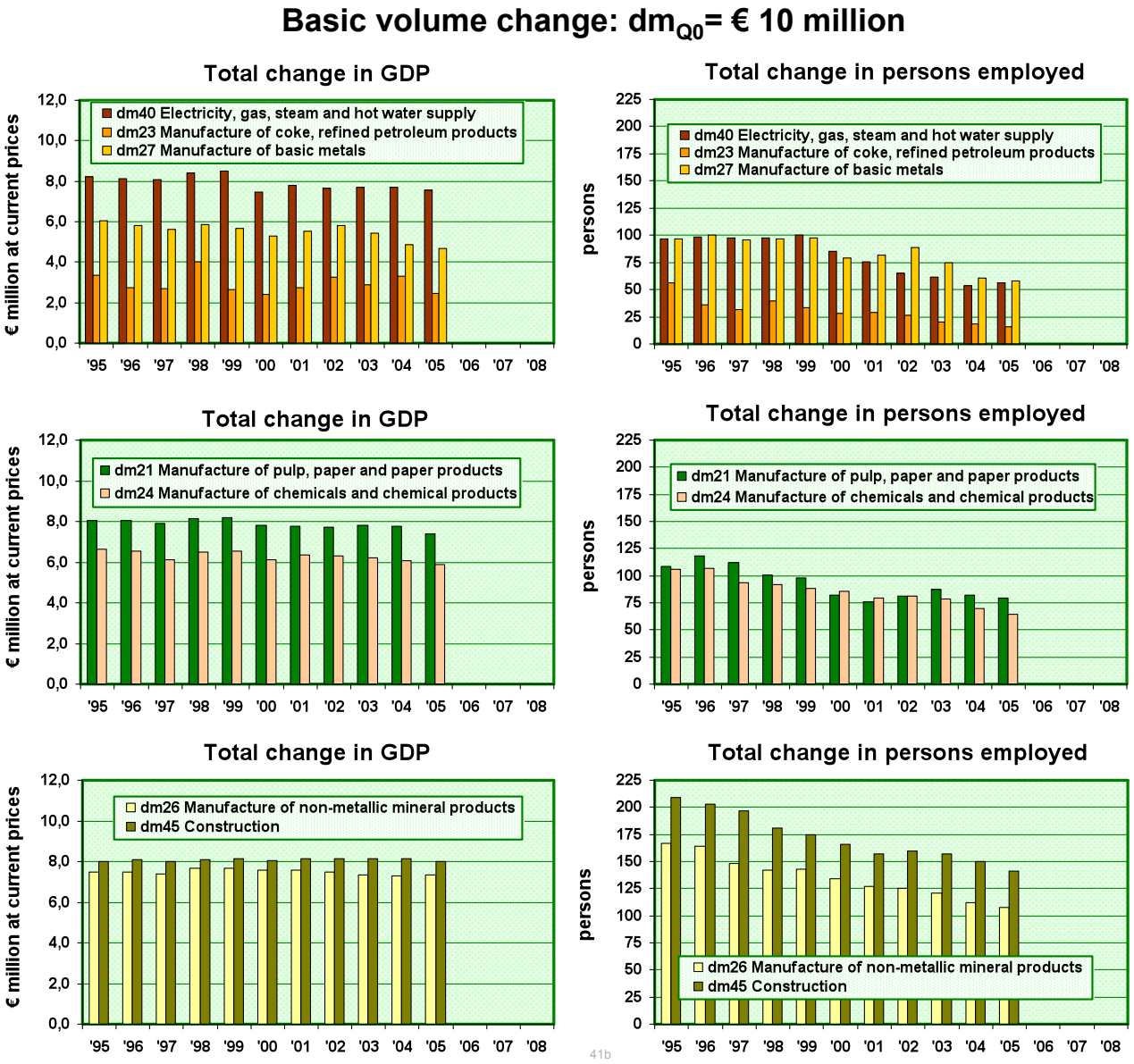


Figure 41b. Summary of the impact analyses of EUR 10 million basic volume changes in the mining and quarrying consumer industries 40, 23, 27, 21, 24, 26 and 45. Total change in GDP and in the number of employed persons. The total impact coefficient can be calculated by dividing the column height by the basic change (EUR 10 million). Summary of Figures 21a, 24a, 27a, 30a, 33a, 36a and 39a.

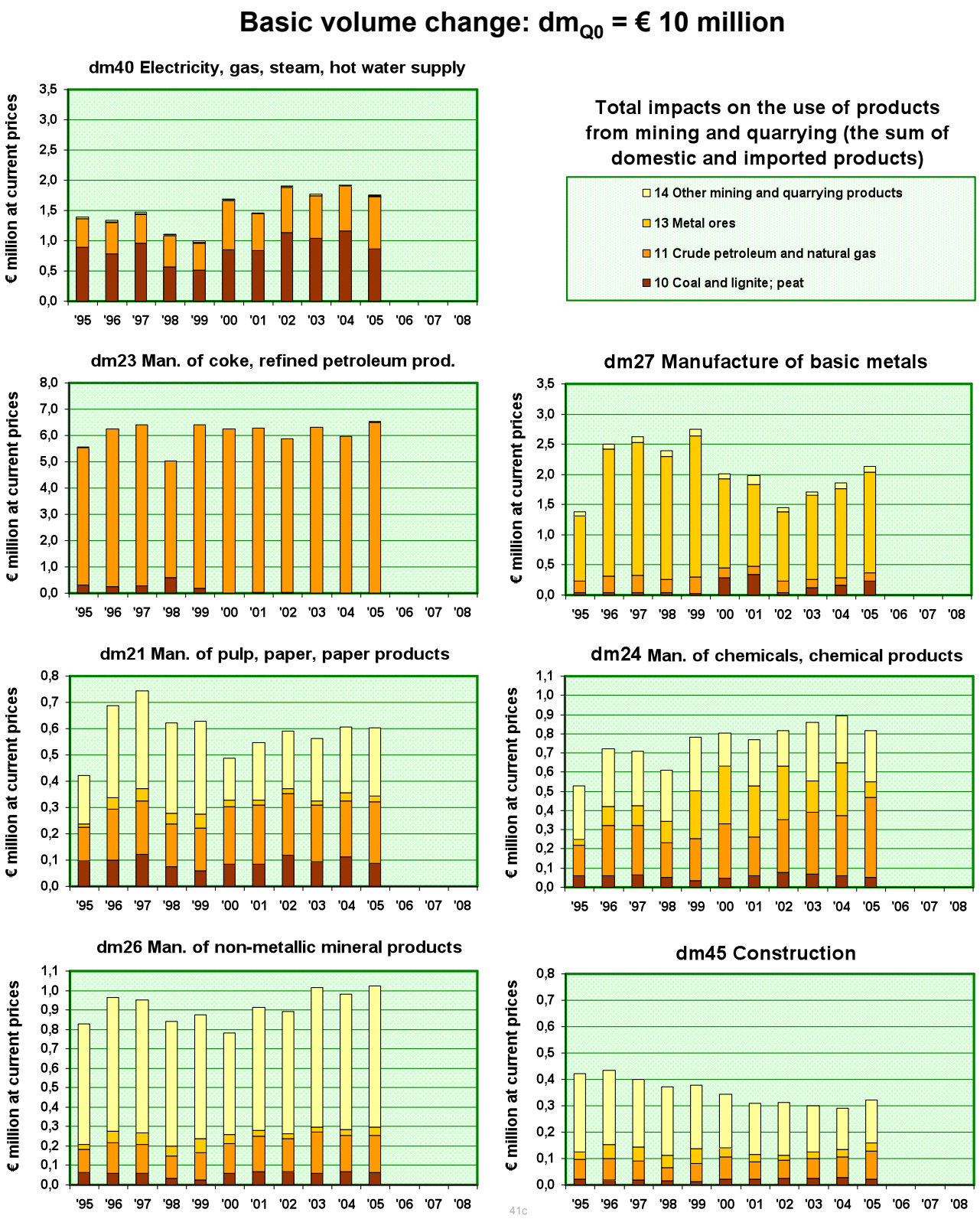


Figure 41c. Summary of the impact analyses of EUR 10 million basic volume changes in the mining and quarrying consumer industries 40, 23, 27, 21, 24, 26 and 45. Total impacts on the use of the mining and quarrying product categories 10, 11, 13 and 14 (domestic production and imports). The total impact coefficient can be calculated by dividing the column height by the basic change (EUR 10 million). Summary of Figures 21b, 24b, 27b, 30b, 33b, 36b and 39b. The Figures also show a breakdown between the use of domestic and imported products.

Figure 41c shows the total impacts of the basic volume change in the consumer industries of mining and quarrying on the mining and quarrying product categories 10 (Coal and lignite; peat), 11 (Crude petroleum and natural gas), 13 (Metal ores) and 14 (Other mining and quarrying products). The figures for both imports and exports are given.

