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The climate challenge

Economic aspects of the Community's strategy for limiting CO_2 emissions

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Directorate-General for Economic and Financial Affairs

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The climate challenge[1]

Economic aspects of the Community's strategy for limiting CO_2 emissions

Statistical annex[2]

Long-term macroeconomic series

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1 This study was prepared by Gert Jan Koopman, Matthias Mors and Jan Scherp under the direction of Pierre Buigues and Horst Reichenbach. The authors wish to thank Juan Climent Leal, Rui Pericao and Maarten Van de Stadt for statistical assistance and Thérèse Delplace-Brangan for secretarial support. This study draws heavily on a separate volume of expert studies entitled 'The economics of limiting CO_2 emissions', published as a special edition of *European Economy*. The manuscript of this study was finalized on 29 April 1992.

2 This document has been prepared under the sole responsibility of the Directorate-General for Economic and Financial Affairs.

Abbreviations and symbols used

Countries

B	Belgium
DK	Denmark
D	Germany
GR	Greece
E	Spain
F	France
IRL	Ireland
I	Italy
L	Luxembourg
NL	The Netherlands
P	Portugal
UK	United Kingdom
EUR 9	European Community excluding Greece, Spain and Portugal
EUR 10	European Community excluding Spain and Portugal
EUR 12	European Community, 12 Member States

Currencies

ECU	European currency unit
BFR	Belgian franc
DKR	Danish krone
DM	Deutschmark
DR	Greek drachma
ESC	Portuguese escudo
FF	French franc
HFL	Dutch guilder
IRL	Irish pound (punt)
LFR	Luxembourg franc
LIT	Italian lira
PTA	Spanish peseta
UKL	Pound sterling
USD	US dollar
SFR	Swiss franc
YEN	Japanese yen
CAD	Canadian dollar
ÖS	Austrian schilling

Other abbreviations

ACP	African, Caribbean and Pacific countries having signed the Lomé Convention
ECSC	European Coal and Steel Community
EDF	European Development Fund
EIB	European Investment Bank
EMCF	European Monetary Cooperation Fund
EMS	European Monetary System
ERDF	European Regional Development Fund
EUA	European unit of account
Euratom	European Atomic Energy Community
Eurostat	Statistical Office of the European Communities
GDP (GNP)	Gross domestic (national) product
GFCF	Gross fixed capital formation
LDCs	Less-developed countries
Mio	Million
Mrd	1 000 million
NCI	New Community Instrument
OCTs	Overseas countries and territories
OECD	Organization for Economic Cooperation and Development
OPEC	Organization of Petroleum Exporting Countries
PPS	Purchasing power standard
SMEs	Small and medium-sized enterprises
SOEC	Statistical Office of the European Communities
toe	Tonne of oil equivalent
:	Not available
—	Nil

Highlights

1. **The problem:** There is growing concern about the risks of global climate change, caused by the increased emissions and atmospheric concentrations of greenhouse gases, emanating from human activities. It is generally recognized that, without policy action, worldwide emissions and, consequently, atmospheric concentrations of these gases, and in particular carbon dioxide (CO_2), are set to increase significantly. Although there is still a considerable degree of uncertainty as to the resulting increases in global mean temperatures, scientists fear that the potential economic, environmental and geophysical effects of the forecast increase in temperatures — including rising sea levels, increased intensity of storms, extinction of certain plant and animal species and disrupted agriculture — could be severe.

2. **The Community's leading role:** Against this background, the European Community has committed itself to stabilizing, by the year 2000, total CO_2 emissions in the Community as a whole at 1990's level and to envisaging progressive emission reductions at the time horizon 2005 and 2010. The Community and Member States thus aim to play a leading role in international efforts to limit human interference with the climate system. To this purpose, the Commission has proposed a Community strategy to limit carbon dioxide emissions and to improve energy efficiency (SEC(91) 1744). On 13 December 1991, a joint Energy/Environment Council expressed its appreciation of the Commission's proposal and recognized it as an important step in the process of developing measures which will enable the Community and its Member States to achieve the Community objective. The Council also recognized that, in order to reach the CO_2 stabilization target in a cost-effective way, higher energy pricing through the use of fiscal instruments is likely to be needed to complement national and Community energy efficiency programmes. It noted, however, that the introduction of Community-wide taxation would raise a range of complex issues requiring further study. Such issues include the economic and social consequences of the proposed tax, the sectoral implications and the most appropriate base of this tax. This report, together with the accompanying special volume of expert studies, provides economic analysis and evidence on these issues.

3. **The composition of the Community strategy:** In order to attain the desired emission limitation in an economically sound way, a mix of different policy instruments is required. Thus, the Community strategy combines, first, so-called 'no-regrets' policies, i.e. policy measures that should be undertaken even without reference to global climate change; second, Community-wide fiscal instruments; and third, in line with the subsidiarity principle, complementary national measures adapted to each Member State's specific circumstances. In particular, the 'no-regrets' component of the strategy, notably measures promoting the rational use of energy, for example of the kind envisaged in the Community's SAVE programme, are of central importance for attaining the emission stabilization target at a low cost or even at an economic benefit.

4. **The role of carbon/energy taxation:** The quest for cost-effectiveness also implies the need for the application of broad-based and Community-wide policy instruments using the market mechanism for reducing carbon dioxide emissions. In view of the transnational nature of the problem, and taking into account the important potential implications for competitiveness, the application of the subsidiarity principle leads to the conclusion that the use of such policy instruments should be decided at Community level. In this context, the choice of a Community-wide tax has the clear advantage that emissions are reduced where the costs of emission reduction are lowest. An alternative approach, based on the idea of reducing emissions where this would appear fair rather than where the costs are lowest, would indeed be very expensive. Instead, the aim for an equitable sharing of the burden should be dealt with by relying on the policy instruments appropriate for dealing with this equity aspect, both at the national and the Community level.

5. **The design of the carbon/energy tax:** The economic guiding principle is that the modalities of a carbon/energy tax have to be designed such as to attain the Community's objectives with as little cost as possible. In addition, equity considerations are of considerable importance. Although, from a strictly economic point of view, a pure carbon tax is likely to be an efficient policy instrument for specifically reducing CO_2 emissions, the Community's multiple policy objectives (e.g. the reduction in greenhouse gas emissions other than CO_2, energy-supply security, economic and social cohesion) may, in reality, be better served with a combined carbon/energy tax. As to the choice between a tax on the production or import of primary energy or a tax on energy products for final consumption, a balance will have to be struck between the economic and environmental advantages of taxing conversion and transmission losses and fiscal considerations. This could consist, for example, of a specific treatment of electricity generation. Economic efficiency also requires that any possible exemptions are strictly limited to those branches or companies where the risk of a delocalization of emissions is greatest.

6. **The macroeconomic effects of the carbon/energy tax:** The macroeconomic effects of the introduction of a carbon/energy tax in terms of economic activity, employment and inflation can be expected to be small provided a few key

factors are taken into account. First, the revenue neutrality of the tax: while without a redistribution of the tax revenues ('revenue recycling') the introduction of the tax would tend to raise the aggregate price level and to have a negative impact on economic activity, offsetting tax cuts can be expected to restore aggregate demand without necessarily reducing aggregate supply. Second, although adjustment will be necessary and entail some costs, these costs will be low if markets are flexible and the tax is phased in gradually and predictably. Third, even abstracting from the environmental benefits, the introduction of such a tax could have positive impacts on economic welfare, if the tax revenues were used for increasing the economy's structural adjustment potential and for lowering existing, strongly distortionary taxes.

7. **The sectoral effects:** The likely impact of the tax on different industrial sectors not only depends on the respective energy intensity of output, but also on the magnitude of the effect on output prices, the intensity of international trade and the demand response to higher output prices. From the analysis in this report it becomes clear that, in the short term, the impact strongly depends on the initial sectoral cost structure, which in turn reflects the sectoral energy intensity as well as the existing level of energy prices. In the longer term, dynamic adjustment and substitution effects are likely to change the initial sectoral picture considerably. An analysis of the present situation reveals that, for the great majority of manufacturing industry, energy costs only represent between 0 and 5% of total production costs. These sectors represent approximately 85% of industrial employment. There is, however, a small group of potentially sensitive and moderately sensitive branches, some of which are exposed to international competition. Generally, the total effect of the revenue-neutral introduction of a CO_2/energy tax is likely to lead to a relatively strong output price increase for energy-intensive branches (unless, of course, these branches are partially or totally exempted in exchange for voluntary agreements), very moderate increases or even decreases for the other manufacturing branches and moderately strong price decreases for services. Moreover, the sectoral effects will also strongly depend on the precise type of revenue recycling.

8. **The effects in terms of household income distribution:** Private households' purchasing power will be affected directly by higher taxes on household purchases of domestic energy and motor fuels and indirectly by the tax incidence on industrial producer prices. The immediate impact of the imposition of a carbon/energy tax is therefore mainly determined by present spending patterns. In this context, it is worth noting that the impact of a USD 10 per barrel of oil equivalent carbon/energy tax would only represent between 0,5 and 1,3% of total household expenditure. The evidence presented in this report reveals that poorer households tend to devote a relatively higher share of their expenditure to the direct purchase of domestic energy compared to high-income households. This contrasts, however, with a lower share for motor fuels. As a result of these two opposing trends, and assuming unchanged spending patterns, a CO_2/energy tax is only slightly regressive. Over the medium and long term, households will substitute away from highly taxed products. The short-term, static tax incidence may therefore be different from the long-term dynamic incidence due to a change in household spending patterns. Moreover, the overall impact of a CO_2/energy tax on different household classes not only depends on this tax, but also on the incidence of the offsetting reduction in other taxes implied by the revenue-neutral introduction of a carbon/energy tax and on the incidence of the benefits in terms of lower environmental damage from energy use, both of which are difficult to assess at this stage.

9. **Inter-country differences in the likely impact of the tax:** The evidence presented in this report does not allow any firm conclusions to be drawn as to possible systematic differences in the economic impact of the tax across Member States. In particular as far as the macroeconomic impact is concerned, different models arrive at different conclusions in terms of economic and social cohesion in the Community. Concerning the sectoral impact, it appears that in sectors moderately sensitive to energy cost increases, the direct energy cost shares are higher in southern Member States than in northern Member States. These differences seem to be largely due to differences in production technologies. Moreover, it appears that in the case of a tax on final energy consumption, inter-country differences in the impact of the tax on producer prices generally tend to be smaller than for a tax on the production or import of primary energy. This points to the fact that conversion losses differ significantly among Member States. As to the impact in terms of household income distribution, there is some evidence pointing towards a more pronounced regressiveness in some northern Member States, in particular Ireland and the United Kingdom. Inter-country differences appear to be larger in the case of a pure carbon tax compared to a pure energy tax.

10. **The international dimension:** Clearly, climate change being a global phenomenon, the policy response should also be a global one. Nevertheless, both ethical and economic arguments would indicate that industrialized countries should take the lead. In this context, the analysis presented in this report points to the conclusion that, although some industrial branches might be significantly affected, the macroeconomic costs of European leadership are likely to

be small. Not only do extra-EC exports represent only a small part of Member States' GDP, in particular as far as trade in energy-intensive products is concerned, but a revenue-neutral introduction of a CO_2/energy tax would also ensure that potential losses in aggregate competitiveness would be very limited. Over the longer term, there could even be advantages in moving first. Nevertheless, as the Community only represents 13% of worldwide CO_2 emissions, broader OECD action is indispensable in order to have a noticeable effect on worldwide emissions. In the long run, ways have to be found to integrate at least the major fossil-fuel-consuming Eastern European and developing countries into efforts to slow down global climate change. Even a united effort by industrialized countries will not be sufficient to reach ambitious CO_2 emission limitation targets. There is clear evidence that, pending a worldwide greenhouse gas emissions limitation agreement, there is already at present a potential for energy conservation, and therefore CO_2 emission reduction, the exploitation of which would be economically rational. Even without reliance on global, market-based policy instruments like carbon taxes or tradable permits, there are a series of innovative policy instruments which could be used immediately for the mutual economic benefit of both developing and industrialized countries.

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Introduction

Since the 1970s, climate researchers have pointed to the possibility of a global temperature rise due to the emission of man-made trace gases. In the 1980s, a series of warm years and some extreme climatic disturbances have helped to make global warming a major political issue. As a consequence, the Intergovernmental Panel on Climate Change (IPCC) was established in 1988, charged with conducting an international scientific assessment programme. The conclusions that the basic theory of climate change is unchallengeable and the world has been getting warmer, broadly supported the growing scientific concerns. The findings of the IPCC and other climate research forums indicate the possibility of considerable future temperature increases and consequent socio-economic damage through, for instance, the flooding of low-lying land due to rising water levels of oceans and the shift of climate zones. Concerned by the potential implications of climate change, the Community has taken political action.

On 29 October 1990 a joint Council of Energy and Environment Ministers declared that the European Community and Member States are willing to take action aimed at stabilizing total CO_2 emissions by the year 2000 at 1990's level in the Community as a whole. Although the Community is only responsible for 13% of worldwide carbon dioxide emissions, ministers agreed that the EC and Member States should play a leading role in tackling the problems of man-induced climate change. As a response to this Council decision, the Commission of the European Communities presented, on 14 October 1991, a Community strategy to limit carbon dioxide emissions and to improve energy efficiency (SEC(91) 1744) (see Commission of the European Communities (1991b)).

On 13 December 1991, another joint Energy/Environment Council expressed its appreciation of this communication and recognized it as an important step in the process of developing measures which will enable the Community and its Member States to achieve the Community objective. Furthermore, the Council recognized that, in order to reach the CO_2 stabilization in a cost-effective way, higher energy pricing through the use of fiscal instruments is likely to be needed to complement national and Community energy efficiency programmes. The joint Council fully recognized, however, that the introduction of Community-wide taxation would pose a range of complex issues requiring further study. Such issues include the (macro)economic and social consequences of the proposed tax, the sectoral implications and the most appropriate base of this tax.

This report, together with the accompanying special volume of expert studies, is intended to provide some additional evidence and economic analysis on these issues. It is aimed at giving first answers to the main economic questions that arise in the context of policies to limit global climate change.

Part A first gives the necessary factual background for the economic analysis. What are the causes of global warming and what is at stake? Why focus on CO_2 emissions? What and where are the sources of CO_2 emissions? Furthermore, the economic approach to responding to the risks of anthropogenic climate change is sketched out.

The chapters in Part B present the economic reasoning underlying the proposed Community strategy for limiting CO_2 emissions. Does it make economic sense to limit CO_2 emissions? If yes, how should emissions be reduced in the European Community? Why a combined carbon/energy tax? What are the requirements to the tax design in order to ensure economic efficiency?

On this basis, the likely economic impact of the proposed combined carbon/energy tax in the Community is investigated in Part C by distinguishing the macroeconomic from the sectoral and distributional effects. What are the likely macroeconomic costs of introducing such a tax? Which factors determine the size of these costs? How do such costs differ between Member States? Which sectors and industrial branches are likely to be most sensitive to tax-induced increases in the costs of energy? Will poorer households be more strongly affected by such a tax than high income households?

In Part D, the analysis is extended to the international dimension of the problem. What can be done to reach a broad international agreement for limiting CO_2 emissions? What might be the costs of European leadership within the group of industrialized countries? How could the emission reduction potential in developing countries be exploited?

Finally, the main results of the analysis presented and the answers given in this report are summarized and some (tentative) conclusions are drawn.

Part A

Points of departure

The first part of the study provides the necessary background information to grasp the nature and the amplitude of the problem. It sketches out the political commitments taken in the Community and in the world to limit global warming and discusses the economic approach to respond to the risks implied by man-made climate change.

1. Greenhouse gas emissions and limitation targets

1.1. Pattern and forecast of CO_2 and other greenhouse gas emissions

Climate change has been identified as one of the major global environmental threats to mankind today. The problem is considered to be as important as that of the ozone hole — the depletion of the stratospheric ozone layer — which gives way to hard UV radiation from the sun which is dangerous to flora and fauna. Although both problems are, to some extent, linked, both in causes (rising atmospheric concentrations of chlorofluorocarbons (CFCs)) and measures to remedy them (reduction of CFC emissions), man-induced climate change is a much broader challenge than ozone depletion. Not only is the number of atmospheric trace gases involved much larger, but also the importance of the economic activities responsible for the emission of these gases is much greater. As a result, the economic costs (and benefits) at stake are orders of magnitude higher in the case of global warming compared to the depletion of the ozone layer. Even though both problems partly require similar policy action, this publication is limited to the analysis of global warming.

This introductory chapter provides some background information on the scientific basis of global warming, the relative importance of carbon dioxide (CO_2) and other gases contributing to the greenhouse effect and on the economic activities which are the underlying sources of emissions. Furthermore, the current and forecast regional pattern of CO_2 emissions in the world and within the European Community will be presented. Finally, the latest international convention to reduce emissions of CFCs and the commitments of some governments to CO_2 emission limitation targets will be highlighted.

The present situation

Global warming, the constant increase of mean global temperature due to the enhanced greenhouse effect (see Box 1 'The science of global warming'), is caused by increasing concentrations of so-called greenhouse gases: carbon dioxide (CO_2), ozone (O_3), chlorofluorocarbons (CFCs), nitrous oxide (N_2O) and stratospheric water vapour (H_2O). The increasing concentration of these gases in the atmosphere is due to emissions which are generated by human activities (burning of fossil fuels, changes of land use, release of industrially produced CFCs, etc.).

Trace gas emissions from these human activities lead, according to the evidence from climate modelling studies, observations and the sensitivity analyses undertaken by the IPCC to an increase of the global mean surface temperature of between 1,5° and 4,5°C, when the concentration of carbon dioxide in the atmosphere will have doubled (see IPCC, 1990a). Such global temperature increases would probably have substantial consequences, for example, an increased moisture stress in specific southern regions, shifting climate zones and melting of glacial ice which could lead to an increase in the level of the oceans. These phenomena could cause considerable damage to agriculture, industrial installations, housing and to the biosphere.

In order to conceive an efficient policy to tackle the problem of global warming, an important first step is to identify the relative importance of the different greenhouse gases.

Scientifically sound calculations of the contribution in per cent of each gas to global warming, have to take into consideration the following:

(i) the absolute quantity of emissions for each gas,

(ii) the specific radiative forcing per molecule of the different gases,[1]

(iii) the atmospheric lifetime of the different types of radiatively active gases.

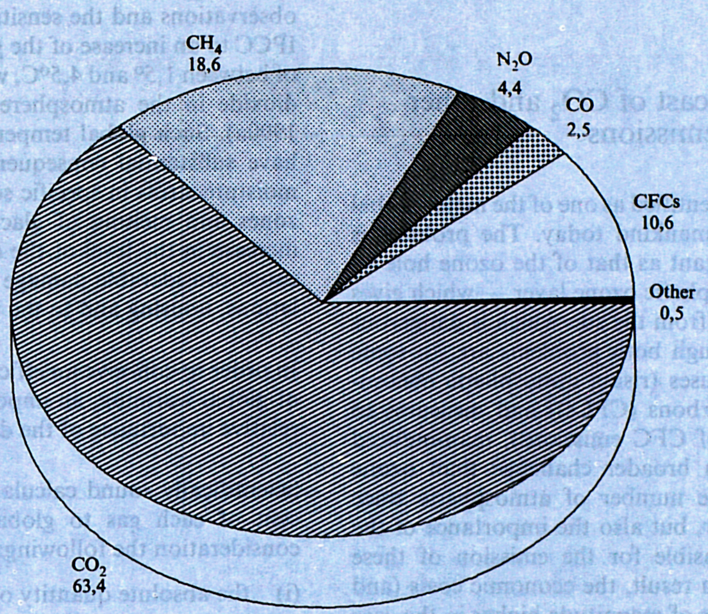
Emissions of CO_2 contribute most to global warming

In order to be able to compare the relative importance of greenhouse gas emissions individual emissions have been calculated according to the above considerations on a CO_2 equivalent basis using IPCC global warming potentials for a 100-year time horizon.

It becomes apparent that carbon dioxide is the most important gas on a global scale. In 1985, it contributed almost two-thirds of the man-made greenhouse gas emissions (see Graph 1). Methane (CH_4) and chlorofluorocarbons (CFCs) account for roughly 20% and 10% respectively of total greenhouse gas emissions.

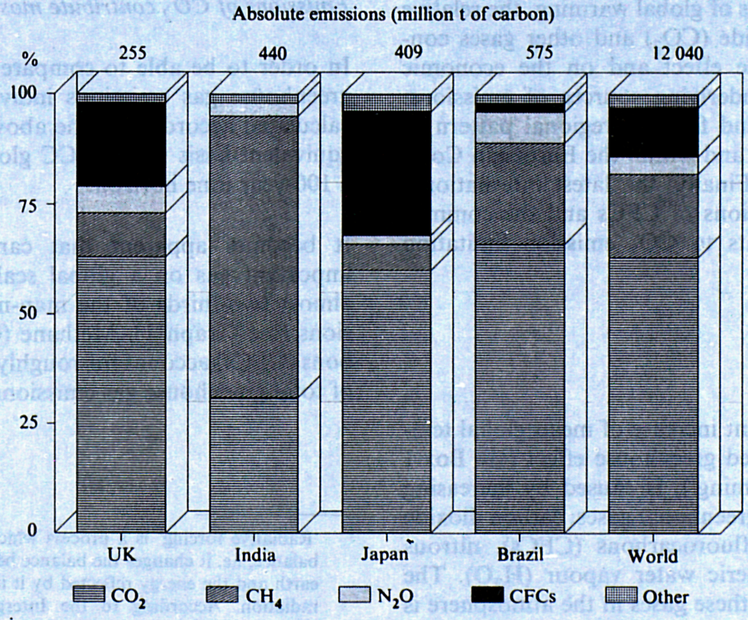
[1] 'Radiative forcing' is a process which influences the earth's radiation balance, i.e. it changes the balance between the energy absorbed by the earth and the energy reflected by it in the form of long-wave infra-red radiation. According to the Intergovernmental Panel for Climate Change (IPCC), this radiative forcing potential of different greenhouse gases relative to that of carbon dioxide (CO_2) is: 21 times for methane, 290 times for nitrous oxide and between 3 500 and 7 300 times for CFCs (all calculated on a 100-year horizon). See IPCC (1990a).

GRAPH 1: Global greenhouse gas emissions by gas, 1985 (shares in % of total)



NB: Calculated on a CO_2 equivalent basis using IPCC global warming potentials for a 100-year time horizon.
Source: EPA.

GRAPH 2: Greenhouse gas emissions by gas in selected countries, 1985



NB: Emissions on a CO_2 equivalent basis.
CO_2 emissions are calculated from fossil fuel consumption, cement production and deforestation.
Source: EPA.

Differences between countries are however considerable

According to the specific sectoral specialization, characteristics of the energy sector and other factors of different countries in the world, the relative importance of individual gases in greenhouse gas emissions varies considerably as can be seen from Graph 2. For instance, due to a large agricultural sector, methane emissions are comparatively large in India, whereas in Japan, the sophisticated industrial sector is at the origin of relatively high CFC emissions.

The pattern of greenhouse gas emissions in the Community is dominated by carbon dioxide but more biased towards CFCs than on world level

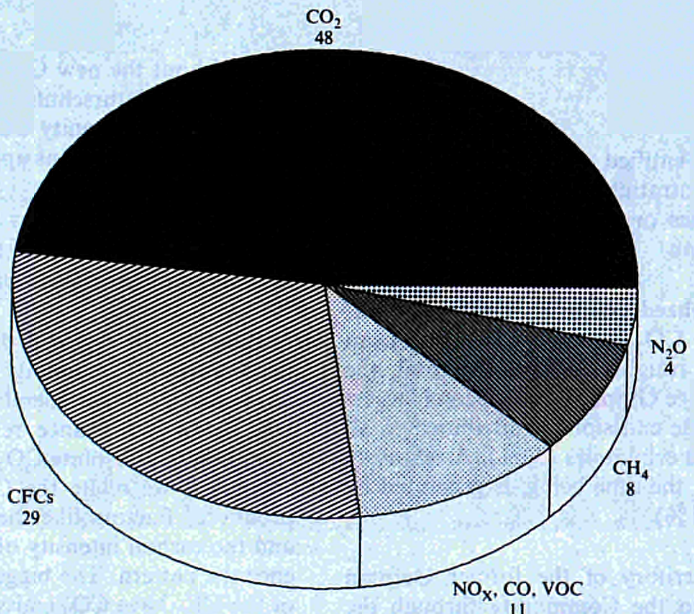
Looking at the pattern of greenhouse gas emissions in the European Community, some differences become apparent compared with the global pattern. In the EC, emissions of CFCs take a more important part (29%) in total greenhouse gas emissions than on a global scale due to the existence of CFC production and its numerous industrial applications in Europe (see Graph 3). Carbon dioxide is still the most important greenhouse gas with a share of 48% of total emissions. Methane, on the contrary, reaches only a share of 8% corresponding to the small agricultural sector in the EC compared with its importance in the world.

Energy production and use are the economic activities which account for the largest part of man-made greenhouse gas emissions

In the energy sector, CO_2, through the combustion of fossil fuels, and methane (CH_4), through coalmining and venting of natural gas, contribute to around 50% of the radiative forcing of all greenhouse gases (see Table 1). Among the other economic activities, the production and use of CFCs in industry as well as deforestation and biomass burning in the forestry sector account for a major part of radiative forcing.

Changes in land use (deforestation, afforestation) constitute an important factor influencing the global carbon cycle. Deforestation, mainly through the clearing of tropical rain forests, causes between 10 and 30% of total anthropogenic emissions of CO_2, the most weighty greenhouse gas (see Deutscher Bundestag, 1990). But forests are also a considerable sink of atmospheric CO_2 due to the vegetal carbon absorption through photosynthesis. Thus, afforestation can reduce the atmospheric concentration of CO_2.

GRAPH 3: Greenhouse gas emissions in the Community, 1989 (% of CO_2 equivalents)



NB: Calculations based on IPCC global warming potential factors.
VOC: Volatile organic compounds.
Source: McKinsey and Company.

Table 1

Anthropogenic greenhouse gas sources by economic activity

Activity/sector	Gas	Source	Relative contribution to radiative forcing in the 1980s (%)
Energy production and use	CO_2	Combustion of fossil fuels for industrial, commercial, residential, transportation and other purposes	46 ± 8
	CH_4	Coalmining and venting of natural gas	
Industry	CFCs	Production and use in various industrial processes	24
Forestry	CO_2, CH_4, N_2O	Deforestation, biomass burning, including wood fuel and other changes in land-use practices	18 ± 8
Agriculture	CH_4	Rice cultivation, livestock Use of nitrogenous fertilizers	9 ± 4
Other sources	CO_2	Cement manufacturing	3 ± 1
	CH_4	Land fills	

Source: IPCC (1990b).

Industrialized countries account for the major share of CO_2 emissions

Carbon dioxide has been identified as the most important greenhouse gas. Thus, concentrating on this gas, it is interesting to know which countries or world regions contribute most to global CO_2 emissions.

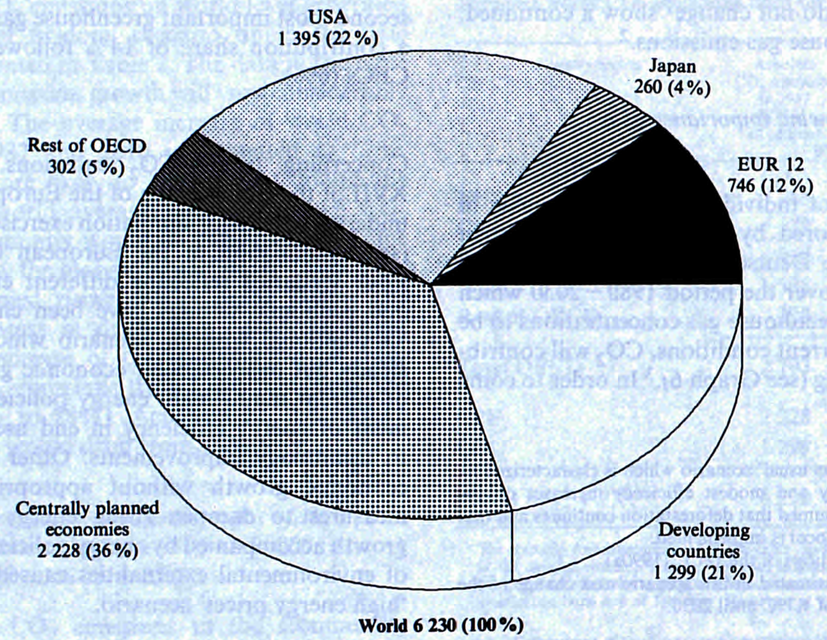
In 1987, Western industrialized countries emitted aproximately 43% of total world CO_2 emissions. The European Community accounted for roughly 12% of the total, the USA 22%, and Japan 4% (see Graph 4). The second largest share in total carbon dioxide emissions is attributed to all (formerly) centrally planned economies (36%). A relatively small part of emissions, for the time being, is generated by the developing countries (21%).

In December 1990, the territory of the former German Democratic Republic joined the Community through the unification with the Federal Republic of Germany. By this event, the CO_2 emissions balance of Germany and of the Community was 78 million tonnes of carbon higher in 1990 than without the new German *Länder* (see Bundesminister für Umwelt, Naturschutz und Reaktorsicherheit, 1991). This increase of Community CO_2 emissions brings the EC share in global CO_2 emissions approximately up to 13%.

The pattern of Community CO_2 emissions is determined by the criteria of measurement

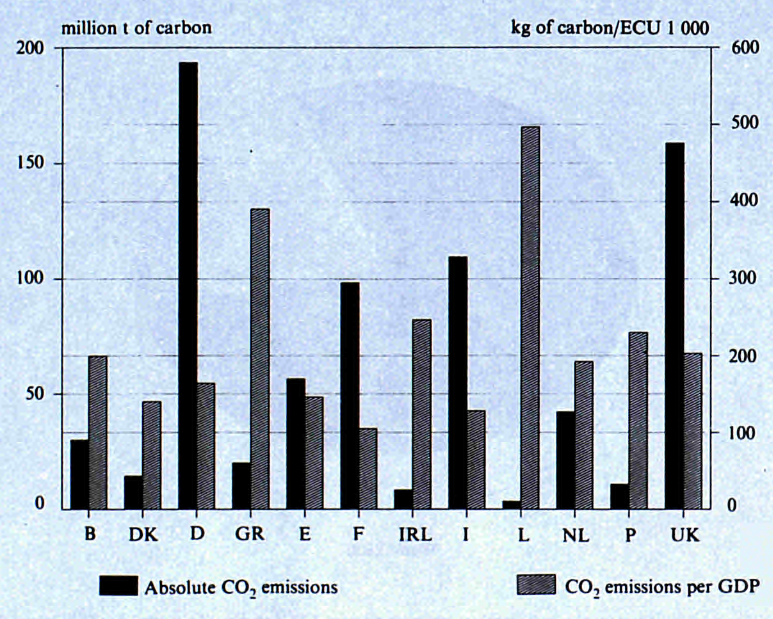
Turning to the regional distribution of CO_2 emissions in the European Community Graph 5 clearly shows that the economically larger member countries like Germany, the UK, Italy and France represent the lion's share of the Community's absolute CO_2 emissions. However, the picture changes if we relate the CO_2 emissions per unit of GDP produced. Factors like the energy intensity of production and the carbon intensity of energy consumption now influence the pattern. The bigger economies, with the exception of the UK, have CO_2 emissions per GDP equal to or below the Community average. Smaller countries like Luxembourg, Greece, Ireland and Portugal take the lead in per GDP emissions.

GRAPH 4: Regional distribution of CO_2 emissions from fossil fuels, 1987 (million t of carbon)



Source: Commission services.

GRAPH 5: CO_2 emissions in the Community, 1990 (absolute and per GDP emissions)



Source: Commission services.

Forecast future emissions

Projections of future emission trends based on the assumption that current policies do not change[1] show a continued, strong increase in greenhouse gas emissions.[2]

CO_2 is likely to have a growing importance as a greenhouse gas in the future

The relative importance of individual greenhouse gases in the future has been explored by experts for the German Enquête-Commission (see Deutscher Bundestag, 1989). In an intermediate scenario over the period 1980 – 2030 which assumes the changes of greenhouse gas concentrations to be roughly comparable to current conditions, CO_2 will contribute 72% to global warming (see Graph 6).[3] In order to come to this estimate, it has further been assumed that CFC emissions will be reduced in all countries according to the Montreal Protocol (see Section 1.2). Methane would be the second most important greenhouse gas, far behind CO_2 with a contribution share of 14% followed by N_2O (8%) and CFCs (6%).

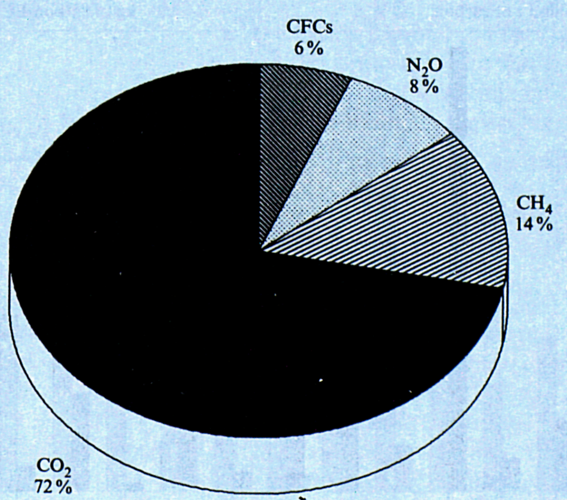
Concerning future CO_2 emissions, Directorate-General XVII of the Commission of the European Communities has undertaken a major simulation exercise of different scenarios (see Commission of the European Communities, 1990a). Four scenarios reflecting different energy-related political and economic settings have been chosen. They include a 'conventional wisdom' scenario which is characterized by steady but unspectacular economic growth, a continuation of current mainstream energy policies and slight improvement of energy efficiency in end use and production due to technology improvements. Other scenarios reflect high economic growth without appropriate energy efficiency measures to dampen rising energy consumption, strong growth accompanied by energy policies aiming at a reduction of environmental externalities caused by energy use and a 'high energy prices' scenario.

1 The IPCC used a 'business as usual' scenario which is characterized by coal-intensive energy supply and modest efficiency increases on the demand side. It is further assumed that deforestation continues and that for CFCs the Montreal Protocol is implemented.

2 See, for instance, the calculations of the IPCC (1990a).

3 Global warming has been estimated in this scenario at a change of the global surface temperature of 1,7°C until 2030.

GRAPH 6: **Future contribution of individual greenhouse gases to global warming — Intermediate scenario,[1] 1980-2030**



[1] The assumed evolution of greenhouse gas concentrations is roughly comparable to current conditions. CFCs are phased out according to Montreal Protocol.
Source: German Enquête-Commission.

CO_2 emissions of developing countries will become relatively more important

Estimates of future CO_2 emissions on world level generated with the 'conventional wisdom' scenario up to the time horizon 2010 are presented in Table 2. The data in the table demonstrate that the emission growth will vary considerably across world regions. The average increase of world CO_2 emissions between 1987 and 2010 is estimated at 62%. Developing countries are likely to have almost double the growth rates of the world average. The increase of CO_2 emissions in the Community would be 24% over the same time period, well below the global mean. Graph 7 visualizes clearly that the assumed rising energy needs during the economic growth process in developing countries would cause a substantial increase of the contribution of these countries to total CO_2 emissions from fossil fuels until the year 2010 (from 21% to 28%). Accordingly, the relative share of EC emissions would drop from 12% to 9%.

According to various scenarios, the development of the Community's CO_2 emissions between 1990 and 2000 could be in the range of −2% to +23%

The development of CO_2 emissions in the Community depends on a wide range of determinants such as economic

Table 2

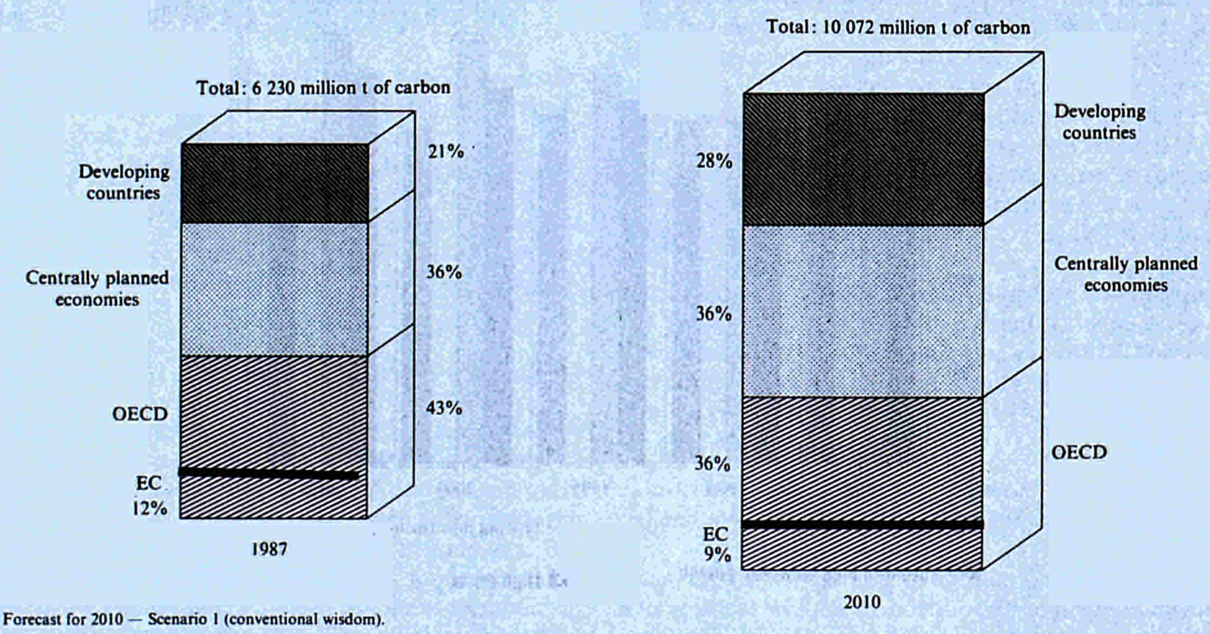
Forecast world CO_2 emissions until the year 2010

Country/region	Absolute CO_2 emissions in 1987 (million t of carbon)	Forecast variations of CO_2 emissions[1] (%)	
		1987-2000	1987-2010
EUR 12	746	19	24
Canada	122	31	51
Japan	260	23	32
USA	1 395	23	37
Rest of OECD	180	32	56
Total OECD	2 703	23	35
CPE	2 228	36	64
LDC	1 299	57	114
World	6 230	34	62

[1] The emission forecasts presented in this table have been established before the preparation of the detailed emission forecasts for each individual Member State presented in Table 3. For these reasons, the aggregate emission forecast for the Community as a whole is not identical in both sets of forecasts. However, at present, both sets of forecasts are under revision.

Source: Commission of the European Communities (1989), 'conventional wisdom' scenario.

GRAPH 7: **CO_2 emissions from fossil fuels by world region, 1987 and 2010**



NB: Forecast for 2010 — Scenario 1 (conventional wisdom).
Source: Commission services.

growth, energy prices, technological development etc., which cannot be predicted with certainty. Therefore a considerable degree of uncertainty exists as to the future development of CO_2 emissions.

Projections of the future CO_2 emissions in the European Community contained in the 'conventional wisdom' scenario (see Table 3) reveal that between the years 1990 and 2000 — the relevant time period for the Community CO_2 policy package — the increase would amount to 9%. The relative position of the outcome of this scenario in comparison to the three other scenarios mentioned above is illustrated in Graph 8. It becomes clear that the 'conventional wisdom' scenario reflects an intermediate evolution of CO_2 emissions, compared with the extreme developments generated by the 'driving into tensions' scenario (+23%) on the one hand and by the 'high prices' scenario on the other (−2%).

Within the Community, CO_2 emission trends will diverge quite strongly

The CO_2 emission projections in the 'conventional wisdom' scenario demonstrate that the 9% increase until 2000 would not be evenly spread over the Member States. In fact, some

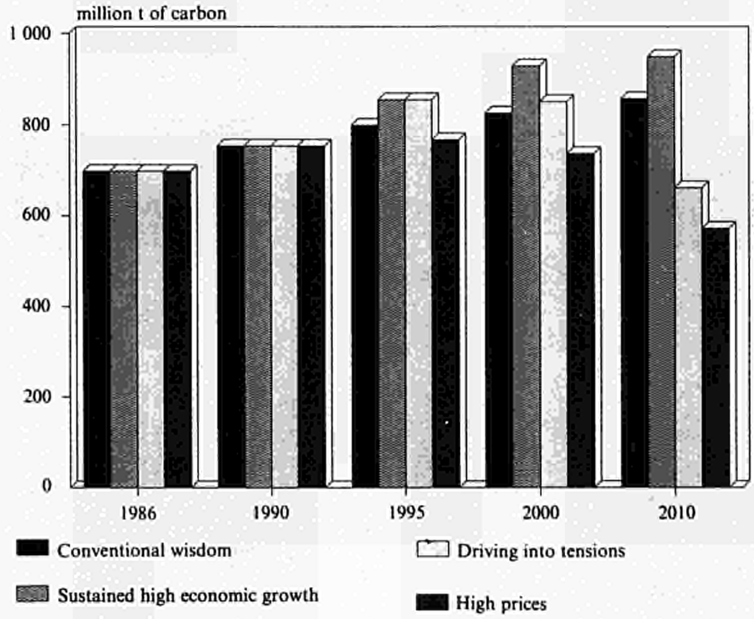
Table 3

Forecast CO_2 emissions until the year 2010 in the Community

Country/region	Absolute CO_2 emissions[1] in 1990 (million t of carbon)	Forecast variations of CO_2 emissions[2] (%) 1990-2000	1990-2010
B	30	12	4
DK	15	9	20
D	193	0	0
GR	20	33	72
E	57	20	30
F	98	5	5
IRL	8	19	43
I	110	12	24
L	3	0	− 3
NL	42	14	15
P	11	33	86
UK	159	13	12
EUR 12	746	9	14

[1] Commission services.
[2] Commission of the European Communities (1990a), 'Balance sheets of pollutants SO_2, NO_x, CO_2', Working Document No 4, 'conventional wisdom' scenario.

GRAPH 8: **Forecast CO_2 emissions in the Community — A comparison of four scenarios, 1986-2010**



Source: Commission services.

countries would exhibit no rise (Luxembourg, Germany), and some only modest increases in their CO_2 emissions (France, Denmark, Belgium and Italy) (see Table 3 and Graph 9). In others, mainly southern Member States, the increase can reach, until 2000, around 20% in the case of Spain and Ireland and up to 33% in Portugal. If the time horizon were to be extended until the year 2010, the intra-country differences of the CO_2 emission pattern would even be accentuated.

The power-generating sector will probably constitute the single largest source of future CO_2 emissions in the Community

A comparison of the shares of the various economic sectors in total Community CO_2 emissions between 1990 and the year 2010 reveals that power generation will become an even more important CO_2 emitter in the future than it is currently (see Graph 10). It is estimated that this sector will increase its current share of 31% to almost 38%. The transport sector is forecast to account for the second largest part (24%) of total CO_2 emissions.

The power-generation sector will become a predominant CO_2 emitter in the Community due to the believed strong increase of electricity demand between 1987 and 2020: a supplementary consumption of 72 million toe would increase the share of electricity in final energy consumption from 17% (1987) to 23% in the year 2010 (see Commission of the European Communities, 1990b). This demand increase relates to an assumed average GDP growth of 2,9% over the period 1987-95 and 2,7% between 1995 and 2010.

Energy use and thus CO_2 emissions in the transport sector are believed to be stimulated by rising demand for road haulage. Reduced rates charged as a result of increased competition in a liberalized market and the general forces of the internal market contributing to increased trade would be responsible for this demand increase. However, increasing congestion in European cities and on motorways will be likely to induce a slowdown of individual car traffic in the future.

The industrial sector is estimated to lose relative importance as a CO_2 emitter compared to other sectors. This good performance is assumed to be due to the projected global decline of the energy intensity in the EC. A restructuring of energy uses can be observed in favour of using steam and heat at a medium temperature instead of oven heating which is more energy intensive. Additionally, the introduction of more integrated production processes and the modernization of the productive capital stock can lead to a more economical use of energy. Energy savings per tonne of product over the period 1985 to 2000 will be feasible in the order of 20% on average for steel, 20% for cement and 10 to 15% for basic chemical products (see Commission of the European Communities, 1990b).

1.2. Present commitments to the limitation and reduction of greenhouse gases

A global convention on the phasing-out of CFCs has been agreed on ...

The expected negative impacts of increased UV radiation through stratospheric ozone depletion and the socio-economic cost related to global warming both caused by rising concentrations of CFCs have fostered international efforts to reduce CFC and halon emissions. The Vienna Convention (22 March 1985) and its follow-up agreements — the Montreal Protocol (16 September 1987) and, in particular, the agreement adopted at the second meeting of the parties to the Montreal Protocol in London (27 to 29 June 1990) — have been the first international agreements to tackle global environmental problems.

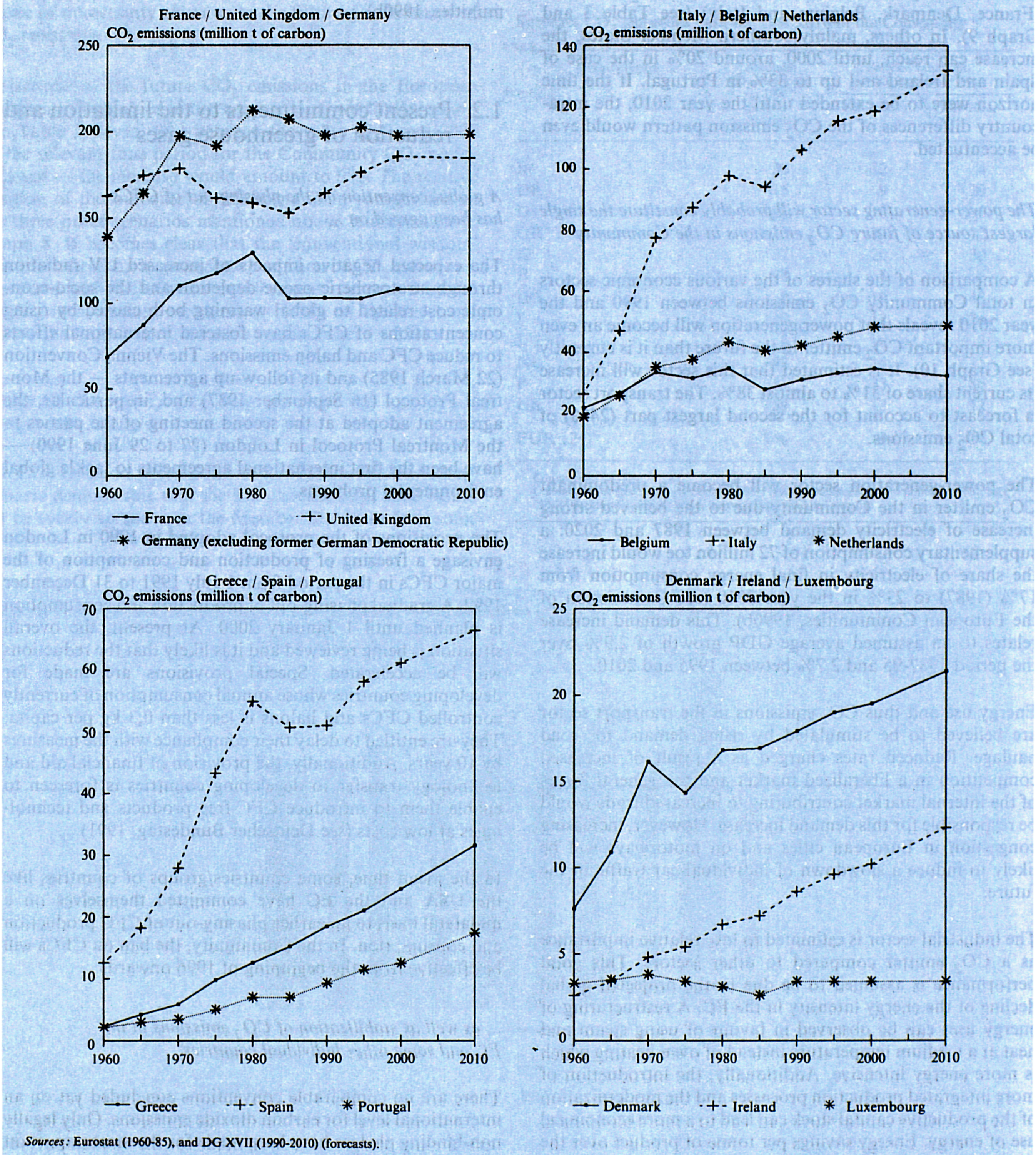
The provisions of the protocol adopted in 1990 in London envisage a freezing of production and consumption of the major CFCs in the period from 1 July 1991 to 31 December 1992. A gradual phasing-out of production and consumption is planned until 1 January 2000. At present, the overall situation is being reviewed and it is likely that the reductions will be accelerated. Special provisions are made for developing countries whose annual consumption of currently controlled CFCs and halons is less than 0,3 kg per capita. They are entitled to delay their compliance with the measures by 10 years. Additionally, the provision of financial aid and technology transfer to developing countries is foreseen to enable them to introduce CFC-free products and technologies at low costs (see Deutscher Bundestag, 1991).

In the mean time, some countries/groups of countries like the USA and the EC have committed themselves on a unilateral basis to an earlier phasing-out of CFC production and consumption. In the Community, the ban on CFCs will be effective from the beginning of 1996 onwards.

... as well as stabilization of CO_2 emissions in the EC and some other individual countries

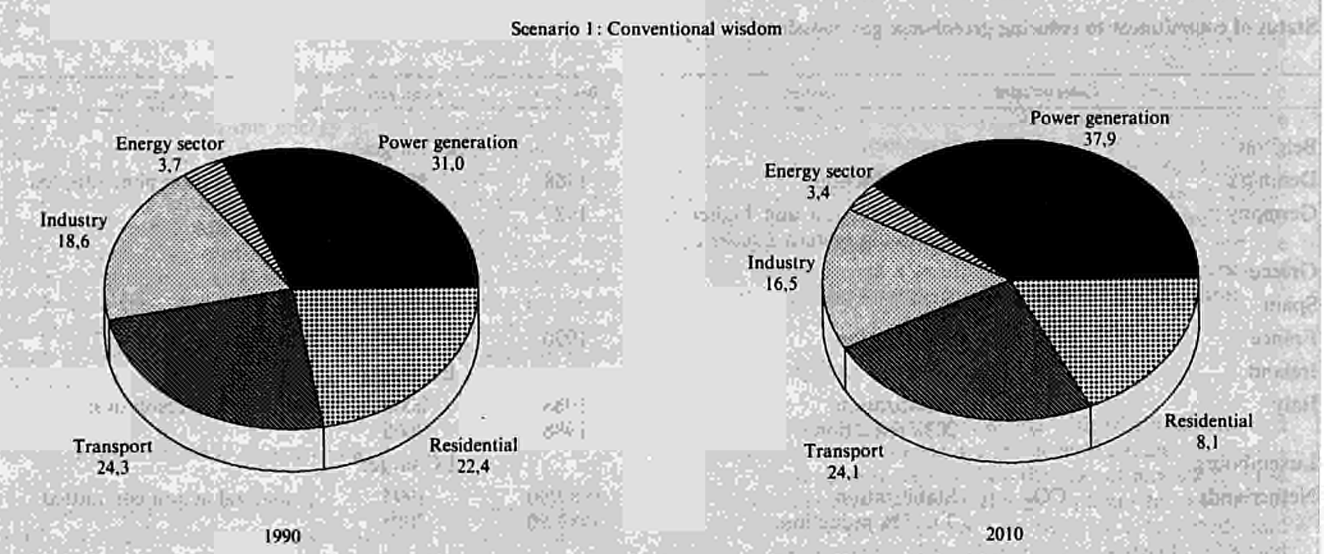
There are no comparable conventions concluded yet on an international level for carbon dioxide emissions. Only legally non-binding pledges have been made for the most important greenhouse gas.

GRAPH 9: CO_2 emission trends in the Community, 1960-2010



Sources: Eurostat (1960-85), and DG XVII (1990-2010) (forecasts).

GRAPH 10: Forecast CO_2 emissions in the Community by sector, 1990 and 2010 (% of total)



Source: DG XVII.

A reduction of CO_2 emissions by 20% of the 1988 levels by the year 2005 was the first carbon emission limitation goal formulated on an international scale at the 1988 UNEP/WMO climate conference in Toronto. Since then, several individual countries have adopted national CO_2 emission targets (see Table 4). However, these objectives differ in many respects between countries: the actual target itself (stabilization or reduction), the target year, the reference year, the degree of commitment (some national governments committed themselves officially, in other countries only declarations of intent were given), conditionality (some national targets will only be implemented if other countries will take similar steps) and sectors covered (generally the CO_2 target applies to the whole economy but, for instance, in Denmark, it is limited to the energy sector).

For the European Community as a whole, in addition to national targets, a joint Council of the EC's Energy and Environment Ministers declared, on 29 October 1990, that the European Community and Member States plan to take actions aimed at stabilizing total CO_2 emissions by the year 2000, at 1990 levels.[1] It was also decided that the Commission will work out, in due time, proposals for establishing EC emission reduction targets separately for CO_2 and other greenhouse gases. These targets should have a time horizon between the year 2005 and 2010.[2]

The proposals of the Commission for such a CO_2 emission stabilization strategy are the subject of the analysis in the following chapters.

1 The Council of the European Communities (9612/90). Minutes of the 1430th meeting of the Council (Joint Energy/Environment Council held in Luxembourg on 29 October 1990).

2 Emission reduction targets have been decided only by very few individual countries until now as can be seen in Table 4.

Table 4

Status of commitment to reducing greenhouse gas emissions[1]

	Gases included	Action	Base year	Target year	Comments
Belgium				EC target[3]	
Denmark	CO_2	20% reduction	1988	2005	Implementation plan adopted
Germany	CO_2	25% reduction and higher reduction in eastern *Länder*	1987	2005	Putative
Greece				EC target[3]	
Spain				EC target[3]	
France	CO_2	Stabilization	1990	2000	Putative
Ireland				EC target[3]	
Italy	CO_2	Stabilization 20% reduction	1988 1988	2000 2005	Non-binding resolution
Luxembourg				EC target[3]	
Netherlands	CO_2	Stabilization 3 to 5% reduction	1989/90 1989/90	1995 2005	Unilateral action committed
Portugal				EC target[3]	
United Kingdom	CO_2 All GHGs	Stabilization 20% reduction	1990 1990	2005 2005	Implementation if others act likewise
EC	CO_2	Stabilization	1990	2000	Putative
Australia	CO_2, N_2O, CH_4 CO_2	Stabilization 20% reduction	1988 1988	2000 2005	Interim planning target Implementation if others act likewise
Austria	CO_2	20% reduction	1988	2000	Still needs Parliamentary approval
Canada	CO_2, N_2O, CH_4	Stabilization	1990	2000	
Finland	CO_2	Stabilization	1990	2000	Putative
Japan	CO_2	Stabilization	1990	2000	On per capita basis. Implementation if others act likewise
New Zealand	CO_2	20% reduction	1990	2005	Putative
Norway	CO_2	Stabilization	1989	2000	Preliminary; putative
Sweden	CO_2	Stabilization			Conditional on like action and only applies to sectors not subject to international competition
Switzerland	CO_2	At least stabilization (reduction after 2000)	1990	2000	Planning target
USA	All GHGs	Stabilization[2]	1990	2000	No CO_2 target

1 All countries have agreed to phase out most CFCs by the year 2000 or earlier.
2 No target for CO_2, N_2O or CH_4. Stabilization of GHGs is achieved primarily by reducing CFC emissions.
3 Countries would agree to an EC-wide target.
Source: OECD (1991).

Box 1: The science of global warming

What is the greenhouse effect?

The greenhouse effect is a natural process which has always operated. The earth absorbs solar radiation, mainly at the surface, and redistributes this energy to the atmosphere and the oceans. The energy is then re-radiated at longer ('infra-red' or 'thermal') wavelengths. A part of this thermal radiation is absorbed by radiatively active ('greenhouse') gases in the atmosphere, principally water vapour, but also carbon dioxide (CO_2), ozone (O_3), nitrous oxide (N_2O), methane (CH_4) and other greenhouse gases. Consequently, the earth's surface loses less heat to space than it would do if there would be no greenhouse gases. The natural greenhouse effect currently ensures a mean global surface temperature of about 15°C, without it the mean global temperature would be roughly −18°C.

Which factors can cause climate change?

Any factor that alters the radiation balance between space and earth, or which alters the redistribution of energy within the atmosphere, and between the atmosphere, land and ocean, will affect climate.

Increases in the atmospheric concentration of the greenhouse gases reduce the ability of the earth to cool and tends to warm the lower atmosphere. The amount of additional warming depends on the increase in concentration of each greenhouse gas, and their radiative properties.[1]

Small particles (aerosols) stemming from volcano eruptions, emissions of sulphurs from industry and other sources can absorb and reflect radiation. Generally they tend to reduce global temperature. Aerosols usually have a much shorter lifetime than greenhouse gases, thus, changes in emissions affect their concentrations in the atmosphere much quicker.

Over long time spans, slow variations in the earth's orbit have led to changes in the seasonal and latitudinal input of solar radiation. These factors explain an important part of the variations of past climate.

What do we have to know in order to predict climate change?

Any changes in the abovementioned factors can affect climate. Since the beginning of industrialization, the atmospheric concentration of greenhouse gases has increased due to human activities, and new greenhouse gases have been added, in particular the CFCs. Emissions from the combustion of fossil fuels have increased the concentration of sulphates, especially in the northern hemisphere. The future concentration of greenhouse gases and aerosols is thus an important input for climate change predictions.

This input must be seen in the context of the earth's climate system and the inter-relations of its components. The pattern of heat and moisture transfer in the atmosphere influences climate change as well as the way in which the oceans and the biosphere take up heat, the effectiveness of sinks for CO_2 (for instance, oceans and forests) and other greenhouse gases. Furthermore, the interactions between temperature change and cloud formation and the resulting feedbacks on temperature as well as the interactions between changing climate and ice cover and the implied feedbacks via a modified ice albedo (reflectiveness of the earth's surface) have an impact on global temperatures.

How do we predict climate change?

The most sophisticated tool available with which climate and climate change are modelled are the general circulation models (GCM). These models are based on the laws of physics, and use descriptions in simplified physical terms ('parameterizations') of the smaller-scale processes such as those due to clouds and mixing of ocean water through major sea currents. Coupled general circulation models (CGCMs) link the atmospheric component to an oceanic component of comparable complexity.

To estimate the influence of greenhouse gases or aerosols in changing climate, the model is first run for a few (simulated) decades. If the model is a good one and includes all the important forcing factors, it will be able to simulate well past climate evolutions. The above exercise is then repeated with increasing concentrations of the greenhouse gases or aerosols in the model. The differences between the results of the two simulations (for example, mean temperature and interannual variability) provide an estimate of the accompanying climate change. Usually, temperature changes are simulated which are due to a doubling of the pre-industrial level of atmospheric CO_2 (likely to occur until the year 2025).

What will be the extent of future climate change and its impacts?

A balanced reading of the scientific literature concludes that it is virtually certain that global warming will occur in response to ongoing changes in atmospheric composition. The timing and the magnitude of this warming, however, continues to be uncertain.

In a 'business as usual' scenario, the IPCC estimated the average rate of increase of global mean temperature during the next century to be about 0,3°C per decade (with an uncertainty range of 0,2°C to 0,5°C). According to the IPCC, 'this will result in a likely increase in global mean temperature of about 1°C above the present value by 2025 and 3°C above today's, before the end of the next century (IPCC 1990a). More long-term oriented estimates conclude an approximate increase of the average global temperature by 10°C over a horizon of 250 to 300 years (Cline, 1991).

[1] The contribution of a particular greenhouse gas to the greenhouse effect depends on how strongly and at what wavelength it absorbs infra-red radiation.

Most recent climate research of the IPCC produces indications for the need to modify the abovementioned estimates of a warming of 0,3°C per decade. 'If sulphur emissions continue to increase, this warming rate is likely to be reduced significantly in the northern hemisphere, by an amount dependent on the future magnitude and regional distribution of the emissions. Because sulphate aerosols are very short-lived in the atmosphere, their effect on global warming rapidly adjusts to increases or decreases in emissions' (IPCC, 1992).

Impacts of the expected climate change are difficult to predict. Direct quantitative assessments are currently not possible with much confidence; Instead, climate researchers estimate the degree of sensitivity of affected human and natural systems to the forecast climate changes. The sensitivity of a particular system can then be used for an estimate of the impacts of the underlying temperature changes.

Given the estimated rise in average global temperature, the IPCC members have predicted an increase of about 20 cm in global mean sea-level by 2030 and 65 cm by the end of the next century. However, significant regional variations have to be expected (see IPCC, 1990a). Other potential physical impacts are, besides permanent inundation of low-lying land, an increased frequency of temporary flooding from higher tides or storm surges and changed regional precipitation patterns.

The effects on the ecosystems have been described in the IPCC report only in qualitative terms due to the large uncertainties involved. A shift of major vegetation zones could influence plant productivity, animal distribution and survival as well as biological diversity.

2. Which approach for dealing with global climate change?

It is thus evident that global warming could have major effects on the earth's ecosystem which, in turn, could have a significant impact on the economy and on the living conditions on earth. These effects are uncertain, which compounds the problem as it implies that it is impossible to make accurate predictions. Furthermore, it is likely that the effects might show a considerable variation over various regions of the world (IPCC (1990a)). It is thus safe to say that global warming presents a policy problem of hitherto unknown dimensions. How should the world community react?

Obviously, it is first of all important to form a clear picture of how greenhouse gas (GHG) emissions could be limited. This raises a number of questions: In which regions could CO_2 emissions be limited with relative ease and at low costs? Which GHGs should one focus on? Which instruments to reduce emissions are, in principle, available and what are their relative advantages? What is the potential of adjustment of production and consumption patterns to climate change? The answers to these questions provide the necessary ingredients for a policy reaction as they provide a set of policy options but will, by themselves, not be sufficient to formulate a coherent policy response. What is first needed is a more general approach which also allows the identification of a policy target.

In principle, many approaches to combat global warming are possible

There are different approaches one could take to address this issue. For example, some might argue from ethical *a prioris,* that mankind should minimize any interference with nature. Such an approach would lead to the policy recommendation of fully countering man-induced global warming, in principle irrespective of the costs that might imply. Other ethical approaches can be imagined as well; each with different policy implications.

Ideally, the economic approach would consist of comparing the costs and benefits of various policy actions

The economic point of view towards global warming is that, ideally, the costs and benefits of the different available policy options should be compared and that the target should be determined by the most attractive policy option. This can only be done by valuing the different effects of each policy option in terms of a common denominator — money. These effects should comprise the full range of potential consequences in a very broad sense (e.g. not only the effects on agricultural production but also the impacts on wildlife). In principle, also, the full spectrum of policy options should be covered from inaction to different forms of action (abatement, adaptation, migration etc). All different greenhouse gases should be considered as well as other so-called CO_2 sinks (e.g. forests) and sources. On the basis of a comparison of the associated net benefits (that is benefits minus costs) the various options can be ranked in order to allow an economically optimal decision to be made in favour of the policy option with the highest net benefits. The economic approach would thus lead to a simultaneous choice on the target and the instruments.

Due to uncertainty, lack of information and methodological problems such an approach is currently beyond reach

There can be little doubt that, despite some interesting first attempts (see Box 2), such a comprehensive cost/benefit analysis, although desirable, is currently beyond reach. This is, basically, the result of two factors. First, the current high degree of uncertainty and lack of information about the process of global warming prevent a definitive and comprehensive inventory of the physical effects of climate change from being made. Secondly, the issue of how to monetarize a number of important physical effects has not been completely solved. This means that, without more information and further methodological progress, policies need to be based on another approach.

Hence, an alternative more pragmatic approach is necessary, which could comprise the following elements

The significant uncertainty attached to the consequences of the greenhouse effect implies that, at present, policies cannot be defined on the basis of a strict cost/benefit analysis but will have to be based on an alternative approach. It appears that such an approach could combine two elements which are justified even if global warming were only to be of limited importance with a third, which is an economic way of dealing with collective uncertainty:

First, information on the greenhouse effect must be improved

Although perhaps self evident, the importance of enhancing our knowledge of the consequences of global warming and the working of the earth's ecosystem cannot be underrated. In view of the stakes involved the associated costs are very modest. Therefore, the strengthening of research policies seems worthwhile.

Box 2: Applying a cost/benefit analysis to global climate change

The first question in the context of policies addressing themselves to the issue of global warming is: Should the emissions of greenhouse gases be limited and, if so, by how much?

In a world of perfect information the answer to this question would seem to be relatively straightforward and would consist of proposing a cost/benefit analysis — the optimal policy would be to compare the costs of various policy actions (abatement, adaptation, migration, etc.) with the benefits of such policies. The latter, in principle, do not only consist of the benefits of reducing global warming but also of the side effects of less energy-consumption-related environmental stress. Ideally, all greenhouse gases and sources and sinks should be taken into account. Such an analysis would allow the construction of marginal cost and benefit curves which describe all the relevant changes in costs and benefits for each additional unit of emission reduction when a certain policy instrument is used. Generally, the marginal cost curve is upward sloping as it becomes increasingly more difficult after a certain abatement level to reduce emissions. Conversely, the marginal benefit curve would be downward sloping as the avoided damage per unit of emission decreases as more emissions are reduced. Graph 11 pictures such a marginal cost curve and two marginal benefit curves. These are, of course, purely illustrative.

Only those policy actions are to be selected which bring along benefits that are greater than their associated costs. Such an approach would lead to the introduction of economically efficient instruments up to the point where the marginal benefits attained are equal to the associated marginal costs. The optimal emission reduction is determined implicitly.

Even in a world of perfect information, the execution of a cost/benefit analysis is, in fact, not straightforward. A major conceptual issue which has to be dealt with is the valuation of changes in variables to which monetary values are at present only rarely attached (if at all) — such as a large number of plant and wildlife species (these changes might partly consist of irreversible losses which complicates things even further). Another example is the determination of the discount rate with which effects in the distant future are to be made comparable to the costs of policies introduced today. Different discount rates can be envisaged. From a narrow notion of sustainable development it could even be argued that intergenerational justice can only be done if future generations are endowed with at least the same natural capital stock as is held by the present generation. Although the science of economics disposes of some approaches to deal with such problems, it cannot be stated that unequivocal solutions have been found.

The clear advantage of a cost/benefit approach is that it establishes an economically sound and comprehensive framework. However, at present, it cannot yield unequivocal results due to the major uncertainties attached to the benefit side (consisting of the reduction of the impact of global warming on various economic activities, human health and nature) and — but to a lesser extent — to the costs side (the economic repercussions of various policy options). The importance of the uncertainties on the benefit side is illustrated graphically in Graph 11 where it is demonstrated that the optimal emission reduction can be strongly influenced by the assumptions made about the benefits of abatement. As shown, the amount of optimal reduction can be significantly higher in the case of relatively high benefits of reducing greenhouse gas (GHG) emissions than in the case of low benefits.

On top of these uncertainties come some of the methodological problems mentioned above. Both sets of factors imply that a number of effects can, at present, not be taken fully into account. It is therefore not surprising that very few cost/benefit analyses have been undertaken. The major exception is the seminal work done by Nordhaus (1989, 1991).[1]

Having established a middle damage function, Nordhaus (1989, 1991) concludes that the optimal reduction of greenhouse gas emissions (that is where the marginal costs of doing so just balance out the marginal benefits) would be roughly 10%. This analysis is mainly based on data for the USA, which obviously limits the extent to which the results can be generalized. The reduction of GHG emissions would be achieved in a cost effective manner if CFCs were phased out completely and CO_2 emissions were reduced by a very modest amount (*c.* 2%). On the basis of this result the combination of a phasing out of CFCs and some 'no-regrets' policies (implying the reduction of unnecessarily inefficient energy use which could be avoided at zero or even negative costs) would suffice: no CO_2 taxes would be necessary.

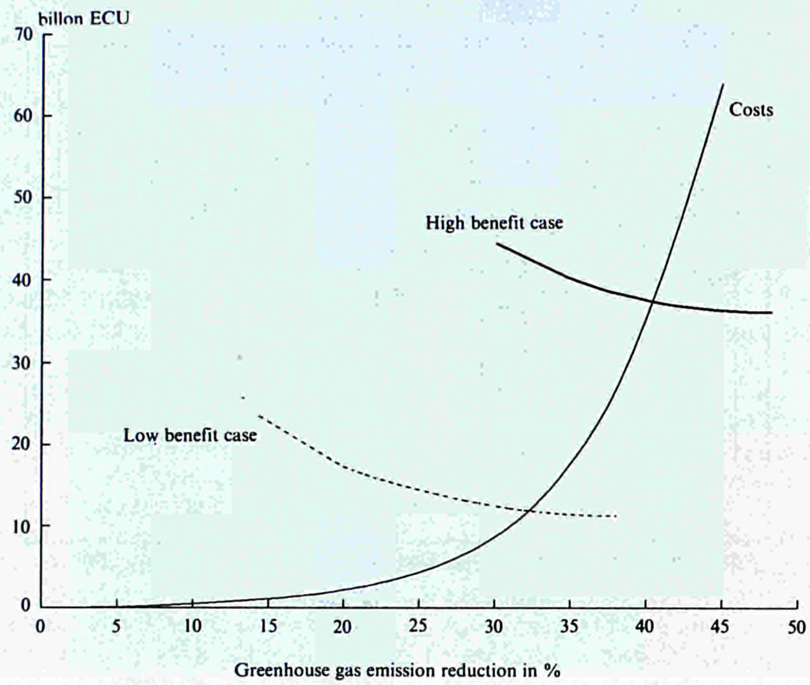
It is essential to mention that in this study no account was taken of beneficial side effects at all and that on the cost side only agriculture and forestry were considered to be of significant importance. The first aspect implies that total benefits of taking action are underrated, the latter points lead to an under-estimation of the costs of not taking action. Thus the amount of emission reduction that is economically viable is biased downwards in this analysis.