In 2005, the total impact coefficient of basic volume change in industry 40 (Electricity, gas, steam and hot water supply) on product category 103 (Peat) was 0.040, product category 101 (Coal), 0.046 and product category 11 (Crude petroleum and natural gas), 0.087. The same year, the impact on the domestic and foreign product categories of mining and quarrying totalled 0.175.

In 2005, the total impact of the basic volume change in industry 23 (Manufacture of coke, refined petroleum products and nuclear fuel) on product category 11 (Crude petroleum and natural gas) was 0.651.

In 2005, the total impact of basic volume changes in industry 27 (Manufacture of basic metals) on product category 13 (Metal ores) was 0.167, of which domestic factors accounted for 0.017 and imports, 0.150. The same year, the impacts on the domestic and foreign product categories of mining and quarrying totalled 0.213.

In 2005, the total impact of the basic volume change in industry 21 (Manufacture of pulp, paper and paper products) on product category 14 (Other mining and quarrying products) was 0.026, of which domestic factors accounted for 0.014 and imports, 0.012. The impacts on product category 11 totalled 0.023. The same year, the impacts on the domestic mining and quarrying product categories totalled 0.060.

In 2005, the total impact of the basic volume change in industry 24 (Manufacture of chemicals and chemical products) on product category 14 (Other mining and quarrying products) was 0.027, of which domestic factors accounted for 0.018 and imports, 0.009. The impacts on product category 11 totalled 0.041. The same year, the impacts on the domestic mining and quarrying product categories totalled 0.082.

In 2005, the total impact of the basic volume change in industry 26 (Manufacture of other non-metallic mineral products) on product category 14 (Other mining and quarrying products) was 0.072, of which domestic factors accounted for 0.059 and imports, 0.014. The impacts on product category 11 totalled 0.019. The same year, the impacts on the domestic and foreign mining and quarrying product categories totalled 0.102.

In 2005, the total impact of the basic volume change in industry 45 (Construction) on product category 14 (Other mining and quarrying products) was 0.016, of which domestic factors accounted for 0.014 and imports, 0.002. The impacts on product category 11 totalled 0.011. The same year, the impacts on the domestic and foreign mining and quarrying product categories totalled 0.032.

The total impacts of the basic price change in the product category of the main products of mining and quarrying consumer industries on the prices of domestic products in the operating environments during the period 1995–2005 are shown in Figure 42a. In 2005, the coefficient for total impacts on product prices was about 2.4 (product category 40), about 2.1 (product category 26), 1.5–1.8 (product categories 21, 23, 24 and 27) and about 1.4 (product category 45).

In 2005, product category 27 was the category where the coefficient for the total impact of the basic price change in the consumer industries' main product category on exports was highest (0.90). Product categories 21 and 24 came second (0.85). In product category 23, the impact on exports was 0.63, in category 26, 0.38, in category 40, 0.32, and in category 45, only 0.02.

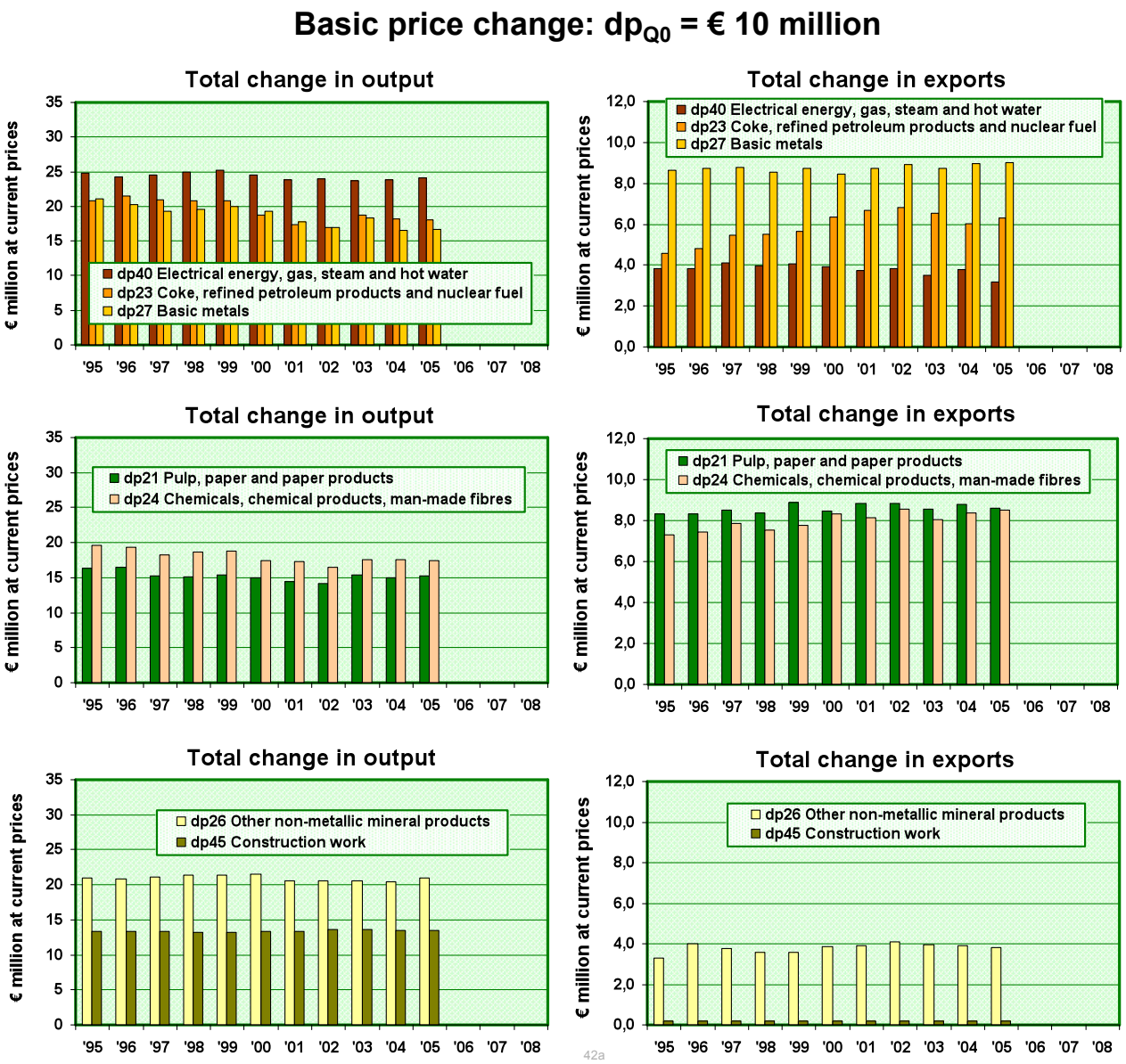


Figure 42a. Summary of the impact analyses of EUR 10 million basic price changes in the mining and quarrying main product consumer industries 40, 23, 27, 21, 24, 26 and 45. Total change in output and in the value of exports of domestic products. The total impact coefficient can be calculated by dividing the column height by the basic change (EUR 10 million). Summary of Figures 22, 25, 28, 31, 34, 37 and 40.

In the operating environment during the period 1995–2005, the total impact of the basic price change in the main product category of the consumer industries on capital formation was basic change multiplied by 0.98, in product category 45. During the period 1995–2005, the total impacts for product categories 40 and 26 on other final uses was basic change multiplied by 0.62–0.68. In 2005, the impact on other final uses in product category 23 was basic change multiplied by 0.37, while in categories 21 and 24 the multiplier was 0.14–0.15 and in category 27, 0.10.

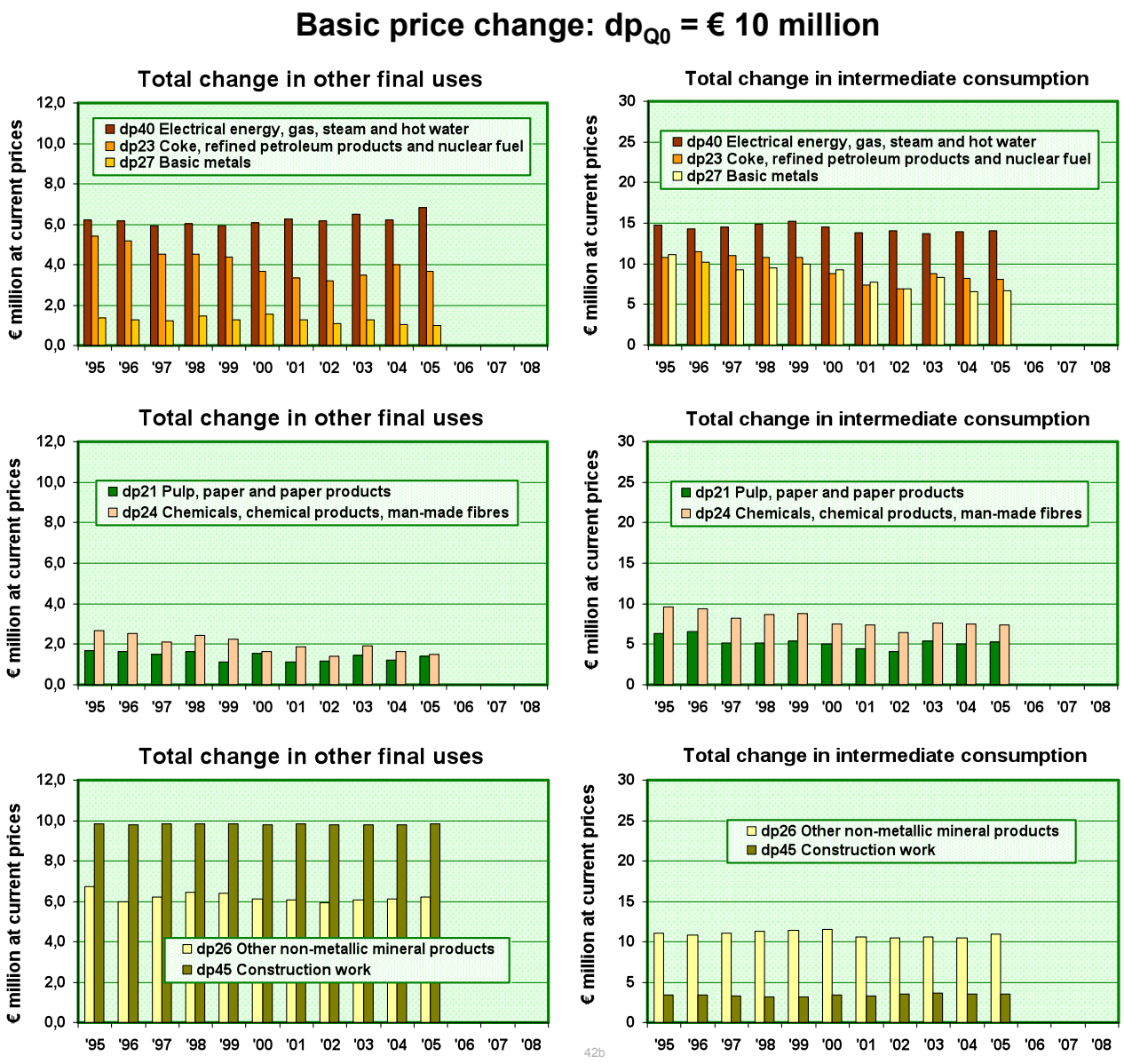


Figure 42b. Summary of the impact analyses of EUR 10 million basic price changes in the mining and quarrying main product consumer industries 40, 23, 27, 21, 24, 26 and 45. Total change in value of other final uses of domestic products and the intermediate consumption of domestic products. The total impact coefficient can be calculated by dividing the column height by the basic change (EUR 10 million). Summary of Figures 22, 25, 28, 31, 34, 37 and 40.

In the operating environment during the period 1995–2005, the impact of the basic price change in the main product category of the consumer industries on products destined for intermediate consumption was basic change multiplied by 1.38–1.52 in product category 40. During the period 1995–2005, the total impacts of product category 26 on intermediate consumption amounted to basic change multiplied by 1.05–1.14. In 2005, the impacts of product categories 23, 24 and 27 on intermediate consumption amounted to basic change multiplied by 0.66–0.81. In category 21, the multiplier was 0.52, and in category 45, 0.35.

### 3.4 Generalisation and combination of basic changes

Generalisation and combination of basic volume and price changes are illustrated in this chapter, using different examples. The total impacts of the basic production volume change in industries 13 (Mining of metal ores) and 27 (Manufacture of basic metals) and the total impacts of basic price changes of the domestic product 13 (Metal ores) are generalised and combined in Figure 43. In generalisation, the coefficients k may be positive or negative. In combination, the number of basic volume and price changes is not limited.

All combinable basic changes are assumed to occur independently in the same operating environment during one year. In practice, the arguments in favour of combining basic changes can be found from the cause-effect relationships prevailing in the product markets of the operating environment under examination.

An example of the generalisation of the basic volume change in the mining and quarrying industry classes 103 (Extraction and agglomeration of peat), 13 (Mining of metal ores) and 14 (Other mining and quarrying) is shown in Figures 44a and 44b. Figure 44a shows the breakdown of the total change in output and Figure 44b, the breakdown of the total change in the number of employed persons into total change in the industry in question and in other industries when the basic change amounts to EUR 10 million and the generalised basic change amounts to 10 per cent of the yearly output of the industry. The assumption in the generalisation is that the size of the basic change does not affect the direct or indirect changes in the operating environment resulting from the basic change. In Figures 44a and 44b this means that the ratio 'change in other industries' per 'change in the industry in question' remains constant regardless of the size of the basic change.

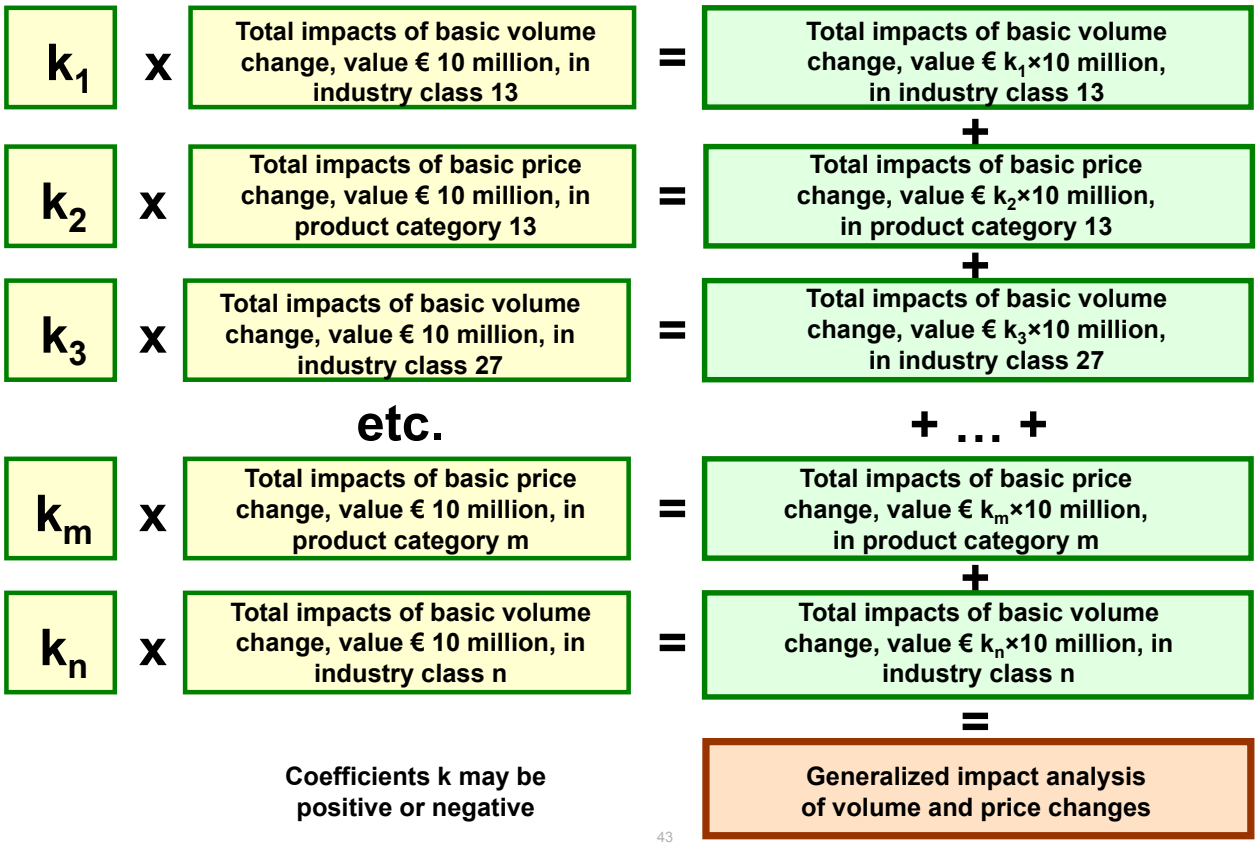


Figure 43. Example of generalisation and combination of impact analyses of basic changes in volume and price.