Recent but still preliminary work by William Cline (1992) seems to suggest that if more damages are included and a longer time horizon is adopted (leading to the inclusion of situations in which the concentration of CO_2 in the atmosphere is more than doubled) the benefits of stronger CO_2 emission reduction policies might outweigh the associated costs.

As far as the European Community and its Member States are concerned, no comprehensive study has yet been undertaken to quantify the likely costs and benefits of greenhouse gas limitation policies. However, ongoing research work by Environmental Resources Limited will eventually allow some light to be shed on these issues. Very preliminary and partial results on the costs of climate change are presented in Graphs 12 and 13.

[1] For a discussion of Nordhaus's results, see various contributions in Dornbusch and Poterba (1991) and Mors (1991).

GRAPH 11: **Aggregate emission reduction cost and benefit curves — An illustrative example**



Admittedly, these results are still surrounded by a considerable degree of uncertainty and are mainly illustrative. Moreover, it has not yet been possible to monetarize all climate change impacts (e.g. impacts on biodiversity) and to include all market feedbacks. Nevertheless, these calculations clearly illustrate a few key aspects of the issue:

(a) First, the high degree of uncertainty. In a majority of cases, the degree of uncertainty is such that it cannot even be determined with any degree of confidence whether a sector will be affected positively or negatively. Thus, it is at present not possible to compare the costs of GHG emissions reduction policies with the benefits of limiting climate change.

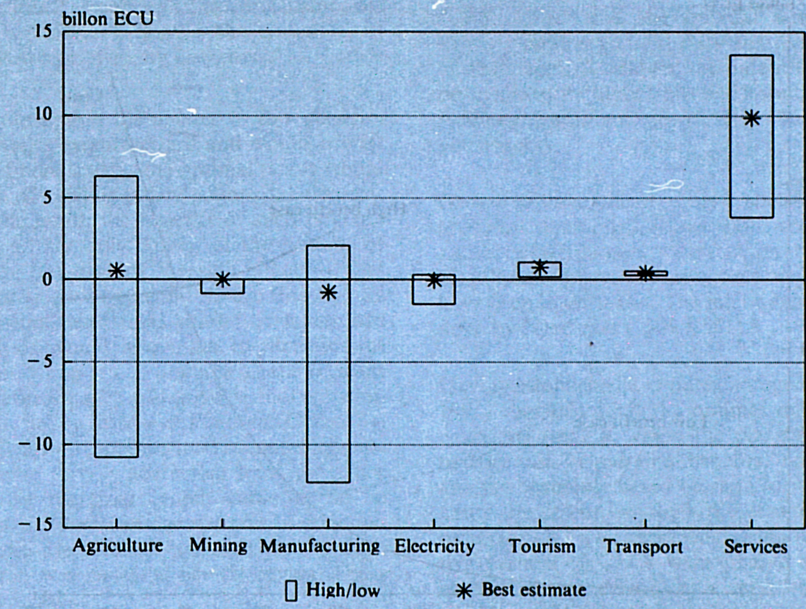
(b) Second, although the results are uncertain, it is nevertheless likely that the impact of global warming on different economic sectors will not be uniform across the economy, reflecting different sensitivities to sea-level rise and key climatic patterns, such as temperature and precipitation. This implies that both the do-nothing case and the policy action case will have distributional consequences.

(c) Third, the impact is also likely to differ significantly between Member States. Although Graph 13 only refers to agriculture, it nevertheless clearly demonstrates important regional variations (due to, amongst other factors, different impacts on crop yields and water resources). Thus, it is insufficient to focus only on the costs of emission limitation policies when aiming at an assessment of the net impact of such policies on the economic welfare of different Member States. What is required, in addition, is to address the issue of which Member States are likely to benefit most from a limitation of global mean temperature increases.

These examples show that although cost/benefit analysis can potentially contribute important insights into the cost-effective design of greenhouse gas limitation policies, it is, at present, not yet ripe to form the cornerstone of policy-making in this field.

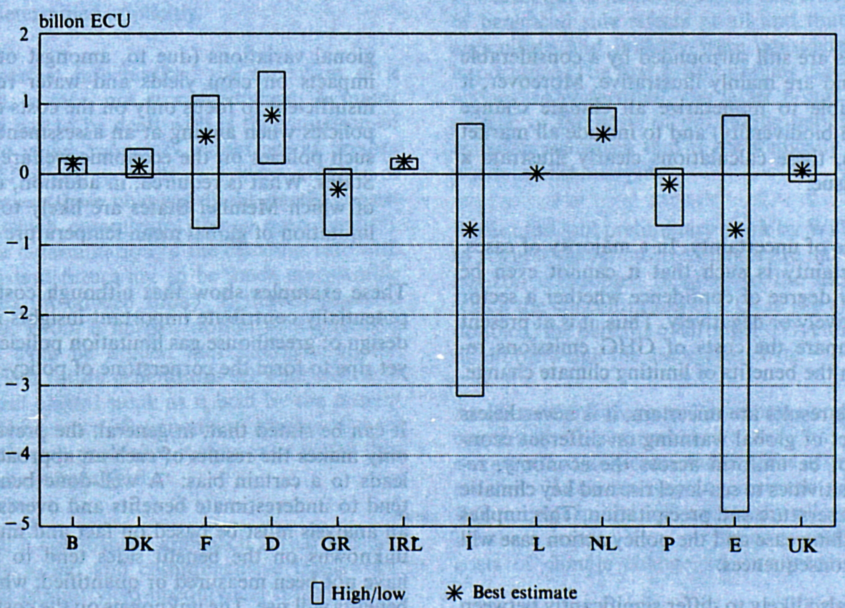
It can be stated that, in general, the prevailing uncertainty not only makes the results of such an approach uncertain, but also leads to a certain bias: 'A well-done benefit-cost analysis will tend to underestimate benefits and overestimate costs, because an analysis must be based on fact and must be defensible. The unknowns on the benefit sides tend to be new benefits that have not been measured or quantified; when they are estimated benefits will rise. The unknowns on the cost side are new technologies that will make abatement cheaper; when they are quantified, costs will fall.' (Lave, 1991)

GRAPH 12: Likely costs or benefits of a 1°C rise in global mean temperatures on different sectors in the Community



Source: ERL.

GRAPH 13: Likely impact, by Member State, of a 1°C rise in global mean temperatures on agriculture



Source: ERL.

Second, inefficiencies in our economic system which lead to an increase in global warming and whose removal is attractive for other reasons, should be removed

It appears that, at present, CO_2 emissions are higher than necessary as a result of the existence of various market barriers. In general, market barriers prevent a potentially profitable transaction from occurring as either there is no market on which the transaction can be executed or the functioning of the market is hampered by institutional arrangements (which prevent optimal decisions from being taken), incomplete information (implying that it is difficult to choose between alternatives) or other factors. These market barriers can be found in a large number of fields: e.g. the absence of sufficient information often leads to non-rational use of energy; as no one owns tropical forests, their exploitation is, in a lot of cases, virtually free, which implies that the value attached by many to protecting them has no influence on how these forests are used — with over-exploitation as an unavoidable result, etc. As these barriers impose unnecessary costs on society, their removal would constitute a net gain. Whatever the precise consequences of the greenhouse effect, such policies would be economically sound in any event. Thus, focusing on no-regrets policies is important. No-regrets policies always imply a societal gain even without taking the greenhouse effect into account as they improve the allocative mechanism by reducing market barriers.[1]

Third, a strong case can be made for going further and reducing still more the likelihood that unacceptable global warming will occur by 'buying global warming insurance'

In general, individuals faced with a spectrum of risks (e.g. theft, illness, etc.), buy some insurance to limit the damage of possible negative outcomes. By doing this, they increase their welfare as they prefer to pay insurance premiums instead of having to run certain risks. Thus, the existence of insurance markets, in general, enhances individual and social welfare.

Many individuals consider the greenhouse effect to be a considerable threat and a major risk that they would like to prevent occurring.[2] However, individual insurance cannot be bought as climate change is a global externality. Global warming has the characteristics of a negative public good: if it happens, none can be excluded from its effects. Conversely, to reduce the chances of it happening, collective action is necessary. Hence, a strong case can be made for introducing collective policies to limit the risk by 'buying some global insurance now':[3] i.e. reduce the likelihood that unacceptable global warming will occur and accept the related costs as a sort of insurance premium. Taking modest action now might also avoid having to undertake more costly policy measures at a later stage when emission levels will have grown significantly.

At present, it seems that the only available avenue along which collective insurance can be bought is to reduce greenhouse gas (GHG) emissions, as other options — such as 'end-of-pipe' removal techniques (which, through storage, prevent CO_2 generated by burning fossil fuels being emitted into the atmosphere) or even climate engineering — are not available. For many OECD countries, focusing on CO_2 would also be advisable, as knowledge of the sources of CO_2 emissions is quite extensive (which is not true for most other emissions) and CO_2 is by far the largest contributor to GHG emissions in these countries. For CFCs such policy steps have already been taken by most OECD countries in the framework of the (revised) Montreal Protocol.

In principle, reducing CO_2 emissions can be done either by setting, politically, an upper limit to the costs of policies aimed at limiting global climate change — hence determining the insurance premium — or by fixing an acceptable (rise in the) level of atmospheric concentrations of greenhouse gases and hence of emissions in the years to come — a quantity approach — and accepting the implicit costs.[4] Given the public goods character of these choices, they will have to be made collectively. Obviously fixing an emission target in principle is not the same as fixing the insurance premium. However, as the decision process will have to be executed collectively, which demands a maximum of transparency, it might — politically — be easier to discuss targets rather

[1] As CFC emissions are creating a hole in the ozone layer which has strongly negative effects (e.g. skin diseases), but the ozone layer is owned by no one, there is, in the absence of policy intervention, no possibility of reducing CFC emissions by means of market transactions. As the costs of phasing out CFCs are relatively low compared to the benefits of avoiding the hole in the ozone layer, the phasing out of CFCs decided upon by governments constitutes a societal gain. Because the phasing out of CFCs also reduces global warming it can, from the point of view of preventing climate change, be considered as a no-regrets policy.

[2] According to an enquiry undertaken in March 1991 in all Member States nearly 90% of all Europeans have heard of the greenhouse effect and more than 70% consider the problem to be very serious. The use of fossil fuels is considered to be a major source of global warming. For the opinions of EC citizens on global warming see *Eurobarometer* (1991).

[3] This approach is closely linked to the so-called 'minimum surprise' approach (Pearce, 1990) which aims at limiting the rise of global temperature (and hence, implicitly, emissions) to a certain maximum rate, above which the climate change effects seem to become very unpredictable indeed because they require faster adaptation of the earth's ecosystems than is currently thought possible without significant adjustment problems.

[4] Such a level would be set while taking into account the best presently available insights from the natural sciences.

than costs. Moreover, as the costs of policies in themselves are also only approximately known it is, in general, difficult to quantify the insurance premium exactly. If costs are very broadly known for certain emissions targets, it might in reality be easier to talk about insurance targets instead of insurance premiums without there being a large difference between the two. The first modest steps in reducing global emissions will probably produce benefits that outweigh the relatively moderate costs.

These elements will only lead to a reduction of worldwide greenhouse gas (GHG) emissions if they are adhered to by the majority of greenhouse gas (GHG) emission countries. The global nature of the problem calls for worldwide action which will allow the world to reap the benefits of a stable climate.

It is evident that, given its share in global CO_2 emissions (13%), the EC cannot, on its own, provide this insurance to its citizens. As stated above and discussed in full in Part D focusing on the international dimension, worldwide measures are necessary for such a strategy to succeed.

However, it should be stated here that, given the great importance of a GHG emission reduction strategy, the EC has a strong incentive to take the lead in efforts to reach an international agreement by providing international leadership.

Part B

The overall EC policy design: Targets and instruments

Part B first presents the economic reasoning underlying the proposed Community strategy for limiting CO_2 emissions. It discusses the principles of economic efficiency, equity and subsidiarity on which the proposed strategy has been built. These principles imply that the CO_2 emission stabilization target in the Community should be reached by introducing a mix of least-cost instruments at the appropriate institutional levels (Community, Member States) whose economic effects can be deemed equitable. It turns out that a key element in such a strategy would be the introduction of a Community-wide market-based instrument: a CO_2/energy tax.

The modalities of the tax are of significant importance to the economic and environmental effectiveness of the proposed strategy and are discussed in Chapter 4.

3. The EC strategy for limiting CO_2 emissions: Principles and implementation

It is in this vein that the Commission has proposed a strategy to reduce CO_2 emissions and to increase energy efficiency

It is in this context that on 29 October 1990, a joint Council of Energy and Environment Ministers adopted a CO_2 target for the Community and the Commission proposed a strategy to achieve it. The target consists of stabilizing the Community's overall CO_2 emissions by the year 2000 at their 1990 level. The EC target is intended to further global action at an early stage and can thus be understood in the context of the global insurance approach. As spelt out in Part D, dealing with the international dimension, strong moral and economic arguments might be brought forward to justify such a position.

3.1. Basic principles of a sound EC policy strategy: efficiency, equity and subsidiarity

The general philosophy underlying the proposed Community strategy is one of designing a cost-effective response to the risks of global warming, which, at the same time, can be perceived as being equitable both at the individual and the Member State level. It also aims at taking policy measures on the governmental level that seems most appropriate. Thus, it is intended to serve as an attractive example with which to persuade other nations to join in a CO_2 limitation strategy.

Given the international context, it should be clear that it is of the utmost importance to devise such a sound policy strategy. Three basic principles thus play an essential role:

Economic efficiency, equity and subsidiarity are the central principles of the proposed EC strategy

Economic efficiency. This criterion can best be understood as implying that a given CO_2 target is reached at least cost.[1]

Equity. Contrary to the former criterion, it is much less easy to define equity from an economic point of view. However, it is generally felt, for example, that the burden (the costs) of a policy strategy should fall relatively more on the rich Member States than on the poor.

Subsidiarity. This principle states that policy measures should only be taken at EC level if there is a clear advantage of doing so compared to the Member State level. Instruments with which to reach the CO_2 target should thus be carefully scrutinized as to the institutional level at which they are to be designed.

Whereas in a world of perfect information, economic theory recommends the use of two different instruments to reach an efficient and equitable outcome ...

From a theoretical economic point of view, equity and economic efficiency can be separated if markets function perfectly and the government disposes of perfect information. The 'orthodox' policy recommendation is to choose least-cost instruments for reaching the environmental goal and to correct possible resulting equity problems via income transfers which under these assumptions do not imply any real costs to society.

... in reality the impact on equity of instruments used to achieve policy objectives cannot be neglected

While the 'orthodox' policy recommendation presents an important insight when formulating environmental policies, it is, in reality, not always desirable or even possible to adhere to it in the strictest sense. This is largely due to the fact that market failures, incomplete information and difficulties in raising tax revenues in a non-distortionary manner might all imply significant welfare losses of strictly following the 'orthodox' policy prescription (see, for example, Atkinson and Stiglitz (1980), Munk (1992), and Lehner and Meiklejohn (1991)). Thus, if, for example, an environmental goal can be reached with two instruments which do not differ much in terms of economic efficiency, but do have dramatically different distributional consequences, then it could be preferable to choose the one with the smallest adverse distributional effects. Such an approach can be defended on second-best welfare economic grounds: policies to counter adverse distributional consequences might involve significant welfare losses due to the need to raise additional tax revenues, could be costly to run and monitor, might need long lead times to be introduced or might, for political reasons, be very difficult to get adopted at all, leaving a serious equity problem. It is clear that, in fact, such considerations play a large and legitimate role in policy making.

In analysing how a sound Community strategy with which to reach the CO_2 target could be formulated, it is worthwhile taking these considerations into account. They should be an important element in designing the modalities of the tax, which are discussed in Chapter 4.

The first focus is directed at two possible avenues for reaching the target in a Community that consists of 12 Member

[1] There is of course a clear link with allocative efficiency; if prices take the externality fully into account the resulting market outcome would, in principle, (that is, if there are no market barriers) be the least costly way of reducing CO_2 emissions.

States: 'burden sharing' versus 'target sharing'. This subject is directly related to the subsidiarity principle as it raises the issue of whether, in general, Community-wide policies have advantages over policy measures at the level of the Member States.

3.2. The allocation of the emission reduction in the Community: burden sharing versus target sharing

How should the Community target be achieved in a Community of 12?

On the one hand, the next step after having defined a Community target could consist of the use of a set of Community-wide policy instruments designed to reach the given Community emission limitation target in a cost-effective way. Obviously, these policies could be supplemented by national measures which have a no-regrets character. In case it should appear that such a horizontal approach would imply an undue burden for some Member States (e.g. because the average costs of emission reduction turn out to be higher in the less prosperous Member States), a system of financial compensations for countries with very high costs (side-payments) could be envisaged in order to allow an equitable solution to be found. Such an approach might be called 'burden sharing'.

On the other hand, one could envisage instead the establishment of national emission targets for each individual Member State (which add up to the EC target) to be attained by instruments to be determined at national level. While in such a system the equity aspect could, at least in theory, be taken into account through the allocation of these national targets, cost-effectiveness would only prevail under certain conditions described further below. This approach might be termed 'target sharing'.

A priori, either solution presents both advantages and disadvantages which will be discussed in turn. While, in theory, both might, under certain conditions eventually lead to the same outcome, this is unlikely to be the case in reality.

3.2.1. Target sharing

An important advantage of target sharing is that Member States have clearly defined responsibilities for CO_2 reductions

As the main advantages of target sharing one can consider that:

(a) Member States have a direct and clearly defined responsibility for reaching a given (national) emission limitation target;

(b) As some Member States have already a quantitative national emission limitation target (see Table 4), only the 'unallocated rest' of emission reduction would have to be distributed among the remaining countries.

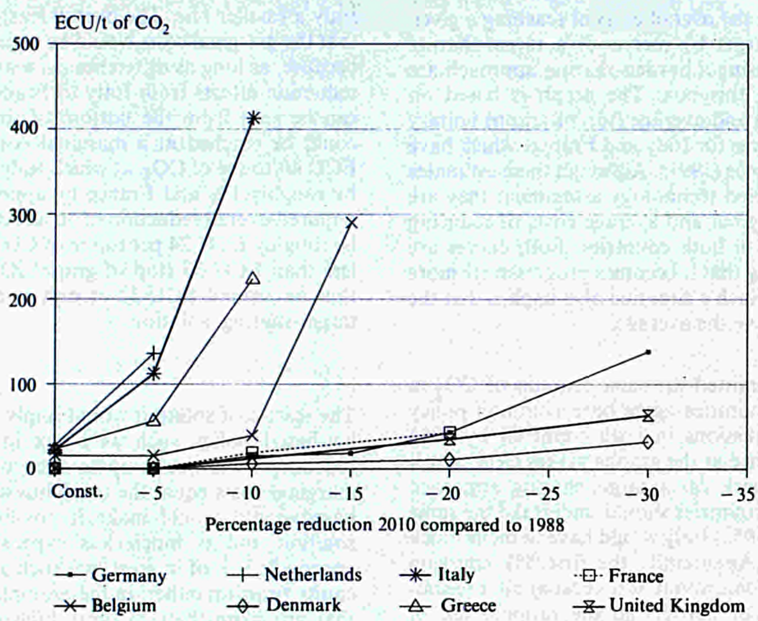
However, such an approach has a number of major disadvantages:

(i) First, the overall costs to the Community of reaching the target will probably be substantially higher than those of the least-cost solution. As the true costs of reaching a given target are not known with any degree of certainty, a target sharing approach is likely to be an expensive way to reach the Community target as the marginal emission reduction costs will not be equal across the Community (see Barrett (1992a) and Box 3). If a Community-wide market-based policy instrument is used instead, the market mechanism will — provided the conditions for a good functioning of the market are fulfilled — 'automatically' ensure that the cost minimum is attained, by equalizing the marginal costs of emission reduction in the Community as a whole.

This issue is of major importance as, given the certainty that cost differences in reducing CO_2 emissions are substantial across the Community but that these differences are not fully known, it is evident that fixing targets will impose unnecessarily high costs on the EC. These cost differences are illustrated in Graph 14, which is based on tentative calculations done by Coherence (1991). An admittedly crude and largely illustrative assessment of these 'extra' costs of target sharing shows that, depending upon the distribution of the targets, they could easily amount to several tens of billions of ecus (Barrett (1992a)). It should be kept in mind that this is not the price of reaching the target, but the price of reaching it in the 'wrong way'; the least-cost approach would cost only slightly more than ECU 1 billion in this analysis. Whereas the figures can only be understood as rough orders of magnitude, they nevertheless clearly indicate that the lack of cost effectiveness of a target-sharing approach can be rather significant and this constitutes an important disadvantage of this approach.

(ii) Second, the choice of national policy instruments might be severely restricted by the principle of free movement of goods in the Community. In the context of the internal market in the Community, it is to some extent an illusion to believe that Member States are completely free to determine their choice of policy instruments for reaching a given national emission target. Although Member

GRAPH 14: **Differences in CO_2 abatement costs in the Community**



Source: Coherence (1991).

States still have significant room for manœuvre as far as non-tradables are concerned, this is no longer the case for tradable products, once all frontiers are abolished in the Community. In such a situation, a conflict is likely to arise between the effectiveness and efficiency of some policy instruments (e.g. energy efficiency norms for consumer products), on the one hand, and the respect of the principle of the free movement of goods in the Community. Given the limits to the free choice of policy instruments by Member States, it seems rational to design at least an important number of policy initiatives on the Community level.

(iii) Third, target sharing does not solve the equity issue. It should be kept in mind that as 'burdens' are not equal to 'targets', a target-sharing approach with fixed targets for all Member States will be unlikely to imply an even-handed distribution of the burden. (See Box 3).

Although, theoretically, the least-cost solution could be reached by bilateral negotiations ...

If a target-sharing approach were nevertheless retained, it could be argued that as the initial distribution of targets will probably be inefficient, individual Member States would have an incentive to try to reach bilateral or multilateral arrangements that would improve the situation of at least one Member State without worsening the position of other Member States. In practical terms, such a process would in all likelihood have to consist of a Member State with costly emission reduction obligations offering (financial) compensation to another Member State with lower emission reduction costs in return for emission reduction beyond this latter country's obligation. Target sharing would then gradually be replaced by a burden-sharing approach. Theoretically, this process of bilateral negotiations may eventually lead to the overall cost-minimum.

... this is unlikely to happen in view of the large uncertainties

In fact, it can be doubted whether governments dispose of the necessary information to determine the actual costs of specific targets which, in fact, are the aggregate of myriad individual costs. Also, negotiations on this issue are not likely to be easy to conduct in view of the intricateness of the problem. Thus, given the major uncertainties, it is very unlikely that, even if 'trading of targets' did take place, the least cost solution would be reached.

Box 3: Cost implications: An illustrative quantitative example

The significant difference in the overall costs of reaching a given CO_2 emission reduction target by means of a target-sharing approach as compared to using a burden-sharing approach are illustrated in the graph in this box. The graph is based on marginal (bottom of graph) and average (top of graph) unitary emission reduction cost curves for Italy and France, which have been constructed by Coherence (1991). Although these estimates have been based on a detailed technology assessment they are only illustrative of the marginal and average costs of reducing CO_2 emissions by 1 tonne in both countries. Both curves are upward sloping — indicating that it becomes progressively more costly to reduce emissions. Such a situation also implies that the marginal cost curve lies above the average.

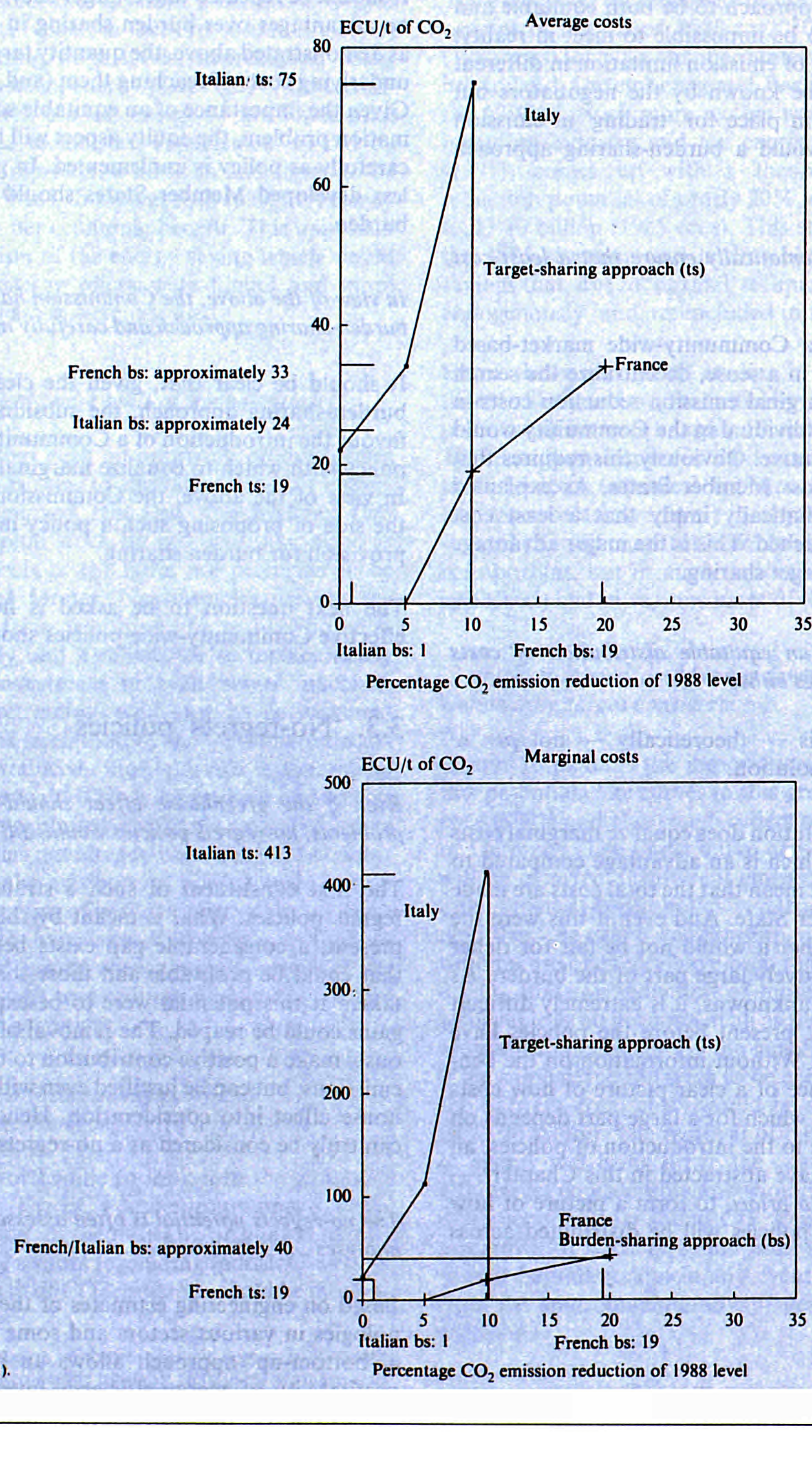
Italy and France roughly emitted the same amount of CO_2 in 1988. Suppose that both countries agree on a common policy target of reducing total emissions in both countries by 10% compared to 1988. One glance at the graphs makes clear that if the countries were to embark on a target-sharing approach which stipulated that both countries should undertake the same emission reduction (that is 10%) Italy would have to incur much higher costs than France. Apparently, the first 5% emission reduction in France could come about at no cost at all, presumably through the removal of barriers to the rational use of energy which existed in 1988. Further emission reductions could be undertaken at relatively low costs. In Italy, on the other hand, even to stabilize emissions at their 1988 level would imply significant costs (ECU 22 per tonne of CO_2). It would be rather expensive to reduce emissions by 5% and these costs would more than double per tonne of CO_2 'avoided' in the case of a 10% target. Average costs per tonne of CO_2 avoided of the target-sharing approach would be ECU 19 in France and ECU 75 in Italy, giving an average over both countries of ECU 47. It is clear that although the targets are equal in both countries the costs differ strongly: target sharing does not imply burden sharing.

Obviously the overall costs of reaching the joint target could be reduced significantly if France could make a greater effort and Italy a smaller one. The overall least-cost solution would imply that the marginal costs would be equalized across both countries because, as long as differences in marginal cost exist, shifting of reduction efforts from Italy to France would be profitable. As can be seen from the bottom of the graph the overall target could be reached at a marginal cost of somewhat more than ECU 40/tonne of CO_2, at which Italy would reduce its emissions by roughly 1% and France by approximately 19%, giving the required overall reduction of 10%. Average costs for Italy would be roughly ECU 24 per tonne of CO_2 and for France somewhat less than ECU 33 (top of graph). Overall average costs would thus be around ECU 32 or only two-thirds of the costs of the target-sharing solution.

The least-cost solution would imply the introduction of a market-based policy such as a tax in both countries: emission reductions will occur up to the point where their associated marginal costs equal the tax. Thus a Community-wide market-based policy would make it possible to reach the least cost solution and is much less expensive than a target-sharing approach. It is of interest that such a policy would not solve the equity problem either: in the example, France would have costs that are more than 25 times higher than those of Italy as it reduces a much greater amount of emissions than Italy at the same marginal cost. Thus, the Community-wide policy would have to be supplemented by a form of burden-sharing which in this example would imply that Italy would pay France.

The burden-sharing issue should, however, in fact take account of the net burdens which also comprise the benefits of reduced climate change. These are at present unknown but might have a significant impact on the distribution of total net burdens as is explained in Barrett (1992a).

GRAPH 15: Marginal and average unitary cost curves of CO_2 emission reduction in France and Italy



Source: Coherence (1991).

3.2.2. Burden sharing

The above discussion has shown that the conditions necessary for a target-sharing approach to be both equitable and cost-effective are likely to be impossible to meet in reality: not only do the true costs of emission limitation in different Member States have to be known by the negotiators but also conditions must be in place for 'trading' in emission rights. To what extent would a burden-sharing approach overcome this problem?

Burden-sharing would automatically ensure that a least-cost solution is reached ...

First of all, the use of a Community-wide market-based policy instrument would, in a sense, decentralize the search for an equalization of marginal emission reduction costs in the Community as each individual in the Community would be faced by an equal incentive. Obviously this requires that the tax rate is equal across Member States. As explained above, this would automatically imply that a least cost solution would also be reached. This is the major advantage of burden sharing over target sharing.

... but cannot guarantee an equitable distribution of costs without additional measures either

The least-cost solution is — theoretically — not *per se* identical to an equitable solution.

Although the least cost solution does equalize marginal costs across Member States (which is an advantage compared to target-sharing) it does not mean that the total costs are made identical for each Member State. And even if this were the case, one could ask whether it would not be fair for richer economies to carry a relatively large part of the burden. As equity depends on many unknowns, it is extremely difficult to measure this aspect at present before the policies have actually been introduced. Without information on the benefit side and in the absence of a clear picture of how costs will develop over time — which for a large part depends on macroeconomic reactions to the introduction of policies, an element from which we have abstracted in this Chapter[1] — it is simply not possible, *a priori*, to form a picture of how the net costs/benefits of policies will be distributed across Member States.

This means that the equity aspect will have to be monitored as the policy is implemented

It should be repeated that a target-sharing approach presents no advantages over burden sharing in this respect because, as demonstrated above, the quantity targets do not reflect the underlying costs of reaching them (and, hence, the burdens). Given the importance of an equitable solution and the information problem, the equity aspect will have to be monitored carefully as policy is implemented. In general, the relatively less developed Member States should not carry an undue burden.

In view of the above, the Commission has proposed adopting a burden-sharing approach and carefully monitoring the burdens

It should be clear that, given the clear advantages of the burden-sharing approach, the subsidiarity principle would favour the introduction of a Community-wide market-based policy with which to equalize marginal costs across the EC. In view of the above, the Commission has come down on the side of proposing such a policy in combination with a provision for burden sharing.

The next question to be asked is how sound and cost-effective Community-wide policies should be constructed?

3.3. 'No-regrets' policies

Even if the greenhouse effect should turn out to pose no problems, no-regrets policies would still make economic sense

The first constituent of such a strategy are so-called no-regrets policies. What is meant by this? It appears that, at present, a considerable gap exists between energy savings that could be profitable and those that are actually undertaken. If this potential were to be exploited, net economic gains could be reaped. The removal of this gap would obviously make a positive contribution to the reduction of GHG emissions, but can be justified even without taking the greenhouse effect into consideration. Hence, such an approach can truly be considered as a no-regrets policy.

The no-regrets potential is often assessed by 'bottom-up' analyses ...

Based on engineering estimates of the costs of energy technologies in various sectors and some basic economic data, a 'bottom-up' approach allows an investigation into the profitability of energy efficiency investments and hence of the extent of the no-regrets potential. In a bottom-up

[1] More information on this macroeconomic aspect of the cross-country differences in abatement costs is presented in Chapter 5, Section 7.

approach, an investigation is made — at a very low level of disaggregation — into energy use/production-related techniques which are currently used. If, according to a calculation scheme which takes into account a number of major cost elements, the costs (which in fact are based on a set of cost variables comprising wage levels, depreciation costs, interest rates and, of course, energy prices etc) of best available techniques — which use less energy — are lower than those of currently used techniques, replacement of old by new equipment would represent a net gain and seems to be economically optimal. Thus, this increase in energy efficiency could come about at a net economic benefit. This approach also allows an estimation of the energy saving which would become attractive if energy prices were higher and more energy-efficient capital stock were installed.

... which give a theoretical upper limit of the potential

It should be stressed that such an approach often assumes that *all* barriers and obstacles to the rational use of energy can, and have, been removed. It is also often assumed that replacement of old capital stock by new will take place as soon as the average costs of the latter are perceived to be lower than that of the former. No obstacles prevent the necessary investment from occurring. In reality, liquidity constraints, uncertainty and a reluctance to replace newly installed capital by investment in even newer machines (which often implies retraining, etc.) have to be reckoned with, which all limit the likelihood of the investment occurring. The estimates produced, thus, provide a theoretical upper limit of the potential.[1] This is an important point as the existence of a non-exploited profitable potential raises the question of why it has not already been tapped. Economists generally point to the existence of hidden costs (which have not been taken account of in the bottom-up calculation scheme) some of which have been discussed above or to barriers to the rational use of energy which cannot all be removed easily. Hence, the true economic potential is likely to be smaller than the theoretical.

Several studies point to a theoretically profitable CO_2 reduction potential of between roughly 10 and 20% ...

This being said, it is worthwhile to look into the empirical results of these studies. The EC's Joule programme (Coherence (1991)) shows that if all theoretically profitable technical measures in end-use sectors (excluding industry) were to be introduced, the growth of CO_2 emissions could be reduced by roughly 10% of the 1988 level.[2] This reduction occurs *vis-à-vis* a baseline scenario in which already considerable savings are incorporated due to 'normal' technical progress. The associated total benefits of introducing all cost effective options in the period 1988 to 2010 is over ECU 65 billion (1985 ecus) for nine Member States (the Community excluding Ireland, Luxembourg and Portugal). Another study for the CEC in which more sectors were taken into account — including industry and the energy sector — (Springmann (1991)) comes up with a theoretically profitable CO_2 reduction potential of nearly 20% with annual gains of over ECU 30 billion (1985 ecus). This study takes as its baseline the 1985 situation and is thus likely to incorporate some savings that, due to 'normal' technical progress, would occur endogenously (and are included in the Joule baseline).

From these and other studies it can be concluded that there is likely to be a theoretically profitable CO_2 reduction potential of between roughly 10 and 20% in the Community. This energy-saving potential is situated in the domestic and tertiary sector (electrical appliances, cookers, lighting), the transport sector (recovery of brake energy), industry (in general the potential for combined heat and power (CHP) is important, but in many industries processes can also be improved) and in various parts of the energy sector.

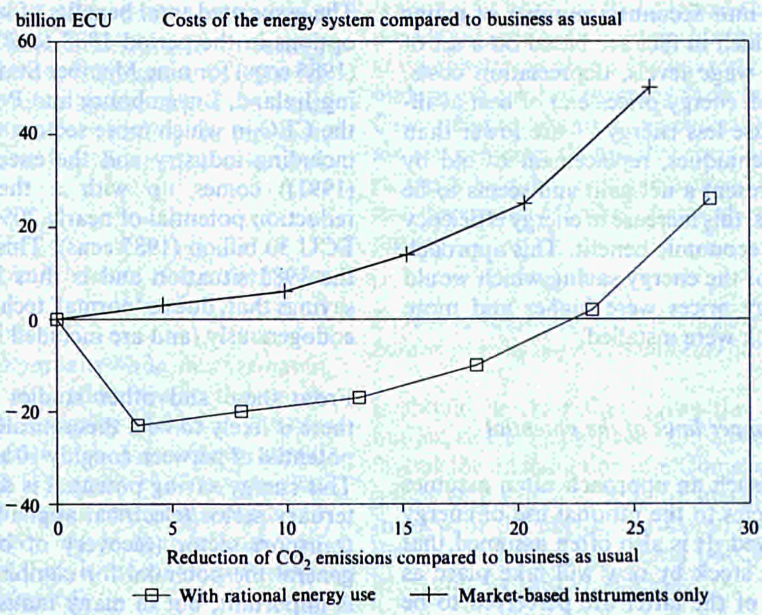
... which, if tapped, could bring down the costs of reaching the Community target considerably

Graph 16 pictures the importance of being able to exploit this potential. The curves in this graph are based on Coherence (1991) and give rough orders of magnitude for the case of Germany. The upper curve depicts the total costs which will be incurred at different emission-reduction levels when only a market-based policy is introduced; the bottom curve describes the same relationship after all barriers to the rational use of energy have been removed. In the latter case, a CO_2 emission reduction of more than 20% seems to be achievable at no net costs at all as the costs of new equipment are fully compensated by the benefits of reduced fuel costs; if the same reduction were to be achieved without removing the barriers, total costs would be significantly higher than ECU 20 billion. The removal of barriers to the rational use of energy will bring down the costs of reaching a specific CO_2 target considerably and should thus be an integral part of an economically sound CO_2 limitation strategy. As such a removal of barriers would imply a net economic gain, it should be undertaken in any event, even when abstracting from the environmental advantages in terms of lower CO_2 emissions.

1 However, as in the discussion of the cost-benefit approach, it should not be forgotten that only presently available techniques are taken into account. Thus, studies with a long time horizon might have an inherently negative bias.

2 This scenario implies that if all barriers could and would be removed, CO_2 emissions in 2000 would be stabilized at their 1990 level.

GRAPH 16: **The costs of emission reduction with and without the rational use of energy** (illustrative example)



Source: Own calculations based on Coherence (1991) data for Germany.

The main causes for the existence of this unexploited potential are barriers to the rational use of energy

A large variety of barriers to rational energy use appear to exist in many sectors of the economy:

(i) A lack of information on the part of consumers

Especially in the domestic sector lack of information can be considerable. Consumers, quite often, are unaware of the profitability of investment in efficient lighting (switching to fluorescent light bulbs), heating (home insulation) and electric appliances (energy efficient fridges, dryers, etc.). Product information on this aspect is quite often not readily available.

(ii) Relatively very short pay-back periods for energy-efficiency investment

Even when consumers are aware, they often demand very short pay-back periods in order to recoup their initial outlay quickly. The implicit real discount rate used is very much higher than normal and can vary between 20 and 50%. The latter implies that an energy-saving potential is present at negative social costs (i.e. social benefits).

(iii) High fixed (search and transaction) costs making energy-efficiency improvements expensive for firms with small energy budgets

Search costs and other fixed transaction costs necessary to invest efficiently could easily outweigh energy savings if these are related to small energy budgets. Often the information problem can be overcome by investing more time in expanding knowledge on this area, hiring specialized staff, etc. Research has demonstrated that if the energy bill of a firm is rather low or if there are financial constraints (e.g. liquidity problems) these investments, although theoretically profitable, will in quite a number of cases not be undertaken (SEO (1991)).

(iv) Property relations which impede 'profitable' energy-saving investment

If energy efficiency can only be improved by investing in property that is not owned but rented, a deadlock can ensue; whereas the investment would deliver net gains in the overall costs of energy services, neither the owner nor the tenant has, individually, an economic incentive in undertaking it. The owner would bear the costs, but would not benefit, while the tenant would lose if forced to leave the property before being able to recover his investment costs. The landlord-tenant problem is a major obstacle towards energy-efficiency improvement and might help to explain why discount rates used to assess the profitability of conservation are so high in the domestic sector. In general property relations can, thus, impede profitable investments.

(v) Market regulations which give no incentive to public utilities to promote increased end-use efficiency

The institutional setting or present market regulations may discourage energy-efficiency investments which are profitable. An important example are public utilities (electricity, gas, water), which under present regulations often have no incentive to promote increased end-use efficiency (e.g. via combined heat and power (CHP)) as profits are in many cases related to sales. Consumers are interested in energy services (e.g. heating) but often do not dispose of the know-how necessary to reduce energy use in a profitable manner without diminishing energy services (e.g. through insulation). Public utilities often do, but have no economic incentive to undertake the investment. If energy services (e.g. heating) can be met more cheaply by increasing end-user efficiency than expanding energy production capacity, the present regulation of public utilities might be seen as constituting a barrier to the rational use of energy.

The removal of these impediments could be pursued along two lines: Given the importance of the issue, the design of no-regrets policies should be studied carefully. It appears that two main policy lines should be pursued:

First, increasing information could improve energy efficiency which is under present conditions already privately profitable. In some cases economic agents are not aware of the existence of a privately profitable potential. This points to the importance of improving available information. An important contribution could be made by energy-efficiency labelling.

Second, in other cases there is a socially profitable potential (even without taking the reduction of environmental externalities into account) which, due to market regulations or property relations, will not be exploited because it is not profitable to private agents. One example would be the case of consumers who are faced with liquidity constraints or, for other reasons, apply very high private discount rates. If a significant difference between the private and social discount rate exists, a case could be made for some financial support (soft loans, tax rebates, etc.), although the cost-effectiveness of such measures should be assessed carefully. Other examples are the cases of the landlord-tenant problem and the incentive structure of public utilities. A sound economic policy consists of creating an institutional setting in which improving energy efficiency is attractive to private agents: getting the incentives right. Various policy measures fall under this heading: they might range from creating new provisions in laws regulating rent contracts, via recognizing specialized third parties which either finance or manage energy savings, to changing the rules of the game for public utilities.

If, for example, an institutional framework would be created in which projected demand for electricity services could only be met by options selected in a competitive bidding process for capacity expansion open to various sources (extra generation capacity but also energy conservation measures), then energy-saving investments and other demand-side measures would have a much better chance of being selected than is the case if forecast demand is automatically met by generation capacity expansion. In that case there would be a level playing field for competition between least cost measures to satisfy energy demand, to which it is known that energy-saving options contribute heavily. US experiments with this so-called 'integrated resource management' have been reasonably successful.

It should be stressed that, although such no-regrets policies are a cornerstone of the proposed Community strategy, this does not imply that all of these measures have to be taken at the Community level. On the contrary, the application of the subsidiarity principle implies that most of the necessary steps have to be taken at the level of Member States, (or even at the regional level) and that the Community only provides a coherent framework for such policies.

3.4. Economic instruments

3.4.1. Introduction: Regulatory policies versus economic instruments

If further progress is to be made, beyond what can be achieved by means of no-regrets strategies, policies will imply costs which should, ideally, be compared with the environmental stress they aim to reduce.

Environmental policies have, traditionally, relied on regulatory measures ('command and control' policies). These generally specify maximum emission levels or minimum efficiency standards which apply equally to all appliances, economic sectors or economic agents on which they are targeted. Examples which fall into this category are building regulations specifying minimum insulation standards, energy-efficiency standards for electric appliances, norms for waste water, etc. Implicitly, each norm represents a certain compliance cost which, however, is usually less visible than that associated to an alternative instrument (e.g. a tax). Regulatory measures have as their main advantage that, if they are respected, environmental targets are indeed reached. For this reason they have traditionally formed the backbone of environmental policies in many countries. In cases where the achievement of a target is of crucial importance (e.g. health standards), they may be preferable to alternative instruments.

There are, however, a number of drawbacks associated with these traditional instruments:

'Command and control' measures do not give a permanent incentive to improve environmental performance ...

Command and control measures only give an incentive to improve the environmental performance up to the level specified. Thus, they do not give an incentive to improve environmental performance beyond what is formally required.

This means that they are not dynamically efficient.

... nor do they allow the exploitation of (compliance) cost differences

Since the same norm applies to all to whom it is addressed in exactly the same way but the ease with which it can be complied with varies significantly among different economic agents it implies strongly diverging costs across the economy. The fact that these policies have no built-in mechanism to exploit existing cost differences prohibits progress being made where it is cheapest to do so. This means that the total costs to the economy of reaching a given environmental target are higher than necessary as the existing low-cost potential is not fully exploited. In other words: command and control measures are generally not least cost instruments and are also statically inefficient.

In general, economic instruments cost less than command and control measures

The growing awareness that regulatory measures often entail high implicit costs, both from a static and a dynamic point of view, has led to a certain reorientation in the formulation of environmental policies and to growing attention to economic instruments.

Economic instruments — or market-based instruments — use the price mechanism to reach the target either by directly influencing prices (taxation) or by flexibly rationing environmental damage through a quota system and allowing trade in quotas to even out compliance-cost differences (tradable permits). These instruments raise prices of environmentally damaging activities in proportion to the environmental stress they cause. Faced with changing prices, economic agents can each weigh the costs and benefits of adapting their behaviour and thereby reducing environmental damage. This implies that low-cost opportunities will be much more exploited than in the command and control case leading to a lower overall economic cost of reaching the same aggregate target. Another important characteristic is that the price signal permanently incites changes in behaviour, thereby ensuring that environmental improvements remain attractive (this in contrast with standards which do not contain incentives for improvements above the target). Economic instruments are thus, in principle, efficient both from the dynamic and the static points of view.

3.4.2. Taxes and charges

... are economic instruments that are well known and ...

Economic instruments that are well known are incentive taxes and charges. These aim to influence economic behaviour by increasing the relative prices of environmentally damaging activities *vis-à-vis* other goods and services.[1] The use of fiscal instruments in this context should be clearly distinguished from taxation for other purposes: a clear understanding of the difference between an incentive tax and a revenue-raising tax is important. The former tax only aims to change the relative price structure, without, however, changing the total tax burden in order to correct prices for externalities. This implies that, in principle, tax revenues should be recycled into the economy. Obviously, this is not the case with the revenue-raising tax which in theory should affect people's behaviour as little as possible. This is an important difference between the two types of taxes which should be taken into account when designing the precise modalities of the tax.

... which — like other economic instruments — can be linked to the 'polluter pays' principle

In fact, if the external costs — that is, the costs to society, which are not taken into account by private decision-makers

[1] The formal difference between a charge and a tax is that the former is paid in return for services received, whereas in the case of the latter there is no direct link with the provision of services.

— of a certain activity are known, then the level of the incentive tax should be made equal to these.

This corresponds to the 'polluter pays' principle (PPP) which ensures that economic agents take *all* costs of their activities into account. It can be demonstrated that if these costs are exactly taken into account (internalized) the resulting changes will lead to an optimal production, consumption and pollution pattern in which no change in one of these three magnitudes can be made without net welfare costs (that is with highest societal welfare).[1] In reality, however, these external costs are often not known exactly and incentive taxes are used to influence behaviour in the direction of a certain target. Whereas, in that case, their level may not be optimal, they do ensure that the costs of the resulting environmental improvement are the lowest possible as each individual economic agent will (permanently) have the possibility to adapt his behaviour. Thus, whereas they do ensure a cost-effective solution, it need not automatically also be the most efficient outcome.

As the amount of CO_2 contained in the various fossil fuels is fixed and — in the absence of so-called end-of-pipe measures — is fully emitted when the fossil fuel is burned, placing a tax on the various fossil fuels in relation to their CO_2 content is an efficient way of implementing a CO_2 tax.

3.4.3. Tradable emission rights

... are an attractive instrument if the amount of emission reduction is of crucial importance ...

An incentive tax on energy products would increase the price of these goods. The resulting reduction of energy use will depend on the demand reaction which ensues. As this is not only determined by the direct price sensitivity (elasticity) of energy demand (which, in fact, is not known with certainty), but also by the reaction of energy suppliers and the induced macroeconomic effects, it is difficult to predict, *ex ante,* what the precise influence of the tax on energy use will be.

Thus, if the attainment of a specific target is very important, it cannot be excluded that revisions of the tax rates will be necessary to fine-tune its effects. It can be stated that in the case of a tax the uncertainties lie mainly with the volume reactions — and hence with the attainment of quantitative targets — whereas the effects on prices and (marginal) costs are known.[2]

... as they allow the precise attainment of a target at least costs

If it is essential that a certain quantitative target is exactly reached it might be an attractive option to choose tradeable permits as a policy instrument. This policy consists of defining and bringing into circulation permits with maximum amounts of emissions that are allowed to holders. Only permit-holders are allowed to emit pollutants. As, in a sense, 'property rights' for emissions are defined, the approach is also sometimes labelled a 'property-rights approach'. If these permits can be exchanged among economic agents, a mechanism is built into the scheme to allow least-cost emission reduction: tradable permits are thus an attractive solution. The basic idea underlying this instrument is that the reduction of the environmentally damaging activity is exactly targeted, but that the way in which this is achieved is flexible so as to ensure that greatest progress is made exactly where it is cheapest to do so. In the context of CO_2 emission limitation, the scheme would imply that permits which each give the right to emit a certain amount of CO_2 would be brought into circulation by a permit authority.[3] The permits could then be traded. Economic agents with low adjustment costs would sell permits to others for whom adjustments are costly. The former would commit themselves to greater emission reductions for which they would be financially compensated by the latter who can, in return, increase their emissions above the levels for which they originally held permits. It can be demonstrated that, in theory, such a scheme would lead to a situation which resembles the tax case quite neatly: marginal costs are equalized across agents and are identical to the price of the permit. Compared to the tax case the uncertainty has now been shifted from quantity effects (the emission reduction) to the influence on prices (the price of the permit, which acts as an equivalent to a tax).

[1] Obviously, all taxation also involves welfare costs (which in the case of internalizing external costs are outweighed by welfare gains related to environmental improvement). This is discussed in more detail in Chapter 5, Section 3.

[2] The marginal costs per unit of energy consumption imposed on each economic agent equal the tax rate (that is energy saving takes place as long as related costs are lower than the tax (plus the costs of saved energy)). It can, however, not be claimed that the total costs are equal across economic agents as these depend on the amount of energy use and on average costs per unit of energy consumption, which do not exclusively depend on marginal costs. This point is also illustrated in Box 3. Hence, heavy energy consumers will generally be faced with higher costs and, even if energy consumption is equal for two consumers, costs can differ according to the flexibility of their respective energy consumption.

[3] For a full discussion of the possibilities of devising an effective tradable permit (certificate) scheme to reduce CO_2 emissions on different levels (regions, individual country, the Community and on a quasi-worldwide level) see: Heister, Michaelis and Mohr (1992).

However, the relatively limited experience with tradable permit schemes ...

It should, however, be stated that there are some other differences between both cases which warrant attention:

(a) If permits are to be economically efficient, then it is essential that a market comes into being. The limited experience available with tradable permits — which, mainly, comes from the USA and does not refer to CO_2 emissions — indicates that transaction costs might be high and that actual trading is quite limited and mainly of the intra-firm type.

(b) Monitoring would be necessary and will imply costs of operating the system. In addition to these, the total societal costs also include the compliance costs which economic agents will incur.

... should also be taken into account when comparing taxes and tradable permits

The limited experience with and the mixed results of existing tradable permit schemes should also be taken into account when comparing taxes with tradable permit schemes.

Finally, concerning the choice between economic instruments and command and control measures in the case of CO_2 emission limitation, significant gains are to be expected from using economic instruments, given that CO_2 is emitted by virtually all sectors and that there appear to be significant cost differences between them in reducing emissions.

3.5. The main characteristics of the EC strategy

In a recent communication from the Commission to the Council (SEC(91) 1744 final) a Community strategy to limit carbon dioxide emissions and to improve energy efficiency was proposed. This strategy has to be seen as a set of measures with which to reach the Community CO_2 emission target decided upon by the joint Energy/Environment Council of 29 October 1990. The target chosen is the stabilization of CO_2 emissions in 2000 at 1990 levels, which, given current projections for CO_2 emissions growth, would roughly amount to a reduction of emissions by 9 to 11% over the period 1990 to 2000, compared to the baseline scenario.

The strategy proposes a package consisting of three types of measures to reach its goal

The first set of instruments consists of regulatory and voluntary measures mainly aiming to improve energy efficiency at zero or low net costs. This set consists of an intensification of R&D programmes and sectoral measures in power generation, industry, transport, the household/commercial sector and in a number of other sectors. It entails a strengthening of existing Community programmes such as SAVE (COM(90) 365 final) and Thermie (which aims at furthering energy efficiency) and the introduction of new programmes such as Altener (which furthers the introduction of new and renewable energies).

The second set comprises a new fiscal initiative, notably an energy/CO_2 tax. Although an important number of issues concerning the tax are left open in the communication, some general principles have been already set out:

(i) the new tax is conceived as a combination of a CO_2 tax with a general energy tax where the energy component should not exceed 50%;

(ii) the tax would be phased in as of 1993, reaching its full size of USD 10 per barrel of oil equivalent in the year 2000;

(iii) the tax rate would be the same for all Member States, although a safeguard clause is foreseen;

(iv) the revenues of the tax would accrue to the Member States;

(v) a key characteristic of the new tax should be its revenue neutrality in order to avoid an increase in the overall tax burden within the Community;

(vi) a limited number of industries, which are heavy energy consumers and are exposed to strong international competition, will temporarily be (partly or totally) exempted in exchange for voluntary agreements to reduce CO_2 emissions as long as the Community's main competitors have not taken similar action. Non-energy use of energy products (e.g. as raw material in the chemical industry) should be exempted as no CO_2 emissions are involved.

The third type of measures consists of complementary national programmes which, in line with the concept of subsidiarity, will have to be worked out by Member States. These measures, adapted to their own particular economic, cultural and geographic circumstances, as well as to differences in the pattern and level of CO_2 emissions, will have to complement the Community package.

The Commission's proposal also contains a section on burden sharing in which it is stated that the Community should, in principle, state its readiness to contribute to the adjustment costs in relatively less-developed Member States.

The programme thus contains a mix of instruments which belong to a least-cost approach, ...

Thus, the Community programme contains a mix of instruments, combining measures — both on a national and a Community level — which can largely be seen as no regrets policies — with a CO_2/energy tax which is a least-cost economic instrument. It should, however, be stated that the efficiency of the package depends also on the modalities of the various instruments which, often, are still to be decided upon.

Calculations reported upon in the communication and elsewhere suggest that the combined CO_2/energy tax plays a central role in the instrument mix. However, a substantial contribution from SAVE and the national programmes is needed if the Community target is to be reached. Moreover, whereas the tax is expected to bring along some economic costs, the latter instrument type is likely to represent a 'free ride'.

The SAVE programme contains measures which increase information (energy labelling) and reduce barriers to the rational use of energy via other means (focusing on, amongst others, the individual charging of energy bills in multi-occupier-use apartment buildings, measures to enhance third party financing, energy auditing, a study on least-cost planning, etc.). Although some of these measures are likely to require considerable lead times, it is nevertheless expected that by the year 2000 they will contribute significantly to the CO_2 emission reduction which, at present, seems necessary to reach a stabilization of CO_2 emissions.

Finally the national programmes will have to contain measures that focus on country specific issues. At this stage they still need to be made concrete.

... contains a provision to deal with potential equity problems and ...

The section in the Commission's communication on burden sharing could, in principle, be seen as a provision in case the distribution of the costs of the policy package turn out to be unequitable. Given the uncertainties regarding the distribution of costs, the call for a monitoring mechanism seems justified. Equity aspects will have to be dealt with if equity problems arise, but cannot be identified precisely before the policy is introduced.

... respects the subsidiarity principle

Obviously, the economic circumstances and characteristics of the energy system differ significantly across Member States. Thus, the subsidiarity principle would seem to suggest that national programmes focusing on national conditions should be an important element in the proposed Community strategy.

However, for studying how market barriers to the rational use of energy that have common characteristics in all Member States could be removed, the proposed Community regulatory and research programmes would be well suited.

The discussion on burden sharing versus target sharing has indicated that the proposed carbon/energy tax should be equal across Member States if it is to be economically efficient. Thus, the subsidiarity principle would seem to suggest that the tax level and other modalities of this instrument could best be set at the Community level. For the actual implementation of the tax it would, obviously, seem best to rely on the national tax administrations.

4. Implementing the CO_2/energy tax: Economic efficiency and fiscal considerations

4.1. Introduction

The implementation of a combined CO_2/energy tax raises a number of issues that have a great bearing on the incentive function of the tax (for an extensive discussion on a number of these issues, see Hoornaert (1992), Proost and van Regemorter (1992)). In short, the fiscal feasibility and the economic efficiency of various possibilities have to be compared.

Decisions on a number of modalities of the tax still have to be taken

Thus the modalities of the tax merit careful inspection, which is the topic upon which this section focuses. As has been indicated, a number of central issues are still open:

(i) The indicative tax rate quoted in the Commission's Communication is expressed in US dollars. In principle this leaves a number of possibilities as to how the tax should be expressed in national currencies over the period 1993 to 2000.

(ii) The precise mix of the tax between the CO_2 and energy components has not yet been fixed (the energy part should not be larger than 50%).

(iii) No decision has yet been taken on where the tax will be levied in the energy system. Several possibilities exist: from a tax on all primary energy (levied when produced or imported) to a tax on energy products that are for final use. Thus the coverage of the tax base is a major issue. This issue is often discussed under the heading of production tax versus consumption tax — these labels referring to taxing primary and final energy, respectively.[1]

(iv) In the communication, (temporary and total or partial) exemptions are announced for a limited number of industrial branches with heavy energy consumption. Fundamental questions that are raised in this context are: How should they be structured and which branches are eligible?

[1] Strictly speaking the label production tax is not appropriate as the tax is a product tax levied on all energy products that enter the energy system. In fiscal terminology all product taxes are labelled 'consumption taxes'; the phrase 'production tax' being reserved for taxes on production processes. As in the discussion on the tax base, the distinction between consumption and production mentioned in the main text is very often used, it is applied throughout this article. For a quantitative description of the differences between both tax bases, see 6.2.2.

These points do not only pose the question of potential implications for economic efficiency, but also raise fiscal considerations which are of great importance

Obviously, decisions as to the tax level, the tax composition, the tax base and the number of exempted branches all influence the effectiveness and the economic efficiency of the tax.

According to the fiscal country of destination principle adhered to by all EC Member States, tax revenues should accrue to the country where final consumption takes place. The way in which the tax is implemented might have implications for the ease with which this principle can be respected.

A second, although somewhat related, fiscal criterion is the manageability of the tax. If the modalities were very complicated, the fiscal authorities might be burdened with a huge workload in administering and monitoring it.

In the following paragraphs the various aspects of the tax which were discussed above are analysed both from the economic and the fiscal angle.

4.2. The tax rate

The level of real tax rate is a key determinant of the effect of the tax on CO_2 emissions

In the Commission's communication, the proposed tax rate has, for illustrative purposes, been expressed in dollars.

Obviously, the tax will have to be integrated in the national tax systems and will therefore have to be expressed in national currencies (as long as these exist). As to the tax rate, it should be stated that there is a close link between the real level of the tax and its effects on the limitation of CO_2 emissions. This would seem to suggest that it is worthwhile to study means which could prevent the incentive function of the tax to be reduced over time due to inflation. For example, a regular revision of the tax rate could be envisaged to take account of this aspect.

The tax rate per unit of energy should be based on the CO_2 and energy content

In practical terms, the tax rates per unit (kg, hl, GJ, m^3) of energy should be determined as the product of the energy content and CO_2 content per unit of energy product on the one hand and the fixed tax rates per joule and per kg of CO_2 on the other hand. Due to large differences between various types of one product, it appears useful to dispose of various classes (each with different CO_2/energy content) for the following products: hard coal, patent fuels, brown coal, peat and black lignite. For nuclear inputs, it would probably be necessary to carefully inspect the issue of energy content.

4.3. The mix between a CO_2 tax and an energy tax

If the aim of the envisaged policy is exclusively to reduce emissions of CO_2, the first best instrument, from an economic point of view, is a pure CO_2 tax as opposed to an energy tax. From a tax administrative point of view, there appears to be no difference between the feasibility of both tax cases. However, a pure CO_2 tax would present some distributional and environmental difficulties which are not inherent to an energy tax.

A CO_2 tax reduces CO_2 emissions via all available channels ...

Theoretically, three channels can be discerned via which reductions of CO_2 can be achieved:

The first is a reduction of energy services in households and firms which is induced by the higher relative price of energy. If no increase in the efficiency of fuel consumption can be reached, this is associated with a pro-rata reduction of energy consumption.

Secondly, however, rising energy prices do give an incentive to improve the efficiency of energy use, both in end-use sectors and in the production process of secondary energy. A large number of potential efficiency improvements exist which are important as they allow emissions to be reduced without decreasing energy services.

Thirdly, fuel substitution leads to the replacement of carbon-intensive fuels by low or no-carbon intensive alternatives. Especially in electricity production, significant possibilities exist. However, this option is also available in end-use sectors, (e.g. substitution of coal for heating by natural gas).

... and is therefore more efficient in doing this than an energy tax

A CO_2 or carbon tax perfectly links the tax burden on various energy products to their CO_2 content and therefore gives the appropriate signal to economic agents. It thus uses all three options described above.

An energy tax does lead to little fuel substitution (because it does not discriminate between fuels on the basis of their carbon content) and is less efficient than a CO_2 tax in limiting emissions by reducing the demand for energy services and increasing the efficiency of energy use. Compared to an energy tax, a CO_2 tax needs a lower tax rate to reach the same CO_2 emission target — even in the absence of any possibility of substituting low or no-carbon content fuels for carbon-intensive energy products — because carbon-intensive fuels are made relatively more expensive. For a theoretical illustration of the economic superiority of a CO_2 tax over a number of alternatives see Proost and van Regemorter (1992).

Modelling work confirms this and shows that the differences between the effects of a CO_2 tax and an energy tax on CO_2 emissions are significant and become strongly visible in the longer run when the substitution potential is being fully exploited (Karadeloglou (1992)). Thus an energy tax would need a higher tax rate than a CO_2 tax to reach the same CO_2 target. Preliminary modelling results of the OECD's 'Green' project show that in the long term the economic costs of reaching a given CO_2 target might be roughly 30% higher in the energy tax case than in the CO_2 tax case. It should be stated, however, that generally this is accompanied by an increase in nuclear electricity, which many consider to constitute an environmental danger in itself.

An energy tax would, however, also reduce an important number of other environmental dangers ...

In a world without externalities, it would make no sense to tax energy as such as this would only distort the optimal allocation of resources. However, an energy tax might be strongly advocated as energy consumption is, in fact, related to a number of important externalities such as acid rain, transport-related externalities (e.g. congestion) and externalities associated with the use of nuclear energy (see e.g. Hohmeyer (1988)). It is true that, in all these cases, the link between the externality and energy use in general is not perfect, implying that an energy tax would not necessarily be a first-best instrument. But if it is difficult to introduce first-best measures (e.g. a tax on emissions of SO_2 or NO_x; road-pricing schemes and specific taxes on nuclear energy) a general energy tax can be put forward as an attractive sort of second-best solution. The same reasoning can be applied to the energy tax when analysed with respect to the security of supply argument: insecure supplies are probably best met using other policy instruments; however, an energy tax —

coming second best — might bring substantial social benefits (Eyckmans and Proost (1991)).[1]

... and would have a less uneven impact on the Member States than a CO_2 tax

It is true that CO_2 intensities differ more strongly across countries than energy use (as Table 9 demonstrates) and, thus, the impact of a CO_2 tax on Member States would be more uneven than that of an energy tax. This in itself, however, does not constitute a first-best reason for supporting an energy tax as it would probably be preferable to take account of distributional issues via other instruments. However, if this is deemed politically or technically difficult to implement, then the energy tax might be considered to be an attractive solution as it reduces the somewhat larger differences in impacts on Member States that a CO_2 tax would have.[2]

The comparison between the carbon and energy tax should take all these factors into account

The preceding discussion has tended to argue that the comparison between a carbon and an energy tax should not only be made on the basis of the respective impact on CO_2 emissions, but also by looking at the overall impact on total welfare, which is influenced by side-effects on other variables too (e.g. other environmental externalities, income distribution, etc.).

4.4. The tax base: production tax versus consumption tax

Economic efficiency points to a production tax

According to the economic efficiency argument, the tax, being an incentive tax, should lead to the incorporation in the price of final energy consumption of a tax element related to *all* energy use and pollution associated with final energy consumption. If, for example, the production of 1 TJ of final electricity involves 2 TJ of conversion losses — which, in fact, is close to the Community average — then the tax on final energy should be related to 3 TJ and not to 1 TJ. Only a production (extraction) tax can ensure that the tax burdens on different final fuels are exactly correlated with energy use and CO_2 emissions. Such a tax is economically efficient and fully consistent with the 'polluter pays' principle (PPP) as the incentives given to economic agents are perfectly linked to pollution: per unit of pollution the tax is equal across fuels and sectors giving each economic agent the same incentive. A consumption tax would only give incentives to reduce energy consumption in end-use sectors, without encouraging the exploitation of the potential for energy saving in the energy sector. Obviously this would involve a welfare loss as part of the least-cost options will not be exploited.

A production tax taps a 40% greater reservoir of CO_2 emission reduction potential than a consumption tax ...

To gain a clear vision of the extent of the potential welfare loss involved, it is first of all essential to have an impression of the amount of energy used for non-final purposes.[3] This potential — which would not be taxed in the case of a pure consumption tax — can be split up into energy lost in conversion processes, energy consumed by the energy branch and distribution losses. Together, these three factors explain why roughly 30% of the primary energy in the Community is not used for final purposes. This means that a production tax impinges on a 40% greater potential of CO_2 emission reduction than a consumption tax.

... which is mainly located in the electricity supply industry

The next question to be answered is where in the energy system this energy saving potential is located. Inspection of the energy balances published by Eurostat shows that roughly 80% of this potential is linked to conversion losses. Table 5 presents an overview of the various energy-generating processes and their efficiencies.

It turns out that the main conversion losses of significant extent are found in electricity generation. Elsewhere, conversion losses are either very limited (refineries, blast furnace plants and coke oven plants) or the conversion processes themselves are of minor importance (gas works, patent fuel and briquetting). The conclusion must thus be that 95% of

[1] An argument which, theoretically, would support an energy tax is the optimal import tax argument. If a group of countries — such as the EC — are an important energy buyer, the introduction of an import tax would lower demand and world energy prices and reduce the import bill which would enhance welfare (via the terms-of-trade effect). This argument, however, does not hold if suppliers retaliate to defend the price. Also, simulations with a world oil model, reported upon in Chapter 5, demonstrate that — even without OPEC reaction — effects on world oil prices of an EC only policy would be very modest. Thus, in practice, this argument seems of limited value.

[2] The loss in efficiency would have to be compared to the value attached to smaller distributional impacts.

[3] See Section 6.2.2. for a discussion in much more detail on this issue.

Table 5

Energy generation processes and conversion losses in the Community, 1990

Process	Losses as a percentage of total input	Share in economy-wide conversion losses
Conventional thermal power station	60,4	55,8
Nuclear power stations	65,7	41,0
Patent fuel and briquetting	10,2	0,2
Coke-oven plants	6,7	4,3
Blast-furnace plants	0,0	0,0
Gas works	15,8	0,0
Refineries	0,8	1,7
Total	26,1	100,0

Source: Eurostat.

the conversion losses are located in electricity supply industry. As conversion losses constitute roughly 80% of the total energy efficiency potential in the energy sector, the electricity supply industry seems of major importance.

Concerning the remaining 20% of the total potential, it can be stated that out of the distribution losses (with a share of roughly over 3%) over 90% are linked to the transport of electricity; the remainder are losses of natural gas. The auto-consumption of the energy branch (share over 16%) seems to be more evenly spread out over the energy sector, with a substantial part going to refineries.

Efficiency improvements and fuel switching in the electricity supply industry can contribute significantly to CO_2 emission reduction, especially in the longer run

Given the significant potential in the electricity supply industry it is of utmost importance to know whether significant gains could be reaped by the introduction of a production tax.

This does indeed appear to be the case. Not only are there manifold possibilities to increase the efficiency of conversion processes (by, for example, introducing combined heat and power plants, setting up highly efficient new combined cycle gas plants, etc.), but the substitution possibilities between 'clean' and 'dirty' fuels are also very considerable. This is confirmed by model simulations which show significant advantages from exploiting the substitution potential in the electricity supply industry.[1]

Thus, from the economic point of view, it appears that a priori a strong case could be made for preferring a production tax on primary energy to a (final energy) consumption tax as the former tax can and will exploit a significant potential for the reduction of CO_2 emissions.

However, from a tax administration point of view, a consumption tax might seem to have certain advantages

A priori a production tax might seem difficult to reconcile with the full application of the country of destination principle to secondary energy products as the energy inputs in the production process of secondary energy (e.g. electricity) — which would be taxed in this scheme — would have to be known: if this involves cumbersome calculations, detaxing at the border of the exporter and re-taxing at the importer's border or, alternatively, the operation of a clearing system might imply a relatively high administrative burden. This would probably suggest that from a tax administration point of view, the tax on secondary energy products should preferably be devised as a consumption tax if the country of destination principle is to be fully complied with in this case. However, concerning the application of this principle, various options exist: it could cover both the energy and carbon component of thc tax on secondary energy, or only one of these components and might even be waived completely as is the case with energy intensive goods such as steel and cement. The decision as to how the principle should be interpreted is a political one.

Whereas economic efficiency thus points to a production tax, the full application of the fiscal country of destination principle to secondary energy products might be achieved more easily by a tax on final energy products and hence a consumption tax. The important efficiency gains of a production tax compared to a consumption tax suggest that a strong effort should be made to reconcile the apparent advantages of the two. How can this be done?

1 In Capros, Karadeloglou, Mantzos and Mentzas (1991) results are reported of two simulations of a USD 10 CO_2 tax; one in which investment in the electricity supply industry is exogenous and one in which it reacts to changes in prices. In both cases a production tax is simulated. Note that if a pure production tax and a consumption tax had been compared, the differences between both scenarios would probably be larger. In that case not only would the substitution possibility have been missing in the first scenario (as it is now), but also the effect on output prices would have been considerably lower in the consumption tax case (because conversion losses would not be taxed at all). Nevertheless, even in this case, the differences between both tax cases are very considerable: national CO_2 emissions avoided are roughly doubled in Germany, Italy and the United Kingdom, whereas they increase by slightly less than 20% in France when substitution possibilities are allowed.