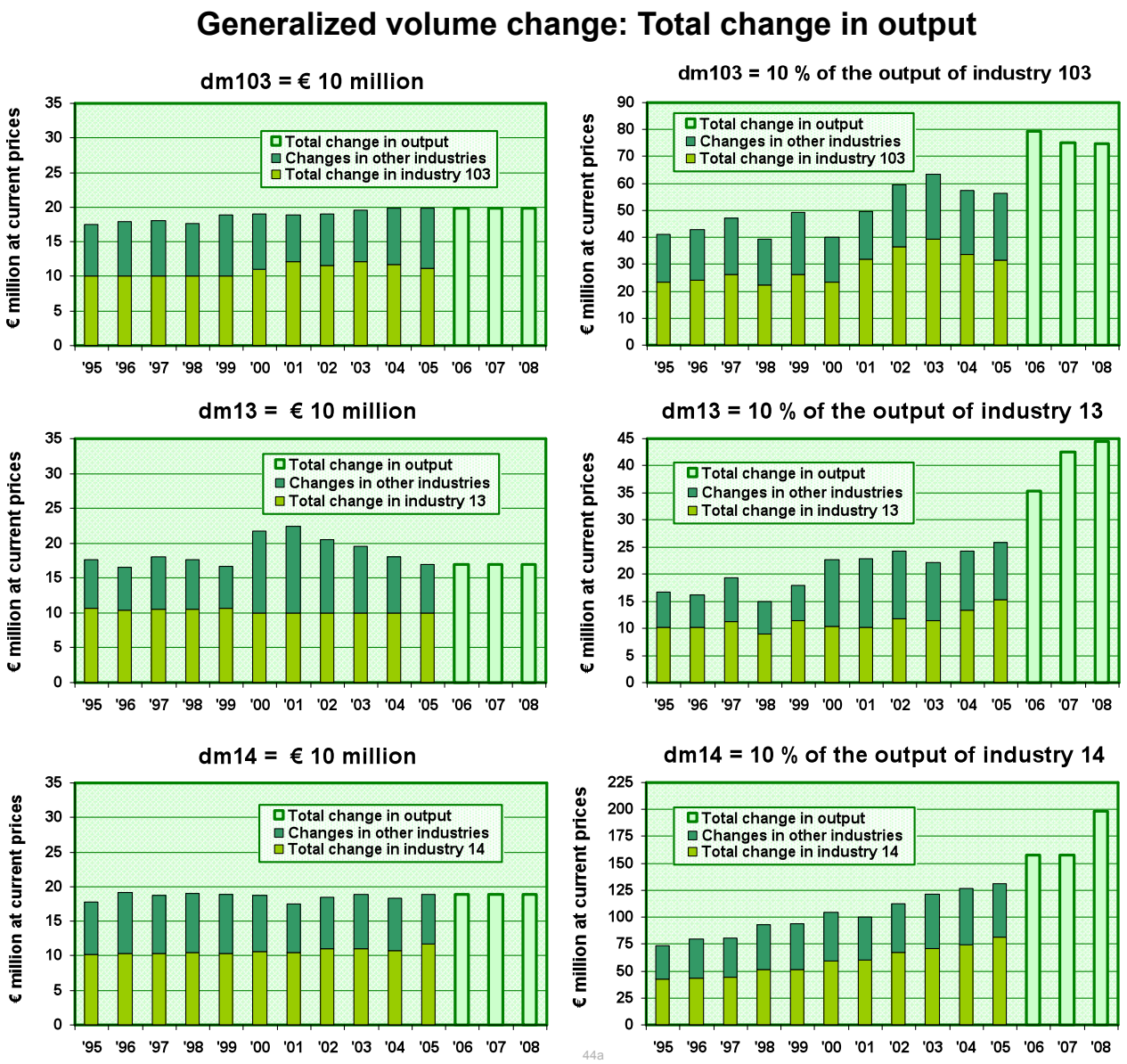


Figure 44a. Generalisation of the basic volume change dm (= EUR 10 million) in the mining and quarrying categories 103 (Extraction and agglomeration of peat), 13 (Mining of metal ores) and 14 (Other mining and quarrying) in the operating environments for 1995–2005. Breakdown of the total change in output into total change in the industry in question and other industries when the basic change amounts to EUR 10 million and the generalised basic change amounts to 10 per cent of the yearly output of the industry. The total impacts of the 2005 basic change dm (= EUR 10 million) on the output of the industries have been generalised as such for 2006–2008. This generalisation has been used as the basic change when the generalised basic change amounts to 10 per cent of the industry's output in 2006–2008.

A variation of +/- 10 per cent in the industry's annual output can be considered normal. The results of the generalised basic change of -10 per cent can be obtained by simply changing the sign in Figures 44a and 44b.

When the generalised basic volume change is equal to the annual output of the industry (dm = 100 per cent of the industry's output), the direct and indirect impacts of the industry on the operating environment can be determined. This information can be obtained from Figures 44a and 44b by multiplying the results of the basic change generalised by 10% by 10 (10% multiplied by 10 is 100%).

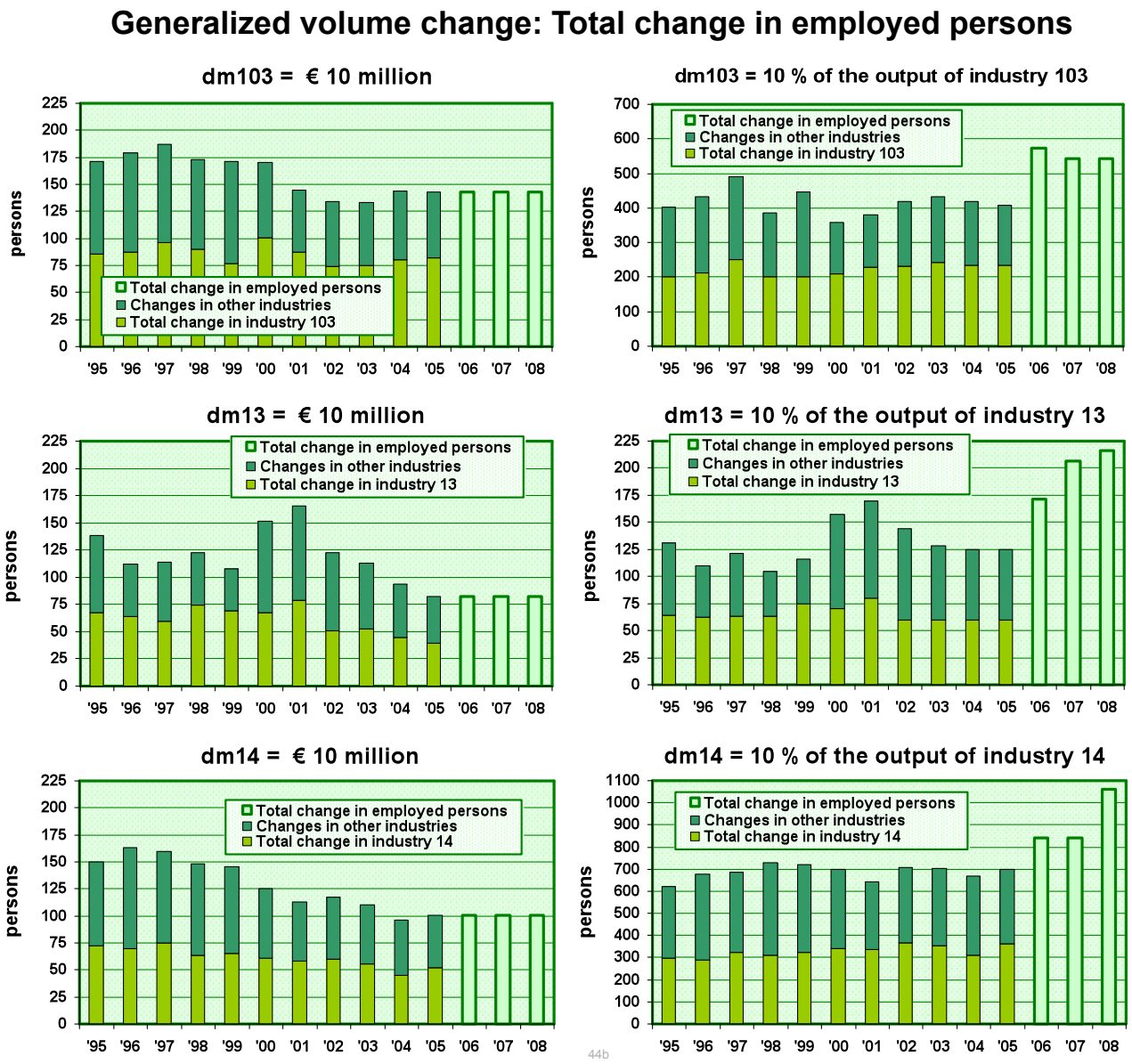


Figure 44b. Generalisation of the basic volume change dm (= EUR 10 million) in the mining and quarrying categories 103 (Extraction and agglomeration of peat), 13 (Mining of metal ores) and 14 (Other mining and quarrying). Breakdown of the total change in the number of employed persons into total change in the industry in question and other industries when the basic change amounts to EUR 10 million and the generalised basic change amounts to 10 per cent of the yearly output of the industry. The total employment impacts of the 2005 basic change dm (= EUR 10 million) have been generalised as such for 2006–2008. The generalisation has been used as the basic change when the generalised basic change amounts to 10 per cent of the industry's output in 2006–2008.

An example of the generalisation of the basic price change in the domestic mining and quarrying product categories 103 (Peat), 13 (Metal ores) and 14 (Other mining and quarrying products) is shown in Figure 45. Figure 45 gives the breakdown of the total change in the value of domestic products into domestic products destined for exports, other final uses and intermediate consumption when the basic change amounts to EUR 10 million and the generalised basic change amounts to 10 per cent of the annual domestic supply in the product category.

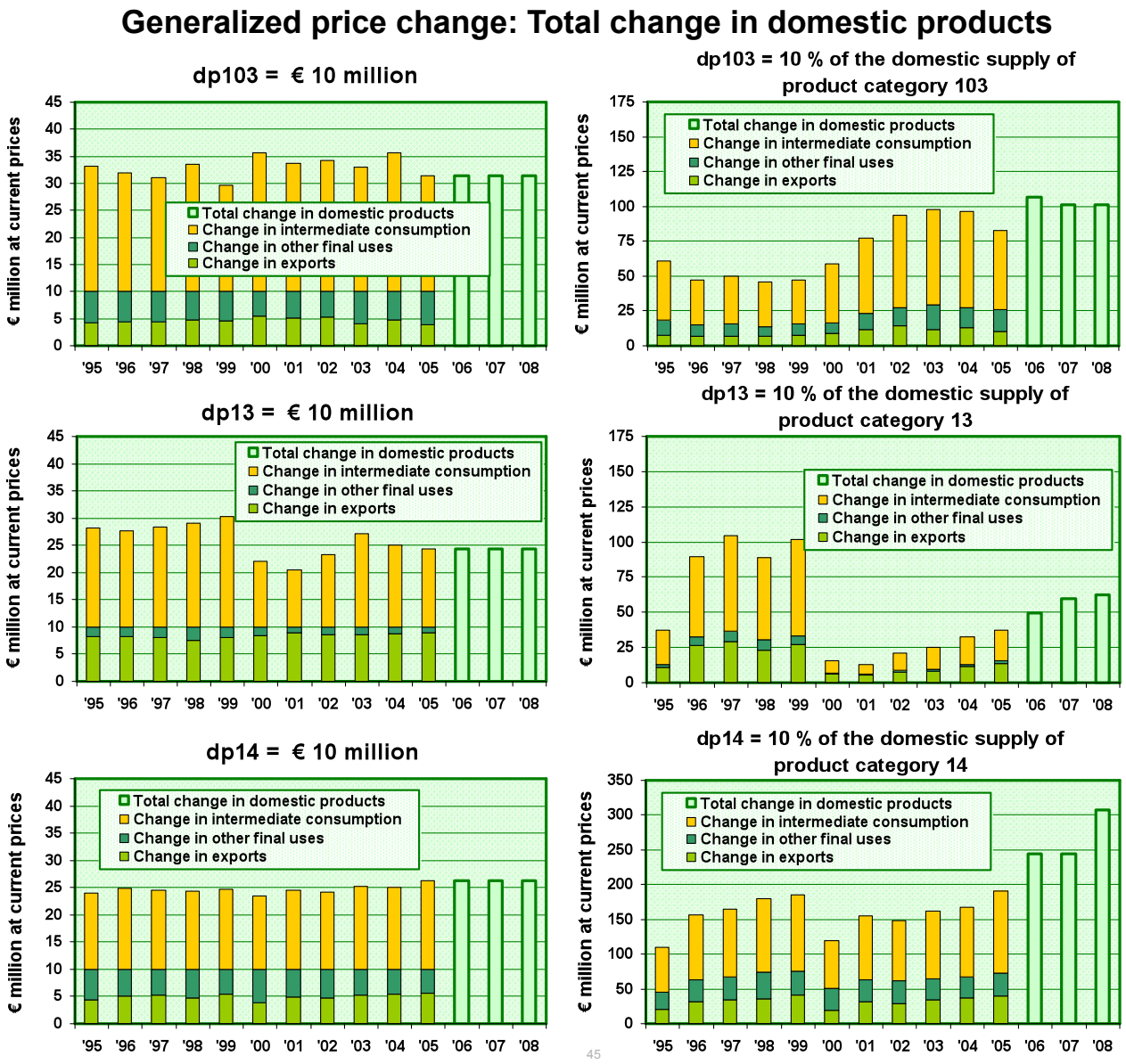


Figure 45. Generalisation of the basic price change dp (= EUR 10 million) in the domestic mining and quarrying product categories 103 (Peat), 13 (Metal ores) and 14 (Other mining and quarrying products). Breakdown of the total change in the value of domestic products destined for export, other final uses and intermediate consumption when the basic change is EUR 10 million and the generalised basic change amounts to 10 per cent of the value of the yearly domestic supply in the product category. The total impacts of the 2005 basic change dp (= EUR 10 million) on the use of domestic products have been generalised as such for 2006–2008. This generalisation has been used as the basic change when the generalised basic change is 10 per cent of the domestic supply of the product category in 2006–2008. The estimated domestic supply of product categories 103, 13 and 14 in 2006–2008 is shown in Figure 3b.

The generalisation of the basic volume and price changes can also be made with respect to time. The latest analysed operating environment covered the year 2005. The manner in which the results are presented in this report makes the continuation of the time series into 2006–2008 an attractive option, and this has also been done in Figures 44a, 44b and 45. Statistical information covering the period 2006–2008 has also been presented in connection with the initial data for the calculations, which means that there is solid data on the trends of a number of key economic parameters. The clearest and most consistent trend can be seen in the employment impact of the basic volume change: there is a clear downward trend.

### 3.5 Other impact analyses in the operating environment

The operating environment can be analysed much more extensively than has been done in Chapters 3.2, 3.3 and 3.4 above. Opportunities presented by the method for evaluating the operating environment developed by the author are discussed in this chapter (Holmijoki 2002, 2005, 2007, Holmijoki et al. 2002, 2007).

The method involves the modelling and analysis of the operating environment. The modelling of the operating environment can be divided into the modelling of money flows and material flows. The modelling of money flows uses the basic-price supply and use tables of the national accounts (Figure 1). The supply and use tables cover all economic activities of the area under examination (usually a country). Economic activities are divided into industry classes, and economic interaction, into product categories of domestic and imported products. Use of the labour force and environmental loads generated in the industry are incorporated into the industry classes shown in the use table. If necessary, other additional information (such as investments, by investment category, or amounts of fuel used, by fuel) is also incorporated into the industry classes shown in the use table. Modelling of the material flows is based on industry-specific material-flow balances.

A supply and use table can be considered the operating environment of any industry appearing on it. The tables used in this report contained a total of 59 industry classes (Table 1a), which means that the tables represented the operating environments of 59 industries. The same tables contained 59 domestic and 59 foreign product categories (Table 1b), which means that the tables modelled the product markets of 59 product categories. If necessary, industry classes can be examined at the level of individual establishments, and product categories, at the level of the products created by individual establishments. The operating-environment tables can thus be tailored to the needs of any enterprise.