Reconciling the advantages of a production tax and a consumption tax: several options exist in the case of electricity

In principle, different options could be considered for combining the main economic advantage of a production tax with the fiscal advantages of a consumption tax. Such options could, for example, envisage a specific treatment concerning the taxation of electricity. This could be done in several ways:

A set of options exists in which electricity output is taxed by means of proxies for the inputs in the electricity generation process ...

One could envisage applying the tax to the output of electricity generation (consumption tax), but to base the tax rates on the amount and structure of the inputs used (production tax approach). If it would be cumbersome to measure inputs at each point in time for each generator it might be worthwhile using a proxy for inputs. In that case, a multitude of possibilities arise, each with different implications for economic efficiency and fiscal feasibility. Only descriptions of two possibilities are discussed here.

... either by using a rough proxy which economically might not be efficient but is likely to be easy to implement technically ...

The simplest system, from a fiscal point of view, would probably be to have one output tax on electricity in each Member State or even in the Community as a whole. The tax rate per kWh would be fixed by the tax authorities. The rate would be based on the national average structure of electricity production in a preceding year and be comprised of a CO_2 tax and an energy tax component. Alternatively, such a system could be used only for the energy part whereas the carbon tax would be formulated as a production tax. It would be applied to all generators or importers, irrespective of the way in which the electricity is produced. International trade in electricity could be taxed and de-taxed relatively easily when imported and exported.

Although such a system would tax conversion losses and thereby stimulate end-user efficiency of electricity, it would reduce the economic efficiency of the tax as individual generators would have no economic incentive to reduce inefficiencies in production, nor would substitution in the direction of clean fuels be induced (coal plants would bear the same burden per kWh produced as gas plants). The price paid for the fiscal transparency is thus significant, as the potential present in the electricity supply industry would not be tapped.

... or by choosing proxies which approximate the inputs in electricity generation closely for each generator and are thus economically attractive

An alternative would be to tax the output of each individual generator (on the firm level) on the basis of the energy/CO_2 content of inputs of a unit produced by it in the previous period (probably a year). This is the consumption tax equivalent of a lagged production tax. Such a system implies that the national tax administration would define *ex ante* the tax rate for each electricity generator.[1] Obviously, the key used to define this tax rate would be identical across the Community and would be based on the general levels of the energy and CO_2 tax components.

A question which arises is how to treat trade in electricity in such a system. Concerning intra-EC trade, de-taxing and re-taxing should be made relatively easy by the fact that trade takes place between a buyer and the producing firm.[2] As the latter — and the public authorities — knows exactly what the tax rate is per unit produced, de-taxing might be relatively straightforward. In this option, re-taxing in the country of import should, in principle, be based on exactly the same tax rate. This rate would have to be communicated by the seller to the buyer and the latter's public authorities. The principal advantage of this system seems to be that domestically produced and imported electricity are nearly exactly taxed on the basis of the pollution and energy use involved. Therefore the economic efficiency would come very close to that of a pure production tax.

... but which might imply a higher administrative burden and other disadvantages

This system might imply a higher administrative burden for the fiscal authorities. It would also lead to the introduction of diverging tax rates for a product which end-users consider to be homogeneous (but which in environmental or energy terms is not).

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1 However, firms would probably have to be allowed to fall under a lower tax rate if they can prove that either their fuel mix differs strongly from the previous year (e.g., in the case of dual-fired plants), or they have brought new capacity on line.

2 For extra-EC exports the procedure could be analogous to the intra-EC case. For extra-EC imports the tax will have to be levied at the border. The most equitable system would probably be to ask non-member States' electricity producers who sell to Member States to provide the Commission with information on their generation mix and efficiency. The Commission could then determine tax rates for individual non-EC producers which should apply in all Member States. If this were not feasible, country averages instead of firm-based taxes could be determined. It should be stated that if proxies were to be used in order to make the system easier to manage, the efficiency loss would be very limited due to the very small role extra-EC imports play in electricity consumption (share less than 3%).

Alternatively an electricity input tax approach could be considered ...

Alternatively, one could also investigate to what extent a production tax approach could be used in which only inputs of electricity are taxed. Whereas the economic efficiency of the tax in reducing emissions would be optimal, it would be necessary to know the fuel mix used in electricity generation at each point in time in order to comply fully with the country of destination principle and to accurately exempt certain industries. It is certainly worthwhile to investigate whether this is technically possible at low cost.[1] Only if detaxation of secondary energy products were not sufficiently accurate would non-compliance with the country of destination principle occur, which would be deemed unattractive from the fiscal point of view if the country of destination principle is to be applied fully to secondary energy products.

Reconciling a production tax and a consumption tax: other energy products

As conversion and other losses seem to be much less important for the other energy products, it would not imply a great loss in terms of economic efficiency if the tax base were to be established on the basis of the CO_2 and energy contents of the final product only. Thus, the difference between a consumption tax and a production tax approach would seem quite limited.

As stated in the Commission's communication, it is generally desirable that, where and if possible, use is made of the existing excise system. From the economic point of view, it is obviously important that, in principle, all energy products should be taxed. As, at present, not all energy products fall under the excise regime it is worthwhile looking carefully into this issue so as to avoid having a situation in which a significant amount of energy products are not taxed at all.

4.5. Exemptions

The Community strategy proposed by the Commission contains a provision for temporary exemptions of the CO_2/energy tax for industries which are heavy energy consumers and operate on competitive international markets.[2] These exemptions will be given in exchange for voluntary agreements to reduce CO_2 emissions and will expire when other countries introduce comparable CO_2-emission limitation policies.

The need for exemptions: Exemptions prevent some of the Community's CO_2-emission reductions from simply being replaced by CO_2-emission increases elsewhere

The Community's CO_2-emission stabilization target is not an end in itself. It is a means of contributing to the limitation of global CO_2 emissions. Thus it cannot be the aim of the strategy that reduced Community emissions are replaced by third countries' emissions. As, however, the Community has decided that it would play a leading role in efforts to limit greenhouse gas emissions, it runs the risk that when it introduces a CO_2/energy tax without additional measures before the Community's main trading partners do so, this emission dislocation could — at least to some extent — happen. Energy price rises in the Community could give an incentive to its energy-intensive industries to relocate their activities outside the Member States. In that case, the Community's emissions would simply be substituted by those from third countries. Another potential effect which would reduce the Community's emissions, but leave global emissions unchanged would be the substitution of energy-intensive goods made in the Community by those produced outside the Member States. If energy efficiency levels in the Community are relatively high, such a development could even lead to an increase in global emissions.

It is, therefore, legitimate to suggest that specific measures such as exemptions are required to avoid such developments. Two broad types of options seem to be possible.

Wide-ranging exemptions prevent CO_2 relocation effects but are likely to increase the cost of stabilizing CO_2 emissions in the Community ...

Obviously wide-ranging exemptions for industrial branches would significantly reduce the likelihood of CO_2 relocation effects.

[1] Due to the specific characteristics of the industry, the grid operator knows at any point in time exactly which generators are feeding into the grid. As generators in most cases have fixed input structures, and, if not (e.g. dual-fired gas and oil plant), know exactly what they are using, one could imagine a pure production tax approach which could be compatible with the country of destination principle. The only condition is that the grid operator can continuously calculate the fuel input structure of the electricity which is being sold. Obviously, the technical infrastructure with which to operate the system would have to be available and its costs should not be prohibitive.

[2] In fact, the communication uses the phrase 'special treatment' which could take the form of (partial or total) exemptions, application of zero rates or introduction of fiscal incentives, tax reductions or reductions in charges for employers. In this paragraph, we will simply denote all these measures by the world 'exemption', although they are — obviously — not the same.

On the other hand, the effect of exemptions is that the marginal costs of emission reduction are no longer equalized across sectors. If a given Community target is to be reached, exempting sectors implies that in general a higher aggregate cost will have to be paid. Only if exempted sectors are very vulnerable to international competition, could it be assumed that the cost of exempting would be limited. This highlights the necessity of carefully selecting the sectors to be exempted rather than introducing wide-ranging exemptions. Thus, wide-ranging exemptions will be costly in economic terms. The higher costs will be borne by other sectors of the economy which have to increase their CO_2-emission reduction effort. From an administrative point of view, however, wide-ranging exemptions might present certain advantages over more detailed schemes.

... a situation which will improve, but probably not completely disappear, if voluntary agreements are introduced

The introduction of voluntary measures by exempted branches will reduce the costs of exempting markedly as it reduces the CO_2-emission reduction efforts which will have to be made by other sectors by tapping the potential present in exempted branches. However, it seems unlikely that voluntary agreements can reduce emissions as efficiently as a CO_2/energy tax. There are two basic reasons for this:

First, even if the voluntary scheme did lead to exactly the same CO_2-emission reduction as the tax in the production process (that is per product produced), the price of outputs of exempted industries would be lower than in the non-exemption case as they would not be paying taxes (which is of course the reason for exempting in the first place). This means that the structure of relative consumer prices would not fully reflect the (marginal) costs of emissions, leading to more consumption of products of those industries than if they were taxed — with associated higher CO_2 emissions. Thus, even if the CO_2-emission reduction potential in the production process were to be fully tapped, there would be no additional reduction in CO_2 emissions due to a change in the consumption mix in favour of less CO_2-intensive products.[1]

Second, it is not likely that the emission reduction potential present in the production process would be exploited as efficiently as in the tax case. The tax — which gives the least-cost incentive — works diffusedly, tapping opportunities in many domains of the production process whereas extra investment programmes resulting from the voluntary agreements have, by nature, a more restricted scope. Thus, even if the same CO_2 effect is reached as in a tax case, it is likely to be at higher economic costs to society.[2] Furthermore, it would be very difficult to ensure that a significant contribution in addition to what would be done anyway were undertaken by exempted industries (which raises the issue of additionality which is discussed below).

Alternatively, exemptions could be targeted carefully on a limited number of branches ...

In view of the potential economic costs of wide-ranging exemptions to the overall economy, it might seem attractive to carefully target exemptions on branches or companies where relocation of CO_2 emissions outside the Community might potentially be of great importance. As roughly 80% of industrial energy use is consumed by only 20% of industry, focusing on only a limited number of industries would not seem to bring along a significant danger of CO_2 dislocation.

... which would seem to limit the economic costs of exempting significantly without leading to a much higher risk of dislocation of CO_2 emissions

Branches or companies where CO_2-dislocation effects might occur can be expected to have high energy cost shares in combination with a large sensitivity to extra-EC competition. This would point to three criteria in this option on which to base the exemption decision: energy cost shares, and — in the absence of knowledge of price elasticities *vis-à-vis* extra-EC competitors — extra-EC import shares on the domestic market and extra-EC export shares in production.

It should be stated that, if the carefully selected exempted sectors are very exposed to international competition (with countries not introducing a tax), and the non-exempted sectors are relatively sheltered, exemptions could prevent a loss of aggregate international competitiveness from occurring. This would constitute a macroeconomic gain which, of course, would have to be balanced with the microeconomic disadvantage of higher resource costs of meeting the CO_2 target. The net welfare change could be positive. The chances of this occurring are higher, the more carefully the exemptions have been targeted.

In general, a number of other considerations should be taken into account when setting up an exemption scheme.

[1] It should be stated that *vis-à-vis* the pure exemption case (without agreements), some use will be made of this potential as the costs of the voluntary measures will be passed on to prices.

[2] Although the costs to the exempted branch would be lower as no taxes are paid.

The exemption scheme would have to be thought through carefully

(i) Using a high level of disaggregation to define branches or even companies which are to be exempted seems of significant importance when setting up a targeted exemption scheme. This enables one to 'finetune' the exemptions and limit them to cases where it seems to be economically sound to do so. Obviously, the potential extra burden for the tax administration of using a fine level of disaggregation should also be taken into account. In this context, it might even be worthwhile investigating whether it is fiscally feasible to define the exemptions on a firm or even process level (e.g. smelting). Also, if a sectoral approach is retained, the question must be asked how the list of sectors which could be exempted is to be established (how are the criteria suggested above going to be used?).

(ii) Full exemption of a number of heavy energy users in combination with tax cuts offsetting the carbon/energy tax revenues in the case of a revenue neutral introduction of the CO_2/energy tax could lead to perverse effects: the production costs of CO_2-intensive industries could on balance be lowered, giving these branches a competitive edge over competitors on domestic and international markets.[1] This would lead to an increase in CO_2 emissions. Further to the economic argument against full exemptions, it can be asked whether such an approach is justifiable on equity grounds. A priori it would perhaps seem unreasonable if the heaviest polluters were to pay the lowest price (or even benefit). The two arguments pleading in favour of partial exemption should, of course, be weighted against the fiscal and technical consequences of — perhaps more complicated — partial exemption schemes.

(iii) If the decision to exempt would be a discrete one and if the exemption would be granted to the full extent whenever the critical level of certain criteria is exceeded, then the incentive function of the tax would be limited. Above the critical level no incentive is given to reduce CO_2 emissions.[2]

(iv) The economic and equity arguments brought forward in the preceding points would favour a gradual — upward-sloping — exemption schedule as pictured in Graph 17. The economic incentive function of the tax would be retained over the full range and there would be no abrupt breaks in exemption levels. However, such a scheme might pose technical problems from the tax administrative point of view. It could be worthwhile investigating whether the permanent incentive could not be approximated by a scheme of tax brackets with marginal rates such as already exist in many income taxation systems. Obviously, the practicability of any system would have to be taken into account.

(v) The Commission's communication links the issue of temporary exemptions to voluntary agreements to reduce CO_2 emissions. The latter are to be seen as a precondition for the former, which will expire when the Community's main competitors take analogous measures. This raises two issues. First, it will be necessary to define what actions make a branch eligible for the exemption scheme. In general one would expect investments to be necessary (either for new equipment or retrofitting). This, then, raises the issue of additionality: which investments are made on top of those which would have been made anyway. Secondly, a definition will be needed of what is meant by analogous measures introduced by the Community's competitors as a broad range of possibilities exist. What regulatory and fiscal initiatives will be considered equivalent to the Community's CO_2-limitation programme?

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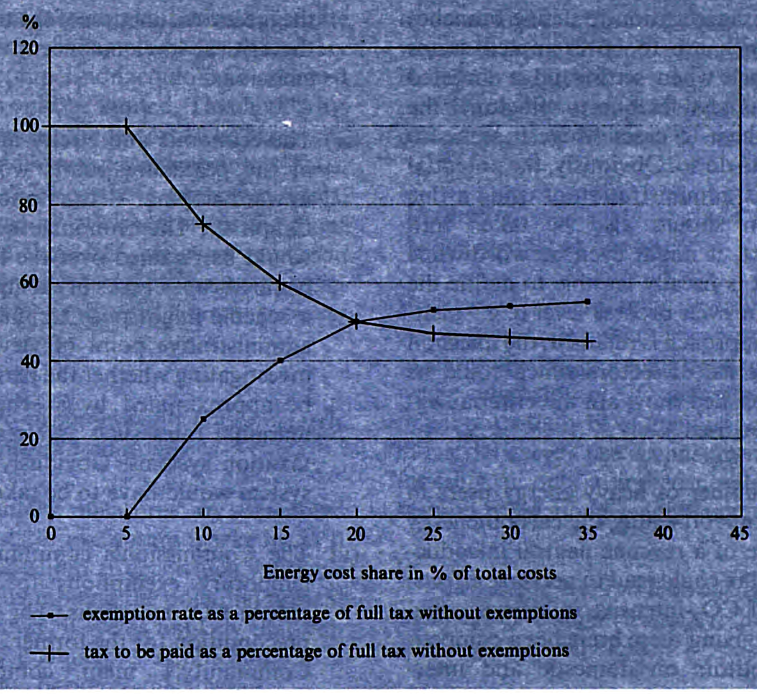
1 Next to competition with producers of the same product (which only plays a significant role on extra-EC markets), inter-product competition (e.g. steel versus plastics) is of importance. As this plays a role on the whole of the — quantitatively very significant — intra-EC market, it could contribute markedly to perverse effects in the case of large-scale full exemptions.

2 Obviously an equity issue is at stake as well: as critical levels always have an element of arbitrariness, it would be difficult to explain why a branch just beneath the critical level would get no exemption at all, whereas one situated slightly above this branch and just over the border would be fully exempted.

GRAPH 17: **An upward sloping exemption curve — An illustrative example**



Part C

The likely economic impact of the proposed carbon/energy tax

The non-fiscal elements of the proposed Community strategy are mostly based on a no-regrets approach. These elements are intended to lead to an unaltered consumption of energy services which are provided at lower resource need. Potential output would be positively affected by such measures as would most other macroeconomic variables.

This underlines the importance of the non-fiscal element of the Community strategy: a substantial part of the Community target might be attainable at essentially very low costs indeed.

At present, it does not seems possible to execute an in-depth quantitative analysis of the effects of the non-fiscal elements, basically because these measures will still have to be specified and are at present too broadly formulated to allow detailed investigation into their economic effects. Moreover, many of these measures rely strongly on efforts made by Member States.

This explains why the economic analysis of the Community strategy presented in this part focuses on the economic consequences of the proposed carbon/energy tax. As discussed in Part B, this innovative instrument is a key element of the proposed strategy.

The modalities of the strategy have still to be decided upon and it is obvious that the design of the strategy should take account of the impact the tax has on the economy as a whole, on the various economic sectors and on the household income distribution. The following three chapters study these three types of impacts one by one.

5. The macroeconomic effects

5.1. Introduction

In this chapter, a primarily qualitative analysis of the macroeconomic effects of the introduction of a CO_2/energy tax in the Community is provided. The aim is to assess whether the macroeconomic impact of the tax is likely to be important and to analyse what the mechanisms are that determine this impact. This analysis is backed up by some quantitative results from model simulations. Most of these results are illustrative and should be considered as presenting only rough orders of magnitude.

In the first part of the chapter, the main economic concepts and transmission mechanisms are set out. First, the two principles of revenue neutrality and market flexibility are discussed by focusing on the domestic economy. Then, in the context of an open economy, the issue of international competitiveness is dealt with. Of some importance to the effects of the proposed Community strategy is the issue of feedbacks to world oil markets (see Box 7).

The second part of the chapter discusses, against the background of these first exploratory sections, possible scenarios of taxation and redistribution of tax revenues. These scenarios are quantified in tables with results from model simulations. First, a number of caveats are discussed regarding these results. Then, three illustrative scenarios for recycling the revenues back into the economy are treated: (a) redistribution via lower social security contributions paid by employers (SSCE); (b) by reducing personal income taxation (PIT); and (c) by means of a decreased value-added tax (VAT). A scenario in which revenue redistribution takes place via a mix of possible instruments is also included in the analysis. It should be stated at this point that these scenarios are purely demonstrative and are only meant to elucidate the different mechanisms as, according to the proposal and in the spirit of the subsidiarity principle, it will be up to the Member States to decide on the use of the tax revenues. The issue of whether differences between Member States in the macroeconomic effects of the package will be large, is of considerable interest and is dealt with in the last section. Finally, some preliminary conclusions are drawn.

5.2. Energy taxation and the principle of revenue neutrality

In order to make the mechanisms via which energy taxation impinges on the economy more transparent to the reader, the analysis in Sections 5.2 and 5.3 abstracts from international competitiveness and terms of trade effects which are specifically dealt with in 5.4.

The initial effect of the tax is to raise prices of energy products and — via that channel — to reduce purchasing power and thus diminish aggregate demand. The introduction of any product tax has this effect. The extent to which these results occur depends on the tax rate and the tax base: at current prices the proposed mixed CO_2/energy tax of USD 10 per barrel of oil equivalent would raise energy prices to final consumers by approximately 10 to 15% depending on whether all energy is taxed (inclusive of conversion and other losses) or only energy sold to final users.[1] However,

Table 6

Economic effects of a CO_2/energy tax of USD 10 per barrel of oil equivalent: Aggregate Hermes model results for the four largest Member States (D, F, I, UK)[1]

	Scenario		
	Without redistribution[2]	Redistribution via employers' social security contributions[3]	Redistribution via personal income taxes[3]
Volumes			
Private consumption	−1,8	−0,3	0,7
Investment	−1,6	−0,7	−0,8
Exports	n.a.	−0,4	−0,6
Imports	n.a.	−0,7	0,6
GDP	−1,6	−0,2	−0,3
Employment	−0,9	0,3	0,0
Prices			
CPI	3,7	1,4	2,7
Export deflator	n.a.	1,3	2,1
Import deflator	n.a.	1,0	1,3
Real unit labour costs	n.a.	−2,1	−0,4
Ratios[4]			
Budget balance	1,3	−0,0	0,0
Current balance	−0,4	0,1	−0,3

[1] All variables, unless otherwise stated, expressed as a percentage change in the level after seven years compared to the reference case.
[2] In this scenario, each EC country introduces energy taxation policies on its own. The models for the four countries have been run in non-linked mode. Effects after five years of a tax that is somewhat larger than USD 10.
[3] In these scenarios, it is assumed that all EC countries introduce energy taxation policies. The models for the four countries have been run in linked mode and weighted average results for the four countries are presented here.
[4] Differences in % of GDP.
Sources: Detemmerman, Donni and Zagame (1991) and Standaert (1992).

[1] In this paragraph, possible exemptions of the tax are not taken into account.

this is to some extent a theoretical conclusion as the tax will be phased in and reaches its full level only in 2000. The introduction of the tax represents a transfer of resources from the private sector of the economy to the government. This transfer represents roughly 1% of current GDP once the tax has been fully introduced. Accordingly, government tax revenues increase substantively.

Without revenue redistribution, the tax will tend to raise the price level and dampen aggregate demand

Similarly, to any other increase in indirect taxation, the initial effect will at first raise the general price level and reduce domestic demand unless the carbon/energy tax revenues are redistributed back to the economy. The drop in demand reduces production and tends to have a negative impact on GDP and employment. In addition to the energy price rises, wages could react to the higher price level which might lead to extra inflation. The slow-down in economic activity would, however, gradually begin to mitigate the upward pressure on prices. In the medium run, the economy would arrive at a situation in which, compared to the baseline, production and employment would be lower and the price level would be higher. This is pictured in the first columns of Tables 6 and 7 where 'revenue-raising' scenarios with the Hermes and Quest models are presented.

However, in the long run — depending on the adjustment potential of the economy (Section 5.3) — the economy might move back in the direction of the level of activity at which it would operate in a situation without energy taxation. If it returns fully, then it is evident that the initial GDP losses are not permanent but should be considered as transitional adjustment costs.

Table 7

Economic effects of a CO_2/energy tax of approximately USD 10 per barrel of oil equivalent: Aggregate Quest model results for all Member States [1]

	Scenario			
	Without redistribution[2]	Redistribution via personal income taxes[3]	Redistribution via employers' social security contribution[3]	Redistribution via VAT[3]
Volumes				
Private consumption	−1,9	−1,0	−0,7	0,4
Private investment	−2,2	−2,0	−1,9	0,7
Exports	−2,0	−2,2	−1,4	−2,5
Imports	−2,9	−2,1	−1,6	−2,3
GDP	−1,2	−1,1	−0,7	−0,1
Employment	−0,4	−0,3	−0,0	0,1
Prices				
CPI	3,8	3,5	2,5	0,9
Export deflator	3,2	2,8	1,8	3,0
Import deflator	3,2	2,1	1,0	2,9
Real unit labour costs	−0,3	−0,4	−0,6	−0,2
Ratios[4]				
Budget balance	0,7	0,1	0,0	−0,1
Current balance	0,3	0,2	0,3	0,0

[1] All variables, unless otherwise stated, as a percentage change in the level after five years compared to the reference case. All scenarios have been computed in linked mode.
[2] In this scenario, the policy is pursued by all EC Member States, the USA and Japan.
[3] In these scenarios, the policy is pursued by all Member States.
[4] Differences in % of GDP.
Source: Commission services.

The scenarios undertaken with the Hermes and Quest models underline that, without revenue redistribution, the macroeconomic effects will, at least, in the medium term, tend to be negative. The analysis up to this point has underlined the importance of revenue redistribution as a means to restore aggregate demand.

Box 4: The principles of budget neutrality and revenue neutrality

In this context, it is useful to briefly address two 'tax principles' which both imply a recycling of the tax revenues back to the economy: budget neutrality and revenue neutrality. According to the first principle (budget neutrality), the introduction of the tax would not change the government budget balance (i.e. borrowing or lending). Thus, the tax revenues could either be used to increase government expenditure or to reduce other taxes. In the former case, this would mean, however, that the share of government spending in the economy would be increased and thus the overall tax burden. The second principle (revenue neutrality) also ensures full recycling of revenues but only via lowering other taxes and charges. Whereas in both concepts the level of aggregate demand is maintained, only in the former the composition might shift in the direction of higher government spending. In some cases, a higher share of government in GDP could have a negative effect on the supply side of the economy. This, in turn, could lead to lower growth rates. Obviously, the effect on the economy of extra government spending depends very much on what the money is actually spent on and it cannot at all be excluded that extra spending for some purposes would be beneficial in terms of economic welfare. Moreover, in the Community context and independently of these analytical aspects, two further aspects are of importance. First, and foremost, in accordance with the subsidiarity principle, the decision on the use of national tax revenues is to be taken by the Member States and not by the Community. Secondly, the transition to economic and monetary union implies that some Member States will have to improve their budget balance significantly. Thus the scenarios in this chapter merely aim at illustrating the different economic impacts of various ways of revenue use, without having a normative character.

The revenue neutrality tends to restore aggregate demand without reducing aggregate supply

Introducing a CO_2/energy tax in a revenue neutral fashion tends to restore aggregate demand without introducing negative side-effects to the supply side of the economy. If the tax is implemented in this way, it will give the right incentive in environmental terms whilst minimizing macroeconomic costs.[1]

In the Commission's communication, this principle has been explicitly incorporated (see point 20 in SEC(91) 1744 final): the tax is only meant to be an incentive tax, not a revenue raising tax. Of course, it is up to the Member States, to whom the tax revenues accrue, to decide on the manner in which the revenues will be recycled by lowering other taxes or charges. Various options exist in this field, all having different characteristics and consequently leading to differences in the macroeconomic effects of the whole package. However, all have one essential aspect in common: the redistribution of the tax revenues restores the initial aggregate loss in purchasing power to the economy without weakening the supply side of the economy. Thus, no loss in aggregate demand occurs initially and the main effect of the policy 'package' is a change in the relative price structure disfavouring energy and carbon-intensive production and consumption. This will lead to an adjustment process in the economy, by gradually changing the production and consumption structure away from carbon and energy-intensive products and production processes.

5.3. Adjustment to a new set of relative prices: the importance of flexibility and transparency

Adjustment will be necessary and will entail some costs ...

The macroeconomic consequences of the proposed package (including the revenue neutrality) depend crucially on the ease with which economies can adapt to the new relative price structure. Flexibility on the supply side of the economy will thus be of great importance. In production processes, attempts will be made to use less energy and to switch to

[1] It should be stated that for economies which have a persistent national savings' deficit, a revenue-raising policy could in the (very) long run be more attractive than a revenue neutral policy. The tax forces national savings to increase, which — after initial negative demand effects — in the long run can lead to lower real long-term interest rates, with positive effects on investment, capacity and — eventually — GDP. Analysis presented in DOE (1991) seems to suggest that this might be the case for the USA which seems set to continue to have a high national savings' deficit for some time.

factor inputs which are relatively unaffected by the tax (labour and, if possible, capital). In consumption, the relative demand for energy-intensive products will decrease. This adjustment process will bring about some costs but these can be limited.

... but these will be low if markets are flexible and the tax is phased in gradually and predictably

These adjustment costs seem to be determined by three main points:

First, the initial impact (the impulse given to the economy) is determined by the energy/carbon intensity of the economy. Tax revenues are a function of this variable.

Secondly, flexibility in the various markets in the economy is of great importance. This determines how easily activities can be expanded or reduced and thus how costly the adjustment to a less energy intensive economy will be. This flexibility hinges on issues such as market structure (e.g. perfect competition vs. oligopolistic markets), as well as on the process of wage formation (e.g. the extent of wage indexation, etc.). One could capture these aspects in the 'structural adjustment potential'. If this is high, macroeconomic disruption following the introduction of a tax will be limited.

Thirdly, and related to the previous point, the issue of phasing in is crucial. If one can anticipate the relative price change well before it happens, expectations are altered and the change can be accounted for in economic decisions in advance. Adjustment costs will then be lower. An important aspect attached to the role of expectations is that it will significantly influence the development of capital and equipment. The fact that it is known that energy prices will increase with a certain amount at a certain point in time, gradually leads, via the natural process of capital stock replacement, to a more energy-efficient capital stock — at low costs before the tax is introduced.[1] If, however, the tax were to be introduced suddenly without prior announcement, parts of the capital stock would become economically obsolete or would require expensive re-equipping at the moment of the introduction of the tax. In that situation, it would be too expensive to adjust the capital stock at once: this points to the importance of sunk costs. Production would, for some time, take place at higher costs and bring along higher emissions than in the former case.

[1] Obviously, costs before the tax is introduced are increased. Total costs measured over the lifetime of the equipment would, however, be lower.

Box 5: Welfare effects of existing taxation

The use of the tax revenues might make an important contribution to increasing the structural adjustment potential of economies and to enhancing economic welfare. This could be done by diminishing existing taxes that have relatively strong negative effects on economic welfare. All taxes impinge on economic decision-making and reduce the efficiency of the allocative mechanism to a certain extent as they raise the relative price of the products or factor input being taxed. As these relative price changes do not reflect scarcity or externalities, they give 'wrong' signals to economic agents (in this context the term 'distortionary tax' is often used). This leads to under-utilization of the resource which would in general make the economy worse off and reduce economic welfare. A heavy tax on labour, for instance, used to finance a generous social security scheme implies that production would be less labour-intensive than otherwise and could — as a side-effect — also bring along a considerable degree of labour market inflexibility. These welfare costs — labelled deadweight losses — can be substantial. Obviously these welfare costs would have to be compared with the benefits of the revenue use in terms of government expenditure. As internalizing the external costs associated with energy use would seem to imply relatively small welfare costs and might even entail welfare gains, replacing existing distortionary taxes with 'environmental' taxes could significantly reduce the welfare costs of raising a given amount of tax revenues.

Although no evidence seems to be available yet for Europe, it appears that the average welfare loss of existing taxation in the USA equals approximately 18% of the revenues. For new taxes, these (marginal) costs are even higher (at least 33%). Capital income and corporate income taxes seem to have especially high costs (Jorgenson and Yun (1990)). Thus, this issue merits further analysis in the Community.

Revenues could be used to increase the structural adjustment potential and improve economic welfare by lowering strongly distortionary taxes

As the introduction of a CO_2/energy tax reduces environmental stress, replacing tax revenues of especially 'distortionary' taxes by those resulting from the new environmental tax brings along a double dividend: the economy is — initially — made better off and the environmental degradation is reduced. Obviously, this double dividend has to be compared with the economic costs of switching to a more environmentally-friendly mode of production and consumption. These costs can, conceptually, be distinguished in transitional (adjustment) and permanent costs.

These benefits will have to be compared to the transitory and permanent costs the policy brings along ...

The transitional costs have already been discussed and consist of two main components: (a) potential macroeconomic disruption as the economy is adapting to a new set of relative prices; and (b) costs of re-equipping or replacing existing energy inefficient capital goods.

Once the adjustment process has been completed, transitional costs are no longer incurred. However, if the economy does not fully return to the growth path along which it was developing, permanent costs will continue to be made. One important factor for assuming that permanent costs might occur is that the use of the production factor energy will be curtailed. This effect is the deadweight loss of the energy tax. An extra constraint on the production possibilities is introduced which will lead to lower welfare if no energy-saving technological development is induced that fully offsets the reduced production possibilities.

Permanent costs could also occur if the macroeconomic disruption following the introduction of the package would be large and the economy could not recover due to a low adjustment potential.

... which would be small if the structural adjustment potential of the economy is enhanced

A conclusion emanating from this analysis is that enhancing the structural adjustment potential of economies is strongly advisable. It should be clear that this holds not only for this specific case but in general, as it diminishes the economic costs of a variety of shocks to the economy. It is evident that also in the particular case of energy taxation the higher the adjustment potential the lower the costs will be: the more flexible markets are the more inexpensive adjustments to a new set of relative prices will be.

It is difficult to predict whether permanent costs would outweigh the positive effects of reductions in distortionary taxes. Thus, when abstracting from the environmental benefits, the sign of the effects on economic welfare of the revenue neutral introduction of carbon/energy tax is a priori uncertain. A very important factor in this respect is what happens to international trade. This is the subject of the next section.

5.4. The international perspective: potential gains and losses in competitiveness and terms of trade

The discussion has, up until this point, not yet explicitly taken account of the international dimension. As the tax changes the relative price structure, the competitiveness on markets exposed to international competition of various sectors in an economy which introduces the tax, is altered. A close look at this open economy issue should complement the analysis of the two preceding sections in an assessment of the effects of a CO_2/energy tax.

The effects of a CO_2/energy tax depend heavily on the openness of the economy and the product and geographical structure of international trade. It is often argued that in open economies, the effects of the tax will be negative because prices of energy intensive branches will rise and a loss of competitiveness *vis-à-vis* countries not introducing the tax will ensue. The share of extra-EC imports and exports of products of these branches and the price sensitivity of demand determines the extent of decrease in demand for EC products.[1] This reduction of demand would have negative consequences for GDP and employment.

Effects on international competitiveness also depend on revenue use and on the indirect macroeconomic consequences ...

It should, however, be strongly stated that this is only part of the story as, in this respect, the use of the tax revenues is also of great importance. If revenues are used to lower other production costs, e.g. social security contributions paid by employers (SSCE) or the cost of capital, then total costs will decline in many branches and competitiveness consequently increase. Obviously, in the energy-intensive sectors, the effect of the revenue redistribution will not outweigh the negative

[1] This issue is dealt with extensively in Chapters 6 and 9.

effects of energy taxation but, in other sectors, it will lead to enhanced competitiveness. The effects on the volumes of aggregate exports and imports depend on these relative price changes and the sensitivities to these changes on the various markets.

The indirect macroeconomic effects are also of great importance. If the adjustment process is slow and a wage-price spiral is generated, then the indirect macroeconomic consequences might impinge negatively on aggregate competitiveness.

... and will probably consist of winners and losers on a sectoral level

It is thus essential to realize that, without further information on revenue use, trade structures and the indirect effects of a macroeconomic nature, it is impossible to arrive at precise conclusions concerning effects on aggregate competitiveness. Whereas the energy tax leads to cost increases, the revenue use can offset negative effects on competitiveness. If revenues are partly used to lower other production costs then the aggregate effect will consist of some sectors experiencing decreases in total cost whereas others are confronted with higher production costs. Obviously, this has an impact on relative prices and hence on sales. Some branches are likely to expand sales; others experience a slow-down in output growth.[1]

The competitiveness of branches is likely to change over time as sectors introduce new production processes and techniques which reduce the impact of the rise in energy prices. This adds a dynamic aspect to the issue of competitiveness. The higher energy price in itself gives a stimulus to research and development in the area of energy efficiency. Obviously, not only branches producing capital goods and other products based on new techniques which result from this will profit, but also sectors which use them. If, at a later stage, environmental policies are tightened in other countries as well, then this 'first mover advantage' can be capitalized upon as national producers are particularly well situated in the growing market for energy efficient capital goods.

Taking up the issue of whether the permanent welfare effects of the introduction of a CO_2/energy tax will be positive or negative — disregarding the environmental benefits — the international dimension introduces competitiveness and terms of trade as new elements. The former has been discussed above, focusing on the impact on relative prices of different sectors in the international arenas. As exports of various sectors adjust to these new prices, welfare is influenced by the impact of changes in domestic production on consumption. A second important effect is what happens to the terms of trade after adjustment has taken place. If the ratio of export prices over import prices has improved in a sustainable manner, this will exert a positive influence on economic welfare as the same amount of exports can now buy a larger quantity of imports. As relative prices are likely to change significantly and the composition of exports differs across countries, the terms of trade effect might be important. Of particular relevance in this respect is what happens to (pre-tax) world energy prices.

5.5. Feedbacks to world energy markets

Feedbacks to world energy markets are potentially important ...

As, due to taxation, consumer prices of energy increase, demand for energy will begin to grow at a slower rate. The question arises as to what will happen on international energy markets and more specifically on the oil market. The issue of feedback effects on world energy markets is not only of importance for the economic effects of the introduction of a CO_2/energy tax but also for its effectiveness of reaching the CO_2 emission target. As the oil market plays a pivotal role it is essential to form an idea of the possible effect of lower EC demand on this market. The oil market is characterized by a limited number of main agents on the demand and supply side of the market as a result of which it is difficult to predict what will happen. In theoretical terms, the behaviour of the market can best be understood in the framework of a strategic game in which coalitions with diverging interests try to reach an acceptable compromise on prices (and, implicitly, on volumes). In this respect, the reaction of the main agents to the implementation of the tax is crucial.

It should be clear that as the OECD countries are generally net importers of oil, the terms of trade could be influenced by changes in oil prices.

In order to analyse the potential effects, four scenarios have been analysed with the aid of a world oil model. These scenarios are discussed in Box 7. Each scenario consists of a different mix of countries introducing tax policies — EC or OECD — (demand) and OPEC reactions (supply). Concerning the latter point, a distinction has been made between a case in which OPEC does *not* adjust supply and a situation

[1] This implies an adjustment in the export and import structures. As this will take some time, a temporary negative impact on a country's aggregate competitiveness is not unlikely to occur.

in which OPEC tries to stabilize the world oil price. In theory, many reactions on OPEC's side are possible — the reactions analysed here vary from an apparently very passive stance (no reaction) to a policy of defending the world oil price; which would prevent an oil-price-related terms-of-trade effect from occurring.[1]

... but appear to be very moderate if the EC is the only region introducing a CO_2/energy tax

From the model simulations, it appears that in an EC-only case — whatever OPEC's reaction — world oil prices will not be influenced significantly. This is due, on the one hand, to the limited share of the EC in world oil consumption and on the other hand to the phased-in introduction of the tax which prevents the occurrence of a sudden gap between demand and supply.

However, when the CO_2 tax policies are pursued by all OECD countries, results are quite different. If OPEC's oil production is not reduced, the world oil price could come down significantly. This would lead to a positive terms-of-trade effect in the OECD, but also to a substantial increase of oil consumption (and CO_2 emissions) outside the OECD.

5.6. Taxation and revenue recycling in open economies: macroeconomic effects

In this section, the macroeconomic effects of a number of possible combinations of taxation and redistribution of revenues are discussed. As stated in the introduction, the issue of how revenues are to be recycled back into the economy is left to the Member States, which means that the possibilities presented here — and partially backed up by results from model simulations — can only be considered as being exploratory.

The appropriate yardstick to measure economic costs are changes in welfare, which are generally not analysed in macroeconomic models

In all the model simulations presented here, no distinction is made between transitional and permanent cost. The models used do not allow the identification of these variables. Also, no estimates of welfare effects are presented when analysing the result of the macroeconomic models.

The difference between macroeconomic and welfare effects can be illustrated by analysing the case of investments made for re-equipping or replacing existing energy inefficient capital goods. Whereas the production of capital goods for the latter purpose would show up in positive GDP effects, it, in fact, does entail a decrease in economic welfare as the capital stock is not used for producing consumption goods. Only consumption creates welfare; production, by itself, does not. This is an important point as it makes clear that the metric most commonly used to measure welfare effects of CO_2 taxes — GDP — is, strictly speaking, inappropriate.[2]. Most empirical models, however, do not measure welfare directly.[3]

5.6.1. Model simulations, some caveats

Predicting the effects of the proposed tax is not straightforward because ...

This brings one to the model simulations which figure in Tables 6 to 8 and which have already been touched upon in the previous pages. Obviously, a number of caveats apply in relating these results to the perceived effects of proposed Community strategy and to each other across tables. These consist of uncertainties concerning the definitive design of the tax itself, the reactions of thc main economic actors, the characteristics of the models and the way in which they are used.

... the modalities of the tax and of the revenue use are still open,

First, much is still unknown about what Member States will do with the revenues. Thus, the scenarios presented here are merely illustrative and by no means normative. However, different recycling strategies lead to significantly different macroeconomic results. Moreover, some modalities of the tax have not been decided upon and could thus not be taken into account. These, however, are of great importance to the effects. The impulse of a pure production tax might, for instance, be approximately 40% larger than that of a pure consumption tax (see Chapters 4 and 6). The issue of exemptions for energy-intensive branches operating on international markets — which are foreseen — has not been accounted for either.

[1] In fact, the 'no reaction scenario' could result from a failure within OPEC to agree on a reduction of oil production; if this would occur, an increase in oil production cannot be excluded. On the other hand, if OPEC manages to defend the oil price, it could well be possible that an increase in the world oil price can be generated.

[2] See, for a clear discussion of this issue: Boero, Clarke and Winters (1991) and Proost and Van Regemorter (1992).

[3] See Burniaux et al. (1992) for some estimates of effects on economic welfare.

Table 8

Economic effects of a policy package to reduce CO_2 emissions containing a phased-in CO_2/energy tax of USD 10 per barrel of oil equivalent: Aggregate DRI model results for 11 Member States[1]

Volumes	
Private consumption	−0,9
Total fixed investment	0,0
Exports	−1,9
Imports	−1,3
GNP	−0,9
Employment	−0,8
Prices	
CPI	3,0
Ratios[2]	
Budget balance	−14,0
Balance of payments	33,6

[1] In this scenario, it is assumed that the energy policy is pursued simultaneously in all the countries of the Community except Luxembourg. The model links the economies of the 11 countries and thus takes interactions into account. All variables, unless otherwise stated, expressed as a percentage change in the level in the fifth year in which the tax is fully *in situ* compared to the reference case.

[2] Differences in billion ECU.

Source: DRI.

... the reaction of oil markets and monetary authorities will be important ...

Secondly, as described above, the reaction of world energy markets is difficult to predict; all exercises presented here assume that world oil prices will not be affected at all.

Thirdly, the reaction of the monetary authorities is important. If they consider the inflationary effects to be too strong and not limited to the first-stage effects of the rise in energy prices, they might not accommodate the price rises by increasing the nominal money supply. The real money supply would then subsequently decrease. This could lead to higher real interest rates which would exert a negative effect on economic activity. In the model simulations used in this paper, real interest rates were assumed to remain constant.

... and model simulations each tell only part of the story

Fourthly, models incorporate in their parameters average behavioural reactions observed in the past. As the proposed policy 'package' is announced before it will be introduced and phased in gradually and predictably, the behavioural reaction is not necessarily the same as in the past. This might especially be of importance for the wage-price dynamics: if employees can be convinced that the *complete* strategy will have neutral effects on their purchasing power, induced inflationary effects can be mitigated strongly. As this possibility has not been taken into account in the model simulations, these might have a pessimistic bias.

Fifthly, concerning differences between tables, it should be kept in mind that differences between econometric models also contribute to the differences found in the tables. As the macroeconomic effects of the various scenarios are generally not very large, but dissimilarities between models are, it is impossible to compare the results from two distinct scenarios calculated by two different models because these probably consist to a significant extent of differences between the functioning of the two models. In this respect, it could be stated that the wage-price dynamics seem to play a more dominant role in the Quest model than in the Hermes model. In the latter model, aggregate demand effects seem to be relatively more important. In Quest, consumption is influenced by the real wealth effect (inflation diminishes private consumption via the erosion of private wealth) which is not the case in Hermes. The structure of the wage equation in both models also differs. See, for a description of the latest versions of the Hermes model Donni, Valette and Zagamé (1992) and for the Quest model, Brandsma et al. (1991).

Another aspect that is of considerable importance is which ancillary assumptions are made in each scenario. Obviously, if these are not identical, differences across scenarios will not only be due to differences in recycling strategies. A case in point is the assumption made on budget neutrality. In the case of ex-ante neutrality, the direct revenues of the new tax are recycled, but the indirect effects of the strategy on the government balance are ignored. Thus, if the policy leads to a negative GDP effect, lower government revenues and, possibly, higher spending make for a negative impact on the budget balance. In the case of ex-post neutrality also the indirect effects are neutralized and the budget balance is not influenced at all.[1] The latter approach seems to be preferable when analysing a policy package as it ensures that the macroeconomic results are not influenced by changes in public savings. As targets for budget deficits are accepted by a number of Member States, it might also be a more

[1] A subtlety could be introduced by distinguishing absolute ex-post neutrality from relative ex-post neutrality. In the former, the absolute value of the budget balance is stabilized in real terms. In the latter, the ratio of the budget balance to GDP is targeted. In practice, differences between both concepts are very small in the case of a CO_2/energy tax of USD 10 per barrel of oil equivalent.

realistic approach. It is followed in the Hermes and Quest simulations but not in the DRI study, all of which are discussed in the next section.

Finally, it is relevant to distinguish between situations in which the number of countries introducing the CO_2 reduction strategy differs. Effects on competitiveness and feedbacks via income effects on total imports make such cases quite different. In all revenue use scenarios presented in 5.6.2, it is assumed that only the Community introduces a policy package.[1]

5.6.2. The CO_2/energy tax and the redistribution of the tax revenues: various possibilities

Redistributing the carbon/energy tax revenues via lower social security contributions leads to modest effects on GDP and inflation as costs in industry are lowered

Tax revenues could be recycled, for example, by reducing social security contributions paid by employers (SSCE). In this scenario, the net aggregate effect on competitiveness depends on the relative energy and labour intensities of production for markets exposed to international competition and on the recycling policies followed by other countries. Note that because, in this scenario, part of the revenues are paid by consumers and all of the revenue redistribution is via lower production costs, in principle there would be some room for improved competitiveness. As, however, according to the behaviour incorporated in the models, the introduction of the policy leads to some macroeconomic disruption with associated inflation, a loss in aggregate competitiveness is still likely to occur. It should be kept in mind that if one looks at the position of institutional sectors, in the short run households lose in this scenario and industry wins, while the effects for government are neutral. Obviously, in the end, all influences affect households in their various capacities: shareholders, taxpayers, etc.

The simulation results in column 2 of Table 6 (Hermes) show that the macroeconomic consequences of this scenario are rather modest. The limited drop in GDP is the consequence of a slight reduction of consumption and investment. The real trade balance improves slightly because the fall in exports due to a limited loss of price competitiveness is outweighed by the dip of imports induced by the slow-down of economic activity. Inflationary effects are very modest because the redistribution leads to a reduction of labour costs (lower social security contributions) and thereby to lower producer prices. This compensates for most of the initial inflationary tendencies. Employment does, on balance, increase slightly, indicating that the effect of more labour intensive production processes (resulting from the decreased relative price of labour) outweighs the influence of slightly reduced activity. This in turn prohibits the effect of the somewhat lower purchasing power of wages (due to the energy price rise) on consumption to be reinforced. The consequence of more labour intensive production processes is that the capital intensity (in the Hermes models for most countries, capital is complementary to energy) declines, which explains why investment is the hardest hit demand component.

The Quest results in the second column of Table 7 show a very similar pattern, although the results are generally somewhat more negative: the slow-down is slightly stronger and inflation is higher. As discussed above Quest tends to accentuate the negative impacts of price rises. Nevertheless, it can be stated that also in this simulation the macroeconomic effects are limited.

An important feature of this scenario is that tax revenue use directly reduces costs and enhances price competitiveness and indirectly decreases inflation (via lower costs) and restores aggregate demand. A second interesting feature of this scenario is that the results improve over time. This is due to the fact that it takes some time before the negative consumption demand shock (due to higher energy prices) is revised as a result of price decreases caused by lower social security contributions paid by employers. Another factor which contributes to this characteristic is the delayed response of real trade to the gradual improvement of international price competitiveness on account of the revenue distribution. Finally, the substitution process in the direction of labour goes on for a considerable amount of time (approximately 10 years) as the replacement of old equipment vintages by new, relatively labour-intensive ones, depends on the turnover rate of capital.

Revenue redistribution via personal income taxes relies on consumption to boost GDP, but does not counter upward pressures on prices

The importance of the way in which the revenues are redistributed can be gauged from a comparison between the previous scenario and one in which tax reductions in personal income taxation (PIT) are introduced. In this scenario, it is evident that as disposable income rises (all revenues go to households, who only pay part of the tax) consumption is initially boosted. This becomes clear from column 3 in

[1] See Box 6 and Chapter 9 for results of CO_2/energy taxes introduced at OECD level.

Table 6 where the results of a simulation with the Hermes model are presented. The increase of consumption initially has positive effects (extra production), but also leads to additional inflation and imports. As higher inflation begins to feed through to wages,[1] a more negative situation arises: In comparison with the social security contributions scenario, a deterioration of the real trade balance occurs as international competitiveness declines (production costs are not lowered) and consumption increases. This can be seen clearly by comparing the effects on exports and imports in columns two and three of Table 6. As in the Hermes model no account is taken of the real wealth effect (lower private consumption due to an erosion of household real wealth by inflation), consumption is not directly influenced by inflation.

On balance, as Table 6 shows, the increase in consumption and the decreased contribution of foreign trade lead to a slightly reduced GDP and a significantly higher price level. Although substitution in favour of labour is less strong than in the social security contribution scenario it practically suffices to compensate the negative GDP effects on employment and consumption.

When one compares this scenario to the previous one, with respect to the development of institutional sectors, it is clear that the roles of industry (now a 'loser') and households are reversed whereas the position of government is unchanged. Eventually, however, households will also feel the negative development in industry via lower profit-related income.

In the linked Quest simulations the results are somewhat different (Table 7) and show that if real wealth effects in consumption are strong — as they are in the Quest model — relatively marked increases in inflation will lead to lower consumption. Obviously, this exerts a negative influence on GDP. As imports for consumption purposes are strongly affected by the real wealth effect, total imports decline — in contrast to the Hermes simulations.

In this scenario, the revenue redistribution directly restores aggregate demand and indirectly, on balance, stimulates inflation and reduces competitiveness somewhat.

In the personal income tax scenario, the economic results worsen modestly over time. The initial positive effects of the consumption boom gradually begin to lead to more inflation which depresses investments, exports and — if the real wealth effect plays a significant role — consumption.

[1] Some countervailing pressure on wage formation might arise from lower personal income taxes, but experience shows that this effect is probably not strong enough to balance inflationary pressures.

Redistribution via VAT relies on consumption to counter negative GDP effects and provides a strong antidote against the upward pressure on prices which brings along beneficial effects

A third possible avenue for recycling consists of reducing VAT rates. This scenario combines positive elements from the two former scenarios. A significant amount of the CO_2/energy tax is levied on intermediary consumption, whereas VAT is predominantly borne by final consumers. This implies that a full redistribution of CO_2/energy tax revenues via lower VAT rates could initially bring down consumer prices quite substantially. However, in the simulations presented, it is assumed that trade margins are increased so as to offset this effect: initially the private consumption price does not change. Nevertheless, inflationary effects of taxation are strongly reduced compared to the previous scenarios as consumer prices do not rise initially. This prevents a negative wage-price spiral from occurring.

Column 4 in Table 7 reports on the relatively positive effects of the VAT recycling scenario with the Quest model. Changes in GDP and employment are very small. It should be pointed out that the rather positive results depend, to some extent, on the wage equation used in Quest. In addition to consumer prices, nominal wages in Quest are also affected by the GDP deflator, which, contrary to the private consumer price, does increase initially, as the share of VAT in consumption is larger than that in GDP. This means that real wages are increased moderately with positive effects on consumption and — via the accelerator mechanism — also on investment.

Although the mechanism in Quest via which the real wage is increased is, perhaps, particular to the model, the real wage increase in this scenario is not unlikely to occur. If trade margins do not increase, or only moderately, real consumer prices will come down and the concomitant rise in the real wage will have the type of effects described above.

This is demonstrated by a Quest simulation in which it was assumed that the VAT reduction was fully passed on to consumer prices: in such a scenario, a very strong virtuous wage-price spiral is generated with substantial positive GDP effects. No comparable Hermes simulations are available yet, but scenarios with other models have brought out similar results, although somewhat less positive (Cambridge Econometrics (1991)).

In this scenario, revenue redistribution directly reduces inflation and restores aggregate demand and indirectly lowers costs and enhances competitiveness.

Combining different revenue-use options: the DRI scenario

Upon request of the Commission, DRI (1991a) has simulated a scenario which differs from the ones discussed above in four respects:

(i) The scenario does not only contain the introduction of a USD 10 (mixed carbon/energy) tax, but also of a non-negligible annual vehicle tax. In addition to the fiscal measures, also regulatory, voluntary and other energy conservation measures are introduced (thus a first attempt has been made to assess the economic impact of the entire proposed Community strategy).

(ii) The tax is phased in, starting with USD 3 in 1993 and is equal to USD 10 in 2000;

(iii) The revenues of all fiscal measures are not redistributed via one channel, but a mix — for each country identical — is used: the bulk is recycled via personal income taxes and social security contributions (75%), the remainder is used for a reduction in corporate taxes (10%) and tax incentives for investments in energy conservation (15%).

(iv) The scenario is *ex-ante* revenue neutral and not *ex-post:* this means that the impact of a changing economic environment due to the introduction of the package on the public sector balance is not sterilized in the revenue redistribution.

As the various taxes reach their full effect only in 2000, the relative impact of the policy package on the economy does not differ strongly from that of the scenarios discussed above even though the total tax is substantially higher (due to the vehicle tax). The regulatory and voluntary measures generally reduce the energy intensity which implies that the impact of the taxes is mitigated *vis-à-vis* the other scenarios where such measures are absent.

Not only on the tax side do the impacts of the DRI scenario look like those of the other scenarios but also on the revenue-use side they resemble a mix of the personal income tax and social security contribution scenarios to a large extent. An exception is the use of tax incentives for investments in energy conservation.

It is thus not surprising that, with the exception of the development of investment, the results of the DRI scenario come quite close to the Hermes and Quest scenarios: the scenario leads to a small drop in economic activity and to a limited rise in the price level, but overall, the economic effects are rather modest (see Table 8).

The simulation results of these four scenarios underline a number of important insights:

Factor substitution might play an important role in the adjustment process.

The indirect effects of the proposed Community strategy and especially the potential wage-price spiral are of major importance to the total effect. Thus, if a 'social consensus' can be reached on the CO_2-emission stabilization policy, unfavourable wage-price dynamics need not occur, and macroeconomic consequences might be more positive.

The effects of the different scenarios can change quite strongly over time: the time profile is important.

Competitiveness will not only change in function of the tax but also in function of the use of tax revenues.

Intra-EC trade is of great importance. Roughly 60% of international trade in the Community is intra-trade and this share is still rising. Changes in aggregate international competitiveness will thus, on average, be modest if the whole of the Community would introduce a similar package.

This implies that for individual countries the revenue use policies pursued by other EC countries are of importance.

5.7. Differences in the macroeconomic effects between Member States

Will macroeconomic differences between Member States be large and on what do they depend?

The issue of whether differences between Member States in the macroeconomic effects of the proposed strategy will be large has drawn considerable attention. It is also often argued that, as the energy intensities of less prosperous Member States are, on balance, somewhat higher than average, these countries will experience a relatively unfavourable economic development after the introduction of the tax.

Without offsetting tax cuts, the economic consequences of a CO_2/energy tax will vary considerably across countries, but seem to be only weakly related to the energy intensity of the economies

Obviously the size of the tax revenues in the Member States depends on the CO_2 and energy intensity of the various economies. Table 9 provides information for the different

Member States. As discussed in previous sections, these variables determine the initial impulse to the economy. If carbon/energy tax revenues would not be used for offsetting tax cuts elsewhere, then one would thus expect the relative effects of a CO_2/energy tax on the economies of the Member States to vary with their relative CO_2/energy intensities. In order to analyse this hypothesis, a revenue-raising scenario was computed with the Quest model assuming that such a tax would be introduced simultaneously in the EC, the USA and Japan. Average results of this scenario for the Community have been reported in column 1 of Table 7. The initial GDP losses for the 12 Community countries, Japan and the USA, from this simulation, have been plotted against the energy intensities of the economies in Graph 8.

Two main conclusions can be drawn from this scenario:

Without revenue recycling, economic consequences of a CO_2/energy tax will vary considerably between the economies introducing such a tax.

In such a revenue-raising scenario, the economic effects seem to be only weakly related to the energy intensity of the economy.

This latter point is somewhat surprising; even when only the initial effects (after two years) are taken into account, other factors (exposure to international competitiveness, structural adjustment potential, etc.) play an important role.[1]

In case of revenue neutrality, energy intensities are an even worse guide to differences in economic effects across countries

The Commission proposal advocates the principle of revenue neutrality. As discussed in the previous section, this would restore the initial loss in aggregate demand in the economy. This implies that the energy intensity of the economy has only a limited influence on the results as it only influences the extent of redistribution and not — directly at least — the level of aggregate demand. In line with the previous section, it is to be expected that, in such a scenario, much more will depend on the dynamic adjustment potential of countries (flexibility of markets) and on the openness of the economy and the product and geographical structure of international trade. As will be elaborated upon in the following chapter, the importance of the exposure of energy-intensive branches to extra-EC competition is, from a macro-

[1] Estimation of a logarithmic specification resulted in an elasticity of GDP losses *vis-à-vis* energy intensity of 0,3. However, the coefficient is hardly significantly different from zero (t-value of 1,3) and the fit of the equation is rather mediocre (R^2 = 0,2).

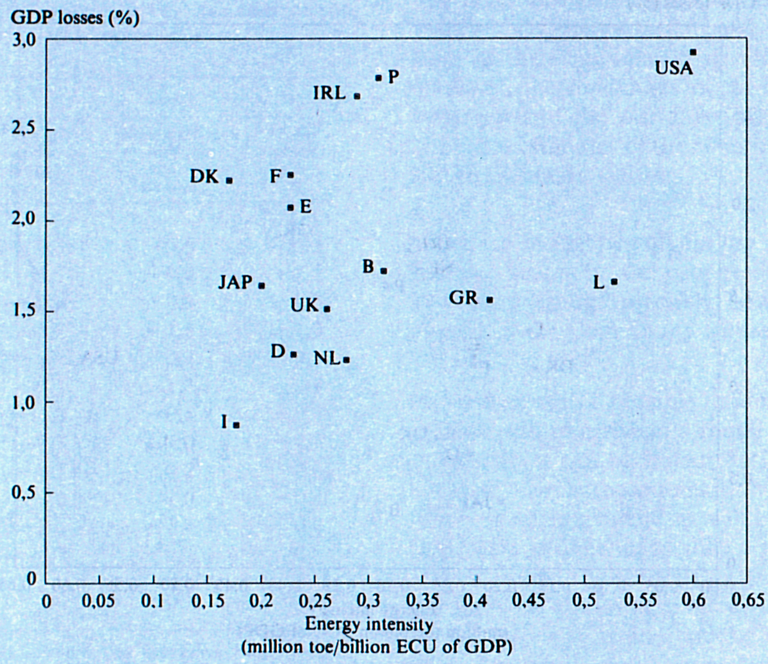
Table 9

Energy use and CO_2 emissions in the Community, 1990

	(1) Gross inland consumption of energy (million toe)	(2) CO_2 emissions (million t of carbon)	(3) GDP (billion ECU)	(4) = (1)/(3) Energy intensity	(5) = (2)/(3) CO_2 emissions per unit of GDP
B	47,6	30,2	151,7	0,31	0,20
DK	17,1	14,5	103,2	0,17	0,14
D	272,8	193,6	1 179,7	0,23	0,16
GR	21,4	20,2	51,5	0,42	0,39
E	85,8	56,7	387,0	0,22	0,15
F	212,6	98,3	934,0	0,23	0,11
IRL	9,8	8,3	33,5	0,29	0,25
I	151,2	109,6	855,3	0,18	0,13
L	3,5	3,4	6,8	0,52	0,50
NL	66,4	42,2	219,3	0,30	0,19
P	15,2	10,9	47,2	0,32	0,23
UK	211,2	158,9	783,6	0,27	0,20
EUR 12	1 114,8	746,6	4 752,8	0,23	0,16

Source: Commission services.

GRAPH 18: **Energy intensity and GDP losses in a scenario without revenue redistribution**



Source: Commission services.

economic point of view, rather limited in all EC countries. Furthermore, a comparison of Graph 18 from this section with Graph 44 from Chapter 6 shows that this exposure is not strongly related to the overall energy intensity of the various economies. These points imply that the overall energy intensities of the various economies are in general a very bad guide to the economic effects of the revenue neutral introduction of a CO_2/energy tax. This is confirmed by a statistical test on the basis of the Quest results.[1] Graph 19, in which the economic effects of the personal income tax reduction scenario with the Quest model are plotted against the energy intensities of the economies, which were also taken into account in Graph 18, illustrates this point.

Offsetting tax cuts reduce the average GDP impact more strongly than the variation across countries

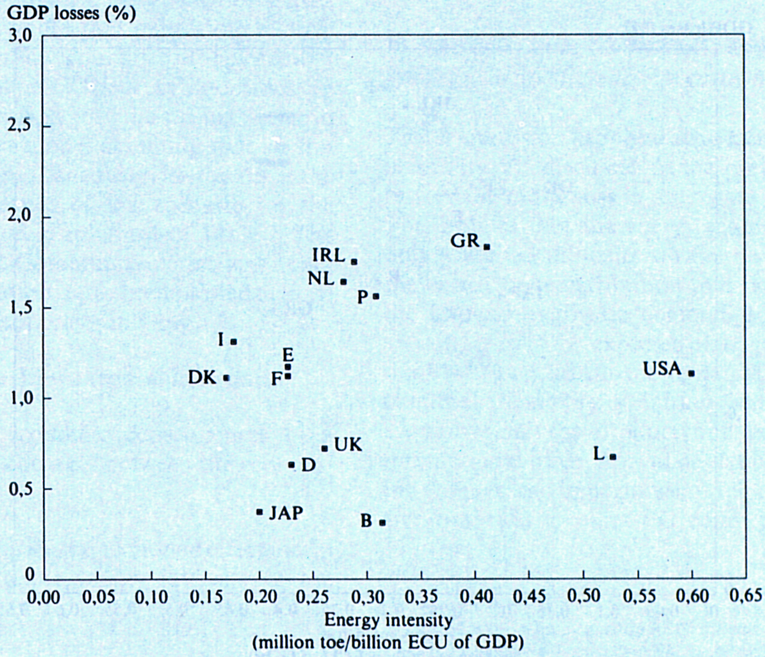
It is striking that, although the differences between countries in Graph 19 are apparently not related to differences in energy intensity, they are, in fact, not negligible. The dispersion of GDP impacts in the Quest social security contributions and personal income tax reduction scenarios is approximately 20% smaller than in the revenue-raising scenario. This implies that, although revenue recycling reduces the average level of the GDP impact strongly, its effects on reducing the dispersion across countries are more modest. The conclusion must thus be that even in revenue redistribution scenarios, differences between countries will occur, although they will not be related to energy intensities.

The higher energy intensity of relatively less prosperous Member States does not necessarily imply a higher vulnerability ...

An important question is what the effects of the proposed Community strategy are for economic and social cohesion within the Community. Is it likely that the economically less prosperous Member States will be confronted with relatively more pronounced economic effects? It should be clear by now that the on average somewhat higher energy intensities of these economies do not form a good reason to answer this question affirmatively. In fact, the answer depends on whether these economies have a lower overall dynamic adjustment potential and whether extra-EC international trade in energy-intensive goods constitutes a relatively important part of total economic activity.

[1] The same specification as in the case of the revenue-raising scenarios was estimated for the social security contributions and the personal income tax scenarios. For both scenarios, the elasticity of GDP losses with respect to energy intensity is very small and insignificant (t-values of 0,4 and 0,2) and the fit is extremely bad (R^2 = 0,01).

GRAPH 19: **Energy intensity and GDP losses in a scenario with revenue redistribution**



Source: Commission services.

... and the relatively small openness of their economies might even be an advantage

As the next chapter indicates the latter is *not* the case: due to the fact that these countries are relatively closed (also with respect to extra-EC trade), the share of GDP that will be exposed to a loss in international price competitiveness is generally much smaller than in Member States with higher per capita GDP levels. This aspect, by itself, would lead one to believe that the relatively less prosperous Member States would experience smaller GDP effects than the richer countries.

... but the dynamic adjustment potential seems to be lower

Regarding the former point, however, the past record probably indicates that in several respects the less prosperous Member States had a somewhat lower overall dynamic adjustment potential than the Community on average and were more prone to generate wage-price spirals. If this were confirmed, it would imply that these economies are generally less capable of absorbing shocks to their economy smoothly than other Member States. However, as these economies are, on balance, catching up, it is difficult to say to which extent past experience provides a reliable guide to future developments. Complicating the analysis further is the fact that much will depend on the precise modalities of the tax introduction, especially with respect to the revenue use.[1]

Model simulations present conflicting evidence on the net effect of these conflicting influences

From a purely analytical point of view, it is thus difficult to predict whether the less prosperous Member States will be hit hardest. If one turns to the results from tentative model simulations — which are presented in Table 10 — the evidence seems to be conflicting. Whereas the analysis contained in the DRI simulation shows that in this scenario, convergence in the Community will actually improve, the Quest personal income tax and social security contributions scenarios generally imply a relatively unfavourable development in the economically less-developed Member States. The ambiguity of the analytical approach combined with the conflicting evidence of the models makes it very difficult to draw any firm conclusions.

[1] It should also be pointed out that if the producer price of oil would decline due to the introduction of a CO_2/energy tax, relatively energy-intensive economies would profit strongly from the favourable terms-of-trade effect.

Table 10

Impacts on Member States' GDP in various CO_2 tax cum 'revenue recycling' scenarios with the DRI and Quest models[1]

	DRI[2] package	Quest[3]		
		Personal income tax scenario	Social security contributions of employers scenario	VAT scenario
B	−1,4	−0,3	−0,6	−0,3
DK	−1,3	−1,1	−0,4	−1,2
D	−0,8	−0,6	−0,3	−0,0
GR	−0,5	−1,8	−1,5	−1,3
E	−0,4	−1,2	−0,7	0,1
F	−0,6	−1,1	−1,3	−0,4
IRL	−0,8	−1,8	−0,6	−0,7
I	−0,9	−1,3	−1,0	−0,1
L	n.a.	−0,7	−0,2	−0,6
NL	−1,0	−1,6	−1,0	−0,3
P	−1,5	−1,6	−1,4	0,0
UK	−1,2	−0,7	0,1	0,5
EC	−0,9	−1,0	−0,7	−0,1

[1] The aggregate results of these scenarios as well as their characteristics are presented in Tables 7 and 8.
[2] Change in the level of GDP in the fifth year in which the tax is fully *in situ* compared to the reference case.
[3] Change in the level of GDP in the fifth year after the introduction of the CO_2/energy tax compared to the reference case.

Improving the adjustment potential and monitoring the effects of the CO_2/energy tax seems to be of great importance

However, it seems that two policy recommendations can be justified. First, strengthening of the dynamic adjustment potential, especially in relatively less prosperous Member States would reduce potential negative impacts of the proposed strategy strongly and is thus advisable. It is, of course, evident that such a policy would be beneficial for a much larger number of reasons than discussed here. As a matter of fact, the Community is already contributing to the improvement of the adjustment potential in the economically less-advanced Member States through its structural Funds. This will diminish the differences in the impact of the CO_2/energy tax across Member States. Secondly, although it is difficult to predict at this stage, diverging economic developments across Member States with a potential negative impact on cohesion can not be excluded a priori. If they would occur, they would constitute an important and negative side effect of the proposed strategy. This means that close monitoring of the economic impact of the carbon/energy tax during phased-in introduction will be of great importance.

5.8. Some conclusions

The macroeconomic effects of the introduction of a Community CO_2/energy tax depend on a number of characteristics of the economies in which the tax is introduced, the tax level, the modalities of the tax itself and reactions in other parts of the world. At present it is difficult to arrive at precise estimates of the consequences of a CO_2/energy tax due to two main factors.

First, the modalities of the tax are still the subject of discussion. Secondly, the proposed tax being a new tax, it is difficult to gauge precisely how economic agents in and outside of the Community will react to it.

Nevertheless, it is possible to identify the main mechanisms at work and to arrive at a rough picture of the likely effects of the tax. It can be stated that, if a number of conditions are met, the macroeconomic consequences of a USD 10 per barrel of oil equivalent tax will be rather modest. This is an important insight as it shows that the aggregate macroeconomic costs of energy taxation can be quite low, despite the fact that the impulse of the tax is non-negligible. Obviously these costs would have to be compared with the benefits of reduced environmental stress.

As has become clear from the analysis in this paper, this does not imply that all economic effects will be small. On a sectoral level and from an income distributional point of view (on a disaggregated level), effects can be much larger as they will be modulated according to the energy intensity of production and consumption which can vary considerably on a low level of aggregation. This aspect will be analysed in the next two chapters.

On the basis of the qualitative analysis and the preliminary model simulations available, the following tentative conclusions can be drawn:

(i) Macroeconomic effects will be limited if the tax is phased in gradually and predictably and the revenues are fully recycled back into the economy by reducing other taxes or charges. GDP losses, if any, tend to be very small; however the rise in the price level might be non-negligible and should be carefully monitored. If a 'social consensus' can be reached on the strategy for limiting CO_2 emissions, no unfavourable wage-price dynamics need to occur and the macroeconomic effects might be even less negative. These conclusions hold for a large number of possible revenue use strategies.

(ii) Flexible markets are very important in reaching a low-cost adjustment.

(iii) A more detailed picture of the effects of the proposed strategy depends heavily on how the tax revenues will be used in various Member States. Although all revenue-neutral tax policies restore aggregate demand, they rely on different mechanisms to do so. Recycling via reduced social security contributions paid by employers and via VAT will probably have relatively positive effects on mitigating upward pressure on prices. The VAT scenario might lead to a rather favourable result if all VAT rate decreases are passed on into consumer prices.

(iv) Competitiveness will not only change in function of the tax but also in function of the use of tax revenues. For an individual country, the policies pursued by itself and by other EC countries are of great importance. Even for energy-intensive economies, a loss in aggregate international competitiveness does not necessarily have to occur. In international trade, as elsewhere, the greatest effects are likely to be visible on a sectoral level.