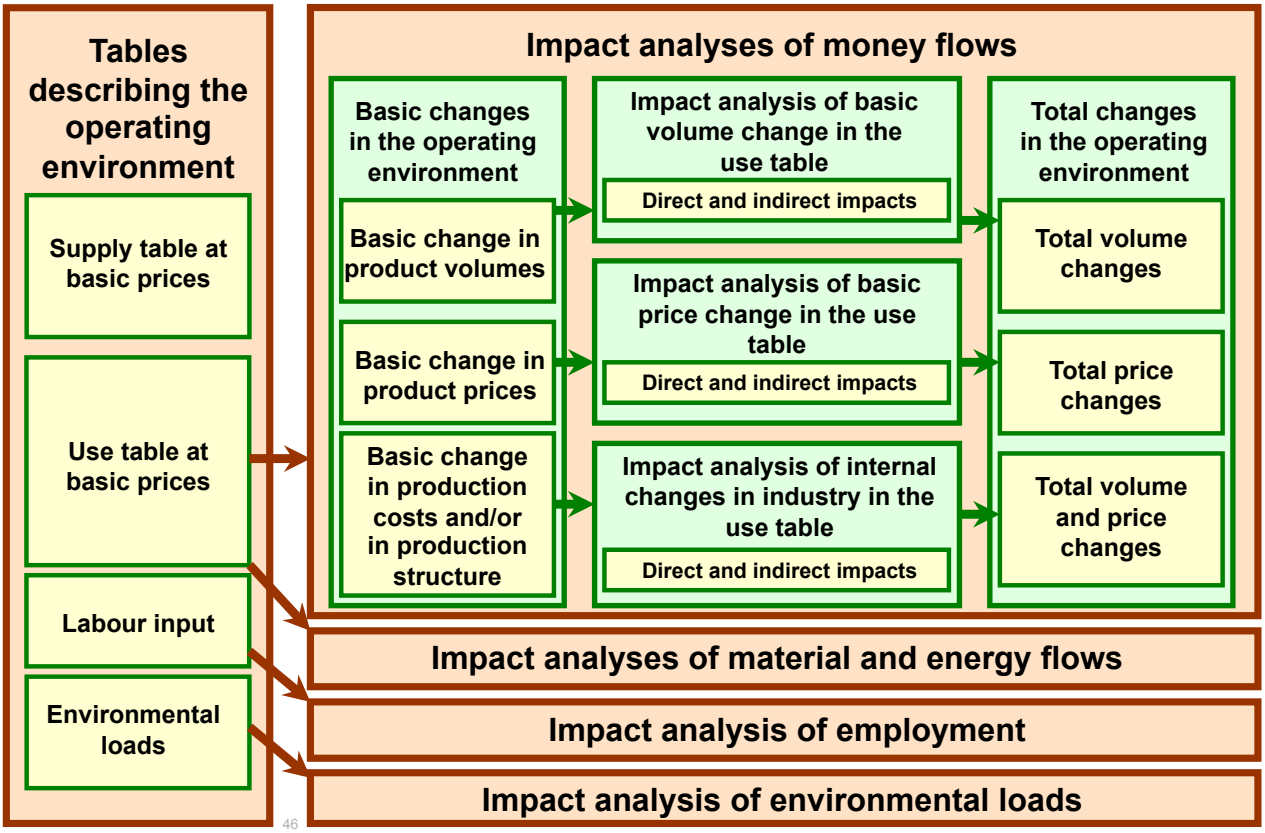


Figure 46. The processes for analysing the operating environment assessment method. The operating environment tables are shown in Figure 1. This report only makes use of the impact analyses covering the basic changes on product volumes and prices.

The analysis of the operating environment involves the money-flow impact analyses and the impact analyses of material and energy flows, use of the labour force and environmental loads (Figure 46). The analysis processes are based on economic input-output theory and are generally applicable. The analysis can be carried out on any industry class in the operating environment and any domestic or foreign product category.

The money-flow impact analyses are further divided into the basic changes in the volumes and prices of the products and the basic change in the production costs and/or production structure of the industry. The money-flow basic change refers to the direct change of EUR 10 million in the basic-price use table describing the operating environment. The total impact of the basic change refers to the direct and indirect impacts of the basic change in the operating environment. The process for calculating the total impacts of the basic change is called the basic-change impact analysis.

The total impacts of the basic changes occurring in the same operating environment can be generalised and combined into impact analyses of total changes in money flows. Generalisation means that the total impacts of a direct basic change of EUR dx million can be calculated by multiplying the total impacts of a basic change of EUR 10 million by multiplier k = dx/10. Combination means that generalised basic changes can be added together. In theory, generalisation and combination can be used for modelling any market situation in the product markets. Generalisation and combination of basic changes allows the forecasting and optimisation of situations arising on the product markets, for example with regard to employment impacts, degree of processing or environmental impacts.

Basic changes in material and energy flows are converted into basic changes in money flows using industry-specific material, energy and money-flow balances. An impact analysis is also carried out for each money-flow basic change. The total impacts of money-flow basic changes are converted into changes in commercial material flows, using unit prices of products. It is also possible to analyse the impacts of non-commercial material flows, such as waste recycling, on money flows.

The impact analysis of use of the labour force involves the accumulation of labour-force usage and employment-impact coefficients, by industry and product. For example, the accumulation of labour-force usage in an industry comprises domestic use of the labour force directly and indirectly generated by the industry and an estimate of the foreign labour force. The accumulation of labour-force usage corresponds to the labour-input accumulation for the product group ‘all products manufactured in the industry’, from primary production to the product group to be sold at the factory gate. The employment impact coefficient for the industry is equivalent to the labour-input accumulation of the product group ‘all products manufactured in the industry’, from primary production to the product group to be sold at the factory gate and divided by the industry’s output (= calculated per output unit).

The environmental-load impact analysis comprises the environmental-load accumulations and environmental-load coefficients, by industry and product. For example, the accumulation of the environmental loads in an industry comprises the environmental loads directly and indirectly generated by the industry in Finland and an estimate of the loads generated outside Finland. The accumulation of the environmental loads corresponds to the life cycle of the product group ‘all products manufactured in the industry’, from primary production to the product group to be sold at the factory gate. The more highly processed the product, the larger the proportion of the life cycle included in the calculations. The environmental-load coefficient for the industry corresponds to the environmental-load accumulation for the product group ‘all products manufactured in the industry’, from primary production to the product group to be sold at the factory gate and divided by the industry’s output (= calculated per output unit).

# 4 SUMMARY

The impact analyses of basic volume and price changes can be made for all industry classes in the operating environment and for all domestic and foreign product categories. All major stages of the processing chain can be analysed with the desired accuracy. The accuracy of the analysis depends on the manner in which the industry and product classification used in the operating environment is applied. The level of accuracy generally used in the national economy, containing 59 industry classes and 59 domestic and foreign product categories, is used in this report. The impact analysis for a basic volume change goes backwards in the processing chain. The impact analysis for a basic price change goes forwards in the processing chain. When the same impact analyses are made in several operating environments representing different years, the resulting information sheds light on the cause-effect relationships that have the greatest impact on the present situation and the changes in them in the processing chain. It follows from the economic input-output theory used that the total impact coefficients describing causation are independent of the size of the basic change.

Table 3 and Figures 47a and 47b show a summary of the impact analyses of the basic volume change of EUR 10 million in the mining and quarrying industry 103 (Extraction and agglomeration of peat), 13 (Mining of metal ores) and 14 (Other mining and quarrying) and their consumer industries 40 (Electricity, gas, steam and hot water supply), 23 (Manufacture of coke, refined petroleum products and nuclear fuel), 27 (Manufacture of basic metals), 21 (Manufacture of pulp, paper and paper products), 24 (Manufacture of chemicals and chemical products), 26 (Manufacture of other non-metallic mineral products) and 45 (Construction). The total impacts shown in Table 3 and Figures 47a and 47b are listed according to their order of magnitude in 2005.

The total impacts of the basic volume change on the industries' output and domestic production in the operating environment of 2005 was 1.20–1.98 times the basic volume change (Table 3). The industry increasing domestic production with the greatest degree of efficiency was the extraction and processing of peat, while the manufacture of refined petroleum products was the least efficient industry in this respect. The size of the impact was largely dependent on the value of domestic purchases vis-a-vis the value of the industry's production. In the time-series comparison, the biggest fluctuations have been in the total impacts of the mining of metal ores.

In the operating environment of 2005, changes in production volumes in industries 103 (Extraction and agglomeration of peat) and 45 (Construction) increased the gross domestic product and employment with the greatest degree of efficiency. The same industries also made the smallest contribution to the increase in imports. The manufacture of refined petroleum products and the manufacture of basic metals made the smallest contribution to the increase in the gross domestic product. These two industries also made the strongest contribution to the increase in imports, and their employment impact was also weak.

Table 3. Coefficient for the total impacts of the basic volume change occurring in industry I on the output of the industries in the operating environment and on domestic production in the operating environments for 1995–2005. The industries are listed in order of the total impacts for 2005. An example of the use of the total-impact coefficient: industry 27 increases its annual production volume by EUR 25 million which, in the operating environment of 2005, results in a total impact of 1.75*25 = EUR 43.7 million on the industries' output.

| | | Year | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Basic volume change** | **1995** | **1996** | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** |
| | **Industry I** | **Total impact coefficient on domestic production, € million / € million** | | | | | | | | | | |
| 1 | 103 Extraction and agglomeration of peat | 1.75 | 1.79 | 1.80 | 1.76 | 1.89 | 1.90 | 1.89 | 1.90 | 1.96 | 1.98 | 1.98 |
| 2 | 21 Manufacture of pulp, paper and paper products | 2.00 | 2.11 | 2.10 | 2.03 | 2.02 | 1.91 | 1.78 | 1.85 | 1.96 | 1.99 | 1.97 |
| 3 | 45 Construction | 1.84 | 1.88 | 1.88 | 1.88 | 1.88 | 1.93 | 1.90 | 1.92 | 1.93 | 1.92 | 1.90 |
| 4 | 14 Other mining and quarrying | 1.77 | 1.92 | 1.88 | 1.90 | 1.89 | 1.87 | 1.75 | 1.85 | 1.89 | 1.83 | 1.89 |
| 5 | 27 Manufacture of basic metals | 2.02 | 2.02 | 2.02 | 2.01 | 2.03 | 1.86 | 1.83 | 1.91 | 1.88 | 1.78 | 1.75 |
| 6 | 26 Manufacture of other non-metallic mineral products | 1.69 | 1.78 | 1.75 | 1.71 | 1.73 | 1.75 | 1.71 | 1.71 | 1.73 | 1.71 | 1.71 |
| 7 | 13 Mining of metal ores | 1.77 | 1.66 | 1.80 | 1.76 | 1.66 | 2.18 | 2.24 | 2.06 | 1.95 | 1.81 | 1.70 |
| 8 | 24 Manufacture of chemicals and chemical products | 1.69 | 1.74 | 1.66 | 1.66 | 1.64 | 1.64 | 1.60 | 1.64 | 1.66 | 1.63 | 1.62 |
| 9 | 40 Electricity, gas, steam and hot water supply | 1.47 | 1.52 | 1.53 | 1.56 | 1.60 | 1.56 | 1.50 | 1.47 | 1.50 | 1.45 | 1.47 |
| 10 | 23 Manufacture of coke, refined petroleum products | 1.43 | 1.30 | 1.24 | 1.32 | 1.30 | 1.29 | 1.26 | 1.25 | 1.22 | 1.22 | 1.20 |