(v) If the tax revenues are used for reducing other taxes, it is likely that the economic consequences of a CO_2/energy tax will not vary considerably between the economies introducing such a tax on account of their energy intensity. Differences across countries will also be smaller than in the case of a revenue-recycling scenario. Differences in economic effects depend crucially on differences in the dynamic adjustment potential and the importance of trade in energy-intensive goods in the various economies. There is conflicting evidence as to the question whether less prosperous Member States will be more severely affected than others.

Box 6:[1] The macroeconomic effects of introducing a carbon/energy tax — Simulations with the Quest model

The introduction of a tax on the use of energy has a direct impact on prices and government revenue. How much export prices are affected, depends on the relative importance of energy-sensitive products. On a global level, the effect on the competitiveness of a country is determined also by how many of its competitors introduce a similar tax.

The increase in government revenue may be used just as a down payment on outstanding government debt or as a means to lower other taxes. In some sense, the introduction of an energy tax may even provide governments with an opportunity to restructure their system of taxation in such a way that it has beneficial supply-side effects. For a proper assessment of the macroeconomic effects it is important to know whether the effect on the budget of the government is neutralized and, if so, how that is brought about.

The macroeconomic implications of single versus multicountry action are investigated here by carrying out simulations on the Commission's Quest model,[2] as are the effects of budget neutrality. Quest links country models for all Member States to models for the non-Community countries, the United States and Japan in particular. The system is closed by trade-feedback models for the rest of the world, divided into 13 zones. Quest distinguishes only one sector of production and does not allow explicitly for energy as a production factor. In the linkage part, energy imports are separated from trade in non-energy goods. Energy exports are identified for Australia, Canada, Norway, Eastern Europe, the United Kingdom and the Netherlands. OPEC is assumed to act as the swing producer.

[1] This box has been prepared by A. Brandsma, Commission of the European Communities (DG II/C/4).
[2] *European Economy* No 47, March 1991.

The sectoral differences between countries are reflected in the size of the ex-ante shock to the value-added prices in the simulation input for each country. It is calculated on the basis of data on gross energy consumption. All intermediate energy use is assumed to be taxed, except for the input of fossil fuels as raw material in the production process. For a tax of USD 10 per barrel, the ex-ante price shock lies between one and two percentage points in the Community countries, while it is about three percentage points in the United States and less than one percentage point in Japan. The imports of energy which are intended for final consumption are taxed according to their primary energy content. This increases consumption prices directly. Except for Ireland and Portugal, the additional shock due to excises on imported energy goods amounts to less than half a percentage point in terms of consumer price inflation.

The increase in the after-tax price of energy relative to other products leads to an ex-ante reduction in the volume of energy imports. It is estimated that energy imports would be reduced to a level of slightly above 70% of what they would be without the energy tax in Denmark, which has the highest price elasticity, and that they would hardly change in a country such as France, where the nuclear energy programme has induced a high degree of self-sufficiency.

Table 11 summarizes the results of a linked simulation of these shocks, if the energy tax is introduced simultaneously in the Community, the United States and Japan. Real interest rates and nominal exchange rates are assumed to be fixed. The results show that EUR12 GDP would fall by 1,7% compared to the baseline level in the third year of the simulation. At the same time, the United States would have lost 3% of GDP and Japan only 1,3%. After three years, a recovery begins in the Community, a year later than in the United States and Japan. Annual inflation over the first three years would, on average, be 1,3 percentage points higher in the Community countries, compared to 0,8 percentage points in the two other countries.

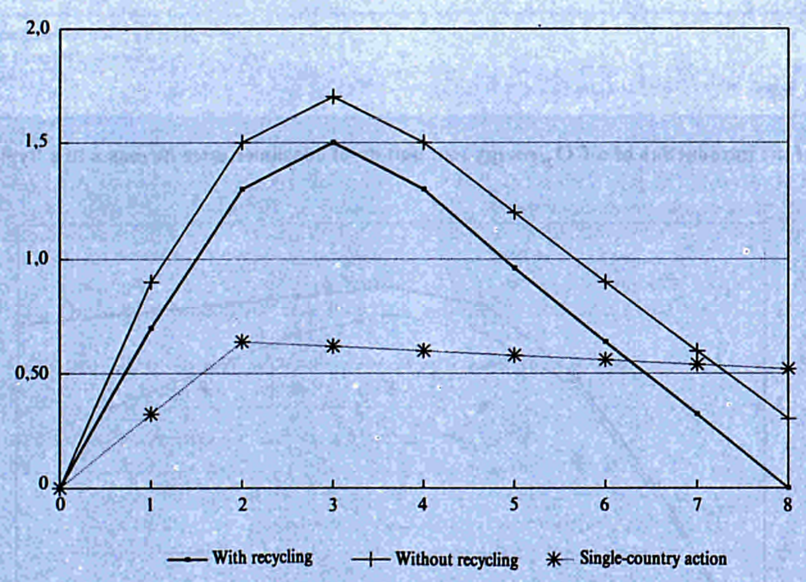
Table 11

The effects of the introduction of a carbon/energy tax in the Community, the USA and Japan

	EC		USA		Japan	
	A	B	A	B	A	B
GDP	− 1,7	− 1,5	− 3,0	− 1,3	− 1,3	− 1,4
Inflation[1] (percentage point)	1,3	1,3	0,8	1,3	0,8	0,8
Unemployment[2] (% of labour force)	0,4	0,3	1,2	0,1	0,0	0,0
Current balance[2] (% of GDP)	0,4	0,4	0,5	0,1	0,2	0,2

NB: A: no recycling of government revenue; B: recycling via income taxes.
Third-year effects in percentage differences from the baseline, unless otherwise stated.
[1] Differences in terms of average annual inflation rates over the three-year period.
[2] Differences in percentage points.
Source: Commission services.

GRAPH 20: Effects of the introduction of a CO_2/energy tax: pattern of GDP losses in a 'typical' EC country



Source: Commission services.

Why is the inflationary impact of the energy tax so much lower in the United States than in the Community, while the *ex-ante* shock is twice as large? The answer is twofold. In the first place, contract wages in the United States are usually negotiated for a three-year period, so that the indexation is spread over 12 quarters rather than four. Secondly, unemployment rises by more than 1% of the labour force, in keeping with the fall in GDP, and this has a depressing effect on real wages.

The large fall in demand in the United States is mainly due to the assumption that the revenue accruing to the government is not used to lower other taxes or to increase government expenditure. Table 11 also shows the results when revenue neutrality is imposed via a reduction of income taxes. The effects on EUR12, US and Japanese GDP are very close in that case, and the inflationary impact in the United States and the Community is the same. For Japan it hardly makes a difference whether budget neutrality is imposed or not. Table 12 shows the effects on the budget balance of the Community, the United States and Japan for the case without recycling. The budgetary impact in the United States is more than twice as large as in the Community, where it slides from 0,6% to 0,3% before climbing up to 1% of GDP. In Japan, the budgetary impact is small in the first three years since the positive effect on tax revenue is accommodated within others part of the budget.

Table 12

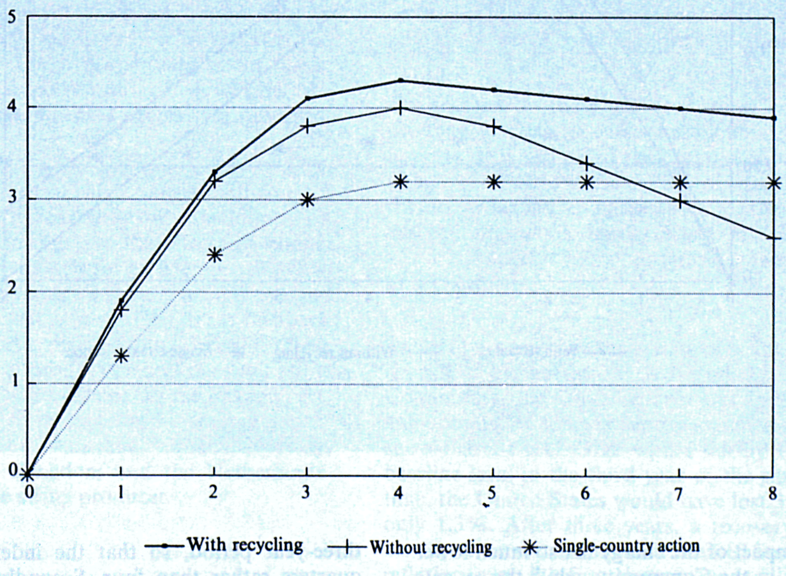
The *ex-post* impact of the introduction of the energy tax on the budget of the government when revenue is not recycled

(Percentage of GDP)

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
EC	0,6	0,4	0,3	0,5	0,7	1,0
USA	1,4	1,1	1,1	1,3	1,7	2,0
Japan	0,0	− 0,1	0,0	0,2	0,5	0,7

Source: Commission service.

GRAPH 21: **Effects of the introduction of a CO_2/energy tax: pattern of consumer price increases in a 'typical' EC country**



Source: Commission services.

A reduction of income taxes is, of course, not the only way to achieve revenue neutrality. Other possibilities are to lower indirect taxes on non-energy products or to change the level of social security contributions made by employers and employees. Table 13 presents the results of reducing employers' social security contributions in the Community countries, as an alternative to the lowering of income taxes. Although the distribution of income is not covered in detail by macroeconomic models, these alternatives highlight the differences between the after-tax income out of wages and the income from profits. The reduction in income taxes increases the disposable income of households directly. The reduction in social security contributions, on the other hand, implies lower wage costs but has no direct effect on income. The difference is most clearly illustrated by the effect on unemployment. In the first case, unemployment rises compared to the baseline. But, in the case of the reduction in social security contributions, unemployment falls because the positive substitution effect of lower real wage costs is large enough to overcome the negative demand effect. Since, in the second case, the price shock is compensated by a supply-side shock, the effects of the introduction of the energy tax on real GDP and employment are smaller.

Table 13

The effects of the energy tax under an alternative scheme of recycling

	No recycling of government revenue			Recycling via income taxes			Recycling via social security contributions		
Year	2	4	6	2	4	6	2	4	6
GDP	−1,5	−1,5	−0,9	−1,3	−1,3	−0,6	−0,4	−0,7	−0,4
Inflation[1] (percentage point)	1,6	1,0	0,6	1,7	1,1	0,7	1,1	0,7	0,3
Unemployment[2] (% of labour force)	0,3	0,4	0,3	0,2	0,4	0,2	−0,1	0,0	−0,1
Current balance[2] (% of GDP)	0,4	0,3	0,3	0,3	0,3	0,1	0,3	0,3	0,2

NB: Percentage differences from the baseline, unless otherwise stated.
[1] Differences in terms of average annual inflation rates over the period.
[2] Differences in percentage points.
Source: Commission services.

The second issue which has been investigated by simulations is whether it would make a great difference for the EC results if the United States and Japan did not implement the energy tax. Table 14 shows that it would matter very little in macroeconomic terms. Exports to the United States are 8% of total EC exports and those to Japan only 2%. On third markets, towards which less than one-third of EC exports are directed, the United States and Japan together have a 25% share in imports. The additional loss of competitiveness when these two countries do not introduce the energy tax is therefore not very strong. Moreover, it is offset by the absence of negative effects on export demand coming from both countries.

Table 14

The effects of the energy tax in the Community for different forms of joint action

	EC + USA + Japan		EC		Single country[3]	
	Short term	Long term	Short term	Long term	Short term	Long term
GDP	−1,7	0,0	−1,5	0,0	−0,6	−0,6
Inflation[1] (percentage point)	1,4	0,4	1,2	0,3	1,0	0,4
Unemployment[2] (% of labour force)	0,3	−0,1	0,3	0,0	0,1	0,1
Current balance[2] (% of GDP)	0,4	0,0	0,4	0,0	0,4	0,1

NB: Percentage differences from the baseline, unless otherwise stated.
[1] Differences in terms of average annual inflation rates over the period.
[2] Differences in percentage points.
[3] Average effects on Community country taking action.
Source: Commission services.

What does matter, however, is whether the measure is taken by all Community countries at the same time. If a single country introduced the energy tax, it would feel the loss of competitiveness on its whole export market. The average short-term and long-term effects for a Community country are shown in Table 14. Initially, the drop in demand could well be smaller than in the case of joint action because demand in other countries is hardly affected and changes in relative export prices take some time to reach their full effect. In the long run, the results of concerted action are better, provided that the increase in government revenue is recycled. The impact of solo action on other countries remains small, more so when the introduction of the energy tax is combined with compensatory supply-side measures.

Box 7:[1] The impact of a new energy tax on the world oil market

1. Introduction

The introduction of a new carbon/energy tax aiming to decrease the consumption of fossil fuels and diminish CO_2 emissions, if adopted, could have an important impact on the world oil markets.

This paper presents a preliminary quantitative analysis of possible impacts of a new tax on the world oil market. Two questions, in particular, are examined: What could be the result of a tax adopted by the European Community on the world oil balance and how would the world oil price react. Other questions related to the impact of the new tax on European energy markets have been studied elsewhere and are not addressed in this paper.[2]

[1] This box has been prepared by N. Deimezis, Commission of the European Communities, (DG XVII/A – 2).

[2] See for example the results of the studies made with the Midas model of the European Commission in Capros et. al. and Neto et al. (1991).

Four alternative scenarios are presented and their possible outcome up to the year 2000 is discussed. This initial approach to a complicated question will be followed later by a more global analysis considering also other forms of energy.

2. The scenarios

Four scenarios are defined by combining two different taxation cases with two different OPEC supply response strategies.

In both taxation cases the level of the tax follows the recent proposal by the European Commission: a USD 10 per barrel of oil equivalent (boe) introduced gradually starting in 1993 with USD 3/boe and increasing to USD 10/boe in 2000. In the first case the tax is adopted only by the European Community and in the second case by all members of the OECD. The tax is expressed in real 1993 US dollars. The following table, shows its level in current prices and national currencies for the seven big OECD countries.[3]

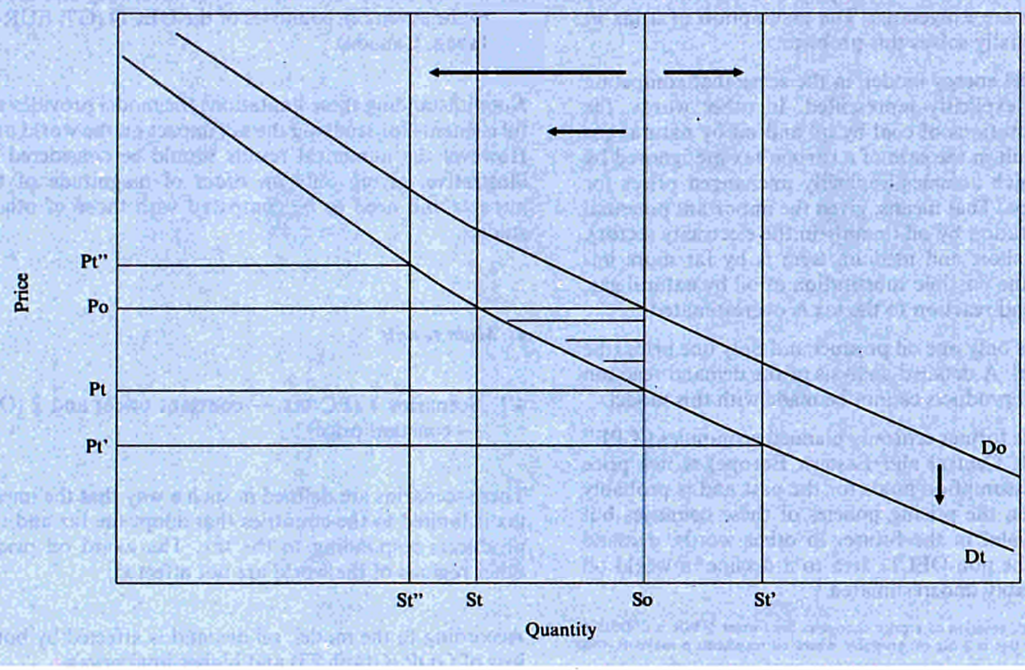
[3] On the basis of exchange rates and inflation rates forecasts made by DRI.

Table 15

Current prices and national currencies for the seven big OECD countries

	1993	1994	1995	1996	1997	1998	1999	2000
Tax: Constant 1993 USD	3	4	5	6	7	8	9	10
Tax: Current prices								
DM	5,0	6,7	8,5	10,4	12,4	14,5	16,7	18,9
FF	16,8	22,8	28,9	35,3	41,8	48,6	55,5	62,8
LIT	2 750	5 200	6 725	8 290	9 900	11 570	13 300	15 000
UKL	1,7	2,4	3,1	3,8	4,6	5,3	6,2	7,0
CAD	3,6	4,9	6,3	7,8	9,4	11,1	13,0	15,0
USD	3,0	4,1	5,3	6,6	8,0	9,4	11,0	12,7
YEN	392	504	633	767	900	1 039	1 186	1 337

GRAPH 22: Call on OPEC and OPEC supply curves



It is very difficult to anticipate how OPEC oil production could react to the introduction of a new tax. For illustrative purposes two cases are examined in this paper:

(i) In the first, OPEC supply is decreased by an amount sufficient to keep the world oil price unchanged (as compared to a 'reference' case without a new tax).

(ii) In the second case OPEC supply remains unchanged and the world oil price is lower than in the 'reference' case.

These cases are illustrated in Graph 22 which presents a simplified supply and demand diagram for OPEC.

If Do is the call on OPEC before the tax and So is the OPEC supply, the price is Po. Assuming that after the tax the demand curve moves down to Dt, different possibilities exist: In case (i) OPEC supply moves to St and the price remains unchanged at Po. In case (ii) OPEC supply remains unchanged at So and the price declines to Pt.

Of course many other possibilities exist. For example, OPEC supply could decrease but not enough to maintain the price at the same level (supply between So and St, price lying between Po and Pt). Two other cases could, at least in theory, arise: a further cut of supply (St'') driving prices up to Pt'' or an increase of supply (St') dropping prices to Pt'.

The four scenarios examined are summarized below:

	EC tax	OECD tax
OPEC supply decreases	*Scenario 1*	*Scenario 2*
World oil price unchanged	EC tax — constant oil price	OECD tax — constant oil price
OPEC supply unchanged	*Scenario 3*	*Scenario 4*
World oil price declines	EC tax — declining oil price	OECD tax — declining oil price

3. Methodology and main assumptions

The four scenarios were analysed with the help of a small econometric model of the world oil market[1] and the results obtained were compared to the 'reference' case for the years 1993 to 2000.[2]

The advantages and disadvantages of using econometric models for policy testing are well known. However, in this particular instance some additional limitations must be mentioned:

(i) The model has a limited macroeconomic feedback. Although a change in oil prices has an impact on GDP, the

[1] The DRI world oil model was used for this study.
[2] The reference case is the latest DRI forecast. See DRI (1991c).

relation between the two variables is far more limited than in full macroeconomic models. This means that the implied impact of the tax on GDP is only illustrative. In addition, inflation rates are exogenous. The assumption of a tax in real terms partially solves this problem.

(ii) This is a partial energy model, in the sense that competing fuels are not explicitly represented. In other words, the possible substitutions of coal by oil and oil by natural gas that could result in the case of a carbon tax are ignored by the model which assumes implicitly unchanged prices for competing fuels. That means, given the important potential of coal substitution by oil (mainly in the electricity sector), which in the short and medium term is by far more important than the possible substitution of oil by natural gas, that the demand reaction to the tax is overestimated.

(iii) The model has only one oil product and only one price (the crude oil price). A detailed analysis of the demand reaction of different oil products cannot be made with this model.

(iv) Demand in the former centrally planned economies ('CPE': former USSR, Central and Eastern Europe) is not price elastic. This assumption holds for the past and is probably still valid given the pricing policies of these countries but may not be valid in the future. In other words, demand reaction for the non-OECD area to a decline in world oil prices is probably underestimated.[1]

[1] However, the demand reaction of a price change in the former USSR is difficult to estimate, given that this is a big oil producer where oil represents a major revenue source.

(v) Due to the regional decomposition of the model, the results refer only to the four big economies of the European Community (EUR – 4: Germany, France, Italy and the UK) and to the seven big countries of the OECD (G7: EUR-4, USA, Japan, Canada).

Notwithstanding these limitations the model provides some useful elements for studying the tax impact on the world oil market. However the numerical results should be considered rather as illustrative, giving only an order of magnitude of the likely impacts and need to be compared with those of other similar studies.

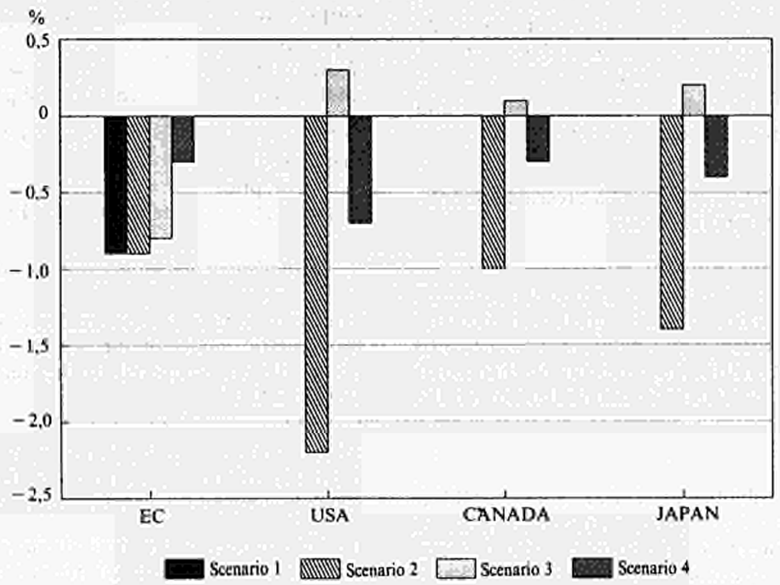
4. Main results

4.1. Scenarios 1 (EC tax — constant price) and 2 (OECD tax — constant price)

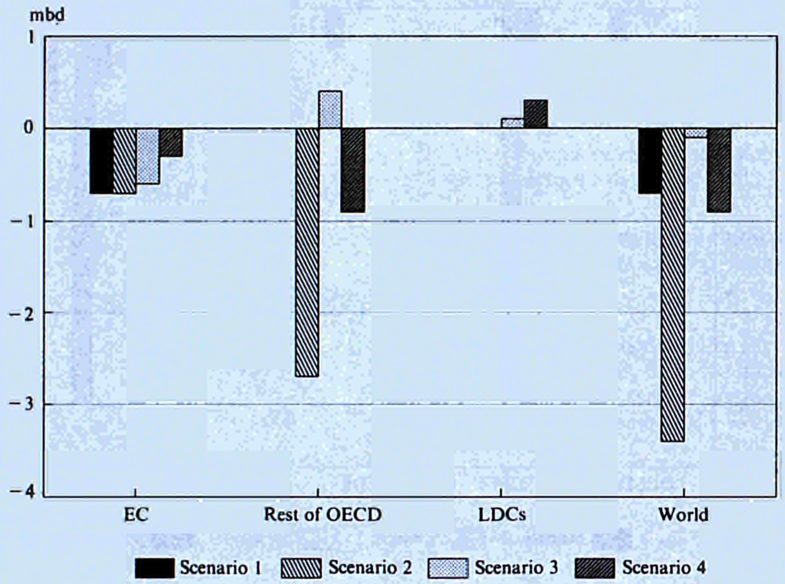
These scenarios are defined in such a way that the impact of the tax is limited to the countries that adopt the tax and the OPEC producers responding to the tax. The world oil price and all other regions of the world are not affected.

According to the model, oil demand is affected by both a small loss of GDP (Graph 23) and higher final prices.

GRAPH 23: **Impact on GDP by the year 2000 (difference from the reference scenario)**



GRAPH 24: **Oil consumption by the year 2000 (difference from the reference scenario)**



Demand decline by 2000, in Scenario 1 (EC tax — constant price) as compared to the 'reference' case (Graph 24), is of the order of 0,7 mbd in EUR−4 (around 8%). This is a much higher figure than the one obtained by more complete energy models of European countries. For example, according to the Midas results, oil consumption could remain almost unchanged due, in part, to an important substitution of coal by oil in the power generating sector.

Demand decline in Scenario 2 (OECD tax — constant price) is of the order of 3,3 mbd given a 10% decrease in the USA. However, as in the European case, this figure is probably overestimated.

Assuming that the tax will have a marginal impact on oil production in the countries adopting the tax, OPEC supply is decreased by an almost identical amount as demand (Graphs 25 and 26).

4.2. Scenario 3 (EC tax — declining price)

In this scenario OPEC supply remains unchanged and the world oil price decreases in 2000 by USD 2/bbl, as compared to the 'reference' case (Graph 27).

As a result, GDP loss and demand decrease in the European countries is somewhat less than in Scenario 1 (EC tax — constant price, Graphs 23 and 24). At the same time, lower world oil prices have a positive impact on GDP outside Europe and oil demand increases in the other parts of the world under the combined impact of higher GDP and lower prices.

According to the model, which assumes no changes in the former CPEs, oil demand in 2000 decreases in Europe, when compared to the 'reference' case by 0,6 mbd. It also decreases in OPEC countries by 0,1 mbd, but increases by 0,3 mbd in the USA, and 0,3 mbd in the rest of the world. Overall, the model gives a decrease of world oil demand of only 0,1 mbd (less than 0,2% of total demand).

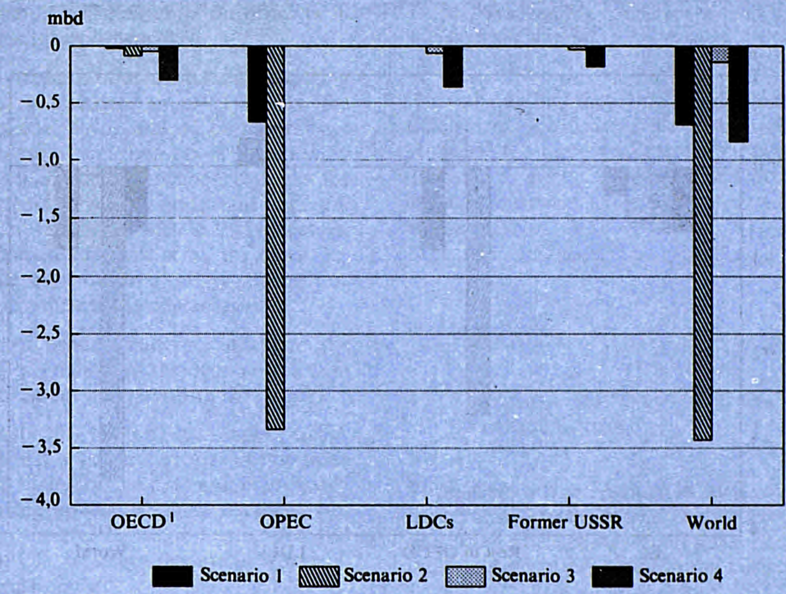
However, given the overestimate of demand decline in taxing countries, the neutral behaviour of former CPEs and the margin of uncertainty of such models it cannot be excluded that in such a scenario, total world oil demand is finally higher than what it could be in the absence of a tax.

Given the small variations in demand and the assumption of unchanged OPEC supply, production in the rest of the world is only slightly diminished (Graph 25).

4.3. Scenario 4 (OECD tax — declining price)

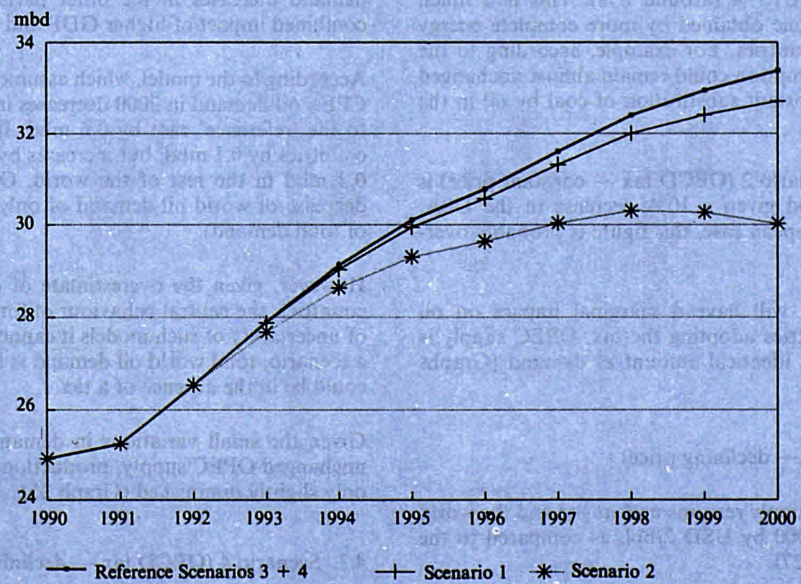
As in the previous scenario (EC tax — declining price), OPEC supply remains unchanged and the world oil price decreases in

GRAPH 25: Oil supply by the year 2000 (difference from the reference scenario)



[1] Including refinery gains.

GRAPH 26: OPEC oil production



2000 by more than USD 10/bbl, as compared to the 'reference' case (Graph 27).

This lower world oil price leads to GDP losses in the taxing countries that are significantly lower than in Scenario 2 (OECD tax — constant price) and after-tax price increases, when compared to the 'reference' case, are relatively small.

According to the model, total oil demand in the G7 countries by 2000, is 1,2 mbd lower than in the 'reference' case. OPEC demand is also lower by 0,6 mbd. Demand in the rest of the world (excluding ex-CPEs) increases by 1,0 mbd leading to a world demand decrease of 0,8 mbd (about 1,1% of world consumption, Graph 25).

In this scenario, oil production declines by 2000 in all non-OPEC producing regions (Graph 26).

5. Comparison with other studies

A few comparable studies were published recently. For example, an OPEC study assuming that a tax similar to the one examined here is introduced, concludes, under a scenario close to our Scenario 2 (OECD tax — constant price), that OPEC production by 2005 could be 2,9 mbd lower than in the base case.[1] This figure is somewhat lower than the one presented here and it is probably closer to reality given that the OPEC model includes other fossil fuels. Other studies made with global models also show increased demand ('carbon leakage') in the rest of the world when a tax is applied to the OECD region only.[2]

6. Preliminary conclusions

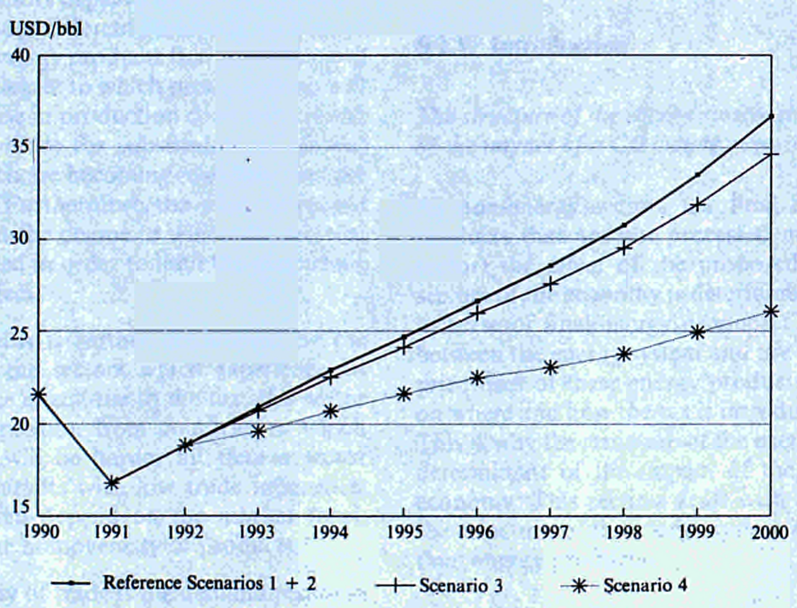
Despite the limits of the methodology adopted here, some preliminary conclusions are possible.

Four scenarios were examined considering the adoption of a tax at the EC or the OECD level and a possible reaction of the world oil price.

If the new tax is applied only in the European Community, it will probably have only a limited impact on world oil consumption by 2000. In the case of Scenario 3 (EC tax — declining price) an overall increase of the world oil demand could not be excluded.

1 OPEC (1991).
2 See, for example, Felder and Rutherford (1991).

GRAPH 27: World oil price



However, if the new tax is adopted by the majority of OECD countries and in particular by the USA, it could have a significant impact on the world oil consumption and on related CO_2 emissions. In that scenario the oil producers are faced by the dilemma of either cutting supply to stabilize prices, in which case (Scenario 2: OECD tax — constant price) the tax may have an important impact on oil demand in the OECD region, or continuing to supply at the same level in which case the world oil price could decline considerably.

These results show that the final impact on total world oil consumption is largely dependent on the reaction of oil-producing countries. Considering that this is a world issue, a concerted approach of the consuming and producing countries seems necessary.

6. The sectoral effects

6.1. Introduction

The analysis of the macroeconomic impacts of a carbon/energy tax of USD 10 per barrel of oil equivalent has shown that the aggregate economic effects can be sufficiently small if an appropriate way of neutralizing the tax revenues is chosen. At a sectoral level, strongly varying energy intensities of production would lead to the a priori assumption that the sectoral impacts could be strong for some sectors and limited for others. In this chapter, we will therefore analyse the sectoral impact in detail.

It has to be stressed at the outset that energy intensity is not the only factor which determines the effects of the proposed carbon/energy tax on sectoral output and competitiveness. Instead, they depend rather on a whole chain of determinants:

(i) The impact of the CO_2/energy tax on the output prices of the energy-generating sector. Differences in the carbon intensity of the fuel mix used in the energy sector and in conversion efficiencies in energy production can mean that the tax induces quite considerably different effects on sectoral output prices.

(ii) The magnitude of the price effect on the producer prices of the non-energy sectors. The impact on the production costs of non-energy sectors depends on the energy intensity of production in the different sectors as well as on the price rise of final energy products that are consumed by these sectors. The degree to which product prices will increase following a rise in production costs will also be determined by possibilities for substitution of (taxed) energy by factors which are becoming relatively cheaper like labour or capital. Furthermore, the effect on output prices is dependent on the degree to which the sectoral profit margin is reduced in order to limit the magnitude of the output price effect.

(iii) Sectoral competitiveness is further determined by the intensity of trade in the sectors which experience an important output price effect due to the tax. If a sector faces significant competition from countries in which no tax is applied, it will be harder hit than a sector which operates on markets with low trade intensities. The trade intensity can depend on the market form, transport costs and the homogeneity of products.

(iv) Related to the intensity of trade is the demand response to higher sectoral output prices. The price elasticity of demand tends to be lower in the case of a product which is less heavily traded. But other factors also shape the magnitude of the demand effect, such as substitution possibilities in consumption and production and non-price factors, e.g. technological content of the product and after-sales service.

All the above determinants plus some additional factors related to the tax design (such as the question of whether, and how, some highly sensitive sectors should be exempted from the tax and the manner in which the revenue from the carbon/energy tax should be redistributed back into the economy in order to ensure revenue neutrality), shape the total impact of the proposed tax on each individual sector of the economy. Moreover, indirect effects of a macroeconomic nature (such as wage-price dynamics) impinge differently on various sectors.

In what follows, the sectoral analysis is presented along the lines of the above-mentioned chain of determinants. Firstly, the manner in which energy price increases feed through the energy system is studied. Secondly, light is shed on the static sectoral sensitivity to energy price rises by an analysis of energy cost shares. In the third section, we assess the likely impact of the tax on sectoral output prices and finally we present the possible consequences of such output price rises on sectoral competitiveness and employment.

6.2. The CO_2/energy tax and the structure of the energy system

6.2.1. Introduction

The structure of the energy system is an important determinant of the impact of a CO_2/energy tax on the economy

As non-energy sectors use final energy products (energy products that are not processed any further in the energy sector) the effect of the proposed tax on the non-energy sectors of the economy is determined by the percentage price increase of final energy products. These constitute the link between the energy system and the rest of the economy. The price rises of these energy products are, in turn, dependent on where and how the tax is introduced in the energy system. This is why the structure of the energy sector is an important determinant of the impact of the CO_2/energy tax on the economy. This section deals with the relationship between the structure of the energy system and the price increases of final energy products.

Some of the final energy products already dispose of their definitive characteristics when they are extracted — as primary energy — and need no further processing (e.g. coal, lignite). Others (cokes etc.) are produced by processing primary energy products. This latter category, called secondary fuels, comprises dominant secondary energy products such as electricity and petroleum products and constitutes by far the most important share in final energy consumption.

The percentage price rise of the average final energy product is determined by the following factors:

Determinants of price increases of final energy products

(i) The structure of final energy consumption over different fuels. This is obviously of interest as the CO_2 component of the tax varies with the carbon content of the various energy products.

(ii) The choice between a production tax and a consumption tax. If a consumption tax is chosen, then final energy consumption will form the tax base; only the consumption of energy outside the energy sector is taxed. In the case of a so-called production tax all primary fuels (for gross inland consumption[1]) are taxed. The tax base is thus formed by all energy which can be used as an input in the energy production process.

Obviously, in the latter case the tax base is generally much broader, although differences between countries in this respect are non-negligible.

(iii) If a production tax is introduced, the structure of the electricity production system is of significance. Fuel mixes differ strongly between countries which leads to large differences in implicit carbon use per kilowatt of electricity. Differences in efficiencies of power stations also contribute to these discrepancies.

(iv) As the proposed tax is an excise tax, the abovementioned factors suffice to define the tax per unit of physical output. Percentage price rises, however, also depend on initial price levels. These are not only determined by fuel mixes and efficiencies but also by other costs of the energy sector (wage and capital costs) and existing taxes. As tariffs differ strongly for various consumer categories (industry, residential, etc.), percentage price rises will also vary substantially across different consumer classes in different countries.

[1] Gross inland consumption captures all energy products, whether from domestic or foreign origin, that enter the energy system of a country. Although most of these products are primary fuels, countries also invariably import secondary products which were produced abroad. A pure production tax should theoretically incorporate all primary energy used, including the primary energy content of imports of secondary products. As, in reality, the primary energy content of some imported secondary fuels is not exactly known, proxies will have to be used. Electricity is the main fuel for which this problem is important. However, the share of imported electricity in energy consumption is very small. Thus the fact that, in this section, gross inland consumption is assumed to be the tax base in the case of a production tax, introduces only a minor inaccuracy in the analysis.

6.2.2. The structure of the energy system and the modalities of the tax as determinants of the tax incidence on final energy products

In Table 16, an illustrative example is provided for a 'typical' EC country in which taxes per unit of energy for a number of fuels sold to final consumers are grouped according to two criteria which could define the tax base.

The first criterion is the distinction between a consumption and a production tax. This demarcates the extent of the tax base: in the case of a production tax all energy products are taxed; in the case of a consumption tax, only final energy products.

The second criterion determines the nature of the tax and distinguishes between a CO_2 tax and an energy tax. Obvi-

Table 16

Tax modalities and tax incidence on energy products: An illustrative example for a 'typical' EC country

(ECU/TJ)

	Consumption tax	Production tax
Energy/Tax (ECU 1/TJ)		
Coal	1	1,06
Lignite	1	1,05
Coke	1	1,34
Crude	1[1]	1,05
Petroleum products	1	1,17
Natural gas	1	1,17
Electricity	1	3,09
CO_2/tax (ECU 1/75 t of CO_2)		
Coal	1,25	1,32
Lignite	1,33	1,39
Coke	1,44	1,60
Crude	1[1]	1,04
Petroleum products	0,96	1,17
Natural gas	0,73	0,87
Electricity	0	3,11

[1] Not sold to final consumers.

ously, the former is a tax on the carbon content, the latter on the energy content.

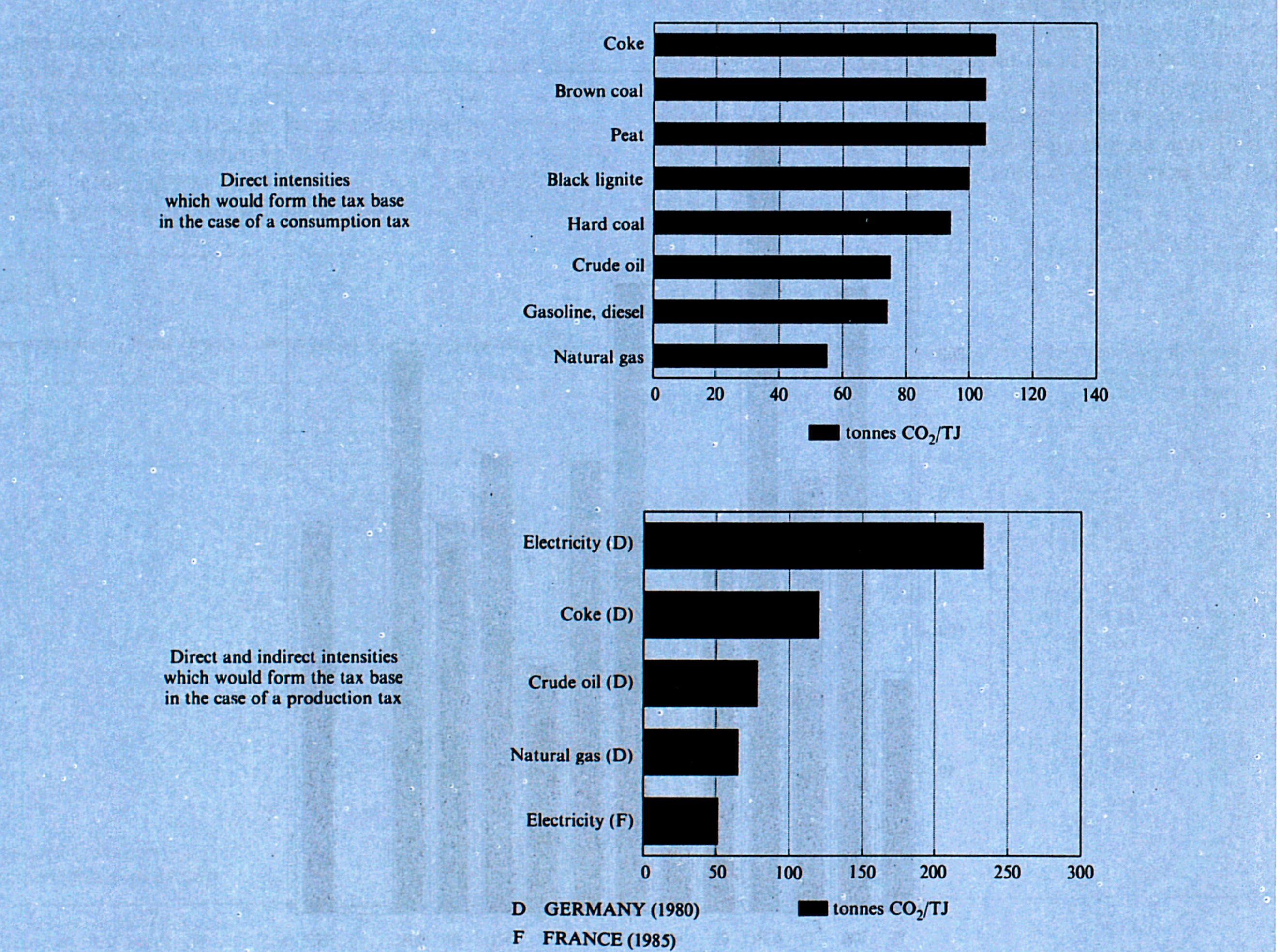
Tax rates for the consumption or production, energy or CO_2 taxes have been chosen in order to ensure identical taxes on crude oil in the case of a consumption tax — this is in order to provide a common point of reference.

The Commission's proposal states that the energy component should not exceed 50%, but leaves the issue of production tax — consumption tax open to some extent.

CO_2 versus energy tax: in principle the structure of final energy consumption is important both for the consumption tax and production tax cases ...

From Table 16 it becomes clear that the structure of final energy consumption over different energy products is an important determinant of the incidence of the proposed tax: the CO_2 component of the tax fluctuates with the carbon intensity of the various energy products. As the bottom part of Table 16 shows, this implies relatively large differences between energy products. Graph 28 presents the underlying

GRAPH 28: CO_2 intensities of energy products — Direct and indirect intensities



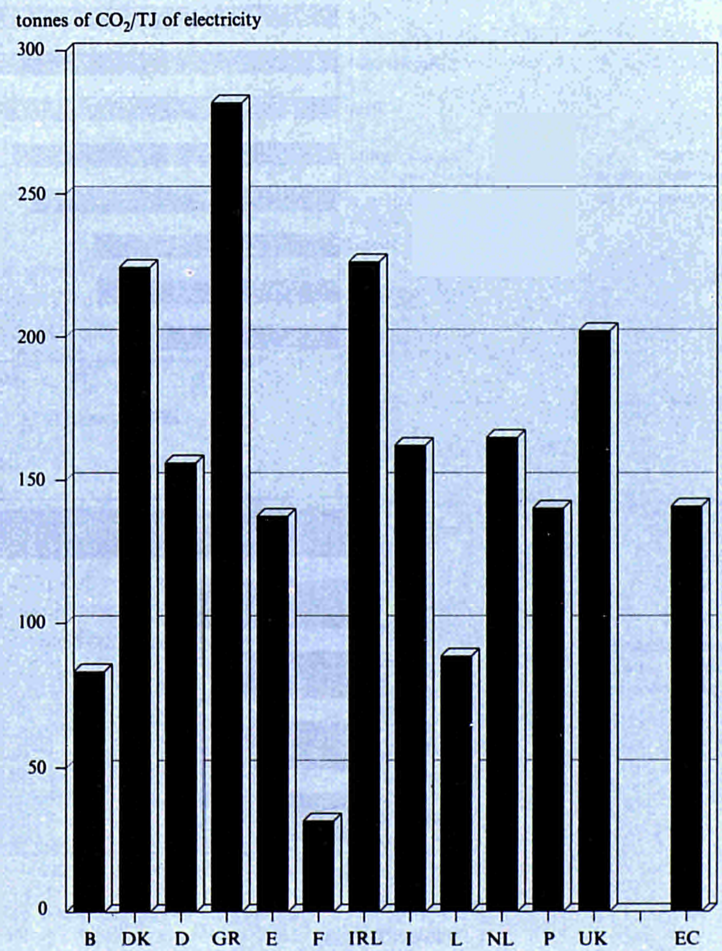
Source: The direct intensities are based on Eurostat figures; the total (direct plus indirect) intensities are based on energy input-output tables.

CO_2 intensities per terajoule (TJ) of energy which determine the variation both for the consumption tax (top of graph) and the production tax (bottom of graph) case. Looking at primary fossil fuels, it is evident that coal is the most carbon intensive and natural gas the least.

... but the structure of primary energy use is only of relevance in the case of a production tax

Due to considerable conversion losses, electricity is also relatively CO_2 intensive — if coal or mineral oils are amongst the dominant inputs in generation. This is true for Germany and most other countries of the Community. If, on the other hand, nuclear and hydro are the dominant inputs, electricity has a very low CO_2 intensity — which is the situation in France and Belgium, as well as in Luxembourg and Spain. These differences are brought out clearly in Graph 29 which presents tonnes of CO_2 emitted per terajoule of electricity produced. Obviously these inter-country differences will only lead to different taxes on electricity in the case of a production tax; in the case of a consumption tax, electricity is taxed identically in all Member States (compare Table 16).

GRAPH 29: CO_2 emissions in electricity generation — Emissions of CO_2/TJ of electricity



Source: Commission services: data on the 1990 structure of electricity generation.

Differences in the structure of final energy consumption are, however, in reality not large enough to lead to strong differences across Member States in the case of a consumption tax ...

As Table 17 shows, the structure of final energy consumption is not very different in the various Member States. This reflects the fact that the sectoral structure of industrial production and the use of different fuels for various end-uses are broadly comparable across Member States. In most countries, petroleum products, natural gas and electricity dominate.

Nevertheless, many countries have clearly distinguishable patterns. In the Netherlands, natural gas is relatively very important, whereas in Ireland, it is consumption of solids (i.e. coal) that is more marked. In France, Portugal and Spain, electricity is relatively dominant.

By and large, however, it can be stated that if a consumption tax with a CO_2 element is introduced, the strong divergences in carbon intensity of different fuels will not lead to radically different tax burdens on the average final energy product in the Member States, although the variation across countries will not be negligible. This is brought out clearly in the last column of the table which shows the average direct CO_2 intensity of final energy products. The standard deviation of the absolute price rise in the case of a full consumption CO_2 tax would be limited to less than 9% of the average. Obviously, as Table 16 shows, the energy tax component would not lead to differences across Member States in the case of a full consumption tax.

... but differences in the structure of primary energy use would lead to more substantial differences across Member States if a production tax were introduced

The last columns of Tables 17 and 18 show that if a production tax with a CO_2 element were introduced, the variation of the tax incidence across countries would be much larger than in the case of consumption tax. This is due to two factors:

First, the conversion efficiencies (measured by the ratio between terajoules of final energy and terajoules of primary energy) of the energy systems differ somewhat in the various Member States. As taxes are levied on primary fuels, the tax incidence on final fuels will vary in relation to the efficiency of the energy system. Although differences between countries occur in this respect, they are generally limited and do not explain most of the extra variation a production tax will cause.

Table 17

The structure of final energy consumption in the Community, 1990

	Coal	Coke	Other solids[1]	Petroleum products	Natural gas	Other gases[2]	Heat	Electricity	Total	Tonnes of CO_2/TJ[3]
					Shares (in %)					
B	3,80	8,29	0,29	46,81	20,96	2,78	0,70	16.36	100	75,0
DK	3,39	0,21	0,02	59,72	11,55	0,28	5,01	19,82	100	72,6
D	3,35	3,84	1,77	48,39	20,45	2,57	1,53	18,09	100	72,5
GR	6,47	0,20	2,32	73,09	0,00	0,11	0,00	17,81	100	85,5
E	3,35	3,10	0,01	63,80	7,51	1,81	0,00	20,42	100	78,6
F	4,05	2,70	0,49	53,01	17,82	1,10	0,00	20,83	100	73,2
IRL	13,84	0,00	9,13	54,21	7,87	0,00	0,00	14,95	100	83,5
I	1,17	2,89	0,00	51,05	26,81	0,89	0,00	17,19	100	73,0
L	4,18	18,37	0,30	47,59	12,71	6,11	0,00	10,74	100	84,3
NL	1,92	1,95	0,09	30,88	48,51	1,21	0,63	14,80	100	63,8
P	5,21	1,32	0,00	70,71	0,00	1,08	0,27	21,41	100	81,1
UK	5,61	2,73	0,23	42,36	30,52	1,09	0,32	17,13	100	70,3
EC	3,70	3,18	0,72	49,47	22,63	1,55	0,60	18,16	100	72,8
Standard deviation										6,3
as a percentage of average										8,6

[1] Patent fuels and lignite (briquettes).
[2] Coke-oven, blast-furnace and gaswork gas.
[3] Counting only CO_2 contained in final energy.
Source: Commission services.

Second, and more important, the variation in the carbon intensity of primary energy consumption is quite significant and much larger than the carbon intensity of final energy alone. This can be gauged from a comparison of the last columns in Tables 17 and 18.

In quite a number of countries, the incidence of the carbon tax component is significantly different in both tax cases. For example, the incidence is below average in Denmark, Germany and the UK in the case of a consumption tax, whereas the opposite is true in the case of a production tax. Conversely, Belgium, France, Italy and Luxembourg would have above-average tax rates in the consumption tax case, but below-average rates in the production tax case.

These differences mainly reflect the heterogeneity of the electricity supply industry in the Community

Given the importance of electricity in total energy consumption on the one hand, and the significant differences in the structure and efficiency of electricity generation across the various Member States on the other, it should be clear that the electricity supply industry is a major source of discrepancy between the impacts of a production tax on final energy prices across different EC countries.

6.2.3. The existing price level as a determinant of percentage energy price increases

Differences in pre-CO_2/energy tax prices ...

The effects of the tax on percentage energy price increases do not exclusively depend on the tax rate per unit of final energy, but also on the existing price levels of energy products. In Tables 19 and 20, an illustrative example is provided of the percentage price rises of gasoline and electricity of a mixed USD 10 per barrel of oil equivalent production tax fully introduced in 1990. Half the tax rate is determined by the energy content and the other half by the carbon content. In both cases, it is assumed that the tax will come on top of the existing excise taxes (in the 1990 structure) and will be subject to VAT. It is worthwhile studying the differences between both fuels.

... explain a large part of the differences in percentage price increases due to this tax across Member States, ...

For gasoline, it is assumed that the production processes are identical and that the new tax per unit of energy will be the same in all countries. It is clear that the percentage price

Table 18

The structure of gross inland consumption in the Community, 1990

	Solids	Petroleum products and crude	Natural gas	Nuclear heat	Other	Total	Tonnes of CO_2/TJ of gross domestic consumption	Tonnes of CO_2/TJ[1] of final consumption
	Shares (in %)							
B	21,54	38,95	17,51	22,62	−0,63	100	53,7	83,2
DK	35,71	49,99	10,43	0,00	3,87	100	77,7	104,6
D	27,67	40,78	17,77	13,31	0,47	100	70,9	106,3
GR	38,32	60,05	0,64	0,00	0,99	100	80,1	124,8
E	22,35	53,15	5,80	15,99	2,51	100	61,8	100,5
F	9,42	41,25	11,72	37,26	0,35	100	47,6	80,7
IRL	35,62	44,57	19,19	0,00	0,61	100	86,6	124,7
I	9,68	59,40	25,83	1,31	3,77	100	68,2	96,2
L	32,20	45,83	12,23	0,00	9,75	100	89,1	94,6
NL	13,72	37,16	46,57	1,33	1,22	100	53,8	83,3
P	17,56	77,19	0,00	0,00	5,25	100	75,4	119,9
UK	30,42	38,67	22,36	7,85	0,69	100	69,0	105,6
EC	21,06	44,71	18,67	14,31	1,25	100	63,8	98,1
Standard deviation							12,7	14,8
As a percentage of average							19,9	15,1

[1] Counting all CO_2 contained in primary energy necessary to produce 1 TJ of final energy.
Source: Commission services.

Table 19

Increases of premium super gasoline prices due to a USD 10 per barrel of oil equivalent mixed CO_2/energy tax, 1990

	Composition of pre-CO_2/energy tax price				CO_2/energy tax (including VAT)	Post-CO_2/ energy tax price	Percentage price increase
	Pre-tax price	Excises	VAT	Total pre-CO_2/ energy tax price			
B	283,6	413,0	174,2	870,8	70,3	941,1	8,1
DK	286,1	513,5	175,9	975,5	68,7	1 044,2	7,0
D	262,7	403,3	93,2	759,3	64,2	823,4	8,4
GR	224,0	252,8	171,6	648,4	76,5	725,0	11,8
E	262,0	436,3	83,8	782,1	63,0	845,1	8,1
F	219,6	566,1	146,1	931,9	66,7	998,6	7,2
IRL	301,0	500,0	192,1	993,1	69,8	1 062,8	7,0
I	273,0	728,2	190,2	1 191,5	67,0	1 258,4	5,6
L	284,8	297,0	69,8	651,6	63,0	714,6	9,7
NL	296,4	478,5	141,5	916,4	66,6	983,0	7,3
P	287,4	559,6	67,8	914,7	60,8	975,5	6,6
UK	264,6	375,4	96,0	736,0	64,7	800,7	8,8
EC	258,8	473,5	122,2	854,5	65,6	920,1	7,7

N.B.: All price levels in ECU per toe.
Source: Commission services.

Table 20

Price increases of electricity due to a USD 10 per barrel of oil equivalent mixed CO_2/energy tax, 1990[1]

	Pre-CO_2/energy tax price levels				CO_2/energy tax (including VAT)		Percentage price increase	
	Households		Industry		Households	Industry	Households	Industry
	Pre-tax price	Pre-CO_2/ energy tax price	Pre-tax price	Pre-CO_2/ energy tax price				
B	1 255,8	1 473,2	769,8	900,0	133,8	133,3	9,1	14,8
DK	802,3	1 573,2	548,8	1 266,3	185,5	186,2	11,8	14,7
D	1 415,1	1 761,6	957,0	1 196,5	159,7	160,9	9,1	13,4
GR	857,0	926,7	776,7	916,3	210,2	229,3	22,7	25,0
E	1 233,7	1 382,5	933,7	1 044,2	147,6	147,3	10,7	14,1
F	1 010,5	1 325,6	682,6	809,3	107,7	107,7	8,1	13,3
IRL	905,8	973,2	709,3	761,3	177,4	177,3	18,2	23,3
I	1 046,5	1 162,8	850,0	1 044,2	142,9	140,2	12,3	13,4
L	1 122,1	1 188,4	669,8	710,5	103,1	103,3	8,7	14,5
NL	984,9	1 167,4	709,3	840,7	159,2	159,2	13,6	18,9
P	1 165,1	1 260,5	861,6	930,2	120,7	120,6	9,6	13,0
UK	1 054,6	1 054,6	766,3	826,7	157,3	169,7	14,9	20,5
EC	1 133,3	1 344,8	829,3	993,2	145,3	148,0	10,8	14,9

N.B.: All price levels in ECU per toe.
[1] Simulation of a USD 10 per barrel of oil equivalent mixed (50%/50%) energy/CO_2 production tax.
Efficiency of nuclear electricity generation assumed to be one-third in all countries.
Source: Commission services.

increases differ significantly across different Member States due to the large differences in pre-CO_2/energy tax gasoline prices. The effect in the country with the cheapest gasoline (Greece) is more than twice as high as in the country with the most expensive fuel (Italy).

... and are to a large extent due to differences in existing exise taxes

The large differences between pre-CO_2/energy tax prices are mainly due to the important discrepancies between the rates of existing excise taxes across Member States as Table 19 clearly demonstrates. Differences in VAT rates also add considerably to the substantial variations of gasoline prices.

In the case of transport fuels this could imply that, if the new CO_2/energy tax were introduced by raising the minimum level of existing excises, some Member States would be under no obligation to raise national energy prices

It has been decided recently to harmonize excise duties somewhat by introducing minimum rates. Nevertheless, the variation of existing excise duties on transport fuels could have a substantial impact on the introduction of the proposed CO_2/energy tax as far as these fuels are concerned. For other energy products, which form the bulk of industrial energy consumption, these differences are less important. If, for instance, the tax were implemented as an increase in the minimum — Community wide — excise rate for transport fuels, it is clear that a number of Member States (notably Italy) would not necessarily have to increase their existing excise rates. Alternatively, if the CO_2/energy tax is conceived as a new tax element, Member States where the existing rates of excise duties exceed the minimum rates could lower their rates and thereby partly compensate for the price effect of introducing a Community-wide CO_2/energy tax. In the tables in this chapter, it has been assumed for analytical reasons that the carbon/energy tax would be levied in addition to existing energy taxes.

In the case of electricity, these differences add to the significant variance of price increases across Member States due to diverging CO_2/energy taxes per unit of electricity

After the preceding discussion, it should be no surprise that the effects of a mixed CO_2/energy tax on electricity prices differ strongly across Member States (see Table 20). This brings along a considerable variation in percentage price increases of electricity. Differences in pre-CO_2/energy tax price levels also contribute to this variation. Although some of the latter variation arises from differences in existing taxation of electricity, the bulk is due to differences in pre-tax prices. This is in stark contrast with the case of gasoline and illustrates the heterogeneity of the electricity supply industry in the various Member States.

The extent of intra-country differences between pre-tax price levels for consumers and industry is also quite remarkable. Obviously, this leads to different percentage price increases for the two groups. On average, electricity prices in industry would rise 40% more than they would in the case of households. In this respect too, the variation across EC countries is non-negligible.

The interaction between significant differences in pre-CO_2/energy tax price levels on the one hand and tax incidences on the other does not produce a clear-cut pattern of relative percentage price increases. In some cases a low CO_2/energy tax and a relatively low pre-CO_2/energy price level lead to modest price increases (France); in others the same holds true for high taxes and price levels (Germany). However, sometimes low price levels are accompanied by high taxes (Greece) leading to relatively high percentage price increases.

Two observations regarding electricity prices should be made. First, the country pattern would change significantly if the mix between CO_2 and energy were changed. Countries like France, Belgium (nuclear) but also Portugal and Luxembourg (hydro) would have much lower price increases if the CO_2 component were higher. Secondly, in countries where nuclear electricity is important, the efficiency of nuclear plants is crucial for electricity price rises. In Table 20, an efficiency of one-third is assumed for all countries — which is fairly close to statistical conventions used by Eurostat. Other definitions, however, are also possible — with strong implications for taxation.

6.2.4. The influence of substitution of inputs in electricity production and of macroeconomic feedbacks

Up to now, only first-round effects of the tax on energy prices have been analysed. In the long run, two additional effects should also be taken into account. First, other prices (including wages) in the economy will be influenced by the tax and will feed back to the energy system leading to changed costs. Although this effect is not negligible and might have different consequences for different energy branches, it seems that in the energy sector this feedback would be of minor importance as compared to the initial price rise due to tax.

The second effect, however, might be of greater importance, especially in the long run — as relative fuel prices are changed, it becomes rational to adjust the fuel mix in energy generation in order to minimize costs. Also, further improvements in energy efficiency are stimulated. This changes the pattern of price increases in electricity over time. Needless to say, such effects are exactly the reason for introducing the tax in the first place as they lead to a reduction of CO_2 emissions from the energy sector.

6.3. Short-term sectoral sensitivity of production costs to the imposition of a carbon/energy tax: the initial sectoral energy cost structure

The answer to the question of how a carbon/energy tax, leading to an increase in final energy prices, affects — via higher production costs — input costs of non-energy branches depends in the first place, on the corporate production cost structure. The relative importance of energy input costs in comparison to labour and capital costs as well as, additionally, to any operating surplus, determines a sector's sensitivity of production costs to energy price rises.

In this section, the analysis of energy cost shares in the manufacturing industry is limited to the EC's manufacturing industry. Agriculture and the service sectors are left out due to the lack of available sufficiently disaggregated data. The omission of these sectors does not mean that they do not include branches potentially sensitive to energy price increases. This is investigated in section 6.4 at a somewhat higher level of aggregation.

Short-term effects of a carbon/energy tax depend strongly on sectoral energy intensity ...

The energy intensity of production determines, together with the unit price of energy, the energy cost share in total production cost. Obviously, sectors whose energy cost share in production increases massively after a rise of energy prices will experience a strong upward pressure on their product prices. The magnitude of sectoral energy cost shares can therefore provide a first indication of the sensitivity of sectoral production cost and, consequently, output prices to a rise in energy prices in the short term.

... and the level of existing energy prices

A reservation, however, has to be made. The percentage increase of energy costs is largely determined by the relative change of energy prices as, in the short run, the energy intensity remains fixed. The magnitude of percentage energy price increases due to the imposition of an *ad quantum* tax (i.e. a fixed tax rate per tonne of carbon and/or per terajoule) also depends on the level of the existing energy prices. If originally this level is high, the percentage increase of the energy price will be relatively small. Thus, the energy cost share and consequently the production cost would increase relatively less than for a sector with the same original energy cost share but operating in a country with lower energy prices. A similar reservation can be made with respect to the structure of energy consumption over different fuels: the higher the share of CO_2-intensive fuels in energy costs, the stronger will the effect of a mixed CO_2/energy tax be on costs.

In the short term, energy intensity is determined by production technology and the way this technology is used ...

In the short term, the sectoral energy intensity is to a certain extent technologically determined. For instance, the production of aluminium with the currently available technology requires a large quantity of electrical current for electrolysis. However, better energy management, improved information on energy use and the development of training and motivational packages for the workforce can further energy efficiency without expensive restructuring being necessary (see March (1991)).

... but in the medium and long term there are substitution possibilities

However, in the medium to long term, a company additionally has the possibility of substituting for energy-intensive production equipment or processes. Within each technology there can be a certain marginal potential for improved energy efficiency. In the energy-generation sector, for example, the efficiency rate of thermal turbines can be improved marginally by changing the rotor design. The company could also try to develop a new, more energy-efficient production process if the necessary technology is available at economical terms, or use existing technology that has now become more attractive (for example, because it uses relatively more labour and less energy). In addition to substituting energy by other production factors, inter-fuel substitution is also of potential interest as the CO_2/energy tax will have different impacts on the prices of the various fuels. For heating purposes especially, this potential would a priori seem to be significant.

The evolution of real energy prices plays an important role

Substitution of energy-efficient production equipment for less efficient equipment is promoted by an increase in real energy prices. The evolution of energy prices plays an important role in deciding to invest in new, more energy efficient production capital.

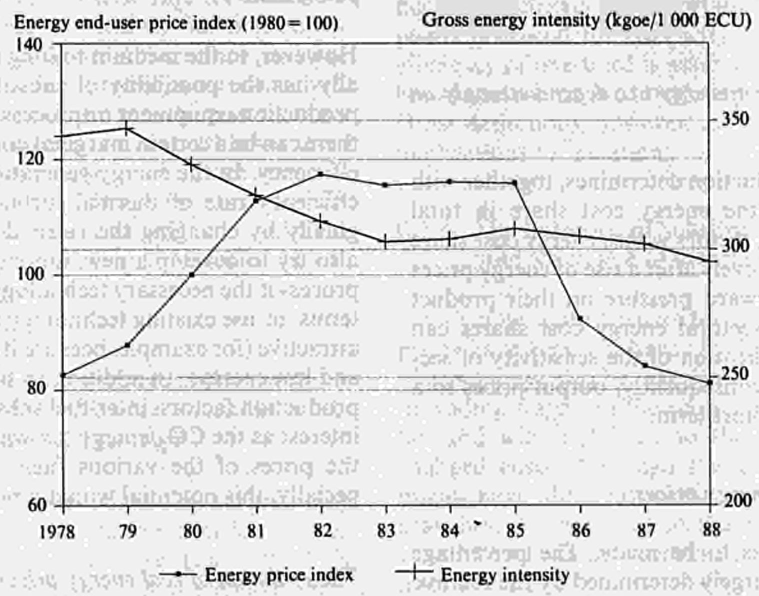
In times when energy prices are expected to rise continuously, investment in new energy technologies can become economically profitable. Hence, the energy intensity of the productive capital stock diminishes. In Graph 30, an example of this negative relationship between the evolution of energy prices and energy intensity has been plotted for the case of the European Community. The graph shows that during periods of steep energy price increases the overall energy intensity of the economy declines, whereas in times of stagnating or decreasing energy prices the energy intensity remains generally stable.

In this section, we concentrate on the analysis of energy cost shares. A comparative static analysis is undertaken and behavioural changes are ignored. Nevertheless, the analysis can provide an impression of the relative magnitude of the short-run effects of a carbon/energy tax on economic sectors.

Analytically, it is useful to distinguish between direct and indirect energy cost shares. Direct cost shares express the monetary value of direct energy purchases for production purposes in relation to total production cost. Indirect cost shares reflect the relative value of energy incorporated in input factors used for production in the considered sector. The underlying idea is that energy has been used to produce intermediate products until they can be employed as an input. Thus, the cost of non-energy input factors also contains an energy cost element (see Box 9).

In the first part of the following analysis, the sensitivity of different manufacturing sectors' production costs to an increase in the energy price is examined by looking only at direct energy cost shares.

GRAPH 30: The evolution of energy prices and energy intensity in the Community 1978-88



Sources: Eurostat and IEA.

Box 8: Methodological aspects of the analysis of sectoral energy cost shares

Computing the weight of energy purchases in production cost

The aim of this analysis is to identify those industrial sectors at a low level of disaggregation for which the direct effects of an energy/carbon tax on output prices are important.

The variables used are the value of purchased energy products (in national currencies) and the value of production. The energy products considered comprise all fossil fuels, their derivatives and electricity but not energy products for non-energetic uses. The variable 'value of production' has been chosen as a proxy for the production cost. It must be kept in mind, however, that the statistical variable 'value of production' contains components, like profits, which must be distinguished from production costs. Therefore, the values of the chosen indicator (energy purchases over production value) are in general biased towards lower values as the denominator is made up of a variable which is generally higher than the variable 'production cost' which it proxies. The alternative proxy for production cost, 'value-added' has not been retained because it does not comprise input cost components which are an integral part of production cost (intermediary inputs such as raw materials, energy, repair work, transport cost, rent, contracted labour).

Data on energy consumption at a rather disaggregated level of industrial classification are available for five EC countries: Belgium, Germany, Spain, Portugal and the United Kingdom.

The data were provided through industrial surveys on production in the Member States. The surveys were executed in 1988 with the exception of the United Kingdom where the latest survey was carried out in 1984. The structure of industrial energy purchases in the UK has, however, not changed significantly between 1984 and 1988.[1] Thus, it can be assumed that the 1984 pattern is comparable with that of 1988.

The national data were collected at the industrial establishment level. Establishments of less than 20 employees were not generally considered in the sample.

The statistics are presented at the 3-digit level of the NACE classification. The definition of 'manufacturing industry' used comprises NACE divisions 1 to 4. The original national statistics are at an equivalent or partly even lower level of disaggregation in their respective national nomenclature (D: Sypro, E: CNAE, UK: SIC).

[1] See: Department of Energy (1989).

Grouping of sectors

An important problem is defining the sectors which are considered potentially sensitive to energy price rises. Two criteria have been chosen to determine the limits of three groups of sectors ('sensitive', 'moderately sensitive' and 'other'). Firstly, the relative frequency distribution of all observations on energy cost shares over a scale of intervals of percentage-energy cost shares. Secondly, the availability of sectoral energy cost shares for the various countries constitutes a constraint which has to be considered as an additional criterion for grouping the sectors.

Energy cost share in production

Fixing the limits of the three groups is based on the exploitation of Graph 31. It shows that the majority of observations is centred in the interval of 0 to 5%. The average for the whole of manufacturing industry varies between 2,5 and 4% according to the country considered. Thus, the interval ($0\% < x < 5\%$) has been chosen to characterize 'normal' branches (i.e. 'other' branches). There is a second peak in the frequency distribution at around an energy cost share of 10%. Consequently, the 'sensitive' branches are defined as having an energy cost share of more than 10%. The branches with an intermediate energy cost share ($5\% < x < 10\%$) are labelled 'moderately sensitive'.

Data availability

For some NACE 3-digit sectors there are no data available for some countries. In order not to base the grouping of a particular branch on one observation only, a second criterion has been introduced. For a given branch, the first criterion must be met in at least 40% of the maximum possible case (five countries). However, sectors 161 and 163 (power generation and distribution, heat generation and distribution) have been included in the analysis although the second criterion is not met.

The procedure outlined above allows the distinction of three groups of NACE 3-digit branches according to their observed energy cost shares. In this study, these groups have been labelled 'sensitive', 'moderately sensitive' and 'other'. As this 'sensitivity' has only been defined in terms of energy cost shares, it represents *potential* sensitivity rather than *actual* sensitivity, as the latter will obviously also depend on a number of other factors. One such factor is the exposure to international competition by firms based in countries that do not introduce a comparable carbon/energy tax. Only if this exposure is large and no tax exemptions are provided for, is it likely that the potentially sensitive branches will indeed be strongly affected by the introduction of a carbon/energy tax in the Community.

The identification of energy-intensive branches depends on data availability as well as on the level of disaggregation

A grouping of the NACE 3-digit sectors of the manufacturing industry according to the sensitivity of their production costs to energy price rises has been undertaken on the basis of two criteria (see also Box 8): their energy cost share in production value and the relative data availability in the sample of countries at hand. The first criterion enables us to approximate the share of energy cost in total production cost. The second criterion stipulates that, for a given branch, the first criterion must be met in at least 40% of the maximum possible cases, thus in at last two out of five cases. It is used to try to avoid possible misinterpretations of the energy cost data. These might, for instance, arise if, for one branch only, one value for one country is available and the magnitude of the energy cost shares in the other countries is just not known.

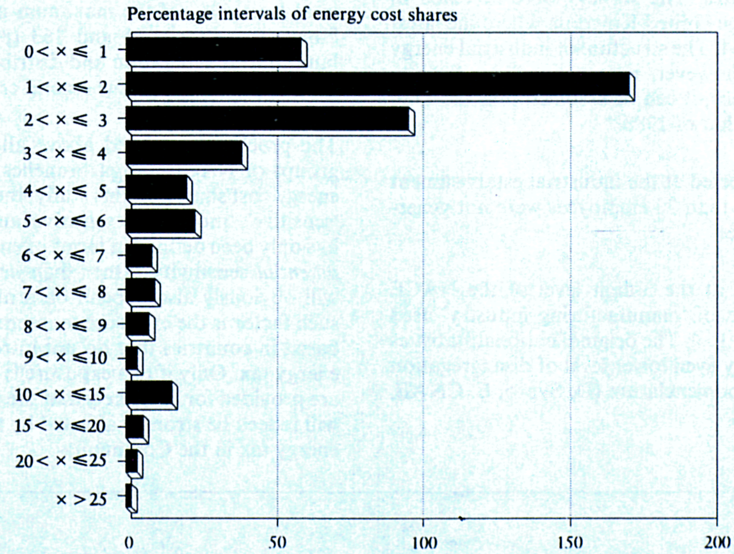
Hence, as a consequence of the second criterion, it could be that a NACE 3-digit sector has not been included in the list of sectors to be examined more closely although its energy cost share might — if it were known — qualify it for such a closer investigation. Examples of such sectors are the other energy branches, the fertilizer industry, the aluminium industry, etc. It has to be stressed, therefore, that due to the limited coverage of available data, the following analysis cannot claim to give an exhaustive picture of all branches that are affected by the CO_2/energy tax, but rather provides a first assessment on the basis of the available information.

Furthermore, it should be kept in mind that the further the industrial sector is disaggregated, the more specific branches (or companies) are likely to be found that have energy intensities diverging from the observed statistical average. Thus it cannot be excluded that within sectors that are not particularly energy intensive, certain subsectors would be relatively strongly affected by the introduction of a CO_2/ energy tax.

Most sectors of manufacturing industry have low direct energy cost shares ...

The great majority of branches in manufacturing industry have a direct energy cost share of between 0 and 5% in production cost (see Graph 31). The average for the whole manufacturing sector varies between 2,5 and 4% according to the country considered.

GRAPH 31 : Sectoral energy cost shares — Frequency distribution of NACE 3-digit sectors over percentage intervals of energy cost shares in industrial production[1]



[1] The numbers of 1988 energy cost shares in total production cost of manufacturing industry in five EC countries (Belgium, Germany, France, Spain and Portugal) have been plotted over intervals of energy cost shares.

Sources: Commission services and national statistical offices.

... although there is a small group of potentially sensitive branches

There are a certain number of sectors which cluster around an average energy cost share of between 10 and 20%. This cluster characterizes a group of energy-intensive branches in manufacturing industry. Their number is, however, comparatively small (eight according to the available statistical information) in comparison to the roughly 130 sectors disaggregated by the NACE 3-digit classification. This group of sectors whose production costs are relatively sensitive to energy price variations comprise heat and energy generating sectors, a certain number of mineral extraction and basic materials industries and the iron and steel industry (see Graph 32).[1]

In terms of employment, six of them represent 1,89 million or 6,4% of total industrial employment. The most important sectors are power generation and distribution with 733 000 employees and the iron and steel industry with 433 000 employees (see Table 21). In the four larger EC countries (Germany, France, Italy and the UK), the proportion of sensitive sectors in total industrial employment is roughly the same as in the Community as a whole and does not vary widely between them. The share of five out of eight sensitive industries fluctuates between 4,8% (UK) and 6,4% (D) (see Table 22).

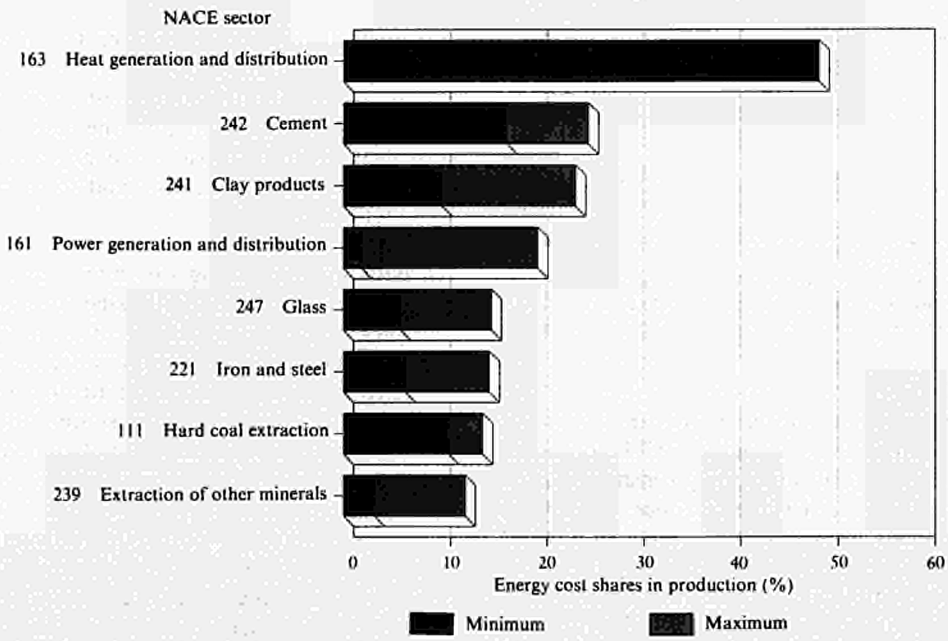
[1] It should be underlined that at a lower level of sectoral disaggregation, smaller branches or sub-branches could have equally high or even higher energy cost shares.

The potential implications of energy price rises on production costs in sensitive sectors appear to be modest

A simple example shall illustrate the sensitivity of the production costs of sensitive sectors to an energy price rise.

According to the mechanics of this comparative static analysis an assumed average 30% increase in industrial energy prices due to a carbon/energy tax would result in an increase in production costs of approximately 3 to 6% in this group of sensitive sectors. Thus, even in sensitive sectors the effect of the tax on total production costs generally appears rather modest. This effect appears to be very small in comparison, for example, to price effects which were caused by US dollar exchange rate fluctuations in the past. During the last 10 years, the USD/ECU exchange rate fluctuated by 50%.

GRAPH 32: Sensitive sectors — Energy cost share more than 10% (in at least 40% of cases in EUR 5 sample)



Sources: Commission services and national statistical offices.

Table 21

Employment[1] in sensitive and moderately sensitive sectors of the Community, 1989

NACE code	Description	Number of employees
	Sensitive sectors	
111	Hard coal extraction	322 000
161	Generation and distribution of power	732 987
163	Generation and distribution of steam and hot water	n.a.
221	Iron and steel	433 307
239	Extraction of other minerals	n.a.
241	Clay products	85 329
242	Cement	79 587
247	Glass	236 767
	Subtotal (6 out of 8 sectors)	1 889 977 (6,4%)
	Moderately sensitive sectors	
120	Coke ovens	n.a.
170	Water supply	138 966
231	Extraction of building materials	87 312
245	Stone and non-metallic mineral products	77 528
248	Ceramics	263 928
251	Basic chemicals	643 578
260	Man-made fibres	71 000
311	Foundries	275 000
418	Starch products	n.a.
437	Textile finishing	107 978
462	Semi-finished wood products	67 500
471	Pulp, paper and board	191 550
	Subtotal (10 out of 12 sectors)	1 924 340 (6,5%)
	Total industry	29 495 200[2] (100%)

[1] In enterprises with more than 20 employees.
[2] Corrections have been made for the construction sector which is not included.
Sources: Commission of the European Communities 'Panorama 1991/92'; Eurostat.

A second group of branches with an energy cost share of more than 5% is composed of an additional 12 branches (see Graph 33). This group of moderately sensitive sectors consists mainly of basic industries like ceramics, working of stone and basic chemicals. However, it also contains finished goods industries such as textile finishing and the pulp, paper and board industry. In employment terms, these moderately sensitive sectors account for approximately 6,5% of total industrial employment (see Table 21). However, for the four larger EC Member States, Germany, France, Italy and the UK, the proportion is slightly lower and fluctuates between 4,5 and 6,0%, (see Table 22). An important share of the industrial workforce at the EC level is employed by the basic chemical industry (644 000), foundries (275 000) and the ceramics industry (264 000).

Direct energy cost shares appear to be generally higher in southern EC countries than in northern countries ...

A comparison of direct energy cost shares between sectors in southern EC Member States and in northern EC countries provides some indication that they are higher in the south of the Community.

Looking at the group of sensitive and moderately sensitive sectors, it appears that the average energy cost share of moderately sensitive sectors in southern Member States is, on average, higher compared to the same sectors in the North (see Table 23). In the group of sensitive sectors the comparison of energy cost shares between southern and northern sectors does not reveal such a uniform pattern. Especially in the iron and steel industry, the energy cost share is significantly lower in southern countries. But this might be due to country-specific differences in the stage of the production process in which the sectors specialize. For instance, steel production in southern countries is specialized in secondary processing of metals which is less energy-intensive than the primary processing which dominates in northern Member States like Germany.

A statistical test with energy cost shares of 51 sectors of manufacturing industry for which information was available for all five EC countries under consideration — three northern (Germany, Belgium and the UK) and two southern (Portugal, Spain) — backs the hypothesis that the direct energy cost shares generally tend to be higher in southern Member States.

An equation estimating the energy cost shares for all of the 51 industrial branches has been established allowing a grouping in energy cost shares of northern and of southern countries with the help of country dummies. The coefficients of the equation have been estimated by running a regression analysis with the energy cost share data available for the five countries. The results show that the coefficient of the average energy cost share in southern countries (Portugal, Spain) is approximately 20% higher than in northern countries at a high level of statistical significance. A similar test has been undertaken with dummies for each individual country. The results reveal that energy cost shares are lower than the EC average in each individual northern country. However, inter-country differences within each country group seem to be quite considerable.

Table 22

Employment [1] in sensitive and moderately sensitive sectors of manufacturing industry in four EC countries (average 1986-89)

(1 000)

NACE code	Description	D	F	I	UK
111	Hard coal extraction	n.a.	n.a.	n.a.	n.a.
161	Generation and distribution of power	229	130	134	145
163	Generation and distribution of steam and hot water	n.a	n.a.	n.a.	n.a.
221	Iron and steel	158	67	78	55
239	Extraction of other minerals	n.a	n.a.	n.a.	n.a.
241	Clay products	15	7	16	16
242	Cement	18	14	17	8
247	Glass	65	50	31	36
	Sensitive sectors (5 out of 8)	485	268	276	260
	(% of total manufacturing industry)	(6,4)	(5,9)	(5,8)	(4,8)
120	Coke ovens	n.a	n.a.	n.a.	n.a.
170	Water supply	15	25	11	43
231	Extraction of building materials	18	23	11	4
245	Stone and non-metallic mineral products	13	5	10	27
248	Ceramics	64	28	55	49
251	Basic chemicals	31	76	76	n.a.
260	Man-made fibres	27	6	16	11
311	Foundries	96	44	35	48
418	Starch products	5	3	1	2
437	Textile finishing	24	15	30	20
462	Semi-finished wood products	21	11	9	4
471	Pulp, paper and board	52	29	25	32
	Moderately sensitive sectors (11 out of 12)	379	269	283	243
	(% of total manufacturing industry)	(5,0)	(6,0)	(6,0)	(4,5)

[1] In enterprises of more than 20 employees.
Source: Eurostat (VISA).

... which seem to be caused by higher energy intensities, not by higher energy prices

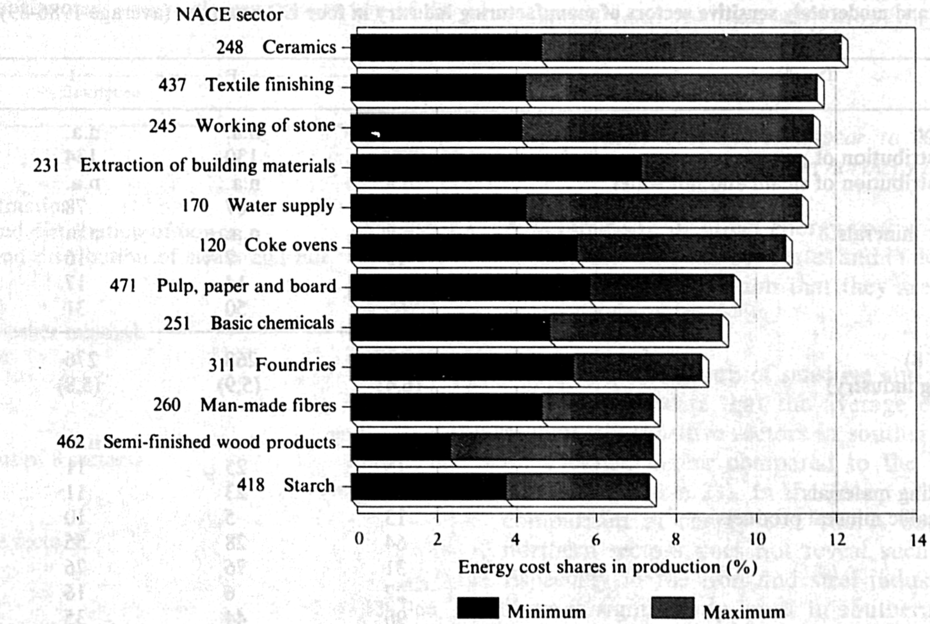
Do higher direct energy cost shares in southern Community countries point to a higher energy intensity of production and therefore to a higher sensitivity to energy price rises generated by the imposition of a carbon/energy tax? Presuming that the productive capital stock in the North is technologically more advanced and thus more energy efficient than in the southern Community countries would support the hypothesis of a higher sensitivity of southern industries to a carbon/energy tax.

This hypothesis has been tested statistically by exploring whether significant differences exist in the level of energy prices between northern Member States (B, D, DK, F, IRL, L, NL, UK) and southern Member States (GR, E, I, P). Net of VAT prices (but including existing excises) of seven categories of energy products[1] from the 12 EC countries have been taken to estimate a regression equation explaining price-level differences between the two groups of countries.

Running the regression revealed that the price level of the abovementioned energy products is 5% lower in southern countries than in northern Member States. The coefficient, however, turned out not to be statistically significant at a 5% level. We thus conclude that, although the analysis does not cover all energy products (coal is missing and some individual prices were not available) there seems to be no statistically significant difference in the energy price level between North and South.

[1] Natural gas (two categories of industrial consumers), electricity (three categories of industrial consumers), residual fuel oil (one category of industrial consumers), and automotive diesel.

GRAPH 33: **Moderately sensitive sectors — Energy cost share more than 5%** (in at least 40% of cases in EUR 5 sample)



Sources: Commission services and national statistical offices.

This means that the higher direct energy cost shares in southern EC Member States point to generally higher energy intensities of production in the South than in the North. These higher energy cost shares cannot apparently be explained by higher energy prices. As to the sensitivity of these branches to the introduction of a CO_2/energy tax, it should be pointed out that the macroeconomic effects, the exposure to competition from countries not introducing the tax, and the possibilities to adjust the production process are also of importance. Thus the relative position of branches in various Member States cannot be gauged by looking at energy costs shares alone.

The range of sensitive sectors is quite similar when we consider total energy cost shares

Total energy cost shares (direct and indirect) can best be determined in the framework of an input/output model (see Box 9). This allows account to be taken, for each sector of the economy, of both the direct energy inputs and the energy component of non-energy inputs coming from other sectors. The following results of our analysis are based on three countries (Denmark, Germany and France) and therefore have an illustrative character. The French and Danish results refer to 1985, the German results to 1980. All sectors of the economy (thus also including the energy sector, agriculture and services) are covered at a higher level of aggregation (approximately 45 sectors) than in the analysis of direct cost shares.

The highest total energy cost shares in the non-energy sectors can be found in the various transport sectors (air, sea, inland waterways and road), the basic material industries like cement, glass, clay products, the iron and steel industry as well as the chemical industry. To illustrate the order of magnitude in these sectors, the total energy cost share varies roughly between 11% (chemical industry in Germany) and 21% (iron and steel industry in Germany). The differences between the three countries can, however, be rather important. For instance, in the iron and steel industry, the energy cost share ranges from 6% in Denmark to 21% in Germany, while in the paper and pulp industry, the margin is 5% (Denmark) to 10% (Germany) (see Table 24). Underlying reasons for these ranges could be differences in energy intensities and/or different patterns of specialization within each sector. The lowest energy cost shares are found in the finished goods industries, agriculture, construction and all non-transport services.

Table 23

Energy cost shares[1] in EC manufacturing: Comparison between southern (E, P) and northern Member States (B, D, UK)

NACE code	Description	Average southern Member States	Average northern Member States	Percentage point differences between group averages
Sensitive sectors				
221	Iron and steel	6,9	11,2	−4,3
241	Clay products	23,0	13,1	+10,1
242	Cement	19,2	19,1	+0,1
247	Glass	8,6	9,4[2]	−0,8
Moderately sensitive sectors				
245	Stone and non-metallic mineral products	4,5	8,2	−3,7
248	Ceramics	8,6	5,7	+2,9
251	Basic chemicals	7,4	5,5	+2,9
260	Man-made fibres	6,0	5,9	+0,1
311	Foundries	7,4	6,4	+1,0
418	Starch products	5,9[3]	5,3	+0,6
437	Textile finishing	8,6[4]	6,0	2,6
462	Semi-finished wood products	7,6	4,4	+3,2
471	Pulp, paper and board	7,9	8,2	−0,3

1 Energy cost share: ratio energy purchases over value of production.
2 Belgium and the United Kingdom only.
3 Portugal only.
4 Spain only.
Source: National statistical offices.

A look at Table 24 suggests the conclusion that the sectors with the highest energy cost shares have also, in general, a high direct energy cost share, whereas in branches with a low energy cost share the indirect energy cost share dominates. This feature seems to be logical as the low share sectors are predominantly 'downstream' (finished goods, services), hence sectors which are refining basic goods that have been produced before with a high energy input. Among the sectors with a high direct energy cost share are transport service sectors, which are naturally fuel-intensive, basic materials, industries and the iron and steel industry. However, Germany's iron and steel industry is an exception: it is characterized by a high indirect energy cost share (twice as great as its direct share), a feature which can probably be explained by the high degree of intra-industry specialization (special steels). The inputs to the production of special steels, which are generally rather energy-intensive, are counted statistically as inputs to the sector and so increase the indirect energy cost share.

Table 24

Direct and indirect energy cost shares in Denmark, Germany and France[1]

I/O Code/branch		Denmark (1985)			Germany (1980)			France (1985)		
		1	2	3[2]	1	2	3	1	2	3
High direct energy cost shares										
135	Iron and steel	9,62	6,19	6	10,08	21,40	1	15,09	12,32	2
151	Cement	22,64	2,54	2	21,93	3,74	2	23,20	3,64	3
153	Glass	5,05	3,66	—	8,58	5,10	—	10,80	4,20	10
155	Clay products	14,91	2,70	4	8,43	4,60	—	15,30	4,51	7
471	Paper, pulp, cartons	7,50	5,09	8	12,19	10,29	6	5,88	6,98	—
613	Road transport	13,04	0,89	7	9,33	2,43	—	16,53	1,81	9
617	Inland waterways	—	—	—	19,67	4,74	5	20,57	2,18	5
631	Sea transport	14,99	2,19	5	17,00	7,88	3	24,99	4,21	1
633	Air transport	21,04	5,48	1	16,11	3,05	9	21,38	2,43	4
High indirect energy cost shares										
137	Non-ferrous metals	2,44	4,70	—	9,01	15,63	4	7,46	5,66	—
190	Metallic products	1,87	4,72	—	2,92	8,55	—	2,54	6,77	—
210	Machines	1,41	3,45	—	1,50	5,07	—	1,55	5,12	—
270	Cars and parts	—	—	—	1,31	6,29	—	1,94	6,52	—
410	Textiles	1,64	3,58	—	2,59	5,48	—	2,26	4,80	—
720	Market services	1,29	1,82	—	1,58	2,11	—	—	—	—

NB: 1 = Direct (%).
2 = Indirect (%).
3 = Rank total energy cost share.
[1] Percentage of total cost.
[2] Rank of 10 highest total energy cost shares.
Source: Own calculations on the basis of Eurostat I/O tables.

Box 9: The input/output model and the CO_2/energy tax

The use of input/output models in analysing the effects of energy taxation is of great importance ...

Analytically, total energy consumption by the various branches of the economy can be divided into two components:

Firstly, branches buy energy products themselves to fulfil a variety of needs in their production process (e.g. heating, smelting, etc.). This type of energy consumption is called direct energy use.

Secondly, branches buy intermediary non-energy products for further processing. To produce such products, however, energy has been consumed — in other branches of the economy. The energy contained in intermediary consumption can be labelled indirect energy use.

When analysing the effects on a specific sector of the economy of the introduction of a CO_2/energy tax, the latter type of energy use is also of importance because the costs of its intermediary consumption will be influenced by rising prices of intermediary products.

... as they take account of direct and indirect energy consumption ...

As all branches of the economy are connected via intermediary deliveries, the production structure of the whole economy should be taken into account when determining the effect of the introduction of a CO_2/energy tax on the costs of a specific sector. Input/output tables have been specifically designed to do this and are thus well suited for the task.

... and therefore allow the identification of sectors of the economy which are sensitive to the introduction of energy taxation ...

At the outset it is worthwhile pointing out the principal advantages and disadvantages of using models based on I/O tables for this goal.

... at a low level of disaggregation

The most important advantage is that, because these tables provide consistent information at a relatively low level of disaggregation (approximately 45 branches), they allow an accurate analysis of the degree of intertwining between the production processes of different branches in the economy and, thus, enable one to carefully identify those branches that are likely to be affected by energy taxation. For the current analyses energy I/O models provided by Eurostat have been used. These distinguish the energy-intensive branches at a very disaggregate level (generally NACE 3-digit, or a grouping of a limited number of NACE 3-digit branches) and aggregate branches with low energy consumption. This means that they provide a very useful tool for analysing the effects of energy taxation.

However, I/O models cannot generally take account of substitution processes

However, I/O models based on these tables generally assume that the structure of production is fixed. No substitution of different inputs (for energy) is possible. As in the long run, the introduction of a CO_2/energy tax aims precisely at generating such substitution processes, the results of an I/O analysis cannot present an accurate impression of the longer term effects of energy taxation. The advantage of consistent detail is bought at the expense of rigidity.

None the less, the I/O tables can be used for several analyses, such as ...

Several types of analyses can be carried out on the basis of these I/O tables, each requiring the use of a specific type of I/O model. The results of this analysis are presented in Chapter 6. The methodology used is described in this box in a concise and non-technical manner.

... the calculation of direct and indirect cost shares, ...

A first possible use of the I/O tables is to construct an I/O cost model (results reported in section 6.3) which allows the identification of direct and indirect energy cost shares. This model uses only I/O tables describing monetary transactions in the economy. The direct energy costs for different branches can be gauged from the matrix of technical energy input coefficients AE which contains the shares of deliveries by energy branches (of which there are Ne in the economy) to the energy and the non-energy branches (of which there are Nn) in the costs of these branches. The total energy cost shares can be calculated on the basis of the following model:

$$\text{ECOSTT} = \text{V'} * \text{AE} * (\text{I-A})^{-1} \qquad (1)$$

in which:

ECOSTT	is a vector containing the total energy cost shares for all branches of the economy, of dimension N (= Ne + Nn)
V'	is a row vector of ones to add up the cost shares of individual energy products, of dimension Ne
AE	is a matrix of energy input coefficients in the production of non-energy goods, of dimension Ne, N
A	is a matrix of input coefficients for all branches, of dimension N, N

This model first calculates total sales in the economy needed for the production of one unit of final output in each branch of the economy ($(\text{I-A})^{-1}$) and then determines the direct energy cost shares in each transaction by premultiplying by AE. As all direct and indirect sales are represented by the latter part of the equation total (direct and indirect) energy costs are covered. Finally, it adds up all the Ne energy cost shares of different energy products to determine the total energy cost share.

... the calculation of the physical energy use and CO_2 emissions generated in production by different branches, ...

A particularly interesting feature of Eurostat's I/O tables is that they not only describe monetary transactions, but also physical deliveries of energy in the economy (in terajoules). This allows one to calculate direct and indirect physical energy use (by energy product) for the production of both the energy and the non-energy branches. As CO_2 emissions per terajoule of energy product are a fixed quantity, this also allows the identification of CO_2 emissions per ECU 100 of production of non-energy branches and per terajoule of production of the energy branches.

The model used to carry out this analysis is a so-called hybrid I/O model as it relies on a matrix of technical coefficients in mixed value/quantity terms. This model has been developed over the last 15 years (for a description of the model see: Herendeen (1974), Bullard and Herendeen (1975), Beutel (1983); a textbook treatment is found in Miller and Blair (1985)). The basic structure of the hybrid I/O table is described in Graph 34.

GRAPH 34: The hybrid input/output model — The matrix of technical coefficients

	Energy branches (Ne)	Non-energy branches (Nn)
Energy branches (Ne)	Terajoule/Terajoule	Terajoule/ECU
Non-energy branches (Nn)	ECU/Terajoule	ECU/ECU

The model used is:

$$ECONTT = P' * PRIM * (I-AHYB)^{-1} \qquad (2)$$

in which:

ECONTT is a new vector containing the total energy content in TJ per unit of final output of all branches of the economy; for the energy branches final output is expressed in TJ; for the non-energy branches in monetary units, of dimension N

P' is a row vector of ones and zeros to add up the sales of the individual primary energy branches (in TJ), of dimension Ne

PRIM is a matrix of ones and zeros to select the primary energy branches, of dimension Ne,N

AHYB is a hybrid matrix of input coefficients (see Graph 34), of dimension N, N

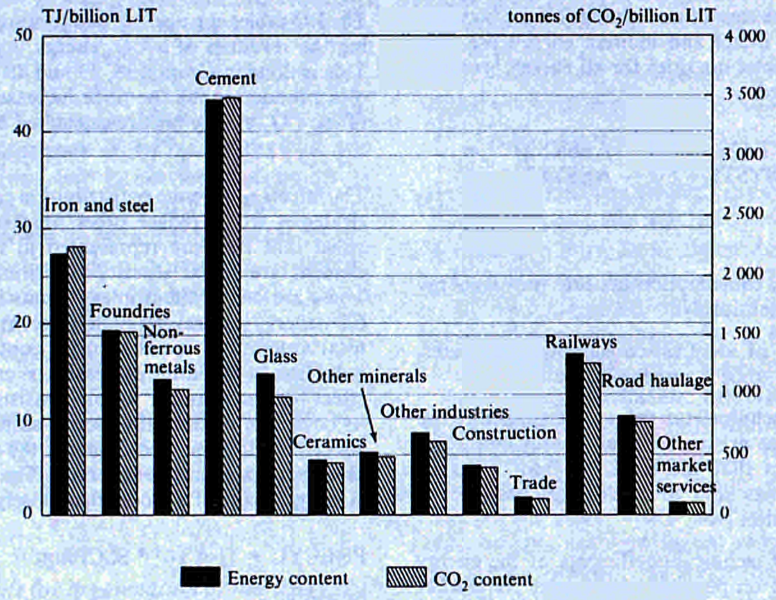
The hybrid representation guarantees that the model first produces an estimate of the sales generated in all branches of the economy for the production of a unit of final output by all branches of the economy — in physical terms for the energy sectors; in non-physical terms for the non-energy sectors ($(I-AHYB)^{-1}$). However, the total energy content of production of a certain branch cannot be calculated by simply adding all the physical energy sales which have been generated in the economy by the production of a unit of final output by that branch. Such a procedure would imply a significant amount of double counting as it would add primary energy deliveries (e.g. coal) to secondary energy deliveries (e.g. electricity). As the latter are already covered by the former from which they have been produced (e.g. electricity generated by a coal fired power station) only the primary branches (coal, lignite, crude oil, natural gas and nuclear fuels) should be included in the analysis (which is done by multiplying by PRIM).

In order to calculate the CO_2 content of production one could, before adding up the sales of the primary energy branches, multiply by a vector containing the CO_2 content of the individual primary energy products. This has been done in calculating the effects of a CO_2 tax.

By way of illustration, the results of these calculations are pictured for a number of selected branches of the Italian economy in Graph 35.

Obviously, the results refer to the year for which the I/O table was constructed. In all cases, with the exception of Germany, this is 1985 (the German table refers to 1980). As the proposed tax would only be introduced in the 1990s, the 1985 results would significantly overestimate the impact on costs on account

GRAPH 35: **Energy content and CO_2 emissions per LIT 1 billion of output of a number of selected Italian industries, 1990**



Source: Commission services.

of the inflation which took place after 1985. For this reason it has been decided to update the results to 1990 (the last year for which sufficient statistical information is available). Assuming that the production structure has not significantly changed, the updating can be done by correcting the energy content per ECU 100 of final output of the various non-energy branches in the economy for the producer price rise which occurred in the period 1985–90. This implies that the energy content has to be divided by the producer price index. For most manufacturing branches this information is collected by Eurostat; for other branches proxies had to be constructed. For the energy branches where all results are in physical units, no updating is necessary. This procedure has been followed in the calculations in section 6.4. It should, however, be stated that if energy efficiency increases over time and if other changes in the production structure have occurred this could introduce an inaccuracy in the results. In the calculations it has, furthermore, been assumed that *all* intermediary products are generated according to domestic production functions, i.e. imported products are taxed as if they were produced domestically.

... which determines the tax base in the case of a production tax, thereby allowing the analysis of such a tax case ...

If a production tax were introduced, the energy content would form the tax base in the case of an energy tax and the CO_2 content in the case of a CO_2 tax. The calculation of the impact of these taxes on production costs of various branches in the economy is thus straightforward after their energy and carbon contents have been calculated. As the tax is an excise tax it suffices to calculate the tax per terajoule of energy or tonne of CO_2 and to multiply the energy and CO_2 contents by these figures. Such an analysis assumes that all primary energy is taxed and that the subsequent cost increases are fully passed on in prices. In fact, a so-called production tax is simulated. This approach underlies the results in Tables 25 and 26.

... and can, if slightly modified, also be used to simulate the effects of a consumption tax ...

If the case of a 'pure' consumption tax is simulated the price rises calculated above will overstate the effects because these also take account of conversion losses in the generation of energy — which are quite significant. For the analysis of a consumption tax case it is assumed that only energy is taxed that is sold to non-energy branches. In the case of an energy consumption tax — analysed in Graph 37 — this implies that the taxes per unit of final energy (that is energy sold to non-energy branches) should be equal across all energy sectors. As the model above taxes primary energy, the tax rates have to be adjusted. This is technically solved by calculating a vector NEWTAX which in its Ne cells, for all primary and secondary energy branches, contains the amount of energy produced by branch i minus all intermediary energy used by branch i after scaling to the production of energy of branch i. This vector thus consists of the difference of a vector of ones and the column sums of AESYST (see below). It can easily be demonstrated that this vector contains the relevant direct taxes to be applied to all energy products in the case of a consumption tax because, if account is taken of all direct and indirect energy use, this vector produces identical total tax rates for all energy products sold to non-energy branches:

$$\text{CONSTAX} = \text{NEWTAX} * (I - \text{AESYST})^{-1} = I'* (I - \text{AESYST}) * (I - \text{AESYST})^{-1} = I' \quad (3)$$

in which:

CONSTAX the (identical) consumption tax rate for all energy branches, dimension Ne

I' a row vector of identical consumption tax rates, here assumed to be 1, dimension Ne

NEWTAX a vector of 'technical' tax rates to be applied to the energy content arising from all energy branches, which ensures that the total tax burden on all energy products sold to non-energy branches is equal, dimension Ne

AESYST the matrix of technical coefficients of the energy system, based on physical data (upper left corner of AHYB), dimension Ne, Ne

By varying I' in calculating NEWTAX, any consumption tax rate can be imposed.

This procedure ensures that if the energy content of all primary and secondary branches in Equation (2) is taken into account when determining the impact of a consumption tax (which implies a slight modification of Equation (2) because in (2) only primary branches are selected) and multiplied by NEWTAX the resulting tax burden on final energy products sold to non-energy branches will be equal for all energy branches, irrespective of the conversion losses in the energy generation process. This methodology has been followed in the analysis presented in Graph 37.

... or alternatively for the study of a scenario in which the revenues of the CO_2/energy tax are redistributed back into the economy

The I/O tables can also be used to study the effects of redistributing the revenues of a CO_2/energy tax back into the economy. This is done in Graphs 38, 39 and 40 in section 6.4. In the case of a production tax the price increases due to the introduction of the CO_2/energy tax are calculated by means of model (2).

The effects of revenue redistribution can be studied for recycling strategies which reduce other production costs elements, provided that they are represented in the I/O tables. One such element are social security contributions paid by employers. These are one of the primary inputs in each branch. Given the CO_2/energy tax revenues that are to be redistributed and the total amount of social security contributions, the percentage reduction in the latter can easily be calculated. The direct price effect for each branch simply consists of the percentage cut in its costs due to the cut in social security rates. The total price effect, in addition, also contains the indirect effects caused by changing prices in the economy. The total effect can be calculated by means of a model that closely resembles (1):

$$\text{PRECYC} = (I\text{-}A')^{-1} * \text{SSCEmut} \quad (4)$$

in which:

PRECYC vector with total effect of revenue redistribution on the costs of all branches in the economy, dimension N

A' the transposed matrix of technical coefficients based on monetary transactions, dimension N,N

SSCEmut vector with direct price changes of branches due to cut in own social security contributions, dimension N

The total effects of taxation and revenue redistribution can be calculated by adding the results of model (2) to those of model (4).

6.4. The effects of a CO_2/energy tax on product prices

6.4.1. Introduction and bird's-eye view of effects

The percentage price rises of energy inputs and the energy cost shares are determinants of the initial cost increase of different branches in the economy. These key variables have been analysed separately in the preceding two sections. This section deals with how they interact and lead to a rise in sectoral production costs and prices. The focus is exclusively on price effects; adjustments of sectoral production volumes and employment are dealt with in the next section.

Faced with higher energy costs, firms may react in several ways. Depending on technical production possibilities, substitution of energy by other production factors can (partly) counteract the effects of higher energy costs. Often, however, substitution will only play a role of importance in the longer run, as in the shorter term the production structure is relatively fixed. The substitution process is also influenced by the revenue use; if tax revenues are used to lower the costs of other production factors, the incentive for the substitution process will be strengthened. It is also clear that even without substitution, costs will come down if the tax revenues are redistributed in this manner.

If cost increases are not offset by substitution — as is certainly the case in the short run — or by the revenue use of the CO_2/energy tax, firms will either increase prices or experience lower profit margins. Obviously, a mix of both is also conceivable. The extent to which these effects occur depends heavily on the importance of foreign competition: if competition from producers not experiencing a tax is significant, it might be difficult for those having to pay the tax to pass it on to final consumers.

Finally, key macroeconomic variables such as wages and interest rates are influenced by higher product prices and lower profits. This, in turn, leads to additional effects at the sectoral level.

The multitude of effects calls for organization of the discussion

From an analytical point of view it is worthwhile organizing the discussion of the sectoral effects into several blocks.

First, completely static effects are analysed, with the tax fully passed on and no revenue redistribution.

The simplest assumption, with which we start, is to assume that no substitution takes place, that all cost increases are fully passed on to final prices and that no compensation via the revenue side of the tax occurs. It should be clear that this approach gives an upward bias to the static picture of the initial price effects as no mitigation of cost rises occurs at all. It does have the advantage, however, of clearly bringing out, at a sectoral level, the combined effects of energy intensities (with respect to different energy products) and energy price rises. It also enables a comparison of the sectoral consequences of a production tax and a consumption tax. For simplicity's sake we label this the 'no-recycling' approach.

Secondly, within the static framework, the effects of a possible scenario of revenue redistribution are studied

Within this static framework, the effects of redistributing CO_2/energy tax revenues via, for example, lower social security contributions paid by employers (SSCE) can be demonstrated. Obviously, this is only one of the possible ways of using revenues, but it clearly demonstrates that, on balance, the sectoral picture consists of 'winners' and 'losers'. To avoid lengthy descriptions this is called the 'static recycling' approach.

Next, the static framework is left and some results with dynamic adjustments in the production structure and the rest of the economy are looked into

As the substitution process only materializes over time, it is virtually impossible to disentangle the effects of a macroeconomic nature from the restructuring of the production processes going on at a sectoral level. Therefore, in section 6.4.3, the combined effects of these forces are tentatively analysed for only one sector to highlight the mechanisms at work. The results are based on a model simulation and clearly underline that the full effects of a policy 'package' of taxation and revenue redistribution will differ strongly from the 'no-recycling' static effects. To complete the terminology, we attach the label 'dynamic' effects to this approach. At this stage, price effects are being determined by complex interactions between initial sectoral price changes, macroeconomic impacts, restructuring of the sectoral production structure, changes in sales volumes and competitiveness on domestic and foreign markets. In fact, the price effects are interrelated with changes in output and employment — which are dealt with in the next chapter.

Finally, in a last section, some conclusions are drawn.

6.4.2. Static effects: no changes in the production structure assumed

'No recycling' static effects

It is tempting to assume that the product of the sectoral energy cost shares and the economy wide average energy price rise equals the cost increases at a sectoral level. Due to the strong variation of prices for an identical energy product delivered to different branches of the economy and significant differences in the composition of energy consumption across various sectors of the economy, this procedure could, however, lead to unreliable results.[1]

A better approach is to link the tax directly to the physical energy use of a sector. In this case, information on pre-tax

[1] A case in point is electricity, where low- and high-voltage consumption, as well as the moment of consumption all impinge on costs leading to different prices for different customers (see 6.2.3). However, it cannot be excluded that some of the variations are also due to differences in market power which lead to price discrimination.

energy prices is not needed. Analogous to the discussion on direct and indirect energy cost shares we can distinguish direct and indirect energy and carbon contents (by energy type) of the output of a particular sector, the latter consisting of the energy (or carbon) used to produce intermediary inputs used by the sector analysed. The sum of the two is equal to the — physical — tax base. On the basis of energy input/output tables the appropriate tax base can easily be established as is explained in Box 9.

Results are presented for five Member States for which input/output tables were available: Denmark, Germany, Spain, France, and Italy. The methodology used to calculate the impact of a CO_2 tax and an energy tax is described in Box 9. It should be noted that the analysis for Spain has been conducted along somewhat different lines and that the original results for this country are taken from Martín and Velázquez (1992). As the tables used in the exercise refer to 1985 and the results have been updated to 1990 by means of a methodology which is described in Box 9, this basically implies that the effects reported upon refer to the introduction of a carbon or energy tax in 1990 on economies which use 1985 production technologies. For Germany, the input/output table used covers 1980 and the updating thus spans a 10-year period. These aspects should be taken into account when interpreting the results. However, as energy efficiency improvements in the second half of the 1980s have been very moderate due to the fall in energy prices in 1986, it is expected that the results for most countries still give a fairly accurate picture of the initial impact of new energy taxation on output prices. For Germany, the results are likely to overestimate the actual impact somewhat.

In the calculations no account is taken of possible exemptions. As the Community strategy foresees (temporary and possibly partial) alleviations of the tax burden for a number of energy-intensive branches in exchange for voluntary agreements to reduce CO_2 emissions, the results presented in the tables might overstate the cost increases in a number of cases.

A production tax leads to significant prices rises for only a limited number of branches

As discussed in section 6.2, the tax base of a 'pure' production tax differs significantly from that of a 'pure' consumption tax.

First, the case of a production tax is analysed. Tables 25 and 26 present 'no recycling, static' results of a USD 10 per barrel of oil equivalent production tax on producer prices for five Member States: Denmark, Germany, Spain, France and Italy. The consumption tax is dealt with later.

The initial effects of rising energy prices consist of higher energy input costs. This is the direct price effect. Next, as prices of all goods and services are affected, the rising prices of intermediary consumption push costs up further. The latter effects are the indirect price effects of energy taxation.

In Graph 36, direct and indirect price effects of a CO_2 tax have been plotted for a number of selected branches of the German economy. Analogous to Table 24 — where direct and indirect cost shares are shown — the graph demonstrates that the direct price effect will dominate in some branches (such as cement and the transport branches) but that generally the indirect price effects are of considerable importance. In the German iron and steel and working of steel and aluminium industries, they are stronger than the direct price effects. Thus, if only price effects via direct energy cost shares are taken into account, the total effect will be significantly underestimated.

In Table 25 total price effects in the case of a CO_2 tax are analysed and in Table 26, those of an energy tax. Three categories of branches are distinguished per country: First, the most affected industrial branches; next, the transport branches and, finally, a number of service sectors. The price rises in other branches of the economy are generally situated somewhat below the level of the price increases in the least affected branches of the first group.

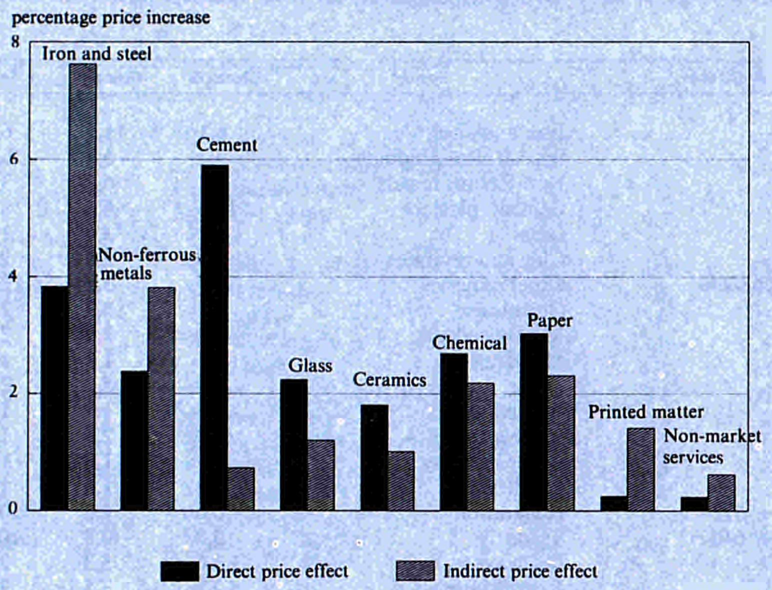
Only the iron and steel industry, specialized steel products and the cement industry would experience production price increases of between 5% and 10%

From the tables it becomes clear that in both tax cases only three branches will experience price increases of between 5 and 10% in (nearly) all five countries: iron and steel, specialized steel products products and cement. These branches have very energy-intensive production processes and concomitant energy cost shares. The economic significance of these three branches differs somewhat across EC economies. However, in the EC as a whole, their combined share in GDP is only about 1%. In Spain and Portugal this share is even smaller. It is interesting to note that the direct energy cost shares provide only a rough guide to the cost increases that will actually occur in the case of energy taxation. This can be seen from a comparison of Tables 25 and 26 with Graphs 32 and 33 from the previous section, which highlights the importance of the factors discussed above.

For the other energy-intensive branches, production price increases would lie between 2 and 4%

A second group of branches will also experience a relatively pronounced price increase: non-ferrous metal industries (alu-

GRAPH 36: Direct and indirect price effects of a CO_2 tax — An example for Germany, 1990



Source: Commission services.

minium), pulp and paper industries, branches producing clay and ceramic products, the chemical industry, the 'other minerals' industry, the glass industry and the transport sectors: maritime transport, inland waterways in countries (in countries where they exist), air transportation, road haulage and railways.

In this second group price increases are generally between 2 and 4%. Although this is certainly not negligible it should be borne in mind that these variations are not excessive when compared to the influence of foreign exchange rate movements and wage rises. In the past five years exchange rate movements of the dollar have pushed prices of EC maritime and air transport — both largely determined in a world market and denominated in dollars — up and down by more than 10%.

Many of very large — in economic terms — service branches will experience price increases of significantly less than 1%

Other market services (comprising, amongst others, business services, banks, insurance services, commercial education and health services) and non-market services (mainly public health and government) experience very moderate price rises of approximately 0,5%. Within some sub-branches of the two very large sectors, price rises are virtually zero. The extremely moderate impact of price rises in these branches reflects the very low energy and carbon intensity of production processes in parts of the service sector.

It should be kept in mind that these two sectors play a very large role in the economy. Approximately 45% of the Community's GDP is generated in these two service sectors which hardly experience an increase in costs due to the introduction of a carbon/energy tax.

Price rises per industry will differ between countries ...

If one compares the price rises in Tables 25 and 26 for identical branches across countries in each tax case it becomes apparent that non-negligible variations might occur. In addition to the statistical problems discussed above, two factors explain the difference.

... but the evidence in the tables also partly reflects the heterogeneity of the outputs of branches in different countries

First, branches do not necessarily produce identical products. In iron and steel production the first phases of the

Table 25

Producer price increases in selected non-energy branches due to the introduction of a USD 10 per barrel of oil equivalent CO_2 tax; estimates for 1990

(%)

I/O code		NACE code	Branch	Denmark	Germany	Spain	France	Italy
13	135	211 + 221	Iron and steel	6,1	11,5	6,8	9,6	6,2
14	136	222 + 223	Special steel products	—	6,4	5,7	5,8	4,2
15	137	212 + 224	Non-ferrous metals	1,7	6,2	3,6	2,2	2,9
16	151	242	Cement, plaster	10,4	6,6	8,9	8,3	9,7
17	153	247	Glass	2,2	3,4	1,8	2,2	2,7
18	155	241 + 248	Clay and ceramics	4,5	2,8	2,7	2,6	2,5
19	157	231/239 + 243/246	Other minerals	3,0	3,8	2,6	1,3	1,8
20	170	25 + 26	Chemicals	2,7	4,9	2,7	3,5	3,5
21	190	311/316	Metal products	1,8	2,9	2,1	1,7	1,8
22	210	321/328	Machines	1,1	1,3	1,3	1,0	1,1
30	471	471	Paper	4,8	5,3	2,5	2,0	3,2
31	473	472/474	Printed matter	1,6	1,7	1,1	0,7	1,2
32	490	481/483	Rubber, plastics	2,0	2,3	1,5	1,7	1,9
33	510	491/495	Other industry	1,1	1,8	1,2	0,7	1,7
34	530	505/509	Construction	1,2	1,4	1,3	1,0	1,1
35	550	620 + 671 + 672	Reparation	0,6	1,3	0,8	0,4	0,6
36	580	610 + 630 + 640	Trade	0,8	0,8	0,4	0,4	0,4
37	611	710	Railways	3,6	3,3	2,4	1,1	3,5
38	613	721/725	Road transport	2,1	1,5	2,0	1,6	2,1
39	617	730	Inland shipping	—	5,4	—	2,1	—
40	631	741 + 742	Maritime transport	5,2	7,3	2,7	6,8	6,5
41	633	750	Air transport	6,7	3,3	3,5	4,6	3,8
42	720		Other market services	0,6	0,5	0,5	0,3	0,3
43	860		Non-market services	0,7	0,9	0,4	0,5	0,4

Source: Own calculations on the basis of Eurostat I/O tables for Denmark, Germany, France and Italy, and on Martin and Velázquez (1992) for Spain.

production process are the most energy-intensive. Further processing can take place without heavy energy use. Such differences may reflect output heterogeneity of outputs, not of production processes of homogeneous products. As various outputs of one industry do not compete directly with one another, the effect on the price competitiveness of industries would be rather limited in this case.

Nevertheless differences in the structure of energy use and in energy intensities of identical products across different countries also play a role

However, it is known that for some identical products energy intensities do differ between countries. These differences are, amongst others, due to discrepancies between countries in the relative prices of factor inputs and the modernity of the capital stock. If this is the main source of variation between countries, it is to be expected that the relative competitiveness of industries within the Community will be influenced directly by the introduction of a tax. Obviously, the structure of energy consumption is also of importance. For example, the Danish iron and steel industry relies heavily on electricity, whereas the steel industries in other countries mostly use coal. As electricity prices would rise much less than coal prices, the Danish iron and steel industry will probably experience a lower price increase.

A careful assessment of underlying factors should be made in each case

This implies that, before one arrives at strong conclusions about the effects on competitiveness of a tax, a careful assessment should be made of the contribution of each of the two factors mentioned above. This analysis should be made at the level of individual industries.

Table 26

Producer price increases in selected non-energy branches due to the introduction of a USD 10 per barrel of oil equivalent energy tax; estimates for 1990

(%)

	I/O code	NACE code	Branch	Denmark	Germany	Spain	France	Italy
13	135	211 + 221	Iron and steel	5,4	10,7	7,1	10,2	5,7
14	136	222 + 223	Special steel products	—	6,1	6,0	6,7	4,0
15	137	212 + 224	Non-ferrous metals	1,5	6,1	4,8	5,0	2,9
16	151	242	Cement, plaster	9,4	6,3	8,9	9,2	9,0
17	153	247	Glass	2,3	3,7	2,3	3,3	3,0
18	155	241 + 248	Clay and ceramics	4,1	3,0	3,3	3,7	2,7
19	157	231/239 + 243/246	Other minerals	2,7	3,8	3,1	1,9	1,8
20	170	25 + 26	Chemicals	2,3	5,0	3,7	4,7	3,7
21	190	311/316	Metal products	1,6	2,8	2,6	2,2	1,7
22	210	321/328	Machines	1,0	1,3	1,6	1,3	1,1
30	471	471	Paper	4,2	5,4	3,6	3,3	3,4
31	473	472/474	Printed matter	1,4	1,7	1,6	1,1	1,2
32	490	481/483	Rubber, plastics	1,8	2,3	2,1	2,5	2,0
33	510	491/495	Other industry	1,0	1,8	1,7	1,2	1,8
34	530	505/509	Construction	1,2	1,4	1,5	1,3	1,1
35	550	620 + 671 + 672	Reparation	0,6	1,3	1,2	0,6	0,6
36	580	610 + 630 + 640	Trade	0,8	0,8	0,7	0,6	0,4
37	611	710	Railways	3,5	3,3	3,4	2,1	3,5
38	613	721/725	Road transport	2,1	1,5	2,1	1,8	2,1
39	617	730	Inland shipping	—	5,4	—	2,4	—
40	631	741 + 742	Maritime transport	5,1	7,4	2,9	7,1	6,5
41	633	750	Air transport	6,7	3,3	3,6	4,8	3,8
42	720		Other market services	0,5	0,6	0,7	0,5	0,3
43	860		Non-market services	0,7	0,9	0,5	0,7	0,4

Source: Own calculations on the basis of Eurostat I/O tables for Denmark, Germany, France and Italy, and on Martín and Velázquez (1992) for Spain.

Sectoral differences across countries between a CO_2 tax and an energy tax depend largely on the structure of electricity production

If one compares Tables 25 and 26, one can gauge an impression of the differences between a CO_2 tax and an energy tax.

It appears that in the case of Denmark, Germany, Spain and Italy, the level of the price rises and the sectoral structure are only moderately affected by the choice between an energy tax and a CO_2 tax. Differences between both cases in the tax incidence on a specific industry do occur and are due to the mix of energy inputs. If coal plays a relatively large role in direct or indirect energy consumption, price rises will be relatively strong after the introduction of a CO_2 tax. This is the case for the steel industry in Germany and Italy, and the cement industry in most countries. If energy consumption mainly consists of mineral oils, differences between both tax cases will be very moderate. The transport sectors in all countries fall into this category.

If electricity generation depends heavily on nuclear and renewables, differences between the two tax cases are much larger. As has been discussed in Section 6.2, there would be no CO_2 tax to pay on these inputs. Electricity prices will thus increase much less in the case of a CO_2 tax, and so will energy costs of branches with heavy electricity consumption. France depends for approximately 90% on these two sources of electricity, which explains why price rises in general are much lower if a CO_2 tax is introduced than in the case of an energy tax. For 'heavy' electricity users, like the non-ferrous metal industry, the difference can be very pronounced.

A consumption tax leads to much lower price increases, especially when electricity consumption is relatively important

A consumption tax only penalizes final energy use. As discussed in Chapter 4 and in Section 6.2, the tax base of a consumption tax will be much smaller than that of a production tax. The former tax 'exempts' extraction, conversion and transportation losses. Prices of energy branches with considerable losses (such as electricity) will increase much less as a result of the introduction of a consumption tax in the case of an energy tax than of a production tax. For petroleum products and coal, price increases will be only marginally lower.

The differences between the impact of a consumption and of a production tax at a sectoral level are thus mainly determined by the fuel mix of the various branches in the economy. Graph 37 pictures the ratio between the price effects of a consumption tax and those of a production tax for some of the branches analysed in Tables 25 and 26. The analysis presented in this graph has been executed for France.

It appears that three groups can be discerned. For the first group, consisting of the transport branches, the tax burden of a consumption tax is only approximately 10% lower than in the case of a production tax. This reflects the dominant role of petroleum products in transport's energy consumption. The only real exception in the transport sector — not in the table — is rail transport, which is a heavy consumer of electricity. For this branch the difference is about 45%. For road haulage and inland waterways the difference is approximately 15%.

For the other branches, the differences are sizeable, being over 30%. With the exception of the transport sectors, all branches in the economy including those not listed in the tables, follow this pattern.

A second group can be discerned, where the differences are approximately 30 to 40%, in which the following industries are situated: iron and steel, steel products, cement, chemical, market health and education services, business services and real estate. All these very heterogeneous branches have fuel mixes in which either coal or petroleum products play a reasonably large role alongside electricity. As extraction and conversion losses for coal are relatively small this somewhat mitigates the large impact of electricity consumption.

In a third group the differences lie roughly between 50 and 60%. Electricity is the dominant fuel. The group comprises industries such as glass, clay and ceramics and non-ferrous metals.

Static revenue neutrality: 'winners' and 'losers' at a sectoral level

Up to this point the analysis has been centred on the CO_2/energy tax aspect of the policy package. As discussed in Chapter 4, the tax is meant to be revenue neutral which implies that other taxes or charges will be lowered. Because the manner in which this will be done is left to the Member States, it is not yet possible at present to get an impression of the total consequences of the package at a sectoral level.

However, in line with the macroeconomic analysis, it seems worthwhile looking into the consequences of the tax revenue redistribution.

In order to analyse these effects it has been assumed that the largest part (approximately 80%) of the tax revenues of an energy production tax are recycled via lower social security contributions paid by employers.

The total effects consist of direct and indirect effects

The analysis has been performed for France on the basis of the I/O table discussed above (for methodology see Box 9). The revenue use implies a reduction of social security contribution rates by somewhat more than 10%. The direct consequences of this proportional reduction of labour costs vary rather strongly over different sectors. Obviously these direct price effects are largely determined by the labour intensity of production.

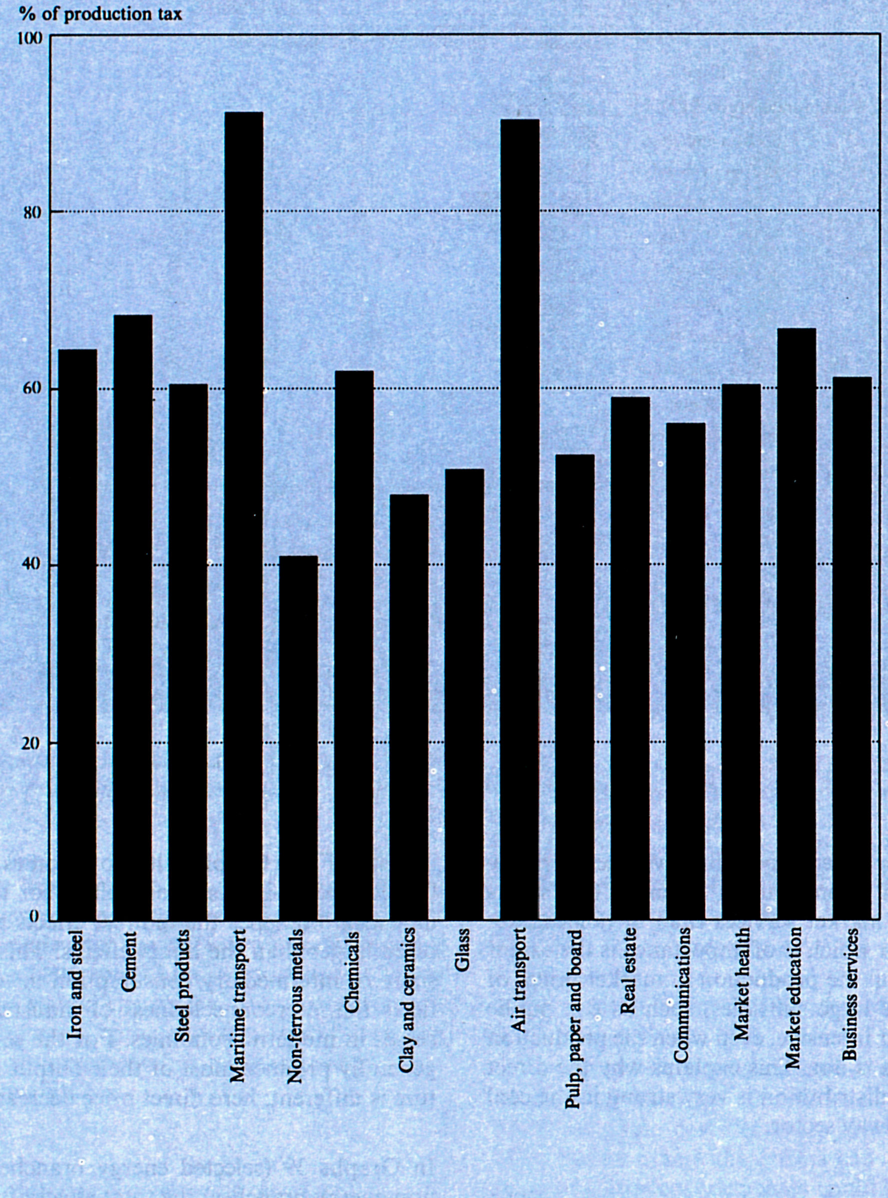
The direct price decreases have important indirect effects as intermediate consumption prices are also lowered. This leads to further rounds of price effects. These indirect effects are modulated according to the level and structure of intermediary consumption. The larger is the intermediary consumption of labour intensive industries, the stronger are the indirect price effects.

In Graph 38, direct and indirect price effects are illustrated for a number of selected industries.

The direct effects of offsetting reductions in social security contributions depend strongly on the labour-intensity of branches, which is particularly high for services

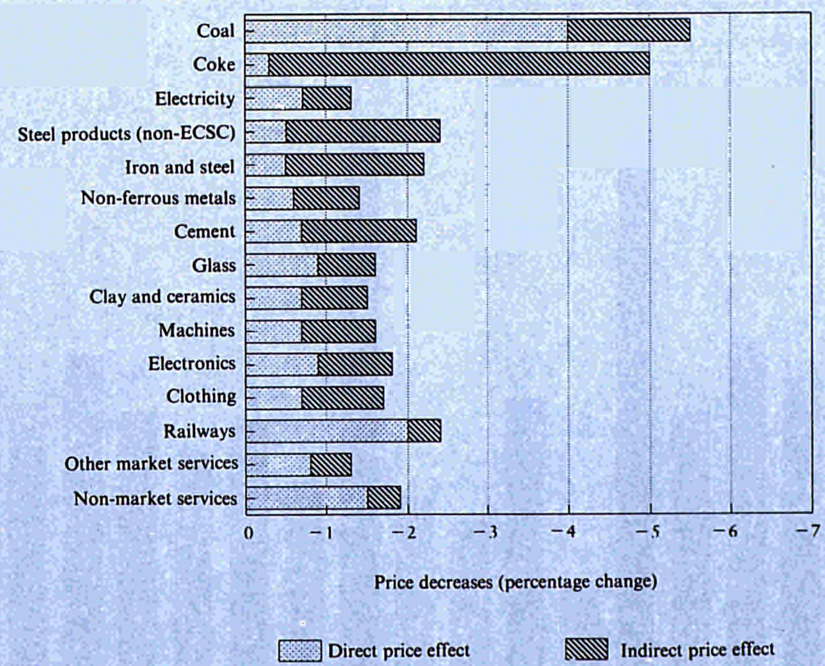
If one analyses the direct price effects one clearly sees that most of the energy-intensive industries are not very labour-intensive and have direct price decreases of between roughly 0,5 and 1%. This is also true for other manufacturing branches such as machines, electronics, milk and drinks. Although the picture is comparable for some service sectors (business services, market health services), for other service sectors and the government the effects are much stronger and price decreases of over 2% do materialize. At this stage it should be stated that these initial effects are not only a function of labour intensity. The amount of social security

GRAPH 37: Producer price increases due to a consumption tax compared to those of a production tax — An illustrative example for France



Source: Commission services.

GRAPH 38: **Sectoral effects of revenue redistribution via social security contributions paid by employers: direct and indirect price effects — An illustrative example for France**



Source: Commission services.

contributions is also dependent upon the coverage of (partly voluntary) social security contribution schemes. This seems to be less extensive in market services than in non-market services. Another factor which is of importance is the extent of existing subsidization: the production in market prices of branches which receive large subsidies, such as e.g. public transport, is very labour intensive, even when the production in terms of factor costs is not. This explains why the direct effect of tax revenue redistribution is very strong in the coal industry and in the railway sector.

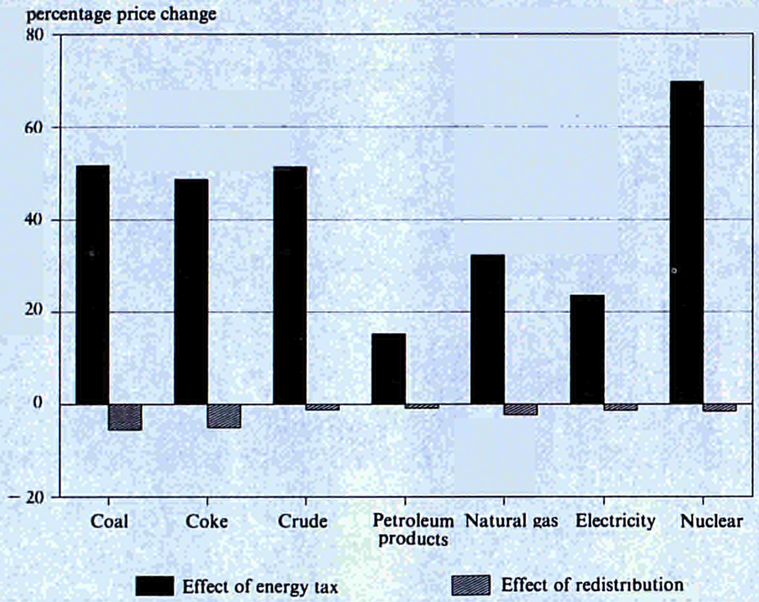
The indirect effect relies on intermediary consumption, which for quite a number of industries plays an important role

The importance of intermediary consumption as a determinant of the indirect effects is clearly underlined by the case of coke. Over 80% of production costs consist of coal consumption as a result of which the direct price decrease of coal has a strong indirect impact on the coke industry. A similar, although less pronounced, effect is found in the steel industry. From Graph 38 it also becomes clear that in general for the energy-intensive as well as for the energy-extensive industrial branches the indirect effects are very strong and often larger than the direct effects. This is due to the large share of intermediary consumption in total costs which reflects the interconnectedness of industrial production processes in modern economies. For the service sectors, which generally produce most of their output themselves, the picture is different: here direct price decreases dominate.

In Graphs 39 (selected energy branches) and 40 (selected non-energy branches) the total effect of taxation and offsetting cuts in social security contributions is pictured.

The 'recycling' of revenues has only a very limited effect on the tax-induced price rises in the energy sector. This is self-evident as the energy intensity of this sector is of course a multiple of its labour intensity. Even for the coal industry, where the recycling leads to pronounced price decreases, the effect of the energy tax clearly dominates the picture.

GRAPH 39: **Taxation and redistribution of tax revenues via social security contributions paid by employers: effects on producer prices in energy branches — An illustrative example for France**



Source: Commission services.

The total effect of taxation and compensating tax cuts implies a relatively strong price increase for energy (intensive) branches,...

For the non-energy branches the picture is quite different. For a number of very energy-intensive branches (iron and steel, non-ferrous metals and cement) revenue redistribution only mitigates a relatively small part (approximately 20%) of the effects of the carbon/energy tax. However, for glass and clay and ceramics — both relatively energy-intensive branches — net price increases after recycling are brought back to a level of roughly 2%.

...very moderate increases or decreases for the other manufacturing branches...

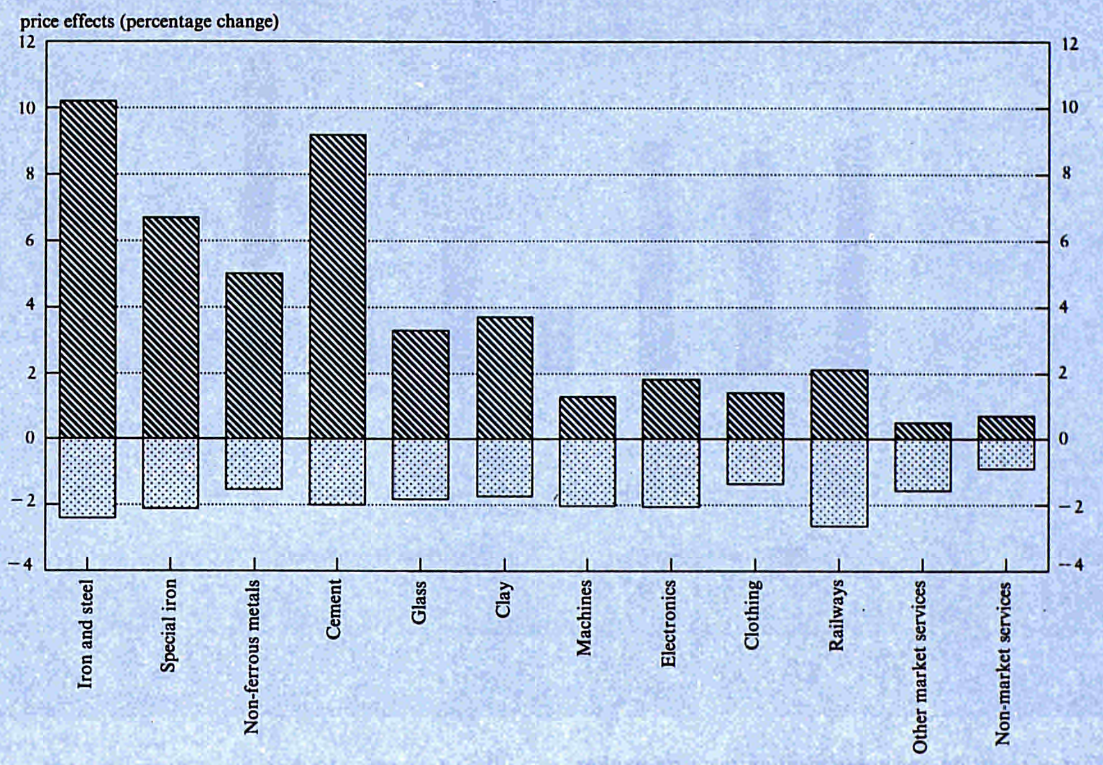
A number of industries which are neither particularly energy-intensive nor extremely labour-intensive, record net price effects which are zero or even slightly negative. This is also true for the railway industry, which is particularly labour intensive. Other industrial branches which have roughly the same characteristics all experience price variations between −1 and +1%. As has been demonstrated in a previous section, these branches constitute the bulk of industrial activity. This clearly shows that for the majority of industrial branches the total initial effects of taxation and offsetting tax cuts are very moderate if a substantial part of the CO_2/energy tax revenues is used to lower other costs.

...and moderately strong price decreases for services

For most service branches (excluding transport) the effects of the total 'package' clearly lead to lower costs. In some branches, these cost decreases are rather moderate (up to 1%), but in others the effects can be relatively strong. In these branches cost decreases could be larger than 1%.

A number of conclusions can be drawn from this analysis. Revenue redistribution can largely compensate the cost-push effect for the majority of industrial branches. For energy-intensive branches, however, it will in general only lead to a slight moderation of the effect of the CO_2/energy tax. Whereas the CO_2/energy tax will dominate the net effect on the energy-intensive sectors' costs, the reverse is true in the

GRAPH 40: **Taxation and redistribution of tax revenues via social security contributions paid by employers: effects on producer prices in non-energy branches — An illustrative example for France**



Source: Commission services.

case of a number of service sectors. Non-market services especially might experience a not insignificant cost decrease.

Overlooking the sectoral arena it becomes clear that there are likely to be 'winners' and 'losers'. While aggregate costs in total industry will not be influenced strongly, effects at a sectoral level are relatively marked. The dispersion of effects at a sectoral level against the background of relatively unchanged aggregate costs is exactly what an incentive tax aims at: by giving an incentive modulated according to the CO_2/energy content of consumption and production patterns it discourages energy use in an economically efficient manner.