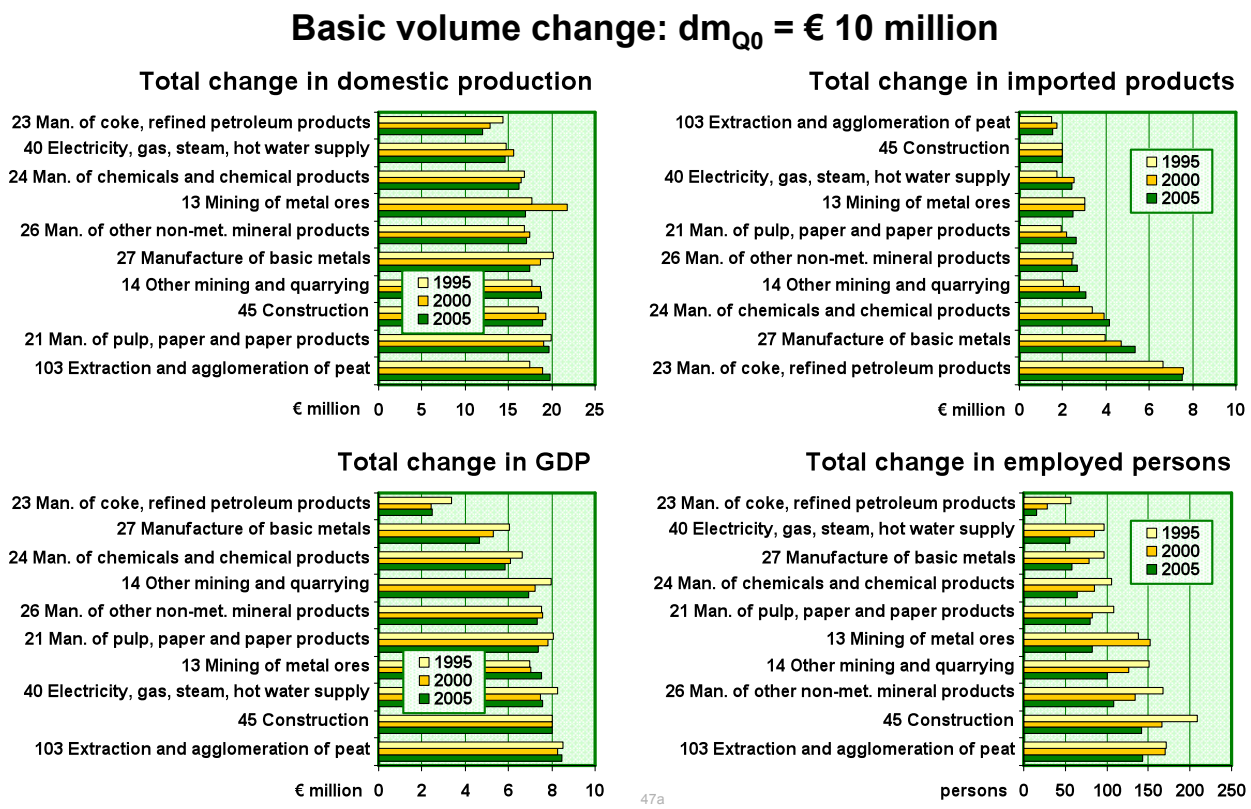


Figure 47a. Summary of the total impacts of the EUR 10 million basic volume changes on domestic production, imports, GDP and employment in 1995, 2000 and 2005. The order of the industries' total impacts is based on the numerical values for 2005. The total impact coefficient describing causation can be calculated by dividing the numerical value of the figure by the basic change (EUR 10 million).

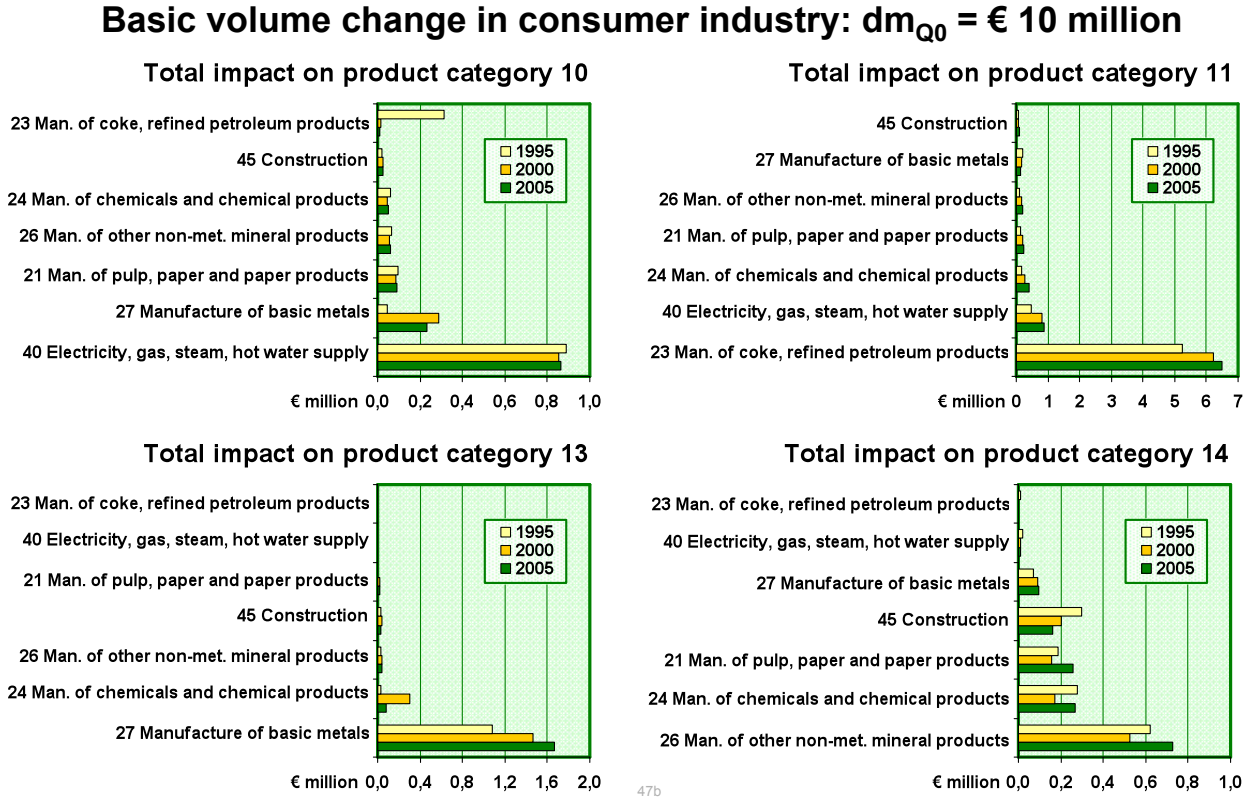


Figure 47b. Summary of the total impacts of the EUR 10 million basic volume change in a customer industry on the mining and quarrying product categories 10, 11, 13 and 14 (domestic and imported products) in 1995, 2000 and 2005. The order of the industries' total impacts is based on the numerical values for 2005. The total impact coefficient describing causation can be calculated by dividing the numerical value of the figure by the basic change (EUR 10 million).

When the years 1995, 2000 and 2005 are compared, the biggest changes have been in the employment impact. The trend was clearly downwards in all industries. Even though the total impacts of the basic volume change on the gross domestic product in proportion to the basic change remained unchanged (for example, Construction, Extraction and agglomeration of peat in Figure 47a), employment impacts became smaller when calculated per basic change. The decline in the employment impact is explained by an increase in labour productivity.

Practically all manufacture of refined petroleum products and basic metals was dependent on foreign mining and quarrying products. In addition to the use of peat, energy production also required substantial imports of coal, crude petroleum and natural gas. In relation to the production volumes, the largest amounts of domestic mining and quarrying products were processed by industry 26, which includes the manufacture of glass, building ceramics, cement, concrete, concrete products and stone products. The economic importance of the manufacture of paper and construction for mining and quarrying is based on the large volume of the industries.

Table 4 and Figure 48 show a summary of the impact analyses of the basic price change of EUR 10 million in the main mining and quarrying product categories 103 (Peat), 13 (Metal ores) and 14 (Other mining and quarrying products) and in the main product categories of the consumer industries.