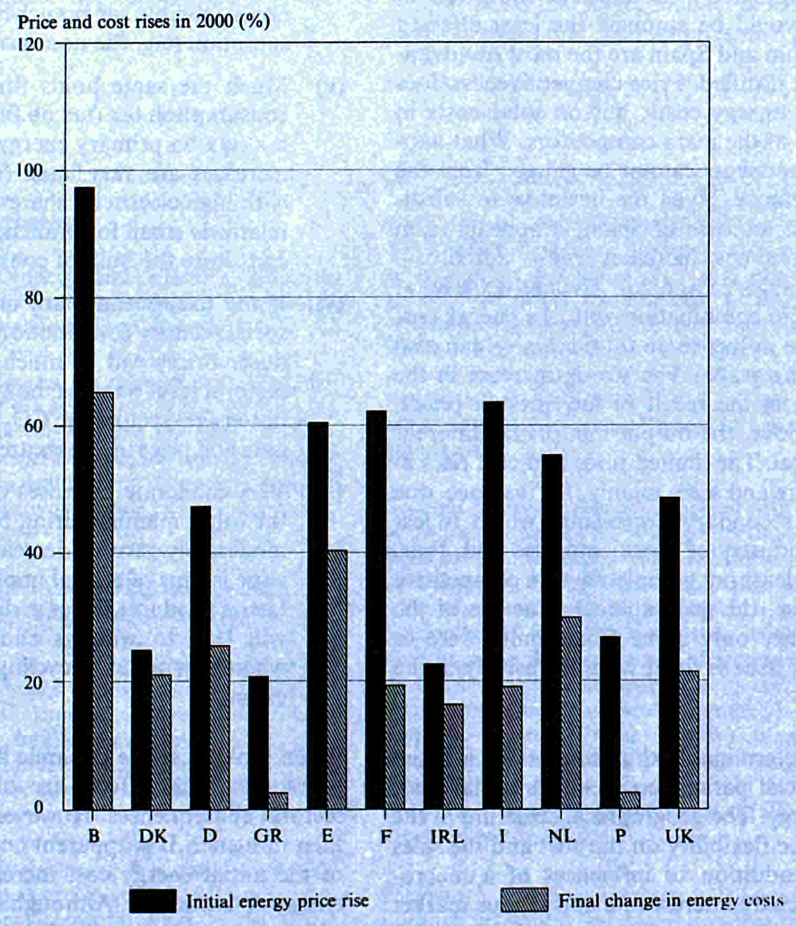
6.4.3. Taking account of substitution, energy conservation and other (macroeconomic) effects

Faced with higher energy prices, other energy conservation incentives (e.g. SAVE) and possibly lower costs of other factor inputs (due to the revenue recycling), firms will have an incentive to save energy and to substitute other factor inputs for energy consumption. This can quite substantially change the initial picture of increases in energy costs which have been discussed up to this point.

No exhaustive discussion is provided at this point, as the picture differs significantly from branch to branch. To illustrate the mechanisms that are at work one sector is looked into more closely. Graph 41 compares the initial energy cost increase (identical to the effect of the energy price rise) with the final increase in energy costs — after substitution and further energy conservation — for the iron and steel industry in the Community after introduction of a USD 10 CO_2/energy tax (DRI (1991a)). A production tax case has been analysed; revenues are recycled via a variety of measures (lower social security contributions paid by employers, cuts in corporate, income and other taxes).

The short term effects pictured in the graph confirm the results above which show that 'static' energy price increases are likely to differ significantly across countries for the same industries. This observation seems to remain valid if the longer run is taken into account, which can be explained by a large variety of factors: non-homogeneity of products, differences in energy intensity, in pre-CO_2/energy tax energy prices, in the structure of energy consumption from different fuels and in the dynamic adjustment pattern.

GRAPH 41: **Energy price rises, energy conservation and substitution — The case of iron and steel**



Source: DRI.

Dynamic effects change the initial sectoral picture considerably

What is striking is the extent and dispersion of energy saving — in absolute terms as well as relative to the price increase — going on 10 years after the tax is introduced. Energy saving per unit of output is proxied by the difference between the two bars in the graph. In almost all countries substantial parts of the initial price increases are counteracted by this phenomenon.

In absolute terms, the decreases in energy use seem particularly large in France and Italy while, relative to the price increase, the countries with the strongest decreases are Greece, France, Italy, Portugal and the United Kingdom.

Obviously, the question of the implications of the results presented in Graph 41 for the development of the iron and steel industries in the various Member States is of great interest. The conclusion one might be tempted to draw at first inspection of the graph — i.e. that the industries in Greece and Portugal would be amongst the least affected and that those in Belgium and Spain are the most disadvantaged — is, in fact, not justified. Price competitiveness does not merely depend on energy costs, but on total costs in comparison with those of the main competitors. What happens to other cost components cannot be gauged from the graph, but is of importance, given the incentive to substitution. For example, in the case of Spain, it appears from the I/O analysis that total cost increases will — initially — be relatively modest (Tables 25 and 26). The pre-tax level of energy costs — which, in combination with the energy cost increase, determines the influence on total costs — can also not be distilled from the graph. The strong increase in the case of Belgium is partly the result of low pre-tax prices. Moreover, as stated above, the output mix of the different industries is not identical. The limited price and cost rises in Portugal, Greece and Ireland seem mainly, for instance, due to the importance of secondary processing (which is less fuel-intensive) in the industry of those countries and, thus, do not constitute — at least not completely — a competitive advantage. Furthermore, the geographical structure of the markets is of importance only if the Community were to introduce the tax. This issue is dealt with extensively in the next section.

The complete set of determinants thus consists of a much greater number of crucial parameters than the initial price or cost increase of energy. The geographical structure of the various markets and the flexibility on the cost and the sales side of industries, in addition to influences of a macro-economic nature (especially interest rate and labour market development) all have a major impact on the development of industries in various Member States.

6.4.4. Some conclusions

The preceding analysis leads to a number of preliminary conclusions, which are discussed from a static and a dynamic point of view respectively.

As for the static effects, we can observe that:

(i) A production tax leads to significant price increases for only a limited number of energy-intensive branches, even if no tax revenue 'recycling' takes place.

(ii) In that case, for the vast majority of sectors, the effects tend to push up prices, but only very modestly.

(iii) Depending on energy intensities, some differences between countries will occur.

(iv) Differences between the sectoral consequences of a CO_2 tax and an energy tax are largely a function of the structure of the electricity generating system. If carbon-free fuels play an important role in electricity generation — as for example in France — these differences are non-negligible for branches with a high electricity consumption (e.g. the non-ferrous metal industry).

(v) Much the same holds for the differences between a consumption tax (tax on final energy) and a production tax (tax on primary energy). Differences between price increases are very large (roughly 50%) for branches with high electricity shares in energy consumption and relatively small for branches where petroleum products constitute the bulk of consumption (transport).

(vi) If the tax revenues are used for reducing employers' social security contributions, the overall impact on producer prices will be much smaller. The variation at a sectoral level remains, however, quite large. For energy (intensive) sectors the CO_2/energy tax aspect will dominate and price increases are not significantly moderated.

(vii) Very moderate increases or decreases are the rule for the other manufacturing branches, whereas in services moderately strong decreases occur. The revenue-use issue is thus of crucial importance for the impact of the tax on producer prices in different branches. 'Recycling' will lead to winners and losers at a sectoral level, whereas without 'recycling' all lose, albeit to different extents.

When looking at the dynamic adjustment behaviour, it appears that these effects are of great importance for the sectoral consequences. However, much less is known about their influence. It is apparent however, that substantial parts of the initial energy cost increase will be counteracted by energy conservation. Although some other cost components will concurrently rise, this has a generally moderating effect on the total cost rise. The extent to which this occurs varies over sectors and Member States. A careful and thorough analysis of the competitivity issue is thus needed.

6.5. How will the international competitive positions of the sectors be affected?

6.5.1. Introduction

The examination of the sectoral competitiveness effects of a carbon/energy tax will be undertaken from two points of view. First, possible short-term effects are highlighted. The short-term effects are mainly determined by the initial price rises and the subsequent reaction of demand. As factor substitution and other adjustments in the production process generally take time, the initial price effect is likely to be larger than the long-term effect (if we abstract from the phasing-in of the tax). Although the adjustment of demand to changed prices is not instantaneous, in the short run demand reactions will dominate the restructuring of the production process.

An important element in this demand reaction is the international competitiveness of sectors. This can be expressed by international trade performance and is determined by the comparative advantage in production factor costs, transport costs and non-price factors such as product quality and after-sales services (see Box 10). The examination of the intensity of competition on world markets enables us to assess how changes in these determining factors (due to an increase of energy input prices) could be translated into potential changes in sectoral competitiveness.

Under a longer term perspective — typically around 10 years after the introduction of the tax — dynamic adjustment processes on the supply side can lead to quite different outcomes in the sectoral impact on competitiveness than in the short term. Demand shifts away from products with a high carbon/energy content and the changed prices of various factor inputs (notably energy) lead to supply responses (reduction of the energy intensity of production) which could eventually have a positive impact on the competitive position of sectors. At this stage, changes in macroeconomic variables such as wages and interest rates also play a significant role.

Box 10: The concept of competitiveness

Competitiveness is a complex concept and difficult to define in simple terms. Usually, three distinctions are made: the terms of trade, national competitiveness and sectoral competitiveness.

The terms of trade index measures the relative level of export prices compared with import prices; it reflects the ability of a country to finance its imports by its exports. The terms of trade are related to the notion of competitiveness at a macroeconomic or national level where we are dealing with aggregates such as national trade balances, productivity growth, wage rates, living standards and exchange rates.

National competitiveness can be defined by starting from the aim of economic policy-making: namely, achieving a sustainable growth in per capita material living standards. The cause of such growth can, in the long run, only be increases in labour productivity — producing a greater value of output per unit of labour input — throughout the economy. Labour productivity can be improved by increasing the efficiency of resource use with existing technologies, by accumulating more capital resources through investment or by introducing new technologies which are inherently more productive.

Contrary to these long-run determinants of national competitiveness, policy measures, such as exchange-rate adjustments or subsidies can influence national competitiveness in the short run.

Indicators of national competitiveness can be typified in two ways: either they are price-based such as country A's export prices relative to country B's export prices for identical goods, or they are quantity-based such as the ratio of the national output per capita in comparison to the average output per capita of the nation's competitors. Productivity levels and productivity growth are indicators of a country's long-term ability to produce products that compete well in price and quality with those of other nations and to maintain and expand sustainable living standards.

Sectoral competitiveness is a concept with a more limited scope. An economy cannot be more competitive than its competitors in all sectors. According to the Ricardian theory of comparative advantage, a country tends to specialize and have a competitive advantage in those products which it makes relatively more efficiently and less expensively than its trading partners. Thus, an economy will be composed of sectors which are either more or less competitive compared to its competitors'. This is the international aspect of sectoral competitiveness. There is also a domestic (internal to the country) interpretation of sectoral competitiveness. It characterizes the competitive position of a sector relative to other sectors within the same country. However, this analysis will only concentrate on the international aspect of sectoral competitiveness.

Indicators of competitiveness at a sectoral level include, for instance, net import and export positions of individual economic sectors and the evolution of their market shares.

Analytically, a distinction between short-term (static) and long-term (dynamic) aspects of sectoral competitiveness can be made. Different factors dominate the determination of these two aspects of competitiveness.

In the short-term (static) analysis sectoral commercial competitiveness is determined by the following factors:

(a) the comparative advantage which a sector enjoys, compared to the same sector in another country, due to the different input factor endowments available to competing countries. The availability of relatively cheap production factors or a high factor productivity create an advantage in production cost; this can then be used to offer products at lower prices than the competing sectors in other countries.

(b) transport costs reduce trade below what it would be in the absence of them. Transport costs can influence trade flows significantly, especially in industries which want to trade in heavy, bulky and low value products. In such a case, transport costs can be prohibitive and make trade completely uneconomic. Closely related to transport costs are the geographical aspects of trade, i.e. distances between markets. In location theory, distance can be considered as a cost to be met — generating a competitive disadvantage — or an input, practically equivalent to a factor of production, along with land, labour and capital. In the latter case, the input is 'distance' with a negative sign — or rather 'nearness'. Nearness to the market makes it possible to produce a commodity for sale more cheaply and thus creating a competitive advantage.

(c) non-price factors of competitiveness like quality of the product, its technological content and after-sales service also play an important role in determining sectoral competitiveness. They are not, however, of primary importance in this analysis, due to the specific character of the branches considered here (basic industries or production of rather homogeneous goods).

Long-term (dynamic) changes of sectoral competitiveness are realized through changes in labour productivity, which can be the result of investment in existing technologies, induced technological progress or international factor mobility (particularly capital).

Investments in the capital stock of an economy maintain its modernity. If new, energy-efficient production equipment is installed, lower production input costs exert a positive influence on sectoral competitiveness. Technical progress, which is generated internally in the production system (induced technical progress) has a similar effect as investments on the capital stock as it usually contributes to a more efficient use of input factors.

Technical progress in relation to energy use thus has a positive influence on sectoral energy efficiency. More efficient sectoral energy use can reduce production costs, thereby allowing more advantageous relative output prices and thus improving the sectoral competitive position.

Contemporary economics has failed until now to provide an exhaustive explanation of the origin and nature of technical change. A possible explanation for induced technical progress[1] can be the change of relative factor prices — for instance, increased energy costs may incite innovation activities aiming to reduce the energy intensity of production. Such improvements in energy efficiency can bring about cost advantages *vis-à-vis* other competitors and hence competitive advantages, especially if the sector exploits the improved technology earlier than do those of its competitors which eventually face the same set of relative energy prices ('first mover advantage').

International factor mobility can lead to an export of capital in the case of an energy-intensive sector. When energy costs increase, for example through the imposition of an energy tax, firms in such a sector could seek to set up an energy-intensive factory in a foreign country which does not apply the tax.

International mobility of capital is a growing feature of modern trading economies and has a significant influence on the trade performance of a sector in different countries. However, the prevalence of multinational firms now makes it difficult to distinguish between one country's production, imports and exports, and another's.

[1] See, for instance, Fellner (1956) who has based his argumentation on Hick's concept of induced innovations.

6.5.2. Analysis of the short-term impact of the proposed carbon/energy tax on the international competitiveness of sectors

A way of assessing the short-term effects of increases in product prices on sectoral competitiveness is to analyse the degree of exposure to competition of sectors which experience relatively high increases in product prices due to a carbon/energy tax. In addition to competition from other branches on the home market, international trade is of particular relevance for the competitiveness issue. Focusing on international trade, we establish an indicator of trade intensity in the sensitive sectors. We try to capture the factors mentioned above which determine 'static' aspects of competitiveness: the comparative (export price) advantage and transport cost. Thereafter, we attempt to assess how changes in international competitiveness, due to the introduction of a CO_2/energy tax could impinge on sales and production.

The impact of a CO_2/energy tax on the international competitiveness of sectors can be measured by the reaction of demand to the induced product price increases ...

Naturally, any analysis of the degree of exposure to international competition of those sectors which experience product price increases due to the imposition of a carbon/energy tax can only provide an approximate picture of the actual effects on their competitiveness. In order to assess the impact of the tax on sectoral sales, the reaction of demand to the induced product price rises — the price elasticity of demand — on domestic and foreign product markets has to be taken into account. Unfortunately, information on price elasticities at such a low sectoral disaggregation is currently not available.

... on which trade intensities provide important information ...

However, traditional trade theory suggests a positive correlation between the trade intensity, which we will analyse when we look at exposure to intra- and extra-EC trade and the price elasticity of demand in the respective markets.

The conventional chain of reasoning implies that in highly energy-intensive industries the products reach only a low degree of processing. Goods of a low degree of processing are usually rather bulky or heavy; thus it can be assumed that they would encounter relatively high transport costs. In a case where such a good is traded with a distant country, the relatively high transport cost would reduce the trade intensity. If a product is less heavily traded on a market, it can be assumed that changes of the sale price would lead to smaller demand reactions than in the case of a highly traded product.

In order to provide a rough idea of the price sensitivity of demand for the outputs of the sensitive and moderately sensitive sectors, sectoral trade intensities have been calculated. This measure is defined as exports plus imports divided by production and could be used as a rough proxy for the price sensitivity of demand following the line of reasoning sketched out above.

... as do energy cost shares

Table 27 presents information on average sectoral energy cost shares, estimates of energy intensity as shown in section 6.5.2 and on trade intensity for the two groups of sectors which are the subject of this analysis. Generally, it can be noted that the trade intensity and hence, probably, the price sensitivity of demand on markets of sensitive sectors is lower than on markets of moderately sensitive sectors. Protected markets (power generation and distribution) or the bulky nature of the products of some sensitive sectors (clay products, cement) could explain this feature. In the group of moderately sensitive sectors, there are also some branches with low trade-intensities (water supply, foundries) but the majority of sectors produce highly traded products.

On the basis of these two indicators, only a limited number of sensitive sectors seems to be exposed to international competition and might therefore face a loss of international competitiveness

In the group of sensitive sectors, two NACE 3-digit branches[1] appear to be sensitive to changes of their competitive position (iron and steel, manufacture of glass). Both have an energy cost share of around 10% and moderate to high trade intensities. The possibility exists, therefore, that demand on import and export markets would react relatively strongly to carbon/energy tax induced price rises.

In the group of moderately sensitive sectors, three branches show a high trade intensity (manufacture of pulp, paper, board; man-made fibres and manufacture of basic industrial chemicals). Although their energy cost share is only moderately high (between 5,8 and 7,7%), it cannot be excluded that these branches could face a relatively strong demand reaction to price rises.

In interpreting the result of this analysis, a certain number of features should be kept in mind. No redistribution of tax revenues has been taken account of, nor the possibility of tax exemptions for certain branches. Both features would substantially reduce the sectoral output price reaction to a carbon/energy tax and hence diminish its effect on competitiveness. Also, it has not been studied to what extent the trade indicator is a good proxy for the relevant elasticities[2]. Furthermore, it must be underlined that data for some sectors rely on observations for only a limited number of countries.

[1] For three sectors (hard coal extraction, production and distribution of steam and extraction of other minerals), no data on the trade intensity were available. It can be assumed, however, that their products are not highly traded as they are either operating on protected markets or producing heavy, bulky products.

[2] It should, however, be stated that preliminary results of an analysis of the historical evolution of EC Member States' shares in various sectoral markets seem to confirm that, by and large, the sensitive and moderately sensitive sectors are not relatively more affected by competitive pressures than other branches of manufacturing industry.

Table 27

Likely sectoral competitiveness effects of a carbon/energy tax in the Community

NACE Code	Description	Average of energy cost shares: On the basis of production value[1,2] %	Average of energy cost shares: On the basis of value-added[3,4] %	Trade intensity ratio[5]
Sensitive sectors				
111	Extraction of hard coal	12,7	81,1	n.a.
161	Generation and distribution of electrical power	11,0	16,1	0,02
163	Production and distribution of steam and hot water	49,1[6]	204,1[6]	n.a.
221	Iron and steel industry	9,7	35,5	0,71
239	Extraction of other minerals; peat extraction	9,4	20,9	n.a.
241	Manufacture of clay products for construction purposes	17,2	29,7	0,17
242	Manufacture of cement, lime and plaster	20,3	34,9	0,13
247	Manufacture of glass	10,0	13,9	0,66
Moderately sensitive sectors				
120	Coke ovens	8,0	40,1	n.a.
170	Water supply	8,0	13,6	0,00[7]
231	Extraction of building materials, refractory clay	9,1	16,2	0,38[8]
245	Working of stone and non-metallic mineral products	7,2	22,9	0,54
248	Manufacture of ceramic goods	7,6	13,1	0,72
251	Manufacture of basic industrial chemicals	6,6	16,3	1,03
260	Man-made fibres	5,8	21,8	1,06[9]
311	Foundries	7,3	14,0	0,22
418	Manufacture of starch and starch products	5,1	23,0	0,49[7]
437	Textile finishing	7,5	14,9	n.a.
462	Manufacture of semi-finished wood products	4,9	15,6[6]	0,74
471	Manufacture of pulp, paper and board	7,7	27,2	1,11

[1] Energy cost share: ratio energy purchases/value of production (1988).
[2] Includes Belgium, Germany, Spain, Portugal and the United Kingdom.
[3] Energy cost share: ratio energy puchases/value-added (1988).
[4] Includes Belgium, Germany and Spain.
[5] Trade intensity: ratio total imports + total exports/production value (average 1987-89).
[6] Value only for one country.
[7] Includes Germany, Spain, France, Italy and the United Kingdom.
[8] Includes Germany, Spain, France and Italy.
[9] Includes Spain, France, Italy and the United Kingdom.
Source: National statistical offices, Eurostat (VISA).

Moreover, exposure to intra-EC competition seems to be of minor importance for the sectoral effect on competitiveness ...

This being said, it is interesting to look at the two international markets on which branches of EC countries operate: intra-EC markets and extra-EC markets. Because it might be possible that the EC will implement measures before others take action — so as to provide international leadership — the distinction between both markets is of potential importance. We first concentrate on the intra-EC markets, after which the extra-EC trade is analysed.

The Commission proposal for a CO_2 policy package provides for a Community-wide introduction of a carbon/energy tax with a uniform tax rate. Each sector would face the same tax rate as the same sector in the other EC countries. Obviously, this would only be different if a non-uniform tax were introduced in the Community. If there are considerable differences in sectoral energy intensities between the countries of the European Community and if a carbon/energy tax would lead to equivalent differences in output prices then, theoretically, exposure to intra-EC competition could have an impact on sectoral competitivity.

In fact, if the direct sectoral energy cost shares in five EC countries are analysed, important differences across the countries considered are revealed, especially in the group of sensitive sectors (see Table 28). Together with the empirical evidence produced in section 6.4 showing that, for some sectors, the producer price rises due to the imposition of a carbon/energy tax will probably vary from country to country, this finding points to the possibility of changes in the competitive positions within the Community through intra-EC competition.

An examination of the degree of intra-EC competition is possible by looking at sectoral openness to intra-EC trade expressed by the ratios 'intra-EC imports over apparent consumption'.[1] Table 28 shows that the openness to intra-EC trade in the sensitive sectors is, however, generally rather low.

It is therefore not surprising that amongst the sectors of this group no major shifts in their competitive positions occurred between 1981 and 1988. Variations of the ratio 'intra-EC trade balance over production value' which has been chosen as an indicator for such changes of intra-EC competitiveness over that time period, have not been substantial indeed (see Table 29).

In the group of moderately sensitive sectors, the margin of energy cost shares across the five countries considered is not generally very large (see Table 28). The majority of these sectors is only little or moderately open to intra-EC trade. The share of intra-EC exports/imports in production and apparent consumption respectively, varies between zero and

[1] Apparent consumption is defined as production plus imports minus exports.

Table 28

Differences in sectoral energy cost shares and openness to intra-Community trade in five EC countries, 1988

NACE Code	Description	Range of energy cost shares [1,2] %	Intra-Community export ratio [3,5] %	Intra-Community import ratio [4,5] %
Sensitive sectors				
111	Extraction of hard coal	10,9-14,4	n.a.	n.a.
161	Generation and distribution of electrical power	1,9-20,1	0,6	0,5
163	Production and distribution of steam and hot water	49,1	n.a.	n.a.
221	Iron and steel industry	6,4-15,1	18,2	22,0
239	Extraction of other minerals; peat extraction	3,2-12,6	n.a.	n.a.
241	Manufacture of clay products for construction purposes	10,2-24,0	4,4	5,1
242	Manufacture of cement, lime and plaster	16,9-25,3	2,5	2,5
247	Manufacture of glass	5,9-15,3	17,9	20,6
Moderately sensitive sectors				
120	Coke ovens	5,7-10,9	n.a.	n.a.
170	Water supply	4,4-11,3	0,1	0,1
231	Extraction of building materials, refractory clay	7,3-11,3	13,3	13,7
245	Working of stone and non-metallic mineral products	4,3-11,6	20,9[6]	46,2[6]
248	Manufacture of ceramic goods	4,8-12,3	20,4	21,9
251	Manufacture of basic industrial chemicals	5,0-9,3	n.a.	n.a.
260	Man-made fibres	4,8-7,6	36,7[6]	42,4[6]
311	Foundries	5,6-8,8	6,2	5,4
418	Manufacture of starch and starch products	2,2-7,5	7,1	18,5
437	Textile finishing	4,4-11,7	n.a.	n.a.
462	Manufacture of semi-finished wood products	2,5-7,6	14,4	13,9
471	Manufacture of pulp, paper and board	6,0-9,6	20,7	15,6

[1] Includes Belgium, Germany, Spain, Portugal and the United Kingdom.
[2] Energy cost share: ratio energy purchases/value of production.
[3] Intra-Community exports/production value, average 1987-89.
[4] Intra-Community imports/apparent consumption, average 1987-89.
[5] Includes Germany, Spain, France, Italy and the United Kingdom.
[6] Includes Germany, France, Italy and the United Kingdom.

Source: National statistical offices, Eurostat (VISA).

Table 29

Evolution of disequilibria in intra-Community trade in sensitive and moderately sensitive sectors
Variation of the ratio 'Intra-Community trade balance/production value' between 1980/82 (three-year average) and 1987/89

(percentage points)

NACE Code	Description	Germany	France	Italy	United Kingdom
Sensitive sectors					
111	Extraction of hard coal	n.a.	n.a.	n.a.	n.a.
161	Generation and distribution of electrical power	−0,1	2,3	0,0	−2,0
163	Production and distribution of steam and hot water	0,0	0,0	n.a.	n.a.
221	Iron and steel industry	0,7	4,3	−5,0	4,8
239	Extraction of other minerals; peat extraction	n.a.	n.a.	n.a.	n.a.
241	Manufacture of clay products for construction purposes	−2,3	3,7	−1,7	−3,4
242	Manufacture of cement, lime and plaster	0,7	1,0	−1,6	−5,9
247	Manufacture of glass	3,3	−2,3	1,7	−8,8
Moderately sensitive sectors					
120	Coke ovens	n.a.	n.a.	n.a.	−9,3
170	Water supply	0,1	0,2	−0,5	0,0
231	Extraction of building materials, refractory clay	2,1	−1,5	5,7	9,0
245	Working of stone and non-metallic mineral products	−0,7	−18,2	−9,4	−1,5
248	Manufacture of ceramic goods	−0,6	−4,6	2,3	−6,0
251	Manufacture of basic industrial chemicals	n.a.	n.a.	n.a.	n.a.
260	Man-made fibres	n.a.	−41,0	−0,7	−32,8
311	Foundries	−0,6	−0,6	−0,3	−0,8
418	Manufacture of starch and starch products	11,8	−11,7	−18,3	n.a.
437	Textile finishing	n.a.	n.a.	n.a.	n.a.
462	Manufacture of semi-finished wood products	4,9	−6,3	3,4	−29,2
471	Manufacture of pulp, paper and board	1,2	2,1	−3,7	7,2

Source: Eurostat (VISA).

roughly 22%. Both arguments tend to lead to the conclusion that intra-EC competition will probably not lead to competitive distortions after the introduction of an EC-wide carbon/energy tax. However, in the 'working of stone' and the 'man-made fibres' industries, the openness to intra-EC trade is more pronounced. These two sectors are amongst the sectors for which intra-EC trade disequilibria of the four countries considered have become more accentuated over the 1980s (see Table 29).

But, as an overall conclusion, it can be said that for the vast majority of sensitive and moderately sensitive sectors the competitive position has not changed substantially following exposure to intra-EC competition over the last decade. Thus, taking into account the limited exposure to intra-EC trade, the limited changes in trade balances in the past and the fact that prices will rise in all Member States — although to a somewhat different extent — it does not seem unreasonable to presume that intra-EC trade would probably have only a minor impact on the competitive position of sensitive or moderately sensitive sectors in the different Member States where a uniform Community-wide CO_2/energy tax to be introduced.[1]

... but that could be different with respect to exposure to extra-EC competition

A relatively strong impact on EC competitiveness could be introduced by competition from countries which are not concerned by the same or an equivalent set of policy measures, and consequently by an increase in their energy cost. The Community strives for global action to combat

[1] The Member States are asked to complement the proposed Community-wide policy package with additional national measures according to the subsidiarity principle. It is therefore possible that individual countries — especially those that previously fixed more ambitious CO_2 targets — take additional fiscal measures in order to achieve their targets. This could consequently lead to a differentiated change of production costs within the EC.

the greenhouse effect and wants other countries to take policy measures for CO_2-emission limitation too. However, political reality suggests that it is sensible to consider what would be the competitive implications of the case where the Community acts as a frontrunner. For an assessment of the sectoral effects of the proposed carbon/energy tax it is therefore important to analyse the exposure of those Community sectors whose production costs are sensitive to variations in energy prices, to extra-EC competition on domestic markets as well as on foreign ones.

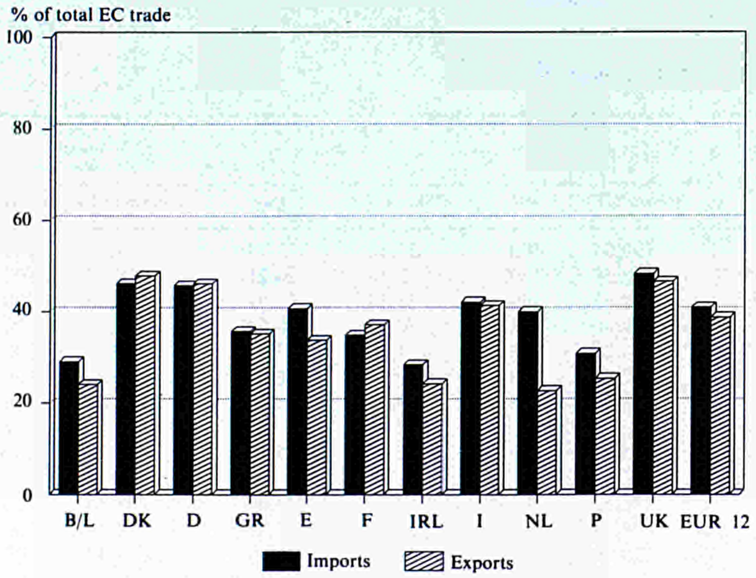
However, extra-EC trade of the Community represents only a relatively modest part of total external trade

The potential threat of a loss of EC sectoral competitiveness through the exposure to extra-EC competitors which might not be subject to a carbon/energy tax is a priori rather limited. The share of extra-Community imports and exports in 1990 was only 41 and 39% respectively which represents slightly over 10% of the Community's GDP. The trade share varies across the Member States between 29% (Belgium) and 48% (UK) for imports and between 24% (Belgium) and 46% (Germany, UK) for exports (see Graph 42). Community trade with its strongest competitors, the USA and Japan, represents 7% of its imports and 7,5% of its exports in the case of the USA and 4% and 2% in the case of Japan for imports and exports respectively (see Graph 43). Around 10% of EC exports and imports go to EFTA countries. As most countries of the latter group can be expected to take similar measures to combat the greenhouse problem, notably the introduction of a CO_2 tax, the share of extra-EC trade with the potentially strong non-European OECD competitors, is limited to roughly 10% of total Community trade. Thus, a potential danger to EC sectoral competitiveness through exposure to extra-Community competition seems *a priori* to be rather small.

Sectors of the Community's manufacturing industry are generally as exposed to extra-EC competition as the average of the EC economy

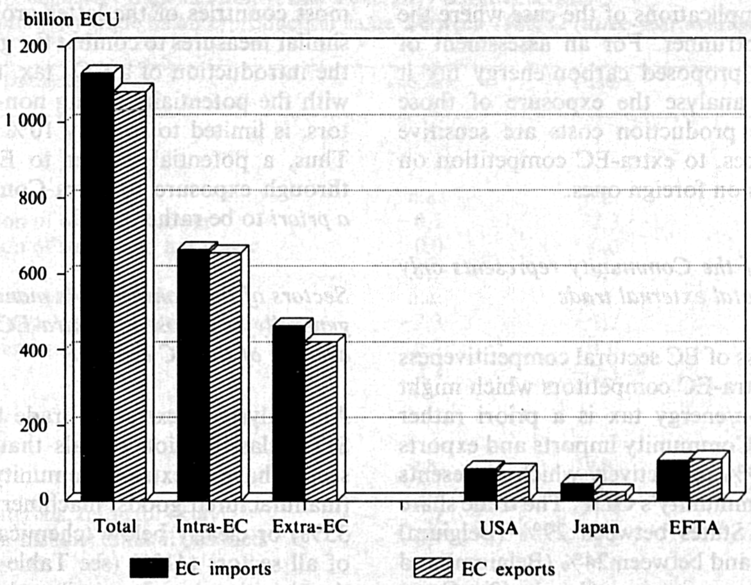
An analysis of extra-EC trade by sectors according to the SITC classification reveals that the majority of industrial sectors have an extra-Community import share which is close (manufactured goods, machinery and transport equipment, 35%) or clearly below (chemicals, 26%) the average share of all sectors (41%) (see Table 30). For extra-EC exports, the situation is quite similar although the extra-EC export shares are slightly higher (between 38 and 40%) than for imports.

GRAPH 42: **Importance of extra-EC trade, 1990**



Source: Eurostat.

GRAPH 43: Structure of EC trade by country, 1990



Source: Eurostat.

Table 30

Trade structure of the Community by SITC groups, 1990

SITC group	Description	Total imports abs.		Extra-EC abs.		Total exports abs.		Extra-EC abs.	
		(billion ECU)	(%)	(billion ECU)	(%)	(billion ECU)	(%)	(billion ECU)	(%)
0	Food and live animals	99,04	100	33,12	33,44	87,77	100	22,92	26,11
1	Beverages and tobacco	12,57	100	2,54	20,21	18,08	100	7,68	42,48
2	Crude materials, except fuels	59,63	100	36,34	60,94	28,80	100	7,43	25,80
3	Mineral fuels	99,36	100	70,49	70,94	39,35	100	11,19	28,44
4	Oil, fat and waxes	4,22	100	1,60	37,91	4,00	100	1,42	35,50
5	Chemicals	112,80	100	30,37	26,92	128,83	100	48,55	37,69
6	Manufactured goods	198,74	100	69,79	35,12	196,87	100	71,82	36,48
7	Machinery and transport equipment	375,97	100	132,16	35,15	419,14	100	169,75	40,50
8	Miscellaneous manufactured products	142,52	100	62,71	44,00	138,45	100	58,90	42,54
9	Commodities n.i.e.	24,19	100	23,60	97,56[1]	20,14	100	20,17	100,10
0-9	Total trade	1 129,06	100	462,72	40,98	1 081,43	100	419,81	38,82

[1] SITC 9 contains all non-matching trade data.

Source: Eurostat, *External trade and balance of payments.*

The share of moderately sensitive and sensitive sectors in extra-EC trade in manufacturing goods is rather small

If we now analyse the exposure of sensitive and moderately sensitive sectors in manufacturing industry to trade competition, especially to extra-EC competition, we see that the share of the EC average for extra-EC exports is, at 12,6%, rather low. For extra-EC imports, the share is somewhat higher (16,2%) but sufficiently low to enable us to say that sensitive and moderately sensitive sectors represent only a small part of EC manufacturing trade (see Graphs 44 and 45).

If we compare the shares across Member States, first, with respect to total shares and, second, with respect to the relative importance of sensitive and/or moderately sensitive sectors, we can state some inter-country differences.

(i) The relative importance of sensitive and moderately sensitive sectors in trade varies — at least in the case of exports — quite substantially among Member States. See, for instance, Graph 44 which gives the difference between the share of Denmark (5%) and the one of Greece (21,6%) concerning extra-EC exports. In the case of imports, inter-country differences are less pronounced (see Graph 45).

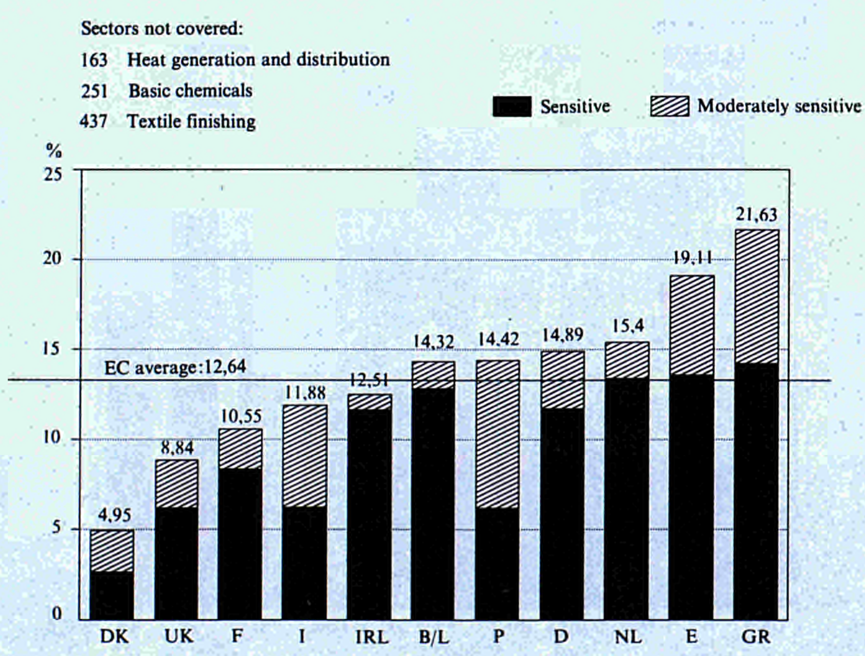
Comparing the combined shares of the two groups of sectors which are the subject of our analysis, for extra-EC imports and exports we can see that there is no country where the share in overall extra-EC exports or extra-EC imports is relatively high or low compared to the EC average. That means that no single EC country seems to be disproportionately exposed to extra-EC trade competition.

(ii) With respect to the relation of the share of sensitive to the share of moderately sensitive sectors in Community exports there exist rather important differences across countries. Countries for which the share of sensitive sectors in exports, both total and extra-EC, is relatively high are Ireland, the Netherlands, Belgium and France. Conversely, the share of moderately sensitive sectors is relatively important for Italy and Portugal (see Graph 44). In the case of imports these composition differences between countries are much less pronounced (see Graph 45).

There is no indication that southern EC countries have a higher vulnerability to extra-EC export competition

Calculations of the relative importance of extra-EC exports by sensitive and moderately sensitive sectors in relation to

GRAPH 44: Relative importance of sensitive sectors in extra-EC exports, 1987-89



GDP in the various Community countries show no indications of a disproportional presence of southern EC countries amongst the sectors most exposed to extra-EC trade competition (see Graph 46). In fact, the highest exposure is encountered by Belgium, Germany, the Netherlands and Ireland. Portugal, Greece and Spain follow with a very wide lag, and have an exposure to extra-EC export competition which is well below the Community average.

Extra-EC competition more generally concerns the moderately sensitive sectors

Analysis of the share of certain sectors in total and extra-EC trade lacks an important piece of information; a reference to the relative importance of trade flows in relation to domestic production or apparent consumption. For five Community countries[1], these additional data are available and have been used to calculate the share of extra-EC exports in gross production value and the share of extra-EC imports in apparent consumption, both for the group of sensitive and the group of moderately sensitive sectors. The figures are based on a three-year average (1987 to 1989) in order to iron out possible short-term fluctuations.

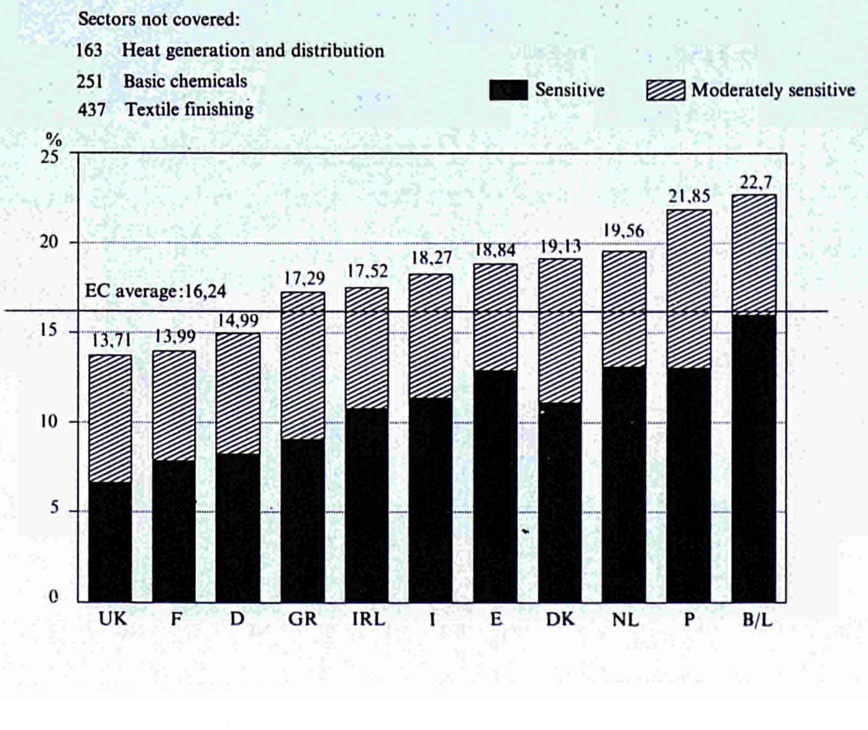
In general, both the share of extra-EC exports in production and the share of extra-EC imports in apparent consumption are higher in the case of moderately sensitive sectors than of sensitive sectors (see Graphs 47 to 50). These shares vary across the moderately sensitive sectors from 0% to 33%, whereas amongst the sensitive sectors they take values from 0,5% to roughly 13%.

Among the moderately sensitive sectors in the five Community countries studied no clear pattern of a potential loss of competitiveness due to the exposure to extra-EC competition exists

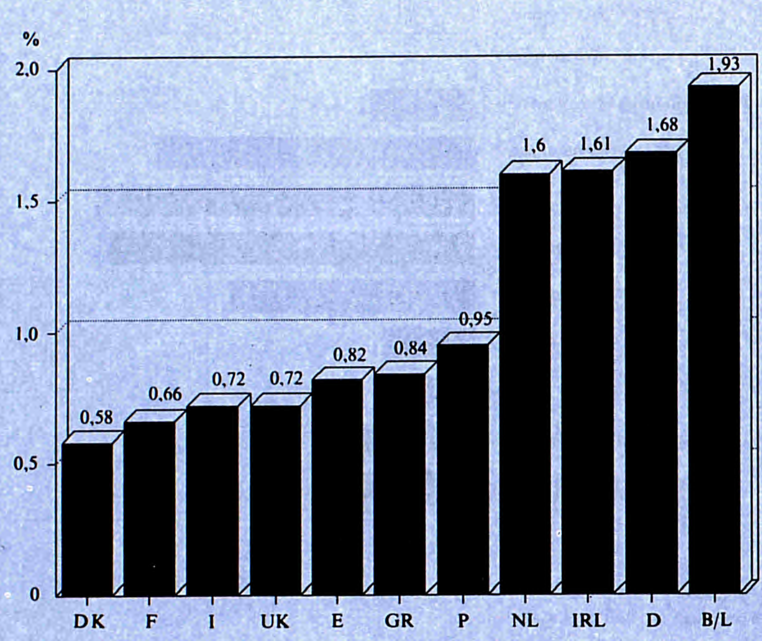
In the group of moderately sensitive sectors, the sectoral pattern of openness with respect to imports does not correspond to the pattern of openness with respect to exports (see Graphs 48 and 50). The share of extra-Community exports in production is relatively high in the working-of-stone, ceramics, and the man-made fibres industries whereas extra-EC imports have a disproportionately important part in apparent consumption in the semi-finished wood products and the pulp and paper industries and also, to a minor extent, the basic chemicals and the man-made fibres indus-

[1] Germany, Spain, France, Italy and the United Kingdom.

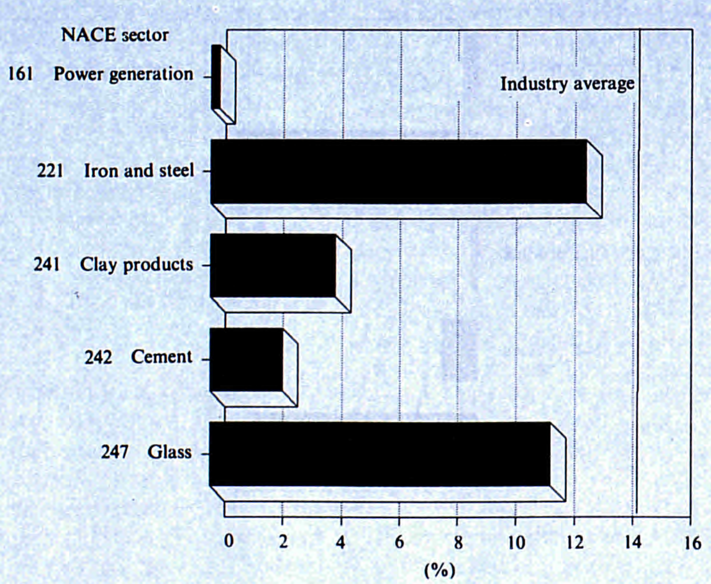
GRAPH 45: **Relative importance of sensitive sectors in extra-EC imports, 1987-89**



GRAPH 46: **Relative importance of sensitive sectors in extra-EC exports in relation to GDP** (Weight of sensitive sectors in extra-EC exports x relative importance of extra-EC exports in GDP)

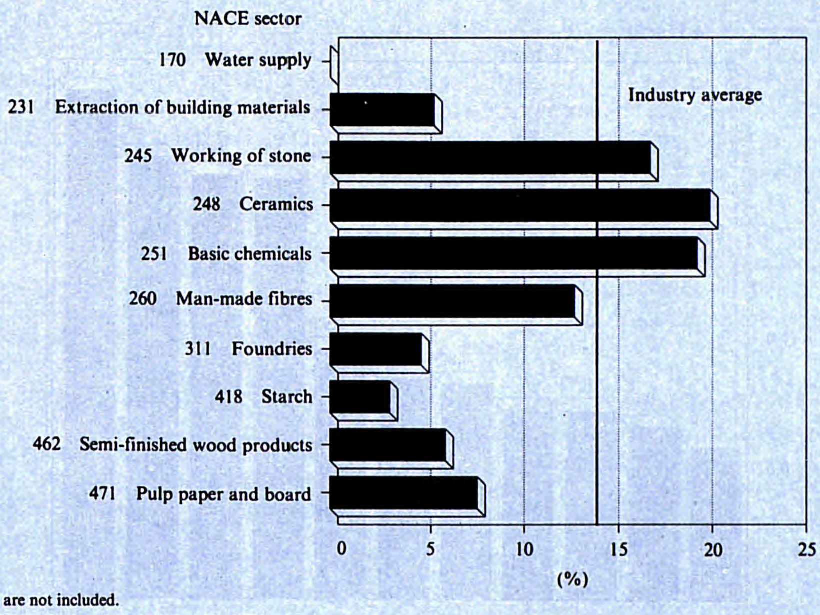


GRAPH 47: **Share of extra-EC exports in gross production in five EC countries,[1] 1987-89 (sensitive sectors)**



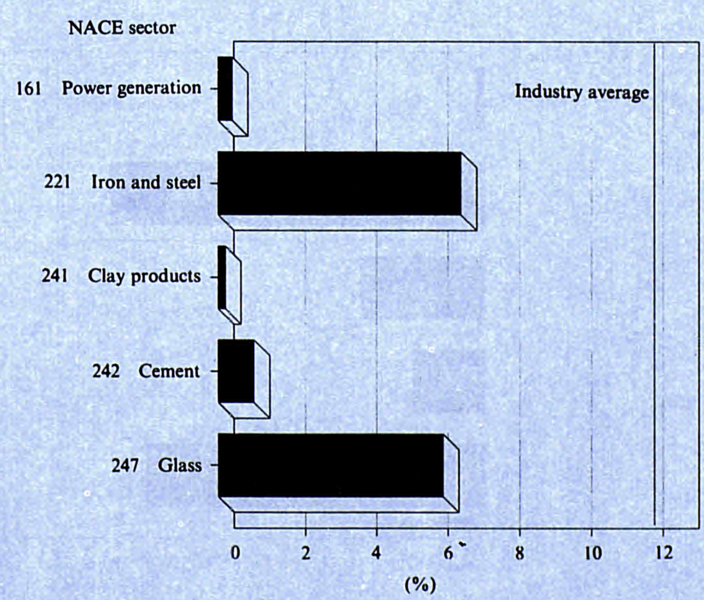
NB: NACE sectors 111, 163 and 239 are not included.
[1] Sample comprises Germany, Spain, France, Italy and the United Kingdom.
Source: VISA.

GRAPH 48: Share of extra-EC exports in gross production in five EC countries,[1] 1987-89 (moderately sensitive sectors)



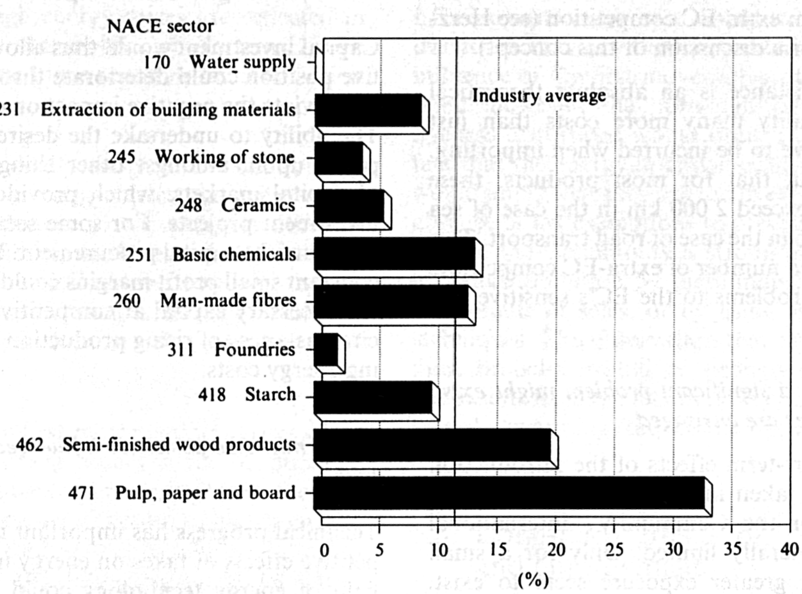
NB: NACE sectors 120 and 437 are not included.
[1] Sample comprises Germany, Spain, France, Italy and the United Kingdom.
Source: VISA.

GRAPH 49: Share of extra-EC imports in apparent consumption in five EC countries,[1] 1987-89 (sensitive sectors)



[1] Sample comprises Germany, Spain, France, Italy and the United Kingdom.
NB: NACE sectors 111, 163 and 239 are not included.
Source: VISA.

GRAPH 50: Share of extra-EC imports in apparent consumption in five EC countries,[1] 1987-89 (moderately sensitive sectors)



[1] Sample comprises Germany, Spain, France, Italy and the United Kingdom.
NB: NACE sectors 120 and 437 are not included.
Source: VISA.

tries. Thus, amongst the moderately sensitive sectors no clear pattern of sectors emerges that would indicate an acute sensitivity to extra-EC competition with respect to both imports and exports. However, some individual moderately sensitive sectors show a certain exposure to extra-Community competition either with respect to imports or to exports. Taking into account the relatively modest sensitivity to energy price increases, their competitive position is not a priori in danger, although a closer monitoring of their trade performance might be advisable in the future.

In these five EC countries, the sensitive sectors are on the whole little exposed to extra-EC trade

Among the sensitive sectors, a much clearer sectoral pattern of exposure to extra-Community competition with respect to both, imports and exports, emerges (see Graphs 47 and 49). Two sectors, the iron and steel as well as the glass industry, have a clearly higher share of extra-EC exports in production and of extra-EC imports in apparent consumption than the other sectors of that group. The absolute level of the shares is not, however, very high for either sector, being around 12% of exports and roughly 6,5% of imports, well below the industry averages. In order to interpret the data correctly, however, it must be added that three sectors of this group of sensitive sectors (hard coal extraction, extraction of other minerals and heat generation and distribution) could not be analysed due to the unavailability of the relevant production data.

Thus, in general, it seems that the majority of energy-intensive sectors might not have significant competitive problems due to extra-EC competition

Analysing the possible static competitive sensitivity to exposure to extra-EC trade among the sectors which will probably experience a relatively strong increase in their output prices due to the introduction of a carbon/energy tax has been complicated to a certain extent by data availability problems both at a country level and at a sectoral level. However, on the basis of the available data it can be said that the great majority of sensitive and moderately sensitive sectors will probably not face major competitive problems.

Preliminary calculations of the influence of transport costs confirm this conclusion. For a number of sensitive sectors, the extra costs due to the introduction of the tax have been compared with the costs of transport. This allows one to make an estimate of the critical distance above which it would no longer be attractive to import goods from extra-

EC countries because the transport costs involved would outweigh the advantage of not having to pay the Community CO_2/energy tax. The lower the critical distance the more shielded branches are from extra-EC competition (see Herzberg and Minne (1992) for a discussion of this concept).

Obviously this critical distance is an absolute theoretical minimum because in reality many more costs than just transport costs would have to be incurred when importing. Nevertheless, it turns out that for most products, these critical distances do not exceed 2 000 km in the case of sea transport and only 300 km in the case of road transport. This suggests that only a limited number of extra-EC competitors could pose competitive problems to the EC's sensitive sectors.

For those branches where a significant problem might exist, temporary special measures are envisaged

Thus, when only the short-term effects of the introduction of a CO_2/energy tax are taken into account, the potential adverse consequences for the Community's international competitiveness seem generally limited. Only for a small group of sectors does a greater exposure seem to exist. However, it should be noted that in the proposed strategy it is exactly this group of sectors (steel, chemicals, non-ferrous metals, cement, glass and pulp and paper) for which special treatment (e.g. partial exemption) is envisaged until the Community's main competitors take analogous measures.

6.5.3. Dynamic, longer-term aspects of competitiveness

Longer-term effects of energy taxation are strongly influenced by substitution processes on the supply side ...

On the supply side, enterprises in each sector will attempt to adapt to rising energy prices by substituting for energy-intensive input factors in order to avoid a deterioration of their competitiveness. An example of the mechanisms at work was provided in 6.4.3. This process can consist of a switch to more energy-efficient production equipment, or new, less energy-consuming production processes. As this can generally only be done gradually, the substitution processes only materialize over time.

Thus, an important role falls to capital investment concerning the medium and long-term evolution of sectoral competitiveness. Investment in new capital stock is a continuous process, allowing the replacement of old, obsolete production equipment in order to achieve maximum factor yields. By replacing old vintages of production capital, it is possible to embody the best available current production technology. The increase in energy input prices through the imposition of a carbon/energy tax would change the pattern of relative factor input prices in a way that would make new investment in energy-related capital profitable earlier than under unchanged relative input factor prices.

Capital investment would thus allow sectors whose competitive position could deteriorate through a carbon/energy tax to alleviate the negative impact on energy-related input cost. The ability to undertake the desired capital investment depends upon, amongst other things, the good functioning of capital markets, which provide the financing for such investment projects. For some sectors, it might be difficult to ensure the capital procurement. For instance, sectors with constant small profit margins could have problems gathering the necessary capital at competitive terms, especially under circumstances of rising production costs induced by increasing energy costs.

... and might be positively influenced by a 'first-mover advantage'

Technical progress has important implications for the competitive effects of taxes on energy inputs. Innovations in the field of energy technology could enable the enterprise to produce energy more efficiently, thus compensating for the price decreases of its energy factor inputs. It is, of course, clear that such innovations cannot be realized overnight. They are long-term features. But it is alleged that the increase in relative factor prices can speed up the process of technical progress and even reward companies which are first confronted with such factor price increases. The 'first-mover advantage' could enable these companies — once their competitors face similar factor price increases — to improve their competitive position because they had adapted their production cost structure earlier, due to the availability of a more energy-efficient technology.

The underlying idea of the concept of the 'first-mover advantage' is that radical environmental policies — either through the imposition of taxes on the use of scarce natural resources, such as energy, or through environmental regulation (for instance, energy-efficiency standards) — change the pattern of relative input prices. In the case of a carbon/energy tax, the price of the production factor energy would rise, hence it would be made scarcer for the producing firm.

Firms would attempt to establish the old input cost pattern. One means of achieving this is to apply a new technology which allows the production of a product with less of the input factor concerned. Induced innovation activity could lead to the development of such resource-saving technology.

Economic history provides some examples for this positive relationship between the relative scarcity of input factors and the consequent technological specialization of countries.

Scarce natural resources were a strong stimulus for the development of the German chemical industry and the synthetic rubber industry during the Second World War. Relatively scarce space and high energy prices are reflected in the small energy-economic automobiles of Western Europe and Japan and the Japanese innovations in small television sets.

Gerstenberger (1992) empirically analysed the relationship between the level of relative energy prices and the number of inventions, a proxy for innovation activity, for different fields of technology and different world regions. His findings point to a generally positive relationship. However, the author underlined that other factors such as the region's climate and the existing industrial structure are also influential factors.

The advantage for firms in a first-mover country arises when a similar change of input prices occurs in the countries of its competitors. The advantage can be twofold: first, the firm has already adapted its own cost structure to higher energy input prices in a way that enables it to produce a lot more cheaply than its competitor and, second, it can sell its know-how of energy-efficient technology, thus exploiting its lead in a specific technological field.

Empirical studies of the relationship between innovation activity and international competitiveness show that the international composition of trade flows, and thus the pattern of trade specialization and competitiveness, is primarily explained by the pattern of technological lags and leads (for a survey of the issue see, for instance, Dosi, Pavitt and Soete, 1990). Gerstenberger (1992) has arrived at similar results investigating this relationship with energy-related technologies.

Needless to say, the potential advantage of the first-mover could become a disadvantage if competitor countries were not to adopt a similar environmental policy — in our case, implement an equivalent carbon/energy tax.

In general, the longer-term mechanisms appear capable of offsetting, to a considerable extent, possible short-run negative impacts

The points developed above show that, in the long-term, the dynamic effects of a carbon/energy tax are varied and difficult to quantify. However, it appears that they are capable of offsetting, to a considerable extent, the negative impacts of such a tax on sectoral competitiveness.

If, in the medium and long-run, the Community's major trading partners were to join in, then it would seem reasonable to lift the exemptions for energy-intensive branches in the Community as their international competitors would face comparable cost increases. In this situation, the extra-EC competitiveness issue would resemble the intra-EC case discussed above, with the possible exception of a positive influence of the first-mover advantage. It should be kept in mind, however, that although no international competitiveness distortions would occur in this situation, the very fact that the energy-intensive branches are energy-intensive would imply that they are relatively strongly affected. In the absence of tax exemptions to prevent relocation of activities outside the Community a strong incentive would be given to reduce pollution by these industries, either by reducing the volume of sales, or by using less-polluting production techniques. The observation that in a concerted action case these branches would be strongly affected is unavoidable and results from the fact that they contribute so significantly to global warming (the 'polluter pays' principle).

6.6. Long-term effects on sectoral production and employment

In the previous sections most of the elements that determine the overall impact on the various sectors of the economy have been analysed one by one. The stage has now been set to inspect the total sectoral effects resulting from the simultaneous interplay of all determinants. At the outset, however, it is useful to point out that it is impossible at present to give a detailed picture of these sectoral effects as many modalities of the tax (notably the issue of possible temporary exemptions) and of the offsetting revenue use have still to be decided upon. Nevertheless, it appears from the empirical evidence of a number of macro-sectoral model simulations that three general conclusions are warranted.

The first conclusion is that in an important number of possible scenarios the overall sectoral incidence of the proposed Community strategy will be broadly similar: In general it turns out that although a considerable degree of sectoral variation exists, no branches will experience major adverse developments. The only branch experiencing a significant loss in sales is, obviously, the energy sector. This is an important conclusion as it shows that reaching the CO_2-emission limitation target will not imply unusually serious and unavoidable negative outcomes for specific branches. However, as stated above, it cannot be excluded that, at a low level of disaggregation, certain activities will be relatively strongly affected.

Empirical evidence from simulations undertaken with the Hermes and DRI models, which corroborates this conclusion, is presented in Tables 31 and 32. Although, obviously, the variation across sectors increases the further the economy is disaggregated in these simulations, even if twenty sectors are distinguished (Table 32) no branches are found, with the exception of the energy branches where sales are likely to be reduced by more than 5%. This confirms the analysis in Section 6.5 where it was shown that a significant international competitiveness problem is likely to exist only in a very limited number of highly disaggregated sectors on specific extra-EC markets. Moreover, it is worthwhile noting that when a rough correspondence is established between the energy-intensive sectors identified in Section 6.4 and those analysed in Table 32, these sectors are, in some cases (ores, metals and chemicals) but not in others (pulp, paper and printing), among the more strongly affected in terms of output losses. This variation points to the importance of other factors than energy intensity in determining the total impact on production. Finally, it should be stated that even in branches where relatively more pronounced output losses occur *vis-à-vis* the baseline scenario, these only imply a modest (at most 25%) reduction of growth and never absolute decreases in economic activity.

Secondly, it appears that the pattern of the policy's incidence on sectors will be relatively stable across scenarios: the hardest hit sector is obviously the energy sector as demand for energy is reduced. Next come basic and intermediary goods, whereas the effects on other sectors of the economy, especially market services, are very modest indeed. This pattern is clearly revealed in the model simulations presented in Tables 31 and 32. The sectoral pattern can largely be explained by three major determinants (Standaert (1992)): demand composition, energy costs and international competitiveness. The first effect consists mainly of macroeconomic feedbacks and influences coming from the type of revenue redistribution used. In general the somewhat reduced overall activity diminishes demand relatively strongly for luxury goods and services, whereas if a substantial part of the revenue redistribution is used to lower income taxes (as in both simulations) consumer goods industries and services experience a relatively favourable development. The cost aspect leads to a shift in domestic and international demand from energy-intensive products to other goods and services. From the analysis in Section 6.4 it becomes clear that especially the demand for services will profit from this aspect. Finally, the international competitiveness effect favours sectors that are relatively sheltered such as the service branches. However, manufacturing branches that produce bulky products with a low value-weight ratio that are thus not intensively traded will also benefit. The results thus show that relatively speaking, within a fairly narrow band, winners and losers can be identified at the sectoral level. Obviously, the more finely we disaggregate, the wider this band becomes.

Table 31

Sectoral effects for the four largest EC economies of a USD 10 per barrel of oil equivalent energy tax[1]

(% change from the baseline)

	Output	Employment
Agriculture	−0,1	−0,4
Energy goods	−3,7	−1,1
Construction	−0,7	−0,8
Consumption goods	−0,4	1,0
Equipment goods	−1,7	−0,2
Intermediate goods	−1,7	0,2
Transport and communications	−0,8	−0,7
Market services	0,2	0,1

[1] Effects after 10 years of a scenario with recycling of revenues via reduced personal income taxes. Unweighted average results for Germany, France, Italy and the United Kingdom. No sectors are exempted from the tax in this simulation.

Source: Standaert (1992).

Table 32

Sectoral effects in the Community of a policy package to reduce CO_2 emissions containing a phased-in CO_2/energy tax of USD 10 per barrel of oil equivalent[1]

(% change from the baseline)

	Producer wholesale price	Production volume
Agriculture	3,4	−1,1
Energy	8,1	−7,0
Ores and metals	5,7	−4,5
Non-metallic minerals	4,2	−1,1
Chemicals	8,6	−3,2
Metal products	3,2	−0,8
Mechanical engineering	3,3	−0,6
Office and electronic data processing	2,3	−3,0
Electrical engineering	2,8	−0,6
Transport equipment	3,3	−1,5
Food, drinks and tobacco	3,8	−0,8
Textiles and clothing	2,9	−0,5
Pulp, paper and printing	3,3	−1,2
Miscellaneous products	2,3	−1,1
Rubber and plastics	5,0	−1,5
Construction	3,3	0,1
Transport services	3,5	−0,1
Retail, tourism and finance	3,2	−0,5
Communication services	2,4	−0,7
Government services	2,8	0,0

[1] Effects in difference from the baseline in the 12th year after the phased-in introduction of the CO_2/energy tax has begun. The macroeconomic effects of this study have been reported in Table 8. No sectors are exempted from the tax in this simulation.

Source: DRI (1991b).

Finally, the results clearly indicate how important factor substitution and other dynamic adjustments aspects are to the total effect. This is of major significance as it demonstrates that a significant amount of the CO_2-emission reduction can be achieved without expense to economic activity, thanks to adjustments in the production structure of various branches. The Hermes results, for instance, show that substantial factor substitution in the direction of labour could occur, especially in the initially relatively strongly affected branches of manufacturing. By using more labour and less energy (and, additionally in Hermes, less capital) total production costs are lowered and the economic impacts of the CO_2/energy tax mitigated. The same aspect can be deduced from a comparison of the price rises in Tables 25 and 26 — which picture the initial effects — and the price rises recorded in Table 32 where account has been taken of dynamic adjustments and macroeconomic feedbacks. This comparison firstly shows that the energy-extensive branches which are hardly affected by the energy/CO_2 tax do, nevertheless, experience cost rises as a result of macroeconomic impacts on the general price level (i.e. the wage-price dynamics). Obviously, this also affects the energy-intensive branches. However, when one compares the sum of the initial and the macroeconomically induced price rises in the energy-intensive branches with the price rises that finally occur (Table 32) it becomes clear that the latter are generally lower than the former. This, again, points to the significance of dynamic adjustments in reducing the economic impact of a CO_2/energy tax.

The bottom line of this analysis has been to show that if an EC frontrunner policy is pursued, a significant international competitiveness problem leading to adverse impacts on sales and employment could occur only in a limited number of branches. These branches can only be discerned at a fine level of disaggregation. In order to prevent dislocation effects, temporary exemptions seem to be warranted for these branches as long as the Community's major competitors do not take similar measures. However, the final effects will be relatively modest for most branches in the economy. These consequences will, in the end, be modulated according to a number of determinants of which energy intensity is only one. It turns out that in branches which are relatively more affected by the introduction of the CO_2/energy tax, dynamic adjustments (such as factor substitution) will significantly reduce potential economic costs by decreasing the energy and CO_2 intensity of production and thus lower the tax burden.

7. The income distribution effects

7.1. Introduction

A tax on the carbon content and/or the energy content of energy products will be applied to energy purchases of private households and of the business sector. The distributional effects of the tax will therefore have a direct and an indirect component. The purchasing power of private households will be directly affected by higher taxes on household purchases of domestic energy and motor fuels because they will have to spend a bigger part of their budget to receive the same quantity of these goods. A tax on industrial energy consumption concerns the living standard of private households indirectly as the expenditure, for products from branches whose product prices will rise due to the tax, grows higher.

The proposed tax is an *ad quantum* tax. This means that a certain fixed amount — in this case USD 10 — will be imposed on energy products per unit of energy content and/or carbon content. In this specification the carbon/energy tax would be very similar to existing excise taxes such as those on mineral oil products.

For analytical purposes, we can distinguish the short-term static incidence of the tax from the medium- and long-term dynamic incidence.

A static view on the distributional incidence of the proposed carbon/energy tax assumes that the imposition of a tax on energy products does not generate a change of the demand pattern. This assumption does not correspond to the situation in the real world, although price elasticities of energy demand may be relatively low in the short-term. Principally, it can be expected that households try to reduce the tax burden by shifting energy expenditure away from more highly taxed products to other less highly taxed ones. This is precisely the reason for introducing such a tax. Thus, although the present — mainly static — analysis of the income distribution effects of a carbon/energy tax provides a number of valuable insights, it will only be complete if dynamic, behavioural reactions are taken into consideration.

It has to be emphasized at this point that all empirical evidence presented in this analysis has been generated under the assumption that the carbon/energy tax revenue is not used for reducing other taxes or charges. This will not be the case in reality as the Commission proposal provides for a redistribution of tax revenues at Member State level. The assumption has, however, been made because at this stage no empirical information for the Community is available for the tax redistribution case. Not only is there a wide range of options for redistributing the tax revenues to the economy but the application of the subsidiarity principle also implies that the decision on the tax revenue use falls into the responsibility of Member States. It has, therefore, to be kept in mind that the presented results on the distributional incidence after tax redistribution could alter significantly. In particular, the revenue redistribution could partly be used for compensating possible undesirable distributional effects of the imposition of the tax.

7.2. Predeterminants of the income distribution effects of a CO_2/energy tax

A number of structural characteristics of consumption behaviour, industrial technology, fuel use and the carbon/energy tax design as well as the level of existing energy prices are determining the distributional incidence of such a tax.

Higher spending of poor households on domestic energy ...

Recent data from EC household expenditure surveys[1] reveal that the poorest household quartile in all six EC countries considered spends a higher share of its budget than the other three quartiles on domestic fuel and power. In all Member States with the exception of Italy the budget share of domestic fuels declines steadily through the income distribution (see Graph 51). There is also a tendency, that domestic fuel budget shares, especially of poorer quartiles, are smaller in southern Community countries. This might be the consequence of a reduced need for heating fuels in warmer countries.

... contrasts with less spending on motor fuels in comparison with rich households

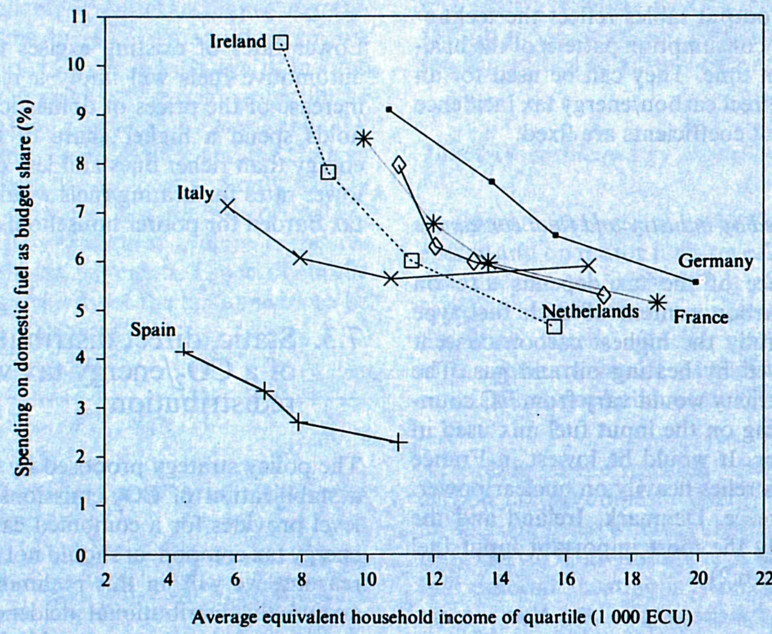
The budget shares for motor fuels are smaller for poorer quartile groups of households than for richer ones, although the budget shares level out between the third and fourth quartiles. They are generally highest in Italy, where petrol is presently heavily taxed, and lowest in the Netherlands and Germany (see Graph 52).

The tax incidence is determined by industrial energy intensity ...

The pattern of industrial energy consumption is largely technologically determined. A blast-furnace, for example, has to

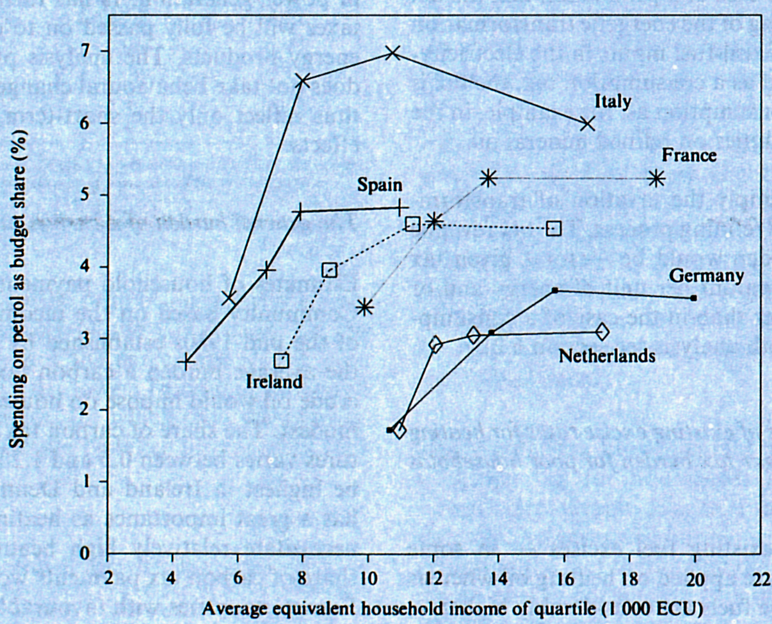
[1] The set of surveys covers six countries, Germany, Spain, France, Ireland, Italy and the Netherlands, and contains data for 1985, except for Germany, where they refer to 1983, and Ireland where they refer to 1987.

GRAPH 51: Budget shares for household spending on fuel and power in six EC countries by quartile groups of gross household income



Source: Eurostat (1990).

GRAPH 52: Budget shares for household spending on motor fuels in six EC countries by quartile groups of gross household income



Source: Eurostat (1990).

be run with coke; the production process would not work with any other fuel. Of course, within each technology there can be a certain margin for a more or less energy-efficient production process. Input/output tables reflect the technologically determined energy consumption pattern of the business sector for one point in time. They can be used for an assessment of the static, indirect carbon/energy tax incidence as the technical input/output coefficients are fixed.

... as well as the fuel mix used by industry and final consumers

The distributional incidence of the tax depends also on the energy content and carbon content of each fuel type consumed. Coal has generally the highest carbon content per unit of energy, followed by heating oil and gas. The burden of taxation on electricity would vary from EC country to EC country depending on the input fuel mix used in the power-generating sector. It would be lowest in France where electricity generation relies heavily on nuclear power. It would be highest in Greece, Denmark, Ireland and the UK where coal is presently the most important input fuel (for more details see section 6.2).

A production tax could imply a higher total tax burden than a consumption tax

The tax design, notably the question whether a production tax or a consumption tax should be applied, has an impact on the tax incidence. In the case of a production tax, the tax will be levied at the beginning of the energetic transformation chain, for instance on the fossil-fuel inputs in the electricity-generating sector. Designed as a consumption tax, the tax is imposed on final energy consumption as, for example, in the case of the existing excise duties on refined mineral oil.

A production tax would imply the taxation of transformation losses in the energetic refining process. The tax revenue and also the total tax burden would be — for a given tax rate defined as a certain amount per unit of energy and/or per unit of carbon — higher than in the case of a consumption tax (for a more in-depth analysis see section 6.2).

In countries with lower rates of existing excise rates for heating fuels, a tendency to a stronger tax burden for poor households could occur

Differentials of rates of existing fuel excises — in some Member States zero rates are applied on heating oil whereas the tax rates on automotive fuels are considerably higher — would exert an influence on the distributional incidence of a carbon/energy tax. The incremental tax burden which is defined as the product of the budget share dedicated to energy purchases and the energy price increase due to the tax will vary between poor and rich households.

Lower rates of existing excises for heating fuels than for automotive fuels will imply a relatively higher percentage increase of the prices of domestic energy. As poorer households spend a higher share of their budget on domestic energy than richer ones and less on motor fuels, the current lower rates for heating fuels would imply a relatively higher tax burden for poorer households than for richer ones.

7.3. Static, direct distributional incidence of a CO_2/energy tax without revenue redistribution

The policy strategy proposed by the Commission aiming at a stabilization of CO_2 emissions in the year 2000 at 1990 level provides for a combined carbon/energy tax where the energy tax component should not exceed 50%. For analytical reasons, we will, in this preliminary economic assessment, analyse the distributional incidence of a pure carbon tax and a pure energy tax separately. It has been assumed that the tax burden for each fuel, purchased by households, is determined proportionally to the respective carbon or energy content of the fuel, with the exception of electricity, where the tax content of sales to final consumers is supposed to reflect the carbon or energy content of the fuel inputs used in power generation. Is has further been assumed that the taxes will be fully passed on to consumers in the prices of energy products. The analysis presented in this paragraph does not take behavioural changes into account. The results thus reflect only the short-term, first-round distributional effects.

The general burden of a carbon tax would probably be low

Estimates of household payments of the carbon tax in the Community based on the income and expenditure pattern of the mid-1980s established by Smith (1992) indicate that the average burden a carbon tax of USD 10 per barrel of crude oil would impose on households in the Community is modest. The share of carbon tax payments in total expenditures varies between 0,5 and 1,2% (see Graph 53). It would be highest in Ireland and Denmark, countries where coal has a great importance as heating-fuel and whose climates necessitate relatively high heating fuel expenditures. The share of carbon tax payments would be lowest in Spain and France, countries with favourable climates and which place greater importance on no CO_2-emitting nuclear energy (in the case of France).

A carbon tax would only be slightly regressive but with differences by country

This carbon tax would probably have only a slightly regressive effect. Calculations of the share of carbon tax payments in household total expenditure by quartile groups of income indicate that the 'ratio of regressivity[1] would generally be — with the exception of Italy — greater than 1 (see Table 33). For four countries (Germany, Spain, France and the Netherlands), the burden of carbon tax payments is only weakly correlated with household income. For the rest of the EC countries, there seems to be evidence of a more regressive pattern to household carbon tax payments. Especially in the UK and in Ireland, the regressivity of the tax appears to be more pronounced.

Table 33

The distributional effects of a carbon and an energy tax: Direct price effects on household expenditure

	Carbon tax Ratio of regressivity[1]	Energy tax Ratio of regressivity[1]
B	1,76	1,64
DK	1,76	1,71
D	1,30	1,28
GR	1,92	1,85
E	1,10	1,15
F	1,27	1,29
IRL	2,14	2,02
I	0,96	0,97
NL	1,28	1,31
UK	2,30	2,13

[1] Ratio of regressivity: tax payments (in % of total household expenditures of the poorest quartile group of households over the percentage tax payments of the richest quartile.
Souce: Smith (1992).

It should be pointed out that the ratio of regressivity is only a proxy for the welfare effects of the CO_2/energy tax on various income groups: even if the percentage loss in purchasing power was equal in the lowest income quartile and in the highest income quartile, (in which case the ratio of regressivity would be 1) it should be taken into account that such a loss would hurt more the poor rather than the rich households. Thus it would seem of significant importance to avoid adverse consequences in specific low income groups (e.g. elderly persons). Careful monitoring might be necessary and, in some countries, financial assistance to specific low income groups could be contemplated.

[1] The 'ratio of regressivity' is defined here as carbon and energy tax payments as a percentage of household total expenditure of the poorest quartile group over percentage-share of the richest quartile group. A value bigger than 1 indicates a regressive effect of the tax, values smaller than 1 point to a progressive effect.

Taxing domestic energy is at the origin of the regressivity

A separate analysis of carbon tax payments on domestic energy and on motor fuels reveals that the slightly regressive effect of the tax is the result of two nearly countervailing forces. This situation originates from differences in the expenditure pattern of richer and poorer households related to the consumption of domestic energy and to motor fuels as was mentioned above (see Graphs 51 and 52).

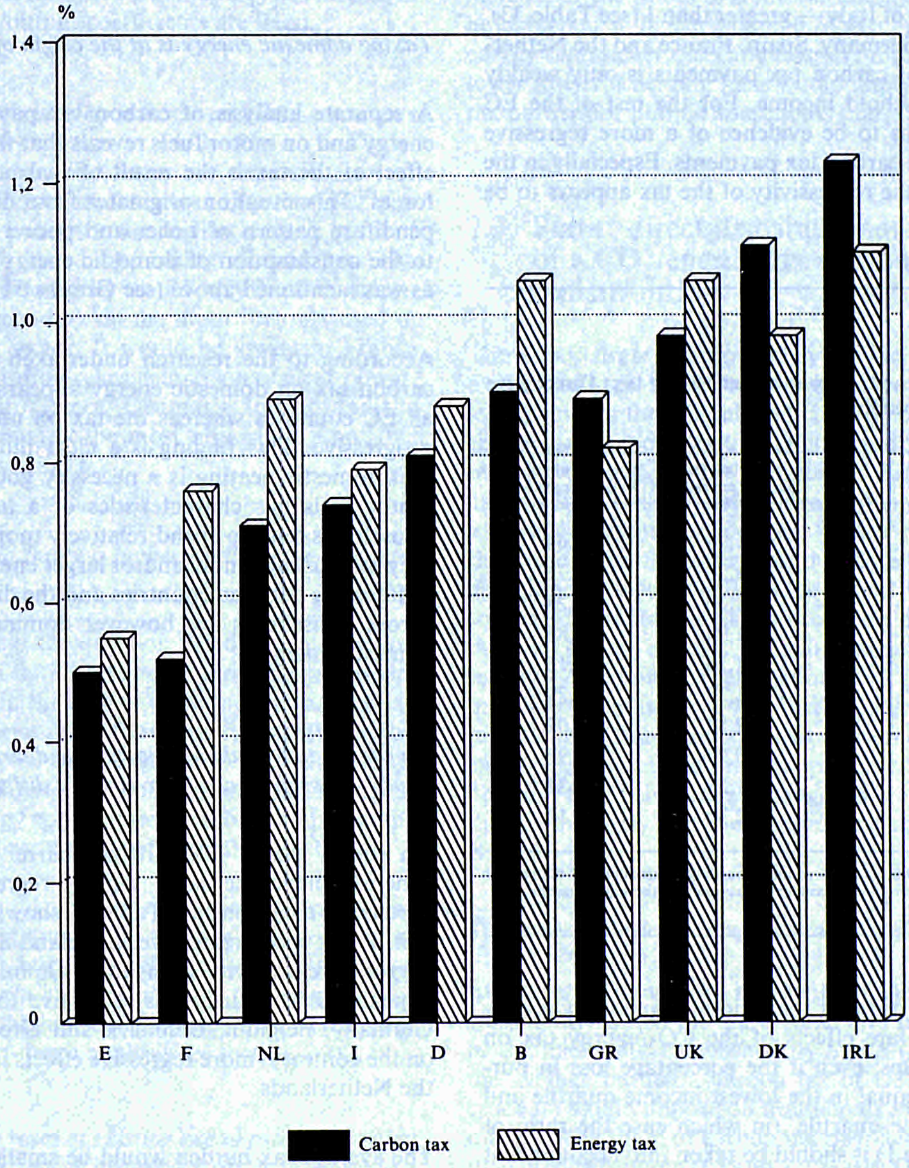
According to the research undertaken by Smith (1992), a carbon tax on domestic energy appears to be regressive in all EC countries whereas the tax on motor fuels would be progressive. This finding is a clear illustration of the fact that domestic heating is a necessity good and spending on motor fuels has characteristics of a luxury good. Richer households tend to spend relatively more on motor fuels as they have usually more and/or larger energy-consuming cars. Differences between countries and the distributional pattern across households are however dominated by the tax on domestic energy.

An energy tax would have a similar distributional pattern but imply less pronounced inter-country differences

An energy tax of USD 10 per barrel of crude oil would generally have the same slightly regressive distributional pattern as a carbon tax. Table 33 shows that the tax would still be the most regressive in Ireland and the UK but the degree of regressivity seems to be diminished. An energy tax appears to be equally less regressive than a carbon tax in Germany, Belgium, Denmark and Greece. It would have, on the contrary, more regressive effects in Spain, France and the Netherlands.

The average tax burden would be smaller in comparison to a carbon tax for households in Ireland, Denmark, and Greece (see Graph 53). In France, the Netherlands and Belgium, however, the burden would be considerably higher reflecting the fact that taxing the energy content in countries whose energy-consumption pattern is less carbon-intensive (through the use of nuclear power or gas) generates a higher revenue than taxing the carbon content.

GRAPH 53: **Carbon and energy tax payments as a percentage of household total expenditure in the Community (all households)**



Source: Smith (1992).

7.4. Overall (direct and indirect) static distributional incidence of a CO_2/energy tax without tax redistribution

The overall distributional incidence of a carbon/energy tax is not only determined by the direct effects which work through price increases for household consumption of domestic and motor fuels but also by the indirect effects which are the consequence of the tax which is imposed on the purchases of energy in the business sector. A further factor is the market characteristics — competitive or monopolistic — which determine if and to which degree factor cost increases can be passed on in the production process.

The burden of these taxes imposed on industry is passed on to different groups of society, the consumer of final industrial products, the shareholders or owners of business, its suppliers or employees. The distributional incidence of taxes on industrial inputs will thus be determined by the extent to which these groups bear the ultimate burden of the tax and by the position they occupy within the income distribution.

Usually, the indirect distributional effects are analytically divided into two groups: effects on final consumers and effects on the owners of factors of production, including capital, labour and natural resources.

Effects on the owners of production factors

At least part of the burden of a carbon/energy tax will be borne by the owners of production factors if the tax induced increase of prices of energy inputs cannot be fully passed on in higher product prices. One obvious example are the shareholders of a pulp mill who might see the pre-tax prices for their very energy-intensive products fall, and thus the profitability of their production activities. This drop of profitability will affect the real incomes and wealth of the households which own such shares.

The magnitude of the distributional effects on the owners of production factors is difficult to evaluate a priori. They are influenced by the following factors:

(i) The degree of monopoly in factor and product markets.

(ii) The degree of international competition. If energy/carbon taxes are introduced by the Community unilaterally, the ability to pass the tax on in prices will depend on the exposure to international competition.

(iii) The degree of substitution of different factors in production. If companies are able to substitute energy or carbon-intensive input factors by alternative factors of production, they will reduce the increase in the prices of energy-intensive products that would otherwise occur. The change in factor demands would then affect the relative prices of different factors tending to reduce the remuneration of the taxed factor and to increase the returns to its substitutes.

Effects on final consumers

If higher prices of energy inputs are passed on in higher industrial output prices, households as final consumers will see their real income affected under the assumption that their pattern of consumption purchases remains unchanged in the short-term. The distributional pattern will be determined by the consumption pattern of energy- and carbon-intensive goods and services whose prices rise due to the tax. If such products constitute a high share of the consumption spending of poor households the tax would be regressive.

An approximation of the first-round indirect distributional effects of a carbon/energy tax can be derived from an analysis of the input/output structure of an economy in combination with data on household expenditure in the same country. The aim is to calculate the impact of the tax on energy inputs on the relative prices of various outputs which are submitted to final consumption. It is assumed that the tax is fully passed on to consumers and that the pattern of inputs used in production does not change. The changed set of relative prices can then be applied to data on the pattern of consumer spending in order to assess the distributional effects of the carbon/energy tax.

The overall distributional effects of the carbon tax are slightly regressive

Preliminary calculations for illustrative purposes with input/output models for two Community countries provide some evidence for a slightly regressive impact of a carbon tax if all effects, direct effects on heating and motor fuel purchases and indirect effects on the consumption of final industrial products, are taken into account (see Table 34). The regressive effect is very small in the case of France but somewhat more pronounced in Germany.

Examining which consumption groups determine the regressive total effect of the carbon tax, domestic energy and food, beverages and tobacco can be identified. A countervailing force in both countries is the progressive effect of taxation on purchases of transportation goods and services. Thus, the pattern of the overall distributional effects of a carbon tax is very similar to the pattern of the direct effects.

Table 34

Overall distributional incidence (direct and indirect effects) of a carbon and an energy tax in France and Germany

	Ratio of regressivity[1]	
	Carbon tax	Energy tax
France 1990		
Consumption group		
Domestic energy	1,72	1,56
Transportation	0,63	0,62
Food, beverages, tobacco	1,54	1,56
Other	0,97	0,95
Total	1,05	1,09
Germany 1990		
Consumption group		
Domestic energy	1,93	1,80
Transportation	0,51	0,51
Food, beverages, tobacco	1,42	1,35
Other	0,88	0,87
Total	1,17	1,11

[1] Ratio of regressivity: loss of purchasing power of poorest household income quartile over loss of richest quartile. A ratio of more than 1 indicates regressiveness.
Source: Commission services.

Indications for inter-country differences in the effects of the tax on the purchasing power of households

The effects of the tax on the purchasing power of households are determined by the magnitude of the contribution of price rises of different consumption groups, e.g. domestic energy, food or transportation, to the price increase in total consumption of households. As the households' budgets are fixed, a price increase in the whole set of consumption goods will imply a quantitative reduction of consumption, thus a loss of purchasing power.

The contribution of price rises of different consumption groups to price increases in total consumption of households depends on two factors: the budget shares of different consumption groups in total consumption and the degree of the price rises of different consumption groups due to the tax.

There seems to be some indication for inter-country differences of the overall effect of a carbon tax on the purchasing power of households. The total loss of purchasing power can be expected to be modest (between 1,5 and 2,6%) but the effect would be almost twice as high in Germany as in France (see Table 35). This difference is mainly due to the magnitude of the negative impact more expensive domestic energy purchases have on households' purchasing power in Germany. The analysis shows that in this particular case the effect of the tax on domestic energy prices is much stronger than in France and overrides the importance of the relatively small budget share of this item.

Table 35

Total effect (direct and indirect) of a carbon and an energy tax on the purchasing power of households in France and Germany

(All households in percentage points)

	Carbon tax	Energy tax
France 1990		
Consumption group		
Domestic energy	−0,43	−0,77
Transportation	−0,64	−0,69
Food, beverages, tobacco	−0,16	−0,22
Other	−0,30	−0,43
Total	−1,53	−2,10
Germany 1990		
Consumption group		
Domestic energy	−1,15	−1,03
Transportation	−0,74	−0,74
Food, beverages, tobacco	−0,22	−0,23
Other	−0,53	−0,54
Total	−2,64	−2,54

Source: Commission services.

The distributional incidence of an energy tax is similar to carbon tax

The pattern of the overall distributional incidence of an energy tax seems to be rather similar to the pattern of a carbon tax (see Table 34). It appears, however, that taxing the energy content of domestic fuels has a less regressive effect in Germany and a more regressive effect in France. The negative impact on the households' purchasing power probably varies less from country to country in the case of an energy tax (see Table 35). This means that the loss in households' purchasing power due to an energy tax in France will be higher than the one of a carbon tax whereas the loss will be smaller in Germany.

7.5. Distributional incidence of a CO_2/energy tax in the medium and long term

The analysis of the distributional incidence of a carbon/energy tax presented until now was of a static nature, i.e. the assumption was made that there are no behavioural changes, neither of consumers nor of producers, after the imposition of the tax. This assumption is of course an illegitimate approximation of reality. However, it seems to be justified for the estimation of the approximate distributional impact in the very short-term. It is clear that households will respond to the tax by changing their pattern of spending away from the taxed products, at least in the medium and long-term. Producers will tend to substitute away from taxed energy input factors.

Models of consumer behaviour presently operational are not developed enough to deal satisfactorily with the dynamic distributional incidence of a carbon/energy tax. Usually, these models are not able to identify energy from different sources, coal, oil, gas, electricity, etc. Therefore, it is only possible to discuss the effects of energy taxes in a very broad sense, and not to separate the impacts of a carbon tax from those of a general energy tax. However, some qualitative considerations can be made.

In the situation of behavioural changes, two types of distributional effect are of interest: changes in tax payments and welfare cost. The changes in tax payments will usually be less than the changes estimated on the basis of unchanged spending patterns. This only reflects the desired effect of the carbon/energy tax, namely that consumers substitute for carbon/energy-intensive products in their consumption basket and thus give the right signals to the producers.

A welfare cost might arise for households when they have to change their preferred consumption pattern confronted with higher prices for taxed goods and constraint by a fixed family budget. The pattern of a welfare cost may be unevenly distributed across households. It is possible, that such changes of the consumption pattern imply a higher welfare cost for poor households as they have not as good substitution possibilities due to a tighter budget constraint as richer households.

Smith (1992) presents results of an existing model of consumer behaviour to compare behavioural and non-behavioural estimates of the distributional effects of a carbon tax on households' purchases of domestic energy and motor fuels in the UK. The model simulates a demand system for 11 categories of household expenditure. A simulation programme using this model and data from the 1988 UK family expenditure survey has been modelled to predict household budget shares for spending on each of the 11 commodities, given an initial vector of relative prices and then calculates how these shares change, if specified tax changes feed through fully into relative prices. A drawback of the model is, however, that the effect of change in the relative prices of different fuels cannot be simulated.

The simulation results indicate that the effect of allowing for demand responses is comparatively small; carbon tax payments are only slightly lower than if behavioural responses were not taken into account. The percentage difference is greater for the poorest decile of households than further up the income distribution scale pointing to a lower regressive effect of a carbon tax if demand responses are considered. The relatively modest amount of induced energy saving points to a number of barriers to the rational use of energy (such as the landlord-tenant problem — see Section 3.3), the removal of which is aimed at by the non-fiscal elements in the proposed Community strategy. Thus, if the barriers were to be removed, the effects of the tax could be larger and the amount of carbon tax payments lower.

7.6. Distributional and efficiency implications of different manners of redistribution of the tax revenue

The proposed carbon/energy tax is meant to be revenue neutral, i.e. the tax revenue will have to be recycled into the economy via cuts in other taxes. As the expected total tax revenue on EC level is quite substantial — it is estimated at approximately ECU 50 billion — the manner in which the tax revenue will be redistributed would have an impact on the distributional incidence of such a tax.

Revenue redistribution could improve the economic efficiency of the tax system

The major issue of principle analysing manners of tax redistribution is the trade-off between returning the tax revenues in a manner which maximizes the gains in economic efficiency, and redistributing the revenues in a way which minimizes the change from the initial distributional position. Economic efficiency could be improved if the tax revenues would be used to reduce the most distortionary aspects of other taxes. Thus, if existing income tax rates were considered to discourage labour effort, or high corporate tax rates were believed to discourage investment, the carbon tax revenues would make a reduction of the rates of these taxes possible. Unfortunately, the use of carbon tax revenues in a manner that maximizes the efficiency gains may conflict with equity objectives.

A proportional reduction of income taxes and employers' contributions to social security would probably be regressive

A proportional reduction of income taxes would be regressive because the part of the carbon/energy tax revenue paid back to poorer households would be smaller than the part going to richer households. A reduction of employers' contributions to social security would probably have a regressive distributional impact as it can be assumed that employers pass at least part of this reduction of their factor input cost on to lower product prices. As this price reduction concerns all products, not specifically domestic energy products, the regressive effect of taxing domestic energy would not be alleviated by this way of redistribution.

Lump-sum redistributions could have a progressive effect

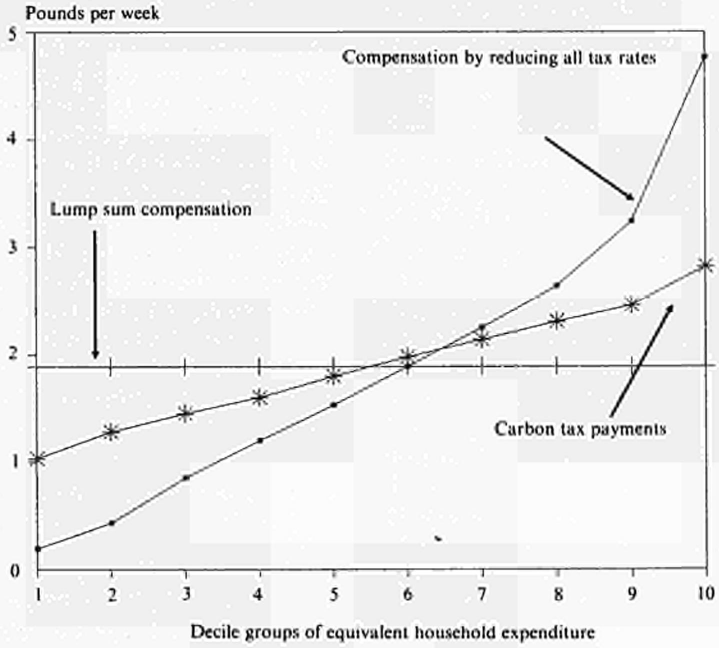
If the revenues were redistributed equally to all households (for example through increases in pensions, social security benefits and increases in income tax allowances), poorer households could be, on average, in the position to pay less tax in total than before the imposition of the tax. Graph 54 illustrates the distributional effects of the two different possibilities of redistributing carbon/energy tax revenues in the case of the UK. The data presented are the results of the abovementioned simulation programme (see Smith, 1992). It is shown that the use of the revenues for a proportionate reduction in all rates of income tax, national insurance contributions, VAT and excise duties has, overall, a sharply regressive impact. On the other hand, should the revenues be returned in the form of an equal lump sum to all households, the net distributional effect (original carbon/energy tax plus redistribution) would be progressive.

7.7. Conclusions

The distributional effect of a carbon/energy tax would consist of three major elements: direct effects related to the pattern of household spending, firstly on domestic energy, and secondly on motor fuels, and indirect effects arising from the taxation of industrial energy inputs. The analysis has shown that the regressive impact of taxation of domestic energy is almost outweighed by the tax on motor fuels which appears to be progressive in all Community countries. Thus, there is some indication for the conclusion that the proposed carbon/energy tax would have only a slightly regressive impact on the income distribution. For an evaluation of the carbon/energy tax, it should be kept in mind that its distributional effects must be compared to the effects of alternative policy instruments (subsidies, regulations, etc.).

An issue of distributional concern would be, however, the differences of distributional effects between Member States. In southern Community countries the expenditure share of poorer households for domestic energy is lower than elsewhere in the Community, and only a little higher than those of richer households in the same country. Taxation of domestic energy in these countries would be, therefore, less

GRAPH 54: **Distributional incidence of the use of carbon tax revenues (United Kingdom, 1988)**



Source: Smith (1990).

regressive than in Northern Member States, especially Ireland, the UK and Denmark.

The manner in which the carbon/energy tax revenues will have to be redistributed to the economy could be used as an instrument to countervail possible regressive effects of the tax. Notably, a lump-sum redistribution of revenues, for instance through higher income tax allowances, could ensure a neutral distributional effect on average of the proposed tax, if it is well tuned with other manners of tax revenue redistribution which would enhance the economic efficiency of the tax system.

Part D

Reaching beyond the Community

Part D presents the rationale for reaching a global agreement on CO_2 emission reduction and discusses the difficulties as well as ways of achieving such an agreement. The issue of Community leadership within the group of industrialized countries with respect to measures to combat global warming is analysed.

It closes with a presentation of a cost-efficient approach to incorporate LDCs and East European countries in an effort to slow down climate change and a discussion of the mechanisms with which such an approach could be implemented.

8. The international agenda: Reaching a global agreement on CO_2 emission limitation

8.1. The need to integrate other countries in CO_2 emission limitation agreements

The greenhouse effect is a global problem which can only be solved by worldwide cooperation

An important characteristic of the greenhouse effect is its global dimension. Unlike emissions of other pollutants like SO_x and CO whose environmental effects are limited to a national or regional level, emissions of CO_2 and other greenhouse gases develop their environmental impact, the warming of the earth's atmosphere, on a world scale. Greenhouse gases are emitted from individual countries but the effects are felt by the world community.

Abatement efforts of a single country or a group of countries would have no significant impact on total emissions if the rest of the world continues 'to have the old emissions habits'. Therefore, the problem of global warming has to be tackled on a global level. Abatement efforts should be made by all countries, or if this is not possible, at least by a significant number of the largest emitters of greenhouse gases.

This point is clearly illustrated by simulation results using long-term models. If the USA, for example, which in 1990 emitted nearly twice as many CO_2 emissions as the Community, were to unilaterally impose a CO_2 tax of slightly over USD 10/barrel of oil equivalent, world CO_2 emissions in the 21st century would hardly be affected, even though US emissions would be cut by roughly 50% compared to baseline in 2100 (CBO (1990), analysis on the basis of simulations with the Edmonds-Reilly model). Such action would delay the doubling of atmospheric concentrations — which is projected to occur around the year 2060 — by only three years. Of course, for the European Community, with its lower share on worldwide emissions, the impact of unilateral action on atmospheric concentration would be even smaller.

Thus, the environmental effectiveness of policies will only be guaranteed if a substantial number of countries take action. However, such a broader international action will be more likely to emerge if a number of committed countries take the lead. It is in this context that the important contribution of the Community strategy has to be seen.

Furthermore, if only a limited number of countries take action, such a policy is likely to be more costly as low-cost possibilities elsewhere cannot be exploited

From an economic point of view, the benefit of integrating more countries in an international CO_2 agreement is that this allows the exploitation of low-cost options. For any given global CO_2 reduction, the costs are likely to decline the more countries embark on CO_2 reduction policies provided that efficient economic instruments are used (by definition, these allow the reduction of emissions where it is least costly to do so — see Chapter 3). If only OECD countries introduce policies to reach ambitious targets it is likely that, after the low-cost options have been exhausted, the costs become rather significant.

The developed countries have caused the bulk of global warming ...

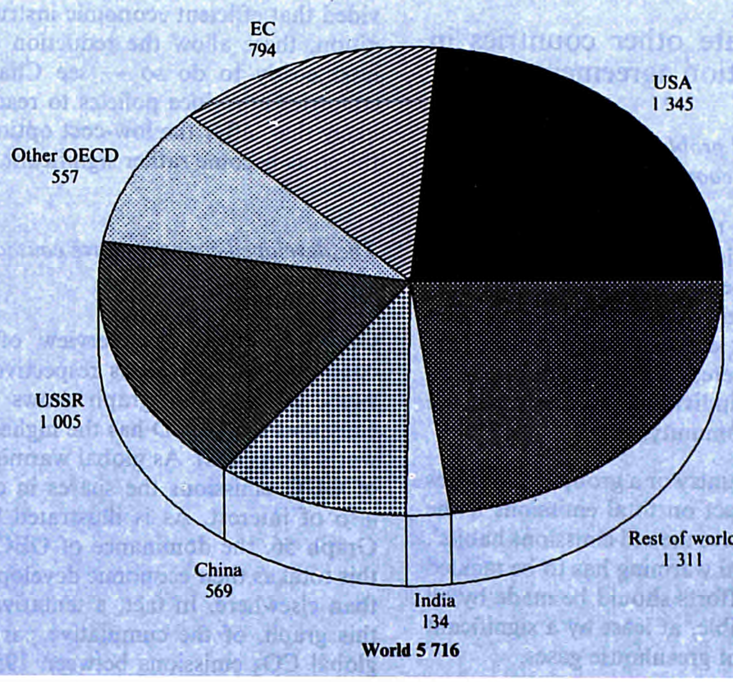
Graph 55 gives an overview of the shares of various countries, world regions respectively, in global CO_2 emissions, in 1990. The graph shows that in terms of current emissions the OECD has the highest share (roughly 45% of world emissions). As global warming is caused by the stock of GHG emissions the shares in cumulative emissions are also of interest. As is illustrated by the left-hand part of Graph 56, the dominance of OECD countries is higher in this total as their economic development began much earlier than elsewhere. In fact, a tentative calculation, underlying this graph, of the cumulative part of OECD countries in global CO_2 emissions between 1950 and 1990 arrives at a share of 57%.

If we switch the perspective from absolute emissions to per capita emissions, the predominance of past emissions from Western industrialized countries in the stock of global CO_2 emissions becomes even more obvious. Although no exact figures are available for the world, the following example gives an impression of the orders of magnitude involved: according to calculations by Siddayao et al. (reported in Shunker, Salles, and Rios-Velilla (1992)) cumulative emissions per head in 2025 would still be 20 times higher in the USA than in India, under the assumption that growth in Indian energy consumption per head would continue to be nine times greater than in the USA up till 2025 (4,5 as against 0,5%).

... but the share of LDCs in future emissions will increase substantially ...

Until the middle of next century, the share of OECD countries' cumulated CO_2 emissions will probably drop to 34% (see Graph 56, right-hand side). A rapidly rising population and consequently increasing energy needs are likely to boost the emissions of CO_2 in developing countries. Their cumulative share over the time span 1990 to 2050 could attain roughly 50% (compared to approximately 25% in 1990).

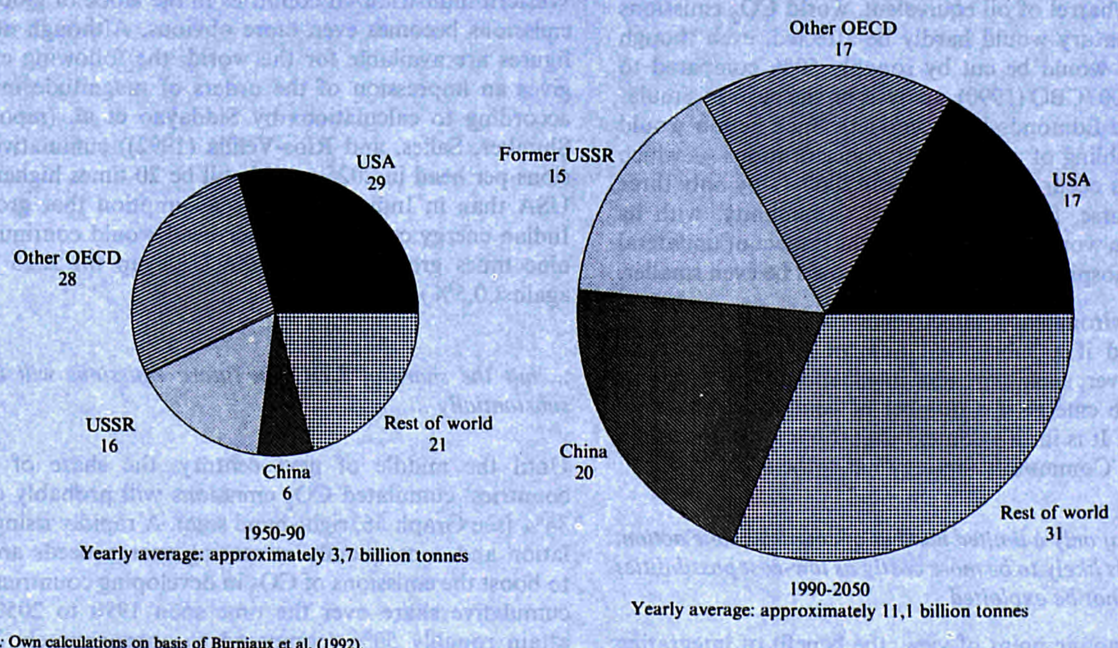
GRAPH 55: CO_2 emissions by world region, 1990[1] (million tonnes)



[1] Baseline path of Green model.

Source: Burniaux et al. (1992).

GRAPH 56: Cumulative CO_2 emissions — Shares by world region, 1950-2050 (%)



Source: Own calculations on basis of Burniaux et al. (1992).

... facts that are likely to play an important role in future negotiations

Many countries believe that a link should be established between the burden of actions to reduce global warming and the responsibility for its occurrence. As this aspect is likely to play a role in future international negotiations, it is perhaps worthwhile to analyse the two groups of countries separately. In fact, with the exception of the USA, all the major developed CO_2 emitters (G7) have pledged to stabilize greenhouse gas emissions by, at least, the beginning of the next century. LDCs have not indicated such intentions.

Moreover, prospects for CO_2 emission growth and instruments for reducing it seem to differ significantly ...

Another aspect that warrants such an approach is that the prospects for CO_2 emission growth and for instruments for reducing emissions differ significantly across both groups.

The OECD countries have already reached a high level of economic development and emission growth is likely to be modest. Although market barriers to the rational use of energy are important in a number of fields, substantial CO_2 reductions cannot exclusively rely on removing these barriers. Market based instruments will be necessary to raise the price of energy. This will stimulate shifts in the consumption and production structures and an increase in the development of energy-efficiency investments.

... across the OECD on the one hand and the LDCs and East European countries on the other

In the less developed countries (LDCs) and Eastern Europe — where the growth of CO_2 emissions will probably be very substantial if no action is undertaken — market barriers often seem to be of great importance and very substantial savings could already be made by introducing best available technologies (BATs).

Artificially low energy prices, lack of information and technical know-how and financial barriers seem to be of far greater importance than in the OECD. Despite many similarities, there are also significant differences between developing countries and Central and East European countries. These differences will be specifically dealt with in Chapter 10.

For these reasons both groups are discussed separately

For these reasons the OECD countries, on the one hand, and the LDCs and the East European countries, on the other, are treated separately in the remaining two chapters. Before turning to this it seems worthwhile to look into how an international agreement can be reached.

8.2. Difficulties of integrating other countries in a CO_2 emission limitation agreement

An agreement on a common CO_2 abatement policy might be difficult to reach because CO_2 reduction is a public good ...

Economic theory suggests that it might not be easy to obtain an agreement at the international level. The reason for this is that emission reductions can be considered as a public good. If a country undertakes investments to abate CO_2 emissions beyond the national 'no regrets' level, which is economically viable in the national context, the entire costs accrue to this country, whereas only a part of the benefits of the investment will fall to this country, a major part going to other countries.

... which could lead to 'free riding'

Thus, each country has an economic incentive not to act because it can benefit from the emission reductions made by other countries. Such behaviour, which is characterized by profiting from the action of others, while not making an own contribution, is called 'free riding'. It is clear that, if too many and especially the largest CO_2 emitting countries attempt to take such a 'free ride', no significant CO_2 abatement will be possible. The problem of free riding is difficult to deter because the costs of abatement can be very large — both in absolute terms and relative to the benefits. This raises the issue of financial compensations ('side payments') for countries with relatively high net costs which will be necessary if an agreement is to be reached. These will have to be paid by others, probably by those with the highest benefits.

All in all, it is likely that, given the significant stakes involved, countries will be tempted to maximize their own net gain by trying to reduce their own effort whilst profiting from actions by others. This could lead to complicated negotiation tactics, intricate and unstable coalition building and other aspects of 'strategic behaviour'.

Uncertainties regarding costs and benefits further complicate the finding of a solution

The difficulties in reaching a global agreement on CO_2 reduction policies are further complicated by the existing uncertainty about the costs (or benefits) of global warming for individual countries. It is, for the time being, not possible to quantify exactly the regional physical impacts of rising temperatures and to assess the exact socio-economic costs or benefits which are the consequences of the physical impacts. Nevertheless, it can be imagined that countries which have a long low-lying coastline or havc alrcady a strong stress on water resources could generally be expected to lose from global warming whereas countries where agricultural development prospects are currently hampered by a cold 'Siberian' climate may gain. Due to the regionally different impact of global warming and a consequently uneven distribution of costs and benefits, it will, *a priori*, be difficult to convince all countries to join in a global action.

Economic efficiency and equity are two requirements on the way to an international agreement

Equivalent to a national approach, a global policy approach to tackle the CO_2 emissions should in principle fulfil two conditions: firstly, it must be an economically-efficient solution, i.e. it has to be a least-cost solution, and secondly, the solution must respect certain equity aspects of the distribution of gains and costs. In order to find a solution which fulfils these conditions, it is useful to consider what can be learned from game and negotiation theory as well as from the experience with other environmental arrangements in the past. Both types of considerations underline the importance of having the right economic incentives in order to reach an economically- and environmentally-efficient agreement.

In fact, Barrett (1991) has, for instance, shown that, in the situation of varying cost and benefit functions for different countries, transfer payments will be needed if the agreement is to gain the signatures of a lot of countries. Even if an economically-efficient instrument like an international carbon tax would be proposed, it might not be acceptable to many countries without compensating transfer payments. An international tradable CO_2 emission permit scheme, although economically efficient also, might be difficult to implement, as many countries would be reluctant to sign a convention that allocated permits initially on the basis of *ad hoc* rules, like population or GNP.

8.3. What might an international agreement look like?

It seems that the developed countries will have to take first steps ...

It appears likely that these complications might first be overcome by the developed countries. A significant number of these have already indicated their willingness to reduce CO_2 emissions. It might be stated, however, that factual experiences with policy measures and moral persuasion of the laggards could be necessary to arrive at concerted action of the industrial world. Thus a case can be made for leadership among the group of industrialized countries.

... and that eventually the rest of the world will become integrated

In the long term, however, it is clear that if the problem of global warming is to be resolved, the participation of LDCs and East European countries is indispensable. Before they become fully integrated, however, it seems that a substantial number of no-regrets policies (especially *vis-à-vis* energy pricing) could be introduced. Also, new flexible innovative mechanisms might be used to limit CO_2 emissions. Measures that go further are likely to be necessary in the long term if substantial global emission reductions are needed. These might be more difficult to obtain as relatively high costs will be involved which might put the issue of compensating payments high up on the agenda.

The advantage of the gradualist approach described here is that consensus building, demonstration effects and no-regrets policies dominate the strategy in the first years. Thus, while international cooperation is growing and further knowledge on the greenhouse effect is being generated, emissions can be reduced at low costs in the early years. If the greenhouse effect then turns out to be as serious a problem as thought today, the political and economic foundations will have been laid for the world to move globally and swiftly taking sound and proven measures to combat global warming.

9. The issue of EC leadership within the group of industrialized countries

9.1. Why EC leadership?

The CO_2 target set by the Energy and Environment Ministers on 29 October 1990 implied that the Community would be prepared to act as a front-runner in devising policies to limit CO_2 emissions with the intention of inducing others to take similar measures. This political decision thus meant that the Community decided it would provide leadership within the group of industrialized countries to limit CO_2 emissions.

In addition to an economic approach, ethical perspectives could also be brought forward in dealing with this question

The question of why the Community should provide leadership is discussed in some detail in this section. A narrow economic view to answering this question would be to state that the perceived benefits of being a front runner should outweigh the perceived costs of doing so. If there were net benefits, such a policy could be justified. Obviously, this statement calls the question as to what should be understood under 'costs' and 'benefits' of leadership.

Before going into this issue, it is perhaps worthwhile to repeat that other approaches to this question are possible and perhaps justified. One such approach would start by recalling that global warming is caused by increases in the atmospheric stock of CO_2 (and other greenhouse gases). Then, it would be argued that the problem should primarily be solved by countries who have contributed most to this phenomenon — which, of course, are the countries that industrialized early and are richest. As the Community, in fact, belongs to this group it should not shy away from its responsibility and take action. Obviously many other approaches in which some metric for 'acceptable CO_2 emissions' (e.g. tonnes of CO_2 per capita) are used can be envisaged (for a number of examples, see Barrett (1992b)). This shows that, if one broadens the set of considerations which should be taken into account, a front-runner policy that may involve net economic costs, can be rationalized on other than pure economic grounds. In a certain sense, such a policy implies the acceptance of the responsibility of having 'polluted' the atmosphere in the past.

The ultimate test for EC leadership is whether it furthers an international agreement

It should be recalled that the ultimate test for the issue of global leadership — from whatever perspective — is whether it increases the chances of an international agreement on action to counteract man-made climate changes to take place. It is clear that this idea forms the corner-stone of the EC policy towards CO_2. It would obviously be the main benefit of a front-runner policy.

In the remainder of this section benefits and costs of EC leadership are discussed. Finally, an assessment is provided.

9.2. Potential benefits and costs of EC leadership

Benefits

Leadership might prevent strategic behaviour from riddling international negotiations ...

The group of countries that makes the first move contributes to the reduction of global CO_2 emissions. Obviously, however, the main advantage of such policy action is to be found in its effect on the behaviour of other countries.

Due to the (negative) public goods character of global warming it is likely — as discussed in Section 4.1 — that it will not be easy to reach an international agreement to limit CO_2 emissions. One of the main reasons for this is the possibility to 'free ride' and aim at limiting the own contribution. In this situation, an international leader can make clear — by going ahead, whatever the position of others — that it will not try to shy away from its responsibility. Such an approach could, so it is hoped, exert a form of moral persuasion. This, in turn, could limit potential strategic behaviour by others and, thereby, enhance the chances of a successful outcome. Given the importance and the difficulties of reaching an international agreement such an element could play a crucial role in future negotiations.

... and show how a sound and cost-effective policy can be devised

A second somewhat more practical point is that by devising a sound and cost-effective strategy the Community can demonstrate that such a policy framework to reduce CO_2 emissions can be set up in practice without posing serious technical problems and significant economic costs. This demonstration effect might be important as it can further an international agreement by giving a real-life example.

This benefit is potentially of great importance, although it is uncertain

These two arguments state that by going ahead the Community might increase the likelihood of an international agreement to succeed. Obviously, it is very difficult at this stage to predict the exact course of future negotiations and, hence, the impact of the EC stance. Thus, this benefit is potentially of great importance, albeit uncertain.

Important positive side-benefits can be expected in the form of other reduced externalities ...

In addition to the beneficial effects on the likelihood of an international agreement coming about and thus the reduction of global warming, two important side effects should be mentioned on the benefit side.

It is well known that a considerable number of other externalities exist (excluding the greenhouse effect) which are linked to energy use. Acidification is an important example, but there is also an impressive list of transport-related externalities (congestion, accidents, noise, etc.). If a CO_2 limitation strategy raises the price of energy it will also reduce these externalities. Although, probably, other instruments might be more efficient in doing the same in each individual case (e.g. road-pricing schemes to limit congestion are more effective than raising fuel costs), it is unlikely that any one instrument would address so many issues at once.

Thus, although raising the price of energy might only be a second or third best solution to a series of externalities, it would nevertheless bring in considerable environmental side-benefits. This is a very important issue because many of these other externalities are very significant; for example, for transport, several estimates indicate that negative externalities could add up to 5% of GDP in developed economies (OECD (1988)). These externalities consist of (parts of) the cost of road accidents, the loss of working hours due to congestion and diminished air quality. In addition, these externalities are much less uncertain than the greenhouse effect and more is known regarding the underlying mechanisms and, hence, also about the effects of energy price rises.[1]

[1] This is not to say that concerning these externalities everything that can be known is known. In fact, many uncertainties concerning dose-response functions and valuation aspects prevail. Nevertheless, the present state of knowledge is much more developed than information on the greenhouse effect and allows, admittedly tentative, estimates to be made.

... which could compensate significant parts of the costs of the policy

In view of the significance of this aspect, it is surprising that so little up-to-date studies are available which deal with this issue. One of the few exceptions is a Norwegian study (CBS (1990)) which includes estimates of the impact of a CO_2 tax policy (notably a front runner approach!) on local pollution (mainly acidification) and traffic-related externalities. These impacts have been monetarized and can thus be set against the (measured) economic costs of the policy. Table 36 provides an overview of the result.

Table 36

GDP effects and environmental benefits from reduced externalities in a Norwegian CO_2 limitation strategy (1987 prices)

(billion NKR)

	2000	2010	2025
GDP effects (costs)	−15,5	−17,2	−34,3
Reduced externalities (benefits)	12,3	18,2	27,2

Source: CBS (1990).

Admittedly such calculations are merely illustrative as the environmental results are uncertain and as direct comparison with GDP costs is conceptually not straightforward. Nevertheless, it should be clear that the issue of side-benefits is of great importance as these might cover a substantial part of the costs of CO_2 limitation policies. As a result, such policies have the same characteristics as the 'no-regrets' policies described in Chapter 3: they should be undertaken even when abstracting from the risks of global climate change, as their other benefits more or less cover the costs of these policies.

By moving first, the front runner might be in better shape to compete on tomorrow's markets

A second important side-effect of a front-runner position is that energy-efficiency technologies are stimulated and that the structural adjustment following the introduction of policiës will put the economy in a better shape to face a world with high energy prices. This is the 'first-mover advantage' which has been touched upon several times in Chapter 6. For an exploration of the interactions between energy prices, innovative activities and expansion of market shares, see Gerstenberger (1992). If, eventually, more countries introduce CO_2 reduction policies, an important market in energy-efficiency equipment might arise on which EC producers would be particularly well placed.[1] Of course, the potential gains of moving first are higher, the more countries eventually follow and the longer it takes these countries to adjust their economies.

Costs

Conceptually, the costs of being a front runner can be distinguished in microeconomic efficiency costs and macroeconomic costs

There are two ways of assessing the costs of a front-runner policy. First, the question can be asked whether the emission reduction is achieved in an efficient manner. If not, the extra costs can be considered as constituting a reduction of the potential welfare gain of introducing efficient environmental policies. It is worthwhile to think of these 'microeconomic' costs in terms of the 'bottom-up' approach discussed in Chapter 3. Secondly, the macroeconomic effects of coordinated action can be compared with those of a front-runner policy. These effects take account of the interactions on the macroeconomic level and are expressed in terms of variables such as GDP. Conceptually, both types of costs are different, but each tell part of the story.

The efficiency losses of being a front runner are inherent to the policy and basically arise because low-cost options abroad can not be exploited

If instruments other than no-regret policies are used to reduce CO_2 emissions in the Community, the costs per tonne of carbon avoided will be higher than if low cost options in non-EC countries could have been exploited.[2] As the costs of emission reduction rise with the amount of reduction undertaken, the costs of emission reduction in the Community will be higher than elsewhere. This argument is similar to that addressed to target sharing (without trading) in Chapter 3: there is no provision to equalize marginal costs across all potential sources which leads to an unnecessarily costly outcome. As is the case with target sharing, a theoretical solution to this issue could be found by providing trading possibilities. However, because this would mean trading with non-EC agents who are not subject to environmental policies, the ensuing monitoring problems would make the implementation of this possibility very difficult.[3] Obviously this aspect loses some of its importance, if, as others join, the CO_2 target is greatly expanded which increases the average marginal cost everywhere.

An economic-efficiency cost of being a front runner that, perhaps, carries more weight is that CO_2 emissions suppressed within the own territory might be substituted by those from extra-EC activities. This so-called 'carbon leakage' would be the case if relocations of energy-intensive elements of industries or expansion of their output abroad took place. Also, effects of domestic action on world energy prices have to be reckoned with. As the ensuing costs of reducing domestic emissions do not lead to an equiproportional reduction of total emissions, part of these costs constitute a welfare loss.[4]

No quantitative estimate of these costs are available

No quantitative estimates of these costs are available, which makes it difficult to assess their significance. For the macroeconomic costs the situation is quite different.

The macroeconomic costs of a front-runner policy are often thought to be substantially larger than of concerted action ...

It is often thought that the macroeconomic costs to the Community of a front-runner policy are significantly higher than those of coordinated action because the introduction of new taxes will lead to a severe loss in competitiveness. The loss in competitiveness would then lead to a strong drop in net exports and in GDP.

1 Not only the market for energy-efficiency equipment is of interest in this respect. In general the competitive position of sectors producing equipment that requires substantial energy use is strengthened.

2 As global warming has no 'hotspot' characteristics, it does not matter whether a tonne of CO_2 emissions is saved in the Community or outside the Community.

3 An example would be tax exemptions for electricity-generating plants in the Community that save CO_2 emissions in the East European power sector by investing in energy-efficiency measures. As technologies in the latter sector are by West European standards very inefficient (Grubb (1990)) the costs per tonne of CO_2 saved in the East would be significantly lower than in the West. However, solving the problem of monitoring these measures does not seem simple, especially if one realizes that there is a multitude of possibilities for extra-EC energy-saving investments.

4 Unfortunately, estimates of such carbon leakages differ widely. Simulations with the Edmonds and Reilly model (CBO (1990)) suggest that they might be limited if the USA would embark on unilateral action (approximately 10%). This assessment is confirmed by recent simulations with the OECD Secretariat's Green model, simulating both an EC-only and OECD-only policy, respectively. On the other hand, calculations by Pezzey (1991) on the Whalley-Wiggle model suggest that these losses might be much higher than 50%.

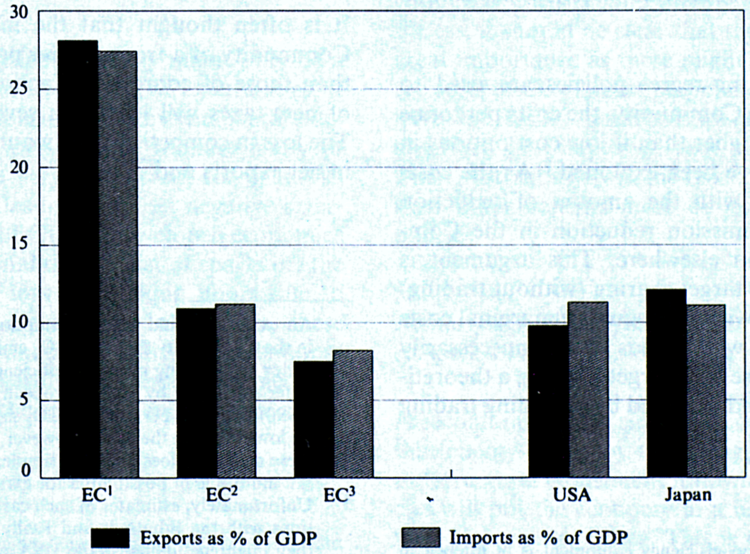
A number of model simulations show, however, that this is not likely to be the case (see Burniaux, et al. (1992); Standaert (1992); and the box on the Quest results in Chapter 3), for two reasons:

First, EC countries mainly trade among themselves and with other European countries, making them a little sensitive as to whether extra-EC countries take action or not. The first reason for this is that extra-EC exports play only a limited role in total exports of EC countries (exports to the USA and Japan form only 10% of total exports). Graph 57 provides further information on this issue and compares the Community with the USA and Japan. Generally, the EC as a whole has a share of external trade in GDP which is similar to those of its main trading partners. This means that the influence of developments on foreign markets is only of limited significance to the EC's economy. If other countries do not introduce a CO_2 tax, the results need not be strongly more negative than in the case of concerted action as the channel via which the influence works is relatively narrow. The graph also shows that as other European countries, (notably EFTA countries) are either considering the introduction of carbon taxes or have already done so, the potential loss of competitiveness implied by the introduction of a carbon/energy tax in the Community would only occur with respect to a very limited part of total sales.

Second, the aggregate demand effect largely compensates the competitiveness issue. The simple 'loss of competitiveness argument' cited above is in itself biased and incomplete. Exports are in general influenced by a number of factors of which price competitiveness and aggregate foreign demand are of particular relevance in this case. It is worthwhile inspecting both variables closely.

Aggregate competitiveness is not only influenced by the carbon/energy tax but also by the tax revenue use and by the indirect macroeconomic effects (e.g. wage price dynam-

GRAPH 57: The openness of the major OECD economies, 1990



1 Including intra-Community trade.
2 Excluding intra-Community trade.
3 Excluding intra-Community trade and trade with EFTA.
Source: Commission services.

ics).[1] The former tends to strengthen price competitiveness (if it results in lower production costs), the latter has a negative influence. All in all, however, in most model simulations a moderate loss in aggregate price competitiveness does seem to appear. This loss, however, is a function of three influences: the tax, the revenue use and the indirect macroeconomic effects.

The volume of exports does not exclusively depend on competitiveness but is also determined by the volume of aggregate demand abroad. The latter aspect is more favourable in the case of a front-runner policy than in the case of concerted action, as extra EC-countries do not introduce the CO_2/energy tax and consequently do not suffer any reduction in economic activity. Hence, EC countries are not faced with somewhat lower import demand on extra-EC markets.

As the effects on competitiveness and on demand work in the opposite direction when comparing the concerted action case with the leadership case, the net influence on extra-EC exports is uncertain but probably small. It certainly does not depend exclusively on the direct influence of the tax on competitiveness.

Both arguments explain why the differences between the two policy cases are very small. Table 37 provides a numerical summary of this conclusion.

A front-runner policy differs from the isolated EC action case in that eventually other countries follow

It can be argued that the comparison between an isolated action scenario strategy and a concerted action does not tell the full story of the consequences of the Community strategy. The strategy may imply that the Community is a front runner for some time but, of course, it is intended that other countries eventually also introduce similar policies. Thus,

Table 37

Differences between the long-term effects of coordinated policy and EC go-it-alone strategy in two model simulations

	Quest[1]		Green[2]	
	OECD-wide[3]	EC only	OECD-wide	EC only
Impact on the Community[4]				
GDP effect	0,0	0,0	−1,0	−1,1
Household real income	n.a.	n.a.	−1,3	−1,1

[1] Simulation of a USD 10 barrel tax (see box in Chapter 3).
[2] Toronto-type agreement in which emissions are restricted to 80% of their 1990 levels by 2010 and stabilized thereafter (this corresponds roughly to an average tax rate of USD 24 in the OECD case and a USD 23 tax rate for the EC-only policy. For details see Burniaux et al. (1992).
[3] USA + EC + Japan.
[4] In percentage change compared to the reference case.
Source: Burniaux et al. (1992) and Commission services.

the front runner scenario analytically consists at first of isolated action characteristics which, after some time, are supplemented by elements from the concerted action scenario. To what extent does this change the picture sketched above?

Once this happens, the front runner having completed the structural adjustment will probably be in a better position than those embarking on concerted action

Obviously, also in this scenario, the effect of the relative closeness of the EC economy is of importance and limits the impact of policies pursued by others. As long as the Community is the front runner, the picture evidently is identical to the isolated action scenario presented above. In addition to the costs of the structural adaptation in the Community resulting from the tax policy, there could be a small loss on extra-EC markets due to a net loss in price competitiveness (not to a reduction in demand).

Then, as other countries start pursuing similar policies two effects occur: the (relative) price competitiveness of the Community improves (as prices of others go up), but, as a result of the income effect, world demand may be reduced. The net effect is uncertain.

However, it should be stated that the front runner has now an advantage: the structural adjustment of production and consumption structures to a high energy price regime has been completed which enhances its competitiveness on the foreign markets and could lead to a better economic performance. Thus, the final improvement of the price competitiveness is likely to be larger than the initial deterioration.

[1] Note that, as the Community is only a very limited exporter of energy, the stronger decline of demand for energy products in the case of coordinated action hardly contributes to the difference between this case and the front-runner scenario.
In both scenarios world energy prices are assumed to be unaffected. Obviously, as discussed in Chapter 5, the development of pre-tax energy prices could differ significantly among the scenarios: as the potential drop in oil producer prices would be stronger in the case of concerted action, the terms of trade effect in such a situation would be more favourable than in the alternative case. This effect is potentially of some significance as energy imports are still substantial in the Community. Nevertheless, this impact should not be overrated as imported oil per unit of GDP is now approximately 55% smaller than 20 years ago (for a discussion of the effect of developments of oil prices on the Community's economy, see CEC (1990)).

This is different from the concerted action case where countries are all in the same position. Obviously, the issue is closely linked to the first-mover advantage, which — if important — could enhance the performance on the foreign markets even more significantly.

This means that, provided others follow, there might even be a macroeconomic benefit of front-runner policies compared to the concerted action case

Thus when reviewing the macroeconomic costs of EC front-runner action, it can be stated that, if similar policies are subsequently followed by others, it is likely that these will be smaller than in the case of concerted action. Compared to the other countries the front runner might have a macroeconomic advantage.

9.3. Conclusions

Given the potential benefits of furthering an international agreement, in light of the substantial side-benefits to be expected ...

If the global warming problem is to be solved, it is likely that, in view of the high share in actual and the even higher share in cumulative emissions and against the background of its advanced stage of development, the developed countries will have to take steps first. Such steps could demonstrate the sincerity of these countries to undertake action, while proving that efficient and equitable policies can be devised. Both factors might persuade other countries and especially, in time, the LDCs — who are essential to the solution of the problem — to follow the lead given. It should be stated that, whereas this benefit is uncertain it nevertheless can make a major contribution to reaching a global solution. If the front runner goes ahead and others do not follow, economic losses will occur even if they will be — partly — compensated by other environmental side benefits.

... and the small relative macroeconomic costs of being a front runner, ...

Given the uncertainty, it is of utmost importance to focus on the costs of leadership. Whereas, more or less inherent to the concept of leadership, some efficiency costs in reaching CO_2 reductions seem to be inevitable (basically because least-cost options outside the Community cannot be tapped), it turns out that the extra macroeconomic costs of this policy *vis-a-vis* concerted action are probably very small for the Community.

... such a policy could be attractive

Making the transition to an economy which operates under a regime of high energy prices before the others do so might give the Community a strategic competitive advantage on markets where energy-efficiency characteristics are important. Leadership can provide a double dividend: it fosters an international solution to the greenhouse problem and allows the transition to a less energy-intensive economy to be better timed.

10. The integration of LDCs and East European countries in efforts to slow down climate change

10.1. The need to integrate LDCs and East European countries in CO_2 abatement

The largest growth potential of future CO_2 emissions lies in developing countries and, to a smaller extent, also in East European countries

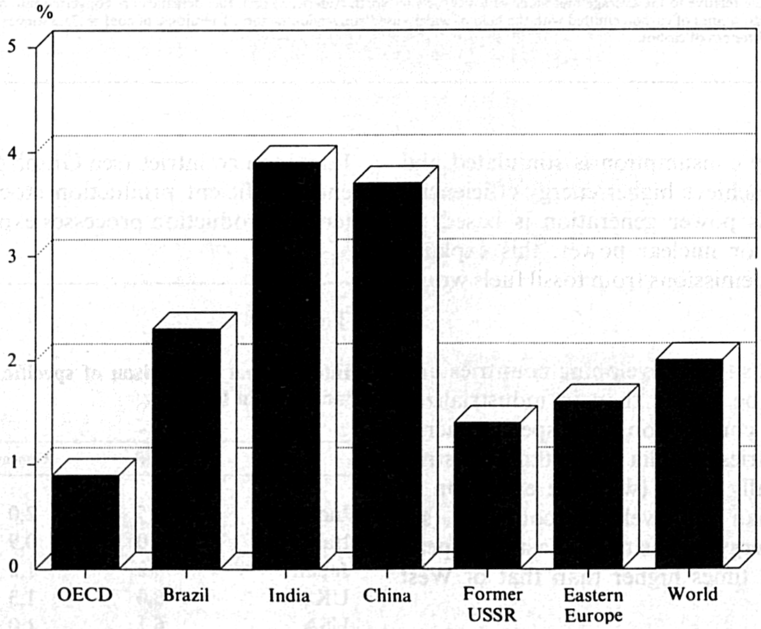
In Chapter 8, it has been shown that the share of OECD countries in global cumulative CO_2 emissions over the period 1990 to 2050 is likely to decrease drastically in relation to the share of emissions of developing and East European countries (see Graph 56). The rising importance of developing countries and, although to a smaller extent, East European countries for the evolution of future global CO_2 emissions is clearly demonstrated by the figures on the annual average CO_2 emission growth rates[1] which form the basis of the data in Graph 56. Graph 58 makes it clear that the CO_2 presented emission growth potential in developing countries in the next 60 years is significantly higher than in OECD countries (3,7% in China, and 3,9% in India against 0,9% in the OECD).

A number of similarities characterize the situation in developing countries and Eastern Europe with respect to this growing CO_2 emission potential ...

Many factors which explain the emergence of this CO_2 emission growth potential and characterize the specific conditions under which CO_2 abatement would have to be undertaken are quite similar in these two country groups. Among the similarities, the factors explaining the strong CO_2 emission potential concern mainly specific characteristics of the

[1] These figures have been generated with the Green model (see OECD, 1992) in a 'business as usual' scenario which reflects a CO_2 emission growth path in the absence of policy actions to restrain their growth.

GRAPH 58: **Future CO_2 emissions by world region — Annual average growth rates, 1990-2050**



[1] Baseline path of Green model.

Source: OECD (1992).

energy sector or the energy use in the economy. Similar CO_2 abatement conditions are related to the level of abatement cost, the level of economic development and, closely associated to that, the lack of financial resources and of the technology to carry out investment in CO_2 abatement.

Specific characteristics of the energy sector in both developing and East European countries support the expectation that the future growth potential in CO_2 emissions will be particularly large in these countries. Energy products are often subsidized to keep energy prices low in order to stimulate economic development. A World Bank report reveals that average electricity tariffs in the developing world are half those in the industrialized countries. Electricity is generally provided below cost; the average electricity tariff in developing countries is about 60% of the marginal provision cost (*The Economist* (1991)).

Prices of fossil fuels in large developing and East European countries are also very low. In the former USSR, relative prices for all fossil fuels, gas, oil and coal, for a long time have been not more than one-quarter the level of average energy prices in the USA due to a high degree of subsidization (see Table 38). In China, the price of the abundantly available fossil fuel coal is only one-fifth of the average US energy price. Admittedly, relative energy prices could change in East European economies in transition towards a free market system in the sense that the prices will reflect more truly generation costs.

Table 38

Relative fossil fuel prices,[1] 1985 (Average price in North America = 100)

	USA	Japan	EC	Energy exporting LDCs	China	USSR	India	Total world
Coal	36,0	128,6	70,0	31,7	21,1	25,3	28,6	37,5
Crude oil	148,5	185,2	173,4	106,4	158,2	24,6	114,7	121,0
Gas	94,2	170,2	147,7	116,4	108,7	17,3	78,5	76,3
Average	100,0	167,4	138,9	98,1	48,3	22,2	54,8	88,5

[1] Defined as the unit value of one terajoule relative to the average unit value of fossil fuels in North America. Fossil fuel demands are converted into a common energy unit (1 terajoule = 100^{12} joules): this facilitates the conversion into tonnes of carbon emitted with the help of widely-used conversion factors: 1 terajoule of coal = 23,3 tonnes of carbon, 1 terajoule of oil = 19,2 tonnes of carbon and 1 terajoule of gas = 13,7 tonnes of carbon.

Source: Burniaux et al. (1992).

At these low prices, energy consumption is stimulated and no incentives are given to achieve higher energy efficiencies in the future. Thus, unless power generation is based on renewable energy sources or nuclear power, this explains why, per unit of GDP, CO_2 emissions from fossil fuels would have the tendency to rise.[1]

The industrial energy intensity in developing countries and Eastern Europe tends to be higher than in industrialized countries. An international comparison of the specific energy consumption in four industries in India shows that industrial energy efficiency is generally lower (with the exception of the fertilizer industry) than in developed countries (see Table 39). The overall energy intensity of East European economies is almost three times higher than that of West European countries (see Graph 59). An out-dated and little energy-efficient production stock and relatively energy-intensive production processes explain this phenomenon.

Table 39

International comparison of specific energy consumption in certain industries in India

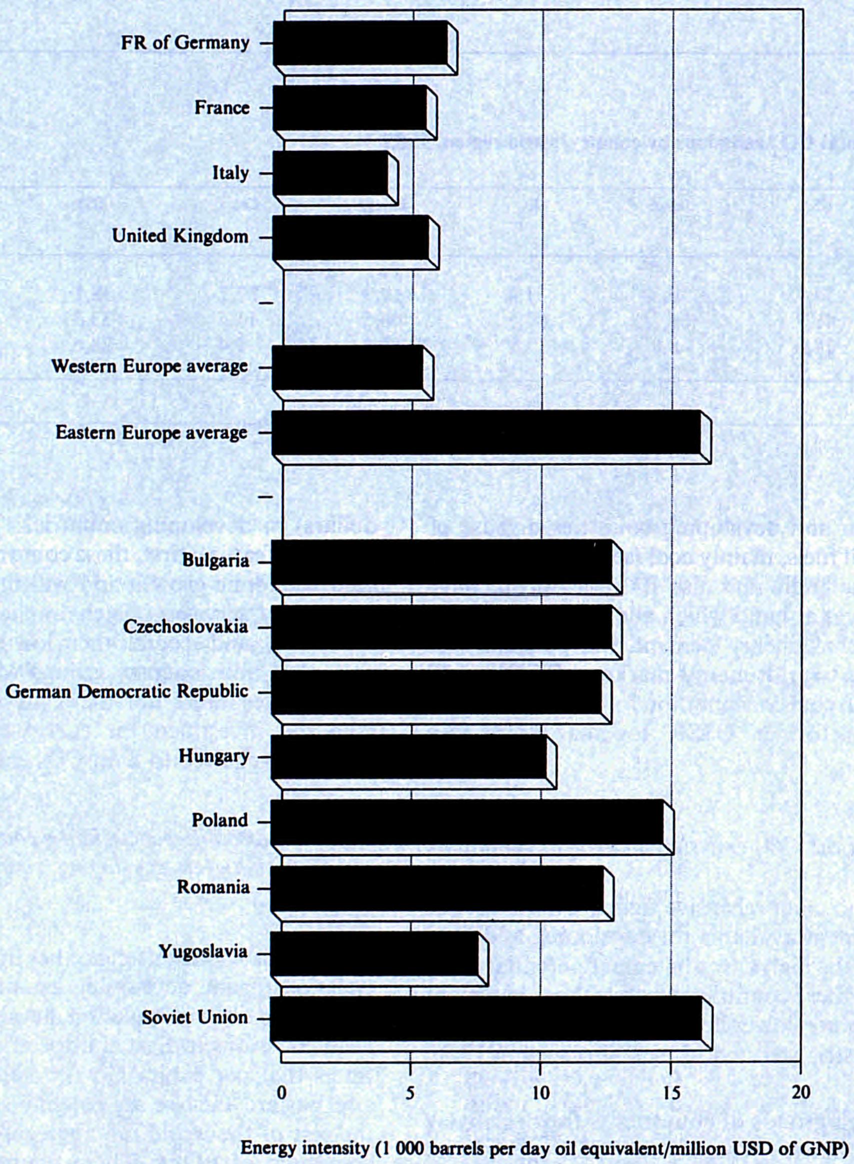
(million kcal/t)

Country	Steel	Cement	Paper	Fertilizer
India	9,5	2,0	11,1	11,2
Italy	4,0	0,9	—	9,9
Japan	4,2	1,2	—	—
UK	6,0	1,3	7,6	12,2
USA	6,1	1,0	9,7	11,3

Source: Shunker et al. (1992).