The total impacts of the basic price change in the domestic product category on the output and domestic production of the industries in the operating environment of 2005 were 1.35–3.15 times the basic price change (Table 4). The greatest price pressures on domestic production resulted from changes in the price of peat and the smallest from construction. The size of the impact was largely determined by what proportion of domestic production in the industry class was used for intermediate consumption. In the time-series comparison, the biggest fluctuations have been in the price pressures caused by metal ores.

The price pressures generated by the mining and quarrying product categories were larger than the price pressures generated by the main product categories of the consumer industries. This is quite natural because mining and quarrying products are at the start of the processing chain. Correspondingly, construction or rather construction taking place at building sites is at the end of the processing chain, which means that changes in construction prices are not transferred to domestic production. Funding of construction and its impacts on the prices of domestic products are not considered in the calculations.

Table 4. Coefficient for the total impacts of the basic price change occurring in domestic product category I on the output of the industries in the operating environment and on domestic production in the operating environments for 1995–2005. The product categories are listed in order of the total impacts for 2005. An example of the use of the total-impact coefficient: The price of the domestic product category 27 increases so that the annual value of domestic production increases by EUR 25 million which, in the operating environment of 2005, results in an total impact of 1.66*25 = EUR 41.6 million on the industries' output.

| | | Year | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Basic price change** | **1995** | **1996** | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** |
| | **Domestic product category I** | **Total impact coefficient on domestic production, € million / € million** | | | | | | | | | | |
| 1 | 103 Peat | 3.31 | 3.20 | 3.11 | 3.35 | 2.96 | 3.56 | 3.37 | 3.43 | 3.30 | 3.57 | 3.15 |
| 2 | 14 Other mining and quarrying products | 2.40 | 2.48 | 2.46 | 2.44 | 2.47 | 2.35 | 2.45 | 2.42 | 2.52 | 2.51 | 2.62 |
| 3 | 13 Metal ores | 2.82 | 2.77 | 2.84 | 2.91 | 3.04 | 2.21 | 2.04 | 2.33 | 2.71 | 2.50 | 2.44 |
| 4 | 40 Electrical energy, gas, steam and hot water | 2.48 | 2.43 | 2.45 | 2.49 | 2.52 | 2.46 | 2.38 | 2.40 | 2.38 | 2.39 | 2.41 |
| 5 | 26 Other non-metallic mineral products | 2.10 | 2.09 | 2.11 | 2.14 | 2.14 | 2.15 | 2.06 | 2.05 | 2.05 | 2.05 | 2.09 |
| 6 | 23 Coke, refined petroleum products | 2.08 | 2.15 | 2.10 | 2.08 | 2.07 | 1.88 | 1.74 | 1.70 | 1.87 | 1.82 | 1.81 |
| 7 | 24 Chemicals, chemical products, man-made fibres | 1.96 | 1.94 | 1.83 | 1.86 | 1.87 | 1.75 | 1.73 | 1.64 | 1.76 | 1.76 | 1.74 |
| 8 | 27 Basic metals | 2.11 | 2.02 | 1.93 | 1.95 | 2.00 | 1.93 | 1.77 | 1.69 | 1.83 | 1.66 | 1.66 |
| 9 | 21 Pulp, paper and paper products | 1.64 | 1.65 | 1.52 | 1.52 | 1.54 | 1.50 | 1.45 | 1.41 | 1.54 | 1.50 | 1.52 |
| 10 | 45 Construction works | 1.34 | 1.34 | 1.33 | 1.32 | 1.32 | 1.34 | 1.33 | 1.36 | 1.36 | 1.35 | 1.35 |

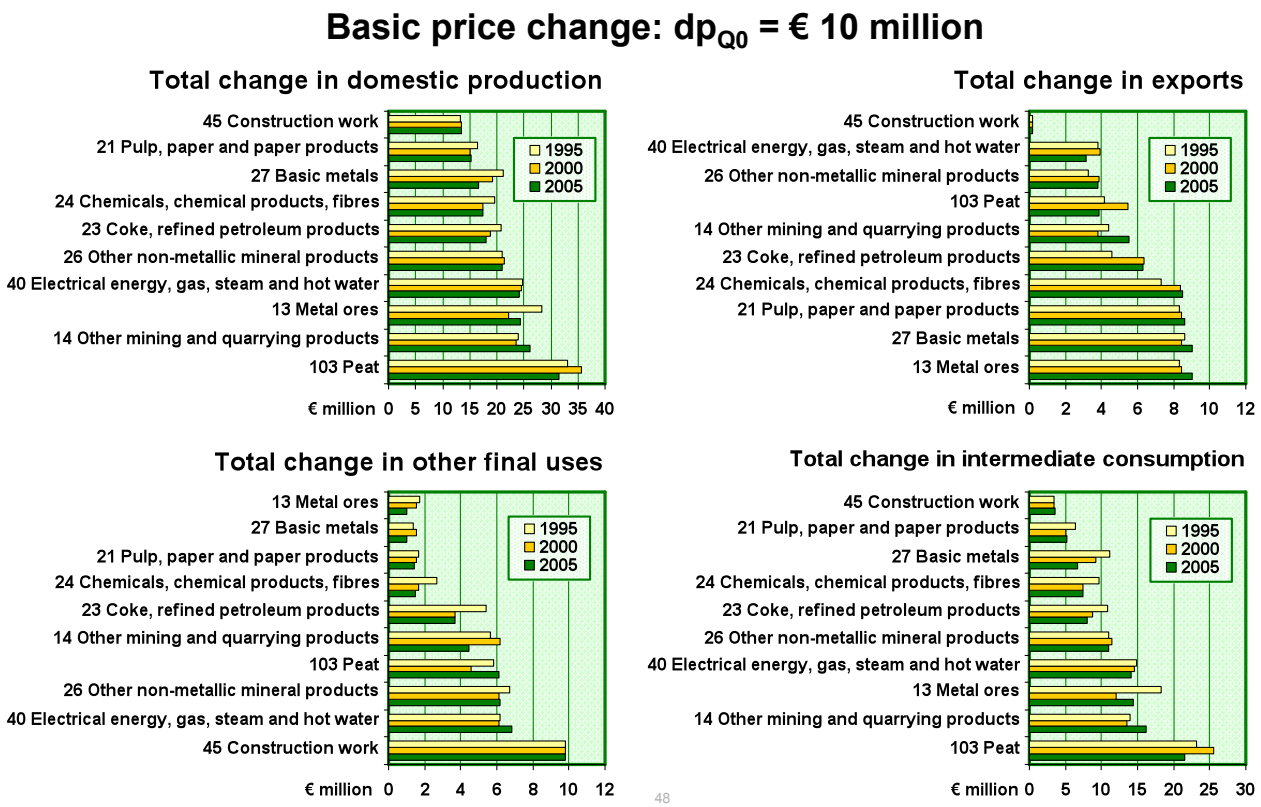


Figure 48. Summary of the total impacts of a EUR 10 million basic price change in a domestic product category on domestic production, exports, other final uses and intermediate consumption in 1995, 2000 and 2005. Only the prices of the domestic products are changed in the calculation process. The order of the total impacts is based on the numerical values for 2005. The overall impact coefficient describing causation can be calculated by dividing the numerical value of the figure by the basic change (EUR 10 million).

The total impacts of the basic change occurring in the same operating environment can be generalised and combined into impact analyses of general changes in money flows. The generalisation of the basic volume and price changes can also be made with respect to time. The latest operating environment which has been analysed and for which information is available covers the year 2005. The manner in which the results are presented in this report makes the continuation of the time series into 2006–2008 an attractive option. Statistical information covering the period 2006–2008 has also been presented in connection with the initial data for the calculations, which means that there is solid data on the trends of a number of key economic parameters. The clearest and most consistent trend can be seen in the employment impact of the basic volume change: there is a clear downward trend, which should be taken into account when predicting employment impacts.

An impact analysis provides information on the total impacts of a basic change in production volumes or prices, in other words, the direct and indirect impacts on all industry and product categories in the operating environment. Generalisation and combination of basic changes allows the forecasting and optimisation of situations arising on the product markets, for example with regard to employment impacts, degree of processing or environmental impacts. The results of the impact analyses can be used in commercial, strategic decision-making processes and in political decision-making.

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The economic interaction between the mining and quarrying industries and their consumer industries in Finland was modelled with the basic-price supply and use tables normally used for the national economy. The economic interactions were analyzed via impact analyses of basic volume and price changes based on national economic input-output analyses. A basic volume change refers to a market situation where an industry increases the production volume of its own main products and by-products so that the industry's direct, annual production value rises by € 10 million. A basic price change refers to a market situation where the price of a domestic product increases so that the direct annual value of supply of the product rises by € 10 million.

The impact-analysis results provide information about the economic cause-effect relationships between the mining and quarrying industries and their consumer industries and about the employment impacts for the years 1995–2005. From the source-data time series, it is possible to estimate the development of the economic cause-effect relationships and the employment impacts for the years 2006–2008. The impact-analysis results can be used both in corporate, strategic decision-making processes and in political decision-making. The publication is available in both Finnish and English.

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