[1] It seems, however, to be questionable whether LDCs and East European countries will be able financially to sustain a heavy subsidization of energy prices in the long term.

GRAPH 59: Energy intensity in Eastern Europe, 1988 (a comparison with Western Europe)



Source: Plan Econ (1990).

The high carbon intensity of current energy use in Eastern Europe and Third World countries is a further factor explaining the potentially high future CO_2 emissions generated in these countries. Table 40 shows that China and India, major developing countries, rely heavily on carbon-intensive coal, 87 and 75% respectively of their CO_2 emissions stem from the combustion of coal. In the former USSR also, coal is the most important CO_2-generating fuel in electricity generation, although the environmentally more benign and less CO_2-generating natural gas has also a big share in the energy consumption mix and provides by its availability the opportunity for a future less carbon-intensive fuel mix in this country.

Table 40

Share of fossil fuels in total CO_2 emissions by country/world region, 1985

(%)

	USA	Japan	EC	Energy exporting LDCs	China	USSR	India	Total world
Coal	34,7	30,3	31,4	19,9	87,2	38,1	74,6	42,1
Crude oil	46,7	61,7	53,5	66,5	11,4	33,3	24,0	42,3
Gas	18,6	8,0	15,1	13,6	1,4	28,6	1,4	15,6

Source: Burniaux et al. (1992).

Some East European and developing countries dispose of huge reserves of fossil fuels, mainly coal (see Graph 60). The former USSR, China, India and also Eastern Europe have important coal reserves at hand which allow these countries to satisfy their internal energy demand independently of supply conditions on world energy markets. China could meet its present (1990) coal consumption for roughly another 180 years and, the former USSR for 480 years (see Graph 61).

... and with respect to the CO_2 emission abatement conditions

Although there are no comprehensive figures on the cost of CO_2 emission abatement available for developing and East European countries, the high CO_2 abatement potential (high energy intensities) in these countries suggests that abatement cost could be significantly lower in both country groups than in the Western industrialized world (see also section 10.2).

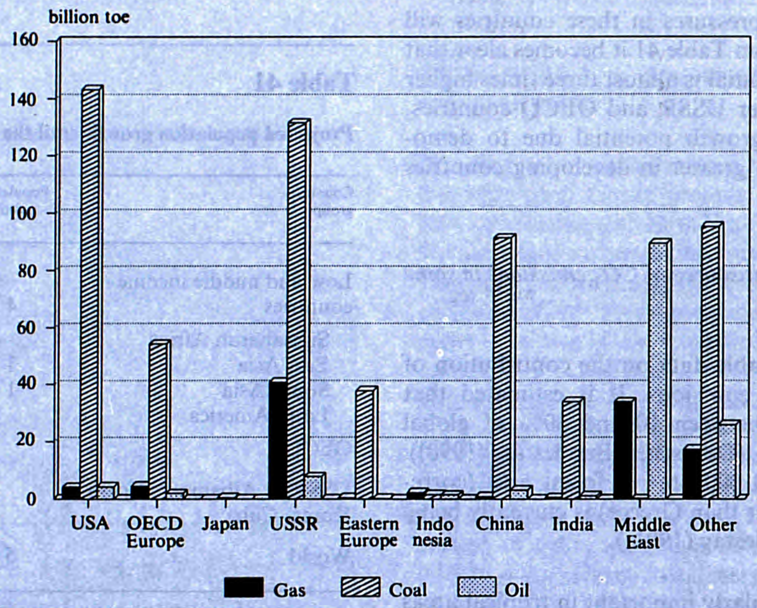
Also common to both groups of countries is their relatively low level of development. Whereas the GDP per capita in OECD countries in 1989 was 10 104 dollars[1] the same indicator of economic development reached only 56% of that value (5 628 dollars) in Eastern Europe and 28% (2 796 dollars) in developing countries. Two consequences result from this feature: first, these countries will want to accelerate their economic growth and will therefore have rising needs for energy services (which implies potentially rising CO_2 emissions); and second, their low level of development suggests that both country groups will have neither sufficient financial resources nor the technology necessary to undertake the investment in energy-efficiency projects which would be required to limit CO_2 emissions significantly.

There are also differences in the characteristics related to CO_2 emissions between developing countries and East European countries

The most obvious difference lies in the fact that current CO_2 emissions from developing countries are rather small in relation to their population number if compared with per head emissions in East European countries. Graph 62 illustrates that per capita CO_2 emissions in the former USSR and Eastern Europe are roughly seven times higher than in the rest of the world, an aggregate which is predominantly composed of LDCs. These figures underline the potential and consequently increasing demand for energy services and the significance of possible rising wealth in the process of economic development for the future growth pattern of CO_2 emissions. As it became evident earlier, developing countries are currently not responsible for the major part of global CO_2 emissions but if per capita CO_2 emissions in LDCs

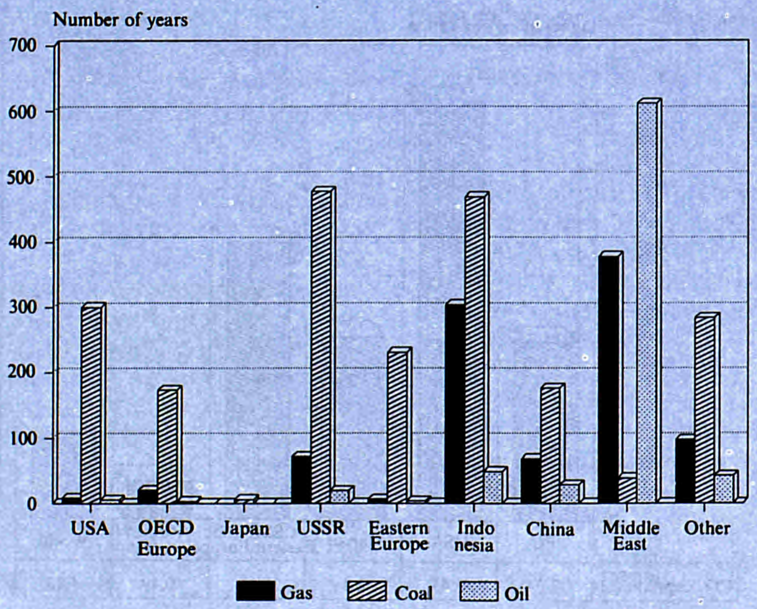
[1] 'International dollars' of 1980, see World Bank (1991).

GRAPH 60: Reserves of fossil fuels at the end of 1990



Source: BP statistical review of world energy, June 1991.

GRAPH 61: Reserves/consumption ratios of fossil fuels, 1990



Source: BP statistical review of world energy, June 1991.

approach 'normal' levels of Western industrialized countries their share will become very prominent.

Foreseeable demographic pressures in these countries will still enhance this effect. From Table 41 it becomes clear that the population growth potential is almost three times higher in LDCs than in the former USSR and OECD countries. Thus, the CO_2 emission growth potential due to demographic dynamism is much greater in developing countries than in Eastern Europe.

Deforestation is an important source of CO_2 emissions in some developing countries

It is difficult to obtain reliable data on the contribution of deforestation to net CO_2 emissions. It is estimated that deforestation contributes between 10 and 30% of global man-made CO_2 emissions (Deutscher Bundestag (1990)). Each year, 160 000 to 200 000 km^2 of forest area (corresponding to a surface larger than Greece) is currently being destroyed (Deutscher Bundestag (1991)).

Net deforestation is particularly important in tropical areas of South America, Asia and Africa (see Table 42). In some tropical countries, deforestation involves CO_2 emissions which are several times higher than CO_2 emissions from fossil-fuel combustion. In Brazil, for example, the amount

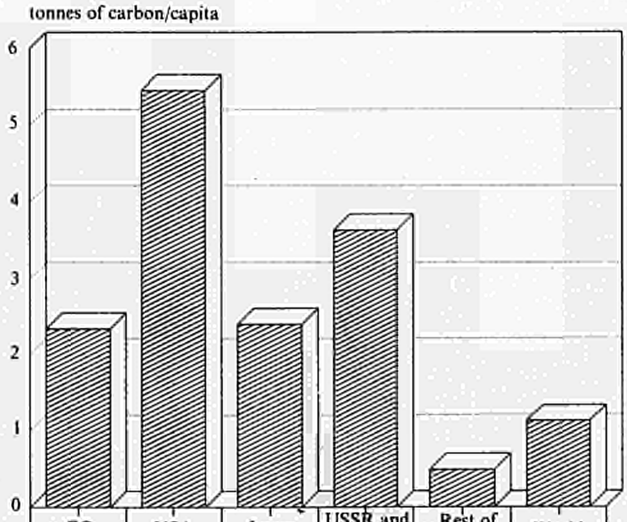
Table 41

Projected population growth until the year 2000

Country group	Population 1990 (million)	Average annual growth 1990-2000 (%)
Low and middle income countries	4 138	1,9
Subsaharan Africa	496	3,2
East Asia	1 580	1,4
South Asia	1 156	1,9
Latin America	430	1,8
OECD	776	0,5
USSR, Albania, North Korea, Cuba	324	0,7
World	5 298	1,6

Source: World Bank (1991), World Development Report.

GRAPH 62: **Per capita emissions of CO_2 by world regions 1989**



	EC	USA	Japan	USSR and Eastern Europe	Rest of world	World
CO_2/capita	2,34	5,45	2,4	3,63	0,49	1,13

Source: EC Commission (1991).

of carbon released into the atmosphere by deforestation is six times greater than the amount generated by fossil-fuel combustion (see Flavin (1989)).

Table 42

Deforestation and reafforestation in the world in the 1980s

Region	Average annual deforestation 1980s		Average annual reafforestation 1990s
	Extent (1 000 ha)	Percentage of existing forests	Extent (1 000 ha)
Africa	3 822	0,6	355
North and Central America	1 251	0,1	2 552
South Amercia	11 189	1,3	760
Asia	4 405	0,9	5 708
Oceania	26	0,0	117

Source: World Resources Institute (1990).

Policy priorities should differ over time

The facts laid out above made it clear that there is an important number of similarities between LDCs and East European countries with respect to the factors which determine future CO_2 emission growth potential and to the economic conditions in which CO_2 abatement would have to take place. Both groups of countries differ, however, in some respects. These features suggest that the priority attached to initiatives supported by the Community, and also by other developed countries could vary over time.

In the short-run, the ongoing transition in East European countries offers a good opportunity for the Community to steer and support CO_2 abatement efforts there. Private investment of Western companies and existing or future public support programmes could contribute to the set-up of a more energy-efficient capital stock in East European economies. In the long-run, present LDCs will determine our climate. Thus, targeted action today in these countries can have a large impact on the growth path of future CO_2 emissions.

In the following, a cost-effective approach to CO_2 emission abatement in LDCs and East European countries as well as the mechanisms which could be used in its implementation will be discussed for both country groups jointly. In fact, the presented approach as well as the mechanisms can be applied to both groups equally.

10.2. A cost-effective approach to CO_2 emission abatement in LDCs and East European countries

The exploitation of international differences in CO_2 emission abatement cost ...

The discussion in the previous section has clearly shown that it is very important to provide an answer to the question of how developing and East European countries could receive the necessary economic incentives to participate in efforts to slow down climate change. Such incentives could be easily provided, if existing international differences of CO_2 abatement cost would be exploited. Estimates of the cost of modestly reducing energy related CO_2 emissions (between 0 and 10%) in EC countries indicate an order of magnitude of between ECU 50 and 150 per tonne of carbon abated (Coherence, 1991). If, for instance, carbon absorption from the atmosphere through reafforestation programmes in tropical countries costs between ECU 5 and 40 per tonne of carbon stored in trees[1] (see Shunker, Salles and Rios-Velilla (1992)), a significant cost difference would exist. These international CO_2 abatement cost differences point the way towards exploiting potentials of CO_2 emission reduction in an economically viable way. It would thus be cost effective for industrialized countries to support abatement in developing countries.

... could lead to the necessary transfer of technology and financial resources to LDCs and East European countries

The issues of technology transfer and financial assistance to Third World and East European countries are thus major elements of an appropriate strategy which integrates these countries into a global approach to limit global warming. The issue at stake is to allow LDCs and East European countries to develop without passing by stages of development which are characterized by high energy intensities as this was the case in industrialized countries. The aim of developed countries should be to support an energy efficient growth in LDCs.

In the strive for reducing CO_2 emissions, LDCs and East European countries as well have an interest in ensuring that policy measures are taken in a least-cost way. Notably 'no-

1 It should, however, be underlined that the reafforestation cost figures represent only the pure engineering cost, they do not take into account possible institutional problems which afforestation programmes can encounter. For instance, in dry regions relatively free from forest cover, saplings have often little chance of growing into mature trees since they are either used as firewood or eaten by herds belonging to nomads.

regrets' policies, which are justified for reasons other than CO_2 emission abatement, like economically viable energy-efficiency improvements or a reduction of local/regional atmospheric pollution stemming from the combustion of fossil fuels, should be favoured in the first place. Furthermore, it is in the economic interest of developing and East European countries to make sure that the micro- and macro-economic conditions are appropriate to carrying energy improvement projects to a successful end. It is very important to eliminate existing market related institutional and legal barriers to the exploitation of economically viable potentials of energy efficiency improvements. Energy price subsidies, in particular, have to be mentioned in this context. However, OECD countries will also gain from such policies.

Two economic arguments other than the cost/effectiveness of a global CO_2 policy suggest that a transfer of technology and financial resources to the developing world can be in the broad economic interest of the developed world. The first is of a general nature stating that an economically healthy developing world is an increasingly important component of a healthy world economy which is of interest to all countries (consider the global debt problem). The second argument follows from the first: some forms of resource transfer represent assured export markets which contribute to ensure fuller employment in industrialized countries (see Grubb (1989)).

Thus, such resource transfers seem to be economically promising measures to abate CO_2 emissions as the present energy use in LDCs and East European countries is much less efficient than in industrialized countries; mechanisms which allow the enhancing of the energy efficiency in developing countries by exploiting international cost differences should therefore be considered more closely.

10.3. Improving energy efficiency in LDCs and Eastern Europe

There is a great potential for improvements of energy efficiency in LDCs and Eastern Europe

It is particularly promising to analyse the energy use in developing countries in order to locate CO_2 emission abatement potentials, as present energy use in these countries is considerably less efficient than in industrialized countries. Transmission and distribution losses in electricity generation are estimated to be twice as high as for OECD countries, energy efficiency in industrial processes is sometimes only half the rate as in developing countries (see, for example, Lawrence Berkeley Laboratory (1989)).

Energy efficiency must be understood as a measure of the relationship between the usefulness of services supplied to end-users and the consumption of primary energy. This implies that energy management improvements involve taking action at all levels of the energy transformation chain: processing primary energy, supplying it to the consumer and converting it into useful energy (e.g. through a motor) in order to provide the final energy service whose energy efficiency depends also on the energy consumption behaviour of the consumer.

In fact, it is the total cost of supplying an energy service which must be minimized. A comprehensive energy management policy therefore consists of taking action in respect of each component of the system, identifying the one which offers the greatest possibilities for cost-effective improvements.

An illustrative assessment, in quantitative terms, of the hypothetical energy reduction potential represented by bringing energy efficiency in the countries of Eastern Europe and the Third World into line with the average of the Community suggests an emission saving in the order of 1,9 to 2 billion tonnes of carbon annually, which corresponds to around 30% of global energy-related CO_2 emissions (Shunker, Salles and Rios-Velilla (1992)).

There are important energy-efficiency potentials to be exploited in power generation ...

A comprehensive assessment of the energy-efficiency potential which is currently technically and economically exploitable in LDCs and East European countries is unfortunately not available. However, research in possibilities to improve efficiency has been carried out in these countries on behalf of international organizations and national planning institutions on a case-study basis.

For example, in India, coal-fired power stations have a low operation time availability. Coupled with relatively high transmission and distribution losses as well as a low efficiency of user equipment, this points to a considerable potential for energy savings. In fact, calculations of Moulik and Shukla (1990) indicate that even moderate improvements, a 7% increase in the power station's operating time combined with a 10% reduction in transmission and distribution losses and a 10% improvement in the efficiency of user equipment, would enable a reduction of primary energy requirements by 30%.

In the former Soviet Union, the introduction of the most efficient technologies available (e.g. heat and power cogeneration, high-pressure steam turbines) in power generation would lead to a cut of primary energy demand by a third over the next 20 years (Chandler et al. (1990)).

... and in end-user equipment

A similar potential for energy-efficiency improvements in developing and East European countries lies in end-user equipment as the following examples will indicate.

In Eastern Europe, 25 to 50 times more energy per m^2 is consumed for heating purposes than in the USA. This enormous inefficiency is due to deficiencies in the control systems. The absence of control and regulation systems in heating installations leads users to regulate the room temperature by opening windows (Chandler et al. (1990)).

Similarly, energy-related development projects of the UN in Egypt have shown that existing energy-saving potentials can be exploited economically through investments in more energy-efficient capital stock with short pay-back periods. An energy audit in a glass and crystal company demonstrated, for example, that 50% of the energy was wasted through thermal losses. The installation of a heat exchange, optimizing and introducing automatic control of temperature and air intake/pressure to improve combustion efficiency as well as improving heat insulation around the boiler and pipe-work, resulted in a 55% reduction in specific energy consumption (Selim (1990)).

A massive potential for future CO_2 emission reduction in LDCs and East European countries lies in the individual transport sector. Average car fuel efficiency in these countries is rather low as the technology of domestically produced cars is on the level of the 1960s or often second-hand cars are imported which do not correspond to the current fuel efficiency standards in industrialized countries. The level of private car ownership is still relatively low, with one vehicle for every 1 000 inhabitants in China and one for every 20 inhabitants in the former Soviet Union, compared with one for every 1,7 inhabitants in the USA (Chandler et al. (1990)), This unbalanced distribution of cars throughout the world illustrates where future energy-efficiency potentials in end-user equipment lie when economic development leads to higher demand for individual transport in developing and East European countries.

A certain number of obstacles impede the implementation of efficient energy management policies

A variety of reasons explain why investors in developing countries do not take action in improving energy management which offers a higher internal rate of return than traditional industrial activity. They are often similar to the barriers encountered in industrialized countries:

(i) Industrialists are not always aware of the potential profitability of projects and do not have access to the relevant information. High start-up costs are often a major obstacle for investment. The energy audits, the analysis of possible technical solutions and the project financing necessitate costly investment by small and medium-sized firms in the acquisition of information on the various possible techniques and financing arrangements.

(ii) Power-generating companies, mostly State monopolies, determine energy policy and have little or no incentives to enforce energy savings as their primary task is to sell energy, not energy services. There are very few energy management agencies in developing countries and those which do exist generally lack the necessary financial, political and organizational support. Means and infrastructure available for research into the various stages of the energy cycle are thus scanty.

(iii) Insufficient institutional conditions such as a lack of energy technology knowledge in public administrations which have to coordinate energy-efficiency programmes and missing local energy research institutes, make the implementation of energy management policies often impossible.

(iv) Access to credit has only recently become easier for investment in energy management projects. Financial institutions adapt slowly lending criteria in measuring the profitability of these investments in terms of costs saved and not in terms of an additional flow of funds.

(v) Subsidization of energy prices often diminishes the private profitability of energy management investment.

Some of these obstacles can be removed, for instance, by measures to provide information and increase awareness or by supporting energy research. Sound microeconomic policies, for example, a policy which 'gets the energy prices right' or fiscal incentives for energy-efficiency programmes, will contribute to provide the economic incentives for such investments. But, in many cases, only more targeted measures can eliminate market imperfections and create market conditions appropriate to sustain the exploitation of economically viable energy saving potentials and thus reduce CO_2 emissions. A number of innovative mechanisms to reach this aim will be discussed in the following section.

10.4. Innovative mechanisms of resource transfer to LDCs and East European countries to exploit CO_2 emission abatement potentials

Once the potentials for CO_2 emission abatement, which can be exploited more cost-effectively in countries of the South or the East than in Western industrialized countries have been localized, the question arises of how to fund such projects and how to make sure that the transfer of know-how is put to positive effect. Such transfers of resources can be conceived and undertaken either in the framework of an international (or bilateral) convention for the reduction of CO_2 emissions or on the basis of transactions of individual economic agents who follow their specific economic interest.

Technology transfer consists not only in providing the hardware but also the necessary know-how, together with production, marketing, distribution and management methods. Equally important, especially in the context of developing countries without well established education and training systems, is the training which allows the proper use of the technology transferred and encourages the development of new, indigenous technology while taking local conditions into account (Shunker, 1990). Closely related to the technology transfer is, of course, the mobilization of financial resources.

Principally, the resources mobilized for environmental aims can be used in two ways: either by choosing projects which mainly pursue ecological aims or by taking account of the environmental aspect when determining whether a project is eligible on economic grounds. The first alternative generally implies more or less immediate restrictions as the field of application of the projects is often restrained to the establishment of nature reserves, research or training institutes, etc.

In the following, some mechanisms which could ensure the resource transfer mentioned in the above defined conditions between industrialized and developing countries in the South and East are discussed. They are, on the one hand, oriented towards a macroeconomic approach (the Global Environment Fund and debt-for-nature swaps), and on the other hand, based on microeconomic interests (third-party financing) and the build—own—operate—transfer schemes.

Providing environmentally conditioned large-scale funds

The Global Environment Facility (GEF)

The GEF, set up by the IMF and World Bank Development Committee has been operational since mid-1991. It is a pilot programme designed for a three-year period, whose objective is to provide resources to help finance programmes and projects affecting the global environment, and to do so in a manner that explores how developing countries can deal pragmatically with these issues, at low cost, and without impeding development (see IMF and World Bank (1991)). The GEF covers projects in four areas of activity: protection of the ozone layer, limitation of greenhouse gas emissions (energy-efficiency, reafforestation and forest conservation, new and renewable sources of energy), protection of biodiversity and international waters. The Fund's resources (USD 1,5 billion) are distributed to projects which are not sufficiently viable without concessionary GEF aid.

Experience with the pilot project to date shows, however, that the GEF suffers from some shortcomings:

(i) Clearly-defined selection criteria for the choice of eligible projects (like cost/benefit analysis, cost-effectiveness analysis) have not yet emerged. Current arrangements are limited mainly to an environmental impact assessment and to considerations on the choice of suitable technology.

(ii) Only projects representing a minor fraction of the available USD 1,5 billion have been considered eligible; in the first tranche, only 14% of the total amount has been called in. This can be interpreted as an indicator of difficulties in preparing environmental protection projects especially those related to the greenhouse effect.

(iii) Some critics believe that there is a lack of interest in energy management projects within the World Bank. 'It is alleged that the World Bank does not have the expertise or the proper structure for this type of project and that the expertise it does possess was gained with infrastructure projects which are different from the relatively small projects with a high level of local participation — characteristics which are not associated with traditional World Bank projects — being considered by the GEF' (Shunker, Salles and Rios-Velilla (1992)).

Debt-for-nature swaps (DNS)

DNS intends to contribute to the solution of two major problems which are facing developing and East European countries: debt reduction and funding for environmental protection measures. The basic function of DNS is to convert foreign debt (expressed in foreign currency) into domestic debt (expressed in local currency). Usually, a non-governmental organization (NGO) in a Western industrialized country buys on the secondary debt market[1], using foreign

[1] Theoretically, the scheme can also be conceived in a way to apply to public debt which is not traded on secondary debt markets.

currency, strongly discounted debt certificates issued by a debtor nation. The NGO negotiates the cancellation of this debt with the central bank of the debtor's country in exchange for a sum in local currency to be used for environmental protection purposes. The implementation of environmental standards or factory approval criteria are other possible policy responses to debt relief.

The volume of DNS transactions to date is small compared to total international debt: some USD 100 million since 1987 for approximately 10 projects involving half a dozen countries (Shunker, Salles and Rios-Velilla (1992)). However, the resources thus made available for environmental protection in developing countries are important in comparison with the funds normally spent.

Although DNS appears to be an interesting instrument for financing environment-related technology transfer, some problems seem to restrain a full development of this instrument in the future:

(i) The existence of foreign currency donations permitting the first purchasing operation on the secondary debt market is one essential condition for the success of the scheme. It is unlikely that there will be many private donors with a sufficiently strong financial background. Commercial banks will only participate if they have substantial incentives to do so (tax rebates, image policy).

(ii) Experience has demonstrated that there is a certain shortage of agencies (until now NGOs) in developing countries which are capable of selecting and implementing viable projects.

(iii) The projects funded to date have very rarely been related to the greenhouse effect, similar to the experience with the GEF.

Creating markets for energy-efficiency investments

The discussion of the GEF and the DNS above has shown that the success of these instruments for funding technology transfer is hampered by difficulties to ensure the social structure to acquire skills and organizational infrastructure which will permit an optimal use of the technology. Two other mechanisms operating on a microeconomic level could guarantee the adaptation of the technology involved to local conditions, its maintenance and its dissemination throughout the country involved, be it an LDC or an East European country. These innovative mechanisms create a market for energy-efficiency investments in ensuring an appropriate legal framework of property rights. Both instruments have the advantage of linking the interests of the beneficiary, the supplier of the funds and, often, the various suppliers of goods and services, thereby helping to guarantee a successful implementation of the projects.

Third-party financing (TPF)

TPF is a financial innovation that was first introduced in North America as a means of stimulating the dissemination of energy management systems for reducing CO_2 emissions with the existing capital stock in an economically viable manner.

Two basic features distinguish TPF from conventional approaches:

(i) the provision of technical services and financing for energy-efficiency projects with both components being supplied by a single energy service company (ESC);

(ii) the repayment of both components out of the energy savings carried out.

Drawing up the contract is a long and complex process which begins with a preliminary audit, which is paid by the ESC, if a contract is not signed. A sensitive point in the following negotiations is the determination of the 'baseline consumption', the energy consumption before investment. A detailed audit ascertains the actual potential for financially viable energy-efficiency improvements and is followed by engineering, design construction and commissioning by the ESC. Once the contract period has come to an end, the ownership of the energy saving equipment is transferred to the consumer. Payments to the ESC are based on the savings made, which are calculated by subtracting actual from baseline consumption. The presentation of the functioning of TPF has demonstrated that the legal aspects of the contractual relationship are of great importance and the responsibilities of the parties as well as the law applicable must be clearly defined.

TPF has become widely spread in the USA and Canada, in the private sector as well as in the public sector, due to strong support from the authorities, e.g. in the form of financial support (deferred repayment loans, bank guarantees, etc.), tax advantages for companies resorting to TPF and promotion of TPF for the financing of administrative buildings. The Community supports third-party financing in the framework of its SAVE programme (Specific actions for vigorous energy efficiency). This programme foresees measures to remove obstacles to the use of the TPF mechanism for energy-efficiency investment in the public sector and to set up a European network for TPF.

The advantages of third-party financing, especially in the context of technology transfer into developing countries, are numerous. At this stage, only the most important are enumerated:

(i) The recipient company does not need to put up any initial financing which is important in countries where the capital market is not well developed.

(ii) The risk of the investment is transferred to the ESC which gives the energy-consuming company an incentive to undertake energy-saving projects.

(iii) The investor has an interest in transferring the necessary know-how to operate and maintain the energy-saving equipment to the user since the financing will be repaid out of the saving resulting from efficient plant operation.

Some barriers, however tend to limit the development of TPF:

(i) TPF requires a high internal rate of return on large investments due to the fact that TPF is a highly capital-intensive activity: the ESC must finance the initial investment, carry the operating risk and pay for any preliminary audits that do not lead to contracts.

(ii) Negotiations are usually very complex and difficult to bring to a successful end.

(iii) The control exercised by the ESC is sometimes considered unacceptable, in particular by industrial beneficiaries of the investment, especially when the ESC is a foreign company operating in a developing country.

Despite these potential barriers, TPF seems to be a very promising mechanism to pass expertise in energy management on a company to company basis on to the countries with large exploitable potentials for cost-effective energy savings. It helps to expand the transfer of technology to the countries of the South and East under conditions which are advantageous to the North, thereby triggering local dynamic processes that are the indispensable first steps in their developing process.

Build—own—operate—transfer schemes (BOOTs)

BOOTs are particularly interesting for financing and providing the necessary know-how to new energy infrastructure investment (e.g. power stations). In a BOOT project, the supplier has a stake in the equities of the BOOT company which builds, owns and operates the power station and eventually transfers the ownership to a local proprietor. The operation is almost always a joint venture, with local and foreign shareholders.

Loans are also made available by local and international banks. The involvement of an expert (supplier, consultant, etc.) in the property of the BOOT company is very reassuring for both international banks and local investors who can rely on its expertise when assessing the project's viability.

Once the power station has been built, the joint venture operates it and sells its output to the local electricity company, which may be one of the partners in the joint venture. The profits of the BOOT project, and thus of the foreign investor, come from the margin realized on the sale of electricity. At the end of the operating period for the joint venture (usually 10 to 20 years), ownership is transferred to the national electricity company at a price agreed beforehand on the basis of national tax law, as for leasing contracts.

The negotiation of the sales contract and the risk-sharing arrangements are the most sensitive points in the BOOT contract which necessitate long and complex negotiation procedures. Difficulties sometimes arise due to lack of experienced project developers and investors familiar with this type of activity, the inefficiency of government cooperation in such projects and inappropriate or missing regulatory and institutional structure in the countries concerned (see Shunker, Salles, and Rios-Velilla (1992)).

BOOT projects create conditions conducive to genuine transfer of know-how while at the same time improve the energy-efficiency of the energy sector in a cost-effective way: costs are kept at a minimum when equipment is chosen and this could mean incorporating as large a local component as possible. As it is in the interest of the joint venture to have the best possible maintenance at the least cost, this will be carried out by suitably trained local personnel.

Conclusions

The discussion in this section has shown that there are interesting instruments and mechanisms available which — while being based on the interests of economic agents in Western industrialized countries — initiate the transfer of technological and financial resources necessary to exploit potentials for energy savings (and thus CO_2 emission reduction) in a cost-effective manner in countries which find themselves in a development process like the countries of the South and East.

These mechanisms and instruments are of great importance as they help to generate a sustainable economic development which is characterized by reducing the strain on natural resources and by preserving the environmental quality in these countries. The transfer and the application of modern energy efficient technology to developing and East European countries will contribute to considerable savings, e.g. in the balance of payments for fuel imports, which will set free resources that are needed elsewhere in these countries.

The discussion has further revealed that there are still a number of practical and institutional problems connected with a successful implementation of the proposed mechanisms. It is clear that they represent, for the time being, only a first step in the direction of economically-efficient global CO_2 emission abatement. Their further conceptional improvement and implementation is very important for providing a set of sound economic mechanisms to LDCs and East European countries at the Earth Conference in Rio de Janeiro in June 1992. In order to achieve a global agreement on greenhouse gas reduction, it will be indispensable for industrialized nations to show to southern and eastern countries that abatement can be achieved at low cost and in the interests of these countries if the policy is well designed.

Developing and East European countries, however, have to make sure that the appropriate micro- and macroeconomic conditions are fulfilled (sustainable energy prices, suitable fiscal incentives, protection of property rights) for ensuring the proper functioning of CO_2 emission abatement projects.

Summary and conclusions

Part A: Points of departure

Two major global environmental challenges are currently dominating the international agenda: the protection of the stratospheric ozone layer and policies to slow down man-induced global climate change. While on the former wide-ranging international agreements have already been reached, little progress has been made to date concerning international efforts to address global warming. One of the reasons for this failure can be found in the fact that policies to limit greenhouse gas emissions raise a wide range of important economic questions. The issues involved include the overall policy design, the appropriate choice of policy instruments, the economic and social consequences of such policies as well as the sectoral implications. This report, together with the accompanying special volume of expert studies, provides economic analysis as well as empirical evidence concerning these issues.

1. Greenhouse gas emissions and limitation targets

The first issue that has been addressed in this report concerns the scientific and political background of the policies to be analysed. The atmospheric concentration of so-called greenhouse gases — notably carbon dioxide (CO_2), methane (CH_4), nitrous oxides (N_2O) and chlorofluorocarbons (CFCs) — has increased significantly since the industrial revolution. Moreover, present forecasts indicate that these concentrations may double before the middle of the next century, compared to the pre-industrial level, and continue to rise thereafter. According to the Intergovernmental Panel on Climate Change (IPCC) and ignoring the possibility of other opposing anthropogenic influences, such a trend would lead to a rise in mean global temperatures by about 0,3 °C per decade (with an uncertainty range of 0,2 to 0,5 °C per decade). This would result in a likely increase in global mean temperatures of between 1,5 and 4,5 °C before the end of the next century, with a 'best estimate' of 2,5 °C. Although there is still a considerable degree of uncertainty concerning the likely impact of such warming, the potential effects could be severe and include rising global mean sea-levels (by 20 to 40 cm before the end of the next century, solely due to oceanic thermal expansion), increased intensity of storms, extinction of certain plant and animal species and disrupted agriculture.

The anthropogenic increase in atmospheric concentrations of greenhouse gases can mainly be explained by industrialized countries' emissions of carbon dioxide and CFCs. In 1989, for example, these two gases alone represented almost 80% of the Community's contribution to the greenhouse effect. While for CFCs an international agreement concerning a complete phasing-out has recently been reached in the context of the revised Montreal Protocol, no international agreement exists yet with respect to the control of carbon dioxide emissions. However, several industrialized countries and the Community have already committed themselves to limiting their CO_2 emissions. Thus, the Community aims at stabilizing its total CO_2 emissions at their 1990 level by the year 2000. By doing so, the Community and Member States have expressed their intention to play a leading role in international efforts to tackle the risks of man-made climate change.

2. Which approach for dealing with global climate change?

Theoretically, the optimal economic approach to emission limitation consists of comparing the costs of emission reduction policies with the benefits arising from such policies in order to arrive at an 'economically optimal' amount of emission reduction. However, it is apparent that, at present, the knowledge-base is insufficient for such a comprehensive and quantitative cost/benefit analysis, in particular as far as the regional impacts of climate change, the monetary valuation of environmental benefits and the precise effects of different policy instruments are concerned. Thus, in this situation of uncertainty and partial information, a more pragmatic approach is called for. In the Community context, this pragmatic approach consisted of setting a quantitative CO_2 emission limitation target, based on the assessment that the benefits of this first step to a worldwide emission reduction would outweigh the relatively moderate costs of reaching this target. Moreover, such modest costs of emission limitation can also be interpreted as a kind of 'insurance premium' against the risks of global climate change in the sense that such measures reduce the likelihood of drastic global warming.

Part B: The overall EC policy design: Targets and instruments

3. The EC strategy for limiting CO_2 emissions: Principles and implementation

This approach to emission limitation in the Community also determines the proposed strategy's overall economic philosophy. As is shown in this report, this philosophy is one of designing a cost-effective response to the risks of man-induced global climate change which, at the same time, can be perceived as being equitable.

The quest for cost-effectiveness in particular implies the need for an appropriate mix of different policy instruments. Economic analysis suggests that a comprehensive and cost-effective strategy should, in particular, consist of the following three sets of instruments:

First, so-called 'no-regrets' policies, i.e. policy measures that should be undertaken even without reference to global climate change (notably measures to promote the rational use of energy, e.g. similar to those envisaged in the Community's SAVE programme). As a matter of fact, there is ample evidence showing that, at present, the same level of energy services could be provided by using less primary energy without incurring a higher total cost. Thus, there is a non-negligible amount of inefficient use of energy in the Community, a fact that can be explained by the existence of various market and institutional failures, representing barriers to the rational use of energy. One set of 'no-regrets' policies should therefore consist of removing such barriers, as this would result in an economic benefit even when abstracting from the environmental benefit.

Second, Community-wide market-based, in particular fiscal, instruments.

Third, in line with the subsidiarity principle, complementary national measures adapted to each Member State's particular circumstances. There are indeed many policy measures which do not have to be taken at the Community level, but which nevertheless could have a decisive impact on CO_2 emissions.

In this report, the emphasis has been on the second component of this instrument mix, namely the economic or market-based policy instruments. It has been argued that one characteristic of an economically sound CO_2 emission limitation strategy is the prominent role of broad-based Community-wide policy instruments using the market mechanism in order to ensure cost-effectiveness in reaching the Community target. The advantages of economic instruments in comparison to traditional regulatory instruments, like technical norms and product standards, lie in the fact that they give a permanent economic incentive to consumers and producers to search for the most cost-effective means of emission reduction.

In this context, CO_2 emissions can be considered to be a particularly suitable candidate for the application of market-based policy instruments for a variety of reasons: the main source of CO_2 emissions, fossil-fuel combustion, involves virtually all aspects of human behaviour; there is no direct health risk involved; the regional concentration of emissions is of no importance and there is no 'end-of-pipe' technology available for removing CO_2 emissions.

As to the precise choice of market-based policy instrument, two aspects are of major importance:

First, there is the question of the type of instrument. A priori, two options exist for using the market mechanism for reducing CO_2 emissions at least cost.

(i) A quantity-based system could be chosen, where the amount of permissible emissions is fixed, while the marginal costs of emission reduction are left to be determined by the market mechanism. Such an approach could, for example, take the form of tradable CO_2 emission permits or certificates, where individual economic entities are entitled to a certain amount of CO_2 emissions and can sell these entitlements if their marginal costs of emission reduction are lower than the permit or certificate price on the market. Although such a scheme appears to be both economically efficient and practically feasible (see the study by Heister, Michaelis and Mohr in *European Economy*, Special edition No 1-1992), there exists no experience in the Community yet with such a type of policy instrument.

(ii) A price-based approach could be chosen. In this case, the marginal costs of emission reduction are fixed by a price per unit of carbon or energy content, while the determination of the total amount of emission reduction is left to the market. Typically, such an approach would take the form of a tax. Although, in general, a tax-based approach will make it more difficult to precisely reach a given quantitative emission target at a specific point in time, taxes not only have the advantage of being a well-known policy instrument, but also of having an already existing administrative infrastructure.

The second issue in the context of the use of a market-based policy instrument concerns the appropriate level at which the decision on the use of such an instrument should be taken and the territory to which it should apply. In this context, the transnational nature of the environmental problem and the potentially important implications for intra-Community competition point, in line with the subsidiarity principle, towards the need for (at least) a Community-wide application of a carbon/energy tax (or tradable permit) scheme. The aim for cost-effectiveness in reaching the Community's CO_2 emission stabilization target requires that emissions should be reduced where the costs of emission reduction are lowest. Thus, the marginal costs of emission reduction should be equal across the Community. An approach based on the idea of reducing emissions where this would appear 'fair', rather than where the cost is lowest, would not only be very expensive (see Barrett in *European Economy*, Special edition No 1-1992), but would not even necessarily guarantee fairness in reality. Instead, the aim for an equitable sharing of the burden inherent in any emission limitation policy should be dealt with by relying on the policy instruments appropriate for promoting economic and social cohesion, both at the national and the Community level. For these reasons, an approach of sharing the burden of emission limitation equitably through transfer payments is, from the economic point of view, clearly preferable to allocating fixed emission targets to each country (target sharing).

For the above reasons, a Community-wide tax can be considered to be a necessary element in a cost-effective approach to reducing CO_2 emissions. Once the choice in favour of the principle of a tax has been made, the next question is: Which type of tax should be chosen? From the economic point of view, a tax on CO_2 emissions (carbon tax) is an economically-efficient policy instrument for limiting CO_2 emissions as it makes it possible to attain this objective at least cost to society (see Proost and Van Regemorter in *European Economy*, Special edition No 1-1992). It has to be stressed, however, that this is likely to hold only for the case in which CO_2 emission limitation is the sole issue of concern. Of course, in reality, political decisions rarely are of this single objective type. As far as CO_2 is concerned, for example, any policy instrument to reduce CO_2 emissions will not only have an impact on CO_2 emissions, but will at the same time also have positive and negative side-effects on other variables (e.g. energy supply security, other greenhouse gas emissions, other environmental externalities, household income distribution, and economic and social cohesion in the Community). In this situation, what matters to society is not only the emission reduction, but also the overall welfare effect of the policy, all side-effects (and policies to deal with undesirable side-effects) included. In terms of political economy, it may be preferable to rely on one policy instrument that, although not necessarily the best instrument from a pure CO_2 limitation point of view, may, nevertheless, allow the multiple objectives characterizing political reality to be reached at less cost than an alternative set of a multitude of single objective instruments. For these reasons, the choice between a carbon tax and an energy tax (or a combination of both) is no longer as straightforward as in the text-book, single objective, CO_2 emission reduction case.

4. Implementing the CO_2/energy tax: Economic efficiency and fiscal considerations

Independent of whether a carbon tax, an energy tax or a combination of both is adopted, the question of the precise definition of the tax bases arises. From the economic as well as from the environmental point of view, the tax base should, in principle, encompass all (energy-related) CO_2 emissions (and/or energy units). Any exclusion from this tax base not only reduces the cost-effectiveness of the tax as a policy instrument for reaching the Community's emission limitation target, but is also inconsistent with the 'polluter pays principle'. These considerations would point to a tax on the production or import of primary energy. However, in the Community context, the choice of the tax is complicated by fiscal considerations (see Hoornaert in *European Economy*, Special edition No 1-1992 on this issue). In particular, Member States have strongly insisted on the application of the country of destination principle, implying that energy should be taxed in the country of consumption. Such an approach would seem to favour the choice of a tax on the consumption of final energy products (excise tax). Moreover, such a consumption tax would make it administratively easier to exempt certain energy products (for example fossil fuels used as feedstocks) and allow for specific arrangements concerning certain particularly sensitive branches.

The main difference between a tax on primary energy and a tax on final energy lies in the treatment of conversion and transmission losses. Such conversion losses, representing almost 30% of the Community's primary energy consumption, are in fact exempted in the case of a pure consumption tax. In a consumption tax system, there is, therefore, little or no economic incentive either for fuel switching in the production of secondary energy or for improving energy conversion efficiencies. In the end, a balance will have to be struck between the economic and environmental advantages of a tax on primary energy and the fiscal advantages of a tax on final energy consumption, in order to arrive at a satisfactory solution. In view of the fact that more than 90% of the overall conversion losses occur in electricity generation, such a compromise may consist of developing a specific way of taxing such losses. Be that as it may, in this report, most of the empirical analysis has been based on the assumption of a tax which has an impact broadly comparable to a tax on primary energy, not only because this can be considered, from the emission limitation point of view, as the best option, but also because the available analytical tools did not allow a more detailed analysis of this issue.

Part C: The likely economic impact of the proposed carbon/energy tax

On the basis of the preceding analysis, the report then proceeds to an economic analysis of the likely economic impacts of the proposed carbon/energy tax by distinguishing the macroeconomic from the sectoral and income distributional effects.

5. The macroeconomic effects

With respect to the macroeconomic effects, it is important to distinguish between the short- or medium-term effects (up to seven years, say) and the long-term effects (around 10 years and more). In this report, the focus is mainly on the short- and medium-term effects, a choice that has partly also been determined by the available analytical tools. The analysis presented in this report made possible the indentification of three key factors determining the macroeconomic impact:

First, the type of carbon/energy tax revenue use. A priori, there are two main options: either the tax revenues are used for improving the budget balance or adjustments are made to other parts of the budget so as to keep the budget balance unchanged. The latter could be done by using the carbon/energy tax revenues either for financing higher expenditures (budget balance neutral) or for cutting other taxes (revenue neutral). Without such a 'recycling' of the tax revenues back into the economy, the introduction of the tax would tend both to raise the general price level and to slow down economic growth, at least in the short term. Revenue neutrality, on the other hand, tends to restore aggregate demand even in the short term, without necessarily reducing aggregate supply. It is therefore likely to be a particularly attractive option concerning the use of carbon/energy tax revenues.

Second, the key result of the analysis is that although adjustment will be necessary and entail some costs, these costs will be low if markets are flexible and the tax is phased in gradually and predictably. Of particular importance is the avoidance of a tax-induced wage-price spiral by orienting wage claims at real after-tax incomes rather than at gross wages. Thus, a societal consensus concerning the pursuit of such an environmental policy may significantly contribute to limiting its macroeconomic costs.

Third, even when abstracting from the environmental benefits, the introduction of such a tax could also have a positive impact on economic welfare if the tax revenues were used for increasing the economy's structural adjustment potential and for lowering existing, strongly distortionary taxes. However, more analysis is required for assessing such a potential for welfare gains in the Community.

Although the illustrative macroeconomic simulation results surveyed in this report only allow a preliminary assessment, they nevertheless illustrate that the specific type of tax revenue redistribution has a significant impact on the macroeconomic impact of the carbon/energy tax (see Standaert in *European Economy*, Special edition No 1-1992 on this issue). While, for example, a revenue redistribution in form of a reduction in income taxes tends to restore disposable income and thereby private consumption, the comparatively strong inflationary effect of the tax-induced increase in the general price level tends to lead to a noticeable slow-down in economic activity. A compensatory reduction in employers' social security contributions, on the other hand, reduces this price and cost increase and consequently favours private investment. Using the carbon/energy tax revenues for reducing value-added taxes leads to broadly similar effects.

The preliminary evidence emerging from the available simulation studies points to the conclusion that in some econometric models, economic activity is relatively sensitive to inflationary shocks. In these cases, a carbon/energy tax revenue recycling via a reduction in other indirect taxes (social security contributions or value-added tax) tends to lead to significantly lower GDP losses (or even GDP gains) compared to alternative tax revenue redistribution schemes, at least in the short and medium term.

Provided the lessons from the above three key determinants are drawn, the macroeconomic effects of the introduction of a carbon/energy tax can be expected to be small. Thus, according to the macroeconometric models used in this report, in the short to medium term, a loss in GDP of the order of 0,5 to 1,0% compared to the reference scenario would appear the most likely scenario in the case of a revenue neutral carbon/energy tax of approximately USD 10 per barrel of oil equivalent. However, other models, in particular those assuming a higher degree of flexibility, may show smaller GDP losses. Over the long term, both types of models tend to arrive at similar results. Concerning possible differences in the likely impact on different Member States, the evidence is, at this stage, conflicting and, therefore, does not allow any firm conclusions to be drawn.

6. The sectoral effects

As far as the sectoral effects are concerned, it is shown in this report that the likely impact on different industrial sectors not only depends on the specific type of tax revenue redistribution and the energy intensity of output of different sectors, but also on a whole chain of other determinants, e.g. the magnitude of the effect on output prices, the intensity of international trade and the demand response to higher output prices. From this analysis it becomes clear that, in the short term, the impact strongly depends on the initial sectoral cost structure, which in turn reflects the sectoral energy intensity as well as the existing level of energy prices. In the medium and long term, substitution possibilities are likely to change the picture to some extent.

The sectoral impact of the tax can also be shown to depend strongly on the structure of the energy system, the size of existing energy taxes and the modalities of the tax. In this context, a pure carbon tax on primary energy products would tend to imply larger differences between Member States in the sectoral impact than a pure energy tax on final energy products, as inter-country differences in the product structure of primary energy use are more significant than those for final energy consumption.

A careful analysis of the present situation in the manufacturing industry in those five Member States for which detailed statistics are available (Belgium, Germany, Spain, Denmark and the United Kingdom) reveals that, although there is a small group of potentially sensitive branches, most sectors have a low direct share of energy costs in total production costs. Thus, for the great majority of the manufacturing industry, energy costs only represent between 0 and 5% of total production costs. According to the available — admittedly incomplete — data, these sectors represent approximately 85% of industrial employment. The average energy cost share for the manufacturing sector varies between 2,5 and 4%, respectively, according to the country considered.

Although there is a small number of energy-intensive sectors which cluster around an average energy cost share of between 10 and 20%, these are only eight out of a total of 130 sectors. Moreover, some of these sectors cannot be classified as being exposed to strong international competition (e.g. heat generation and distribution). On the basis of the available data it appears that the branches with a share of energy costs in total costs of more than 10% represent approximately 6% of industrial employment.

In a second group of (approximately 12) branches, the energy cost shares lie between 5 and 10%, so that these sectors can be considered as being potentially moderately sensitive to energy cost increases. In terms of employment, these sectors represent approximately between 5 and 6% of industrial employment. Even if the available evidence is only sketchy, there is, nevertheless, the impression that, in these moderately sensitive sectors, the direct energy cost shares appear to be higher in southern Member States compared with northern Member States. Such differences do not appear to reflect differences in pre-CO_2/energy tax prices, but rather seem to be largely attributable to differences in production technologies. It appears that in the case of a tax on final energy consumption, inter-country differences in the impact of the tax on producer prices generally tend to be smaller than for a tax on the production or import of primary energy. This points to the fact that conversion losses markedly differ between Member States.

Direct energy costs only represent part of the energy costs borne by companies. In order to investigate the total incidence of the introduction of carbon/energy taxes, an input/output analysis has been undertaken for a few selected Member States for which the necessary statistical information is available (France, Germany, Denmark and Italy; see also Martín and Velázquez in *European Economy*, Special edition No 1-1992, for an application to Spain). Although such an analysis has the disadvantage of implying a higher degree of sectoral aggregation (approximately 40 sectors compared to 130), it has the advantage of allowing an assessment of the impact of energy costs embedded in companies' intermediate inputs and of the importance of the product structure of energy consumption for the overall tax incidence. For analytical purposes, the analysis — both for the case of a tax on primary energy and for a tax on final energy consumption — has assumed that no sector is exempted from the tax. Moreover, no macroeconomic feedbacks are taken into account.

It emerges from this input/output analysis that, although for a significant number of energy price sensitive sectors, the conclusions are quite similar when looking at total cost shares compared to only direct cost shares (e.g. cement, iron and steel), for others the picture may differ significantly (e.g. glass, hard coal extraction, transport services). Assuming that the increase in input costs would be fully passed through to output (production) prices — which, in turn, will have an effect on competitiveness — the following assessment can be made. Only iron and steel, special steel production and cement industries would experience production price rises of between 5 and 10%. For the other energy-intensive branches, this increase would lie between 2 and 4%. A large number of — in economic terms very large — service branches would only experience price increases of significantly less than 1%. The analysis in this report also showed that, in view of the strong differences in the fuel-mix used in electricity generation, the precise impact of a carbon/energy tax may differ significantly among Member States, depending on the precise type of the tax.

In the longer run, dynamic adjustment and substitution effects are likely to change the initial sectoral picture considerably. Moreover, the sectoral effects will also depend on the type of revenue recycling. Generally, the total effect of the revenue-neutral introduction of a CO_2/energy tax is likely to be a relatively strong output price increase for energy-intensive branches (unless, of course, these branches are temporarily partially or totally exempted — for example, in exchange for voluntary agreements), very moderate increases or even decreases for the other manufacturing branches and moderately strong price decreases for services.

7. The income distribution effects

Finally, as to the distributional impact of the introduction of a CO_2/energy tax on private households, several factors have to be taken into account (see Smith in *European Economy*, Special edition No 1-1992):

First, it has to be stressed that the overall impact of the additional carbon/energy tax payments on energy products on total household expenditure would only be modest. This direct impact would only represent between 0,5 and 1,3 of total household expenditure.

Second, based on data from EC household expenditure surveys for six Member States (Germany, France, Spain, Ireland, Italy and the Netherlands) the evidence presented in this report reveals that the poorest 25% of households tend to spend a relatively higher share of their expenditure on the direct purchase of domestic energy compared to the other three household quartiles. With the exception of Italy, the budget share of expenditure on domestic fuels declines steadily. There is also a tendency for domestic fuel budget shares to be smaller in southern Member States, which might be due to climatic circumstances.

Third, this contrasts with a lower budget share of expenditure on motor fuels for poorer households in comparison with richer ones. Thus, taxation of transport fuels would in fact be progressive in terms of household income classes.

Fourth, as a result of these two opposing trends, and assuming unchanged spending patterns (i.e. a static analysis), a CO_2/energy tax is only slightly regressive in most Member States. However, there is some initial evidence pointing towards a more pronounced regressivity in some northern Member States, in particular Ireland and the United Kingdom. It is interesting to note that the inter-country differences appear to be larger in the case of a pure carbon tax in comparison with a pure energy tax.

Fifth, over the medium and long term, households (and producers) will substitute away from highly taxed products. The short term static tax incidence may therefore be different from the long term dynamic incidence due to a change in household spending patterns.

Finally, the overall impact of a CO_2/energy tax on different household classes not only depends on this tax, but also on the incidence of the compensatory reduction in other taxes and charges implied by the revenue-neutral introduction of a carbon/energy tax and on the incidence of the environmental benefits of such a tax, both of which are difficult to assess at this stage.

Part D: Reaching beyond the Community

8. The international agenda: Reaching a global agreement on CO_2 emission limitation

The final part of the report then focuses on the international aspects of the Community's CO_2 emission limitation strategy. Clearly, man-induced climate change being a global problem, the policy response should also be a global one. Acting alone, the Community with its 13% share in worldwide CO_2 emissions will only have a negligible impact on the atmospheric concentration of greenhouse gases. Nevertheless, both ethical and economic arguments would indicate that industrialized countries should take the lead. Not only have these countries the resources as well as the technology to implement effective emission limitation policies, but also they are responsible for the overwhelming majority of the anthropogenic increase in atmospheric concentrations of greenhouse gases.

Thus, there are good reasons for suggesting that it is urgent to forge an emission limitation agreement among the main industrialized countries. Admittedly, such an agreement might not be easy to establish due to the public good character of CO_2 emission reduction: some countries could be tempted to act as 'free riders' by benefiting from the CO_2 emission reduction achieved by others, without having to incur the costs of such emission reduction policies. A certain amount of 'moral persuasion' might therefore be needed in order to arrive at a broader international agreement. The Community's emission limitation strategy has to be seen from this viewpoint. By setting an example, the Community can demonstrate that emission limitation and economic prosperity are not in conflict. In so doing, the chances for an international agreement would be improved which, in turn, would result in higher benefits to the Community compared with a 'wait and see' approach.

9. The issue of EC leadership within the group of industrialized countries

In this context, it is sometimes argued that the Community's exposure to international competition would imply high costs of European leadership in terms of CO_2 emission limitation. However, the analysis and evidence presented in this report do not support this view (see Burniaux et. al. in *European Economy*, Special edition No 1-1992). Although any emission limitation policy implies some microeconomic costs, unilateral emission limitation does not necessarily have to lead to major macroeconomic costs. This can be ascribed to three main factors:

First, Member States' involvement in extra-EC trade of energy-intensive products is relatively small. On average, approximately 60% of each individual Member State's total trade is with other Member States. This trade would only be very moderately affected by the introduction of a Community-wide carbon/energy tax. Extra-EC exports of goods and services only contribute approximately 10% to the Community's GDP. Taking into account that other European OECD countries either have already introduced similar taxes or at least have announced their intention of doing so, one can conclude that trade with countries which have not taken (or are presently not willing to take) comparable action probably represents less than 8% of the Community's economic activity. Moreover, only a fraction of this trade consists of trade in energy-intensive products. Thus, the channel through which a loss in international competitiveness caused by unilateral emission reduction could affect the Community's GDP is relatively small. This is not to deny, of course, that individual companies or even branches might be significantly affected.

Second, there are two main mechanisms through which external trade is affected by unilateral emission limitation policies: the Community's price competitiveness and the foreign trade partners' economic activity. As to price competitiveness, a certain deterioration might be difficult to avoid. However, a revenue-neutral introduction of a CO_2/energy tax would ensure that any losses in aggregate competitiveness would be limited, as the average tax burden in the economy would not increase. For avoiding a significant deterioration in international competitiveness it would, however, be necessary to ensure that no wage-price spiral is set in motion. On the other hand, the Communiy's exports are not only determined by export prices, but also by the volume of economic activity in the countries of destination. If, as indicated above, a CO_2 limitation policy may have a modest negative impact on economic activity, at least in the short term, then the Community's exports could actually be higher if third countries did not embark on emission limitation policies than if they did. Thus, the total effect on Community exports is the combination of two opposing trends. Both the sign and the size of the net impact is difficult to predict.

Third, over the longer term, there may even be advantages in moving first. Although the empirical evidence on this issue is only sketchy (see Gerstenberger in *European Economy,* Special edition No 1-1992), the impression nevertheless emerges that there could by a positive feed-back from higher energy prices to energy-efficiency-related innovation activity and trade performance in the field of energy technologies. However, further research is required to investigate this aspect.

Of course, these arguments should not be misinterpreted in the sense of implying that it would make no difference whether other countries follow the Community in limiting their CO_2 emissions or not. On the contrary, as an isolated EC emission limitation policy will not be effective in noticeably slowing down climate change, the full benefits of such a policy can only be reaped in the context of a broader international agreement. This is even more so as emission reduction in only one world region may, due to dislocation and oil price feedback effects, even partly be compensated by an increase in CO_2 emissions elsewhere. However, the important point to retain is that there are both costs and benefits of leadership and it may well be of economic advantage to start embarking on such a policy path, provided that such leadership improves the chance of success of a broader international agreement.

10. The integration of LDCs and East European countries in efforts to slow down climate change

It is evident that, in the long run, even a united effort by industrialized countries will not be sufficient to reach ambitious CO_2 emission limitation targets. According to forecasts, industrialized countries will account for less than 40% of worldwide CO_2 emissions by the turn of the century and might even fall to around 25% by the mid-21st century. Thus, ways have to be found to integrate at least the major fossil-fuel consuming developing and Central and East European countries into any efforts to slow down global climate change. Although in some important respects the present situation differs significantly between groups of countries, many of the cost-effective measures for exploiting the existing emission limitation potential are equally applicable to both of them. Generally speaking, policy instruments for limiting CO_2 emissions in these countries will have to fulfil the same requirements as an emission limitation strategy in the Community: they have to be cost-effective in reaching the overall emission limitation target and they have to be perceived as equitable in order to obtain an agreement.

From the economic point of view, such a global emission limitation scheme should ideally take the form of either an international carbon and/or energy tax or an international tradable emission permit/certificate scheme. However, to date, it seems unlikely that agreement on such a worldwide market-based approach can be reached in the foreseeable future. The question then arises of whether one has to conclude from this assessment that there is no role for emission control policies in developing and East European countries before such a comprehensive scheme has been put into place.

The answer given in this report is a clear 'no'. There is clear evidence that, pending a worldwide greenhouse gas emission limitation agreement, there is already at present a potential for energy conservation, and therefore CO_2 emission reduction, the exploitation of which would be economically rational. Even without reliance on global, market-based policy instruments such as carbon taxes or tradable permits, there is a series of innovative policy instruments which could be used immediately for the mutual economic benefit of both developing and industrialized countries (see Shunker, Salles and Rias-Velilla in *European Economy,* Special edition No 1-1992).

In analysing the presently available cost-effective CO_2 emission reduction options in LDCs and Central and East European countries, it is useful, from the analytical point of view, to distinguish between two main classes of emission reduction potential, even though such a distinction will sometimes be difficult to make in practice:

The first emission reduction potential consists of measures which can be considered as being in the economic self-interest of the developing countries themselves, but which, at present, are not exploited for a number of reasons such as intervention failures (e.g. large-scale energy price subsidies), inappropriate technologies (e.g. energy-transmission losses), or capital constraints. A modest transfer of resources in combination with technological and administrative assistance by industrialized countries would be sufficient for exploiting this emission reduction potential.

The second class of emission reduction potential consists of measures which, although entailing a net economic cost for developing countries, are less costly than alternative emission reduction measures taken in order to obtain the same amount of CO_2 emission reduction in industrialized countries. Although it is difficult to expect developing countries to finance such emission reduction measures themselves, it is in the clear economic interest of industrialized countries to find ways of exploiting such international differences in emission abatement costs.

Several sets of innovative policy instruments for exploiting the available emission reduction potential in developing and East European countries have been surveyed in this report. Such measures range from an expansion of the Global Environmental Facility and debt-for-nature swaps to international third-party financing and build-own-operate-transfer schemes (BOOTs). Admittedly, such policy instruments are only little used at present. Moreover, they are likely to have an overall impact on worldwide CO_2 emissions which has to be considered as only modest in comparison to worldwide carbon/energy tax or tradable emission permit schemes. However, what all these resource and technology transfer schemes have in common, is that not only can they be implemented almost immediately, but they are also economically particularly attractive as they offer economic benefits to at least one country without implying any net costs for other countries. For these reasons, such measures merit a significant initiative on the part of industrialized countries, in order to exploit the full economically rational emission reduction potential represented by such measures.

The final outcome of the analysis presented in this report can be summarized as follows: Although many aspects of CO_2 emission limitation policies are still subject to a considerable degree of uncertainty, the available evidence nevertheless justifies the conclusion that CO_2 emission limitation inside and outside the Community may well go hand in hand with economic prosperity, provided some basic economic guidelines are respected.

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Statistical annex

Long-term macroeconomic series

Notes on the statistical annex

General remarks

This edition of *European Economy* gives updated time series of annual data in its statistical annex.
For the period up to 1990, the aggregates are defined for member countries as in the ESA (European system of economic accounts), and for the USA and Japan as in the SNA (UN-OECD system of national accounts). Unless otherwise specified, the sources of the data are Eurostat for the EC member countries and OECD for the USA and Japan.

Figures for 1991 and 1992 are estimates and forecasts made by Commission staff using the definitions and latest figures available from national sources. These series are not fully comparable with the corresponding figures for earlier years, however the discontinuities of the levels of these series have been eliminated. The figures for 1991-92 are based on data up to 6 May 1992.

Up to 1991 the data concerning Germany refer to West Germany, from 1991 onwards data for both unified (D) and West Germany (WD) are available.

See also the explanatory notes on the tables for specific definitions.

List of tables

Symbols and abbreviations

—	nil
:	not available
%	per cent or percentage
Mio	million
Mrd	1 000 million
ECU	European currency unit
EUA	European unit of account
UA	Unit of account
PPS	Purchasing power standard
GDP	Gross domestic product, at market prices

Table 1

Total population

(1 000)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12−	EUR 12+	USA	JAP
1960	9 153	4 581	55 433	:	8 327	30 559	45 684	2 834	50 198	313,5	11 483	8 426	52 372	279 364	:	180 671	94 118
1961	9 184	4 612	56 185	:	8 398	30 880	46 163	2 819	50 524	316,9	11 637	8 420	52 807	281 945	:	183 691	94 965
1962	9 221	4 647	56 837	:	8 448	31 133	46 998	2 830	50 844	320,8	11 801	8 410	53 292	284 782	:	186 538	95 853
1963	9 290	4 684	57 389	:	8 480	31 405	47 836	2 850	51 199	324,1	11 964	8 466	53 625	287 512	:	189 242	96 772
1964	9 378	4 720	57 971	:	8 510	31 716	48 330	2 864	51 601	327,8	12 125	8 505	53 991	290 039	:	191 889	97 791
1965	9 464	4 757	58 619	:	8 551	32 060	48 778	2 876	51 988	331,5	12 293	8 511	54 350	292 578	:	194 303	98 851
1966	9 528	4 797	59 148	:	8 614	32 427	49 184	2 884	52 332	333,9	12 455	8 492	54 643	294 838	:	196 560	99 769
1967	9 581	4 839	59 286	:	8 716	32 824	49 568	2 900	52 667	335,0	12 597	8 486	54 959	296 758	:	198 712	100 839
1968	9 619	4 867	59 500	:	8 741	33 214	49 915	2 913	52 987	335,9	12 726	8 496	55 214	298 528	:	200 706	101 999
1969	9 646	4 893	60 067	:	8 773	33 540	50 318	2 926	53 317	337,5	12 873	8 482	55 461	300 633	:	202 677	103 261
1970	9 651	4 929	60 651	:	8 793	33 849	50 772	2 950	53 661	339,2	13 032	8 432	55 632	302 692	:	205 052	104 674
1971	9 673	4 963	61 284	:	8 831	34 163	51 251	2 978	54 015	342,4	13 194	8 382	55 928	305 005	:	207 661	105 713
1972	9 709	4 992	61 672	:	8 889	34 471	51 701	3 024	54 400	346,6	13 330	8 364	56 097	306 995	:	209 896	107 156
1973	9 739	5 022	61 976	:	8 929	34 783	52 118	3 073	54 779	350,5	13 438	8 368	56 223	308 798	:	211 909	108 660
1974	9 768	5 045	62 054	:	8 962	35 119	52 460	3 124	55 130	355,1	13 543	8 482	56 236	310 279	:	213 854	110 160
1975	9 795	5 060	61 829	:	9 046	35 487	52 699	3 177	55 441	359,0	13 660	8 737	56 226	311 516	:	215 973	111 520
1976	9 811	5 073	61 531	:	9 167	35 909	52 909	3 228	55 701	360,8	13 773	8 942	56 216	312 620	:	218 035	112 770
1977	9 822	5 088	61 400	:	9 309	36 338	53 145	3 272	55 930	361,4	13 856	9 044	56 190	313 756	:	220 239	113 880
1978	9 830	5 104	61 327	:	9 430	36 749	53 376	3 314	56 127	362,1	13 939	9 105	56 178	314 841	:	222 585	114 920
1979	9 837	5 117	61 359	:	9 548	37 079	53 606	3 368	56 292	363,0	14 034	9 189	56 240	316 032	:	225 055	115 880
1980	9 847	5 125	61 566	:	9 642	37 356	53 880	3 401	56 416	364,4	14 148	9 289	56 330	317 365	:	227 757	116 800
1981	9 853	5 122	61 682	:	9 730	37 726	54 182	3 443	56 503	365,4	14 247	9 358	56 352	318 564	:	230 138	117 650
1982	9 856	5 119	61 638	:	9 790	37 950	54 480	3 480	56 639	365,6	14 312	9 429	56 306	319 365	:	232 520	118 450
1983	9 855	5 114	61 423	:	9 847	38 142	54 728	3 505	56 825	365,7	14 368	9 502	56 347	320 022	:	234 799	119 260
1984	9 855	5 112	61 175	:	9 900	38 311	54 947	3 529	56 983	366,0	14 423	9 577	56 460	320 638	:	237 011	120 020
1985	9 858	5 114	61 024	:	9 934	38 474	55 170	3 540	57 128	366,7	14 488	9 640	56 618	321 355	:	239 279	120 750
1986	9 862	5 121	61 066	:	9 964	38 604	55 394	3 541	57 221	368,4	14 567	9 686	56 763	322 158	:	241 625	121 490
1987	9 870	5 127	61 077	:	9 984	38 716	55 630	3 542	57 331	370,8	14 664	9 727	56 930	322 969	:	243 942	122 090
1988	9 902	5 130	61 449	:	10 004	38 809	55 884	3 538	57 441	373,9	14 760	9 761	57 065	324 117	:	246 307	122 610
1989	9 938	5 132	62 063	:	10 033	38 888	56 161	3 515	57 525	377,7	14 846	9 793	57 236	325 507	:	248 762	123 120
1990	9 967	5 140	63 232	:	10 140	38 959	56 420	3 503	57 647	382,0	14 947	9 808	57 411	327 556	:	251 357	123 540
1991	9 972	5 154	64 140	80 168	10 170	39 025	56 679	3 521	57 810	382,4	15 062	9 815	57 577	329 309	345 336	254 062	123 960
1992	9 977	5 169	64 800	80 723	10 201	39 085	56 940	3 549	57 966	382,8	15 171	9 825	57 751	330 816	346 739	256 856	124 380

EUR 12−: including WD; EUR 12+: including D.

Table 2

Occupied population: total economy

(Annual percentage change)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12−	EUR 12+	USA	JAP
1961	0,8	1,5	1,4	:	0,4	0,2	0,1	−0,2	0,2	1,1	1,5	0,5	1,2	0,7	:	−0,4	1,4
1962	1,6	1,5	0,3	:	−1,0	0,9	0,2	0,7	−1,1	0,3	2,0	0,5	0,7	0,3	:	2,1	1,3
1963	0,7	1,2	0,2	:	−1,3	0,5	1,0	0,6	−1,5	−0,4	1,4	−0,2	0,1	0,1	:	0,9	0,9
1964	1,3	2,1	0,1	:	−1,2	0,5	1,1	0,5	−0,6	1,7	1,8	−0,1	1,1	0,5	:	1,8	1,3
1965	0,2	1,8	0,6	:	−0,7	0,5	0,4	−0,2	−1,7	0,9	0,9	0,4	0,9	0,2	:	3,3	1,6
1966	0,5	0,5	−0,3	:	−0,9	0,5	0,8	−0,3	−1,5	0,5	0,8	−0,6	0,6	0,0	:	4,5	2,1
1967	−0,3	−0,6	−3,3	:	−1,2	0,8	0,3	−0,6	1,1	−1,1	−0,3	−0,6	−1,4	−0,8	:	2,5	1,9
1968	−0,1	0,8	0,1	:	−1,1	0,8	−0,3	0,3	0,0	−0,4	0,9	−0,6	−0,6	−0,1	:	2,4	1,7
1969	1,7	1,2	1,6	:	−0,3	0,9	1,5	0,3	0,5	1,4	1,7	−0,6	0,4	0,9	:	2,5	0,8
1970	−0,4	0,7	1,3	:	−0,1	0,7	1,5	−1,2	0,0	2,0	1,1	5,2	−0,8	0,6	:	−0,8	1,1
1961-70	0,6	1,1	0,2	:	−0,7	0,6	0,6	0,0	−0,5	0,6	1,2	0,4	0,2	0,2	:	1,9	1,4
1971	1,0	0,6	0,4	:	0,3	0,5	0,4	−0,4	0,6	3,2	0,5	0,3	−0,9	0,2	:	−0,4	0,7
1972	−0,1	2,1	0,4	:	0,5	0,3	0,6	0,3	−0,6	2,7	−0,9	−0,3	−0,2	0,1	:	2,5	0,5
1973	1,3	1,3	1,1	:	1,0	2,0	1,4	1,4	2,2	1,9	0,1	−0,5	2,3	1,6	:	4,3	2,3
1974	1,4	−0,3	−1,2	:	0,1	0,7	0,9	1,4	2,0	2,8	0,2	−0,5	0,3	0,4	:	1,6	−0,4
1975	−1,4	−1,3	−2,7	:	0,1	−1,6	−0,9	−0,8	0,1	1,2	−0,7	−2,6	−0,4	−1,1	:	−2,1	−0,2
1976	−0,6	1,8	−0,5	:	2,3	−1,1	0,8	−0,8	1,5	−0,1	0,0	−0,2	−0,9	0,1	:	2,8	0,8
1977	−0,2	0,8	0,1	:	0,8	−0,7	0,8	1,8	1,0	−0,1	0,2	0,8	0,1	0,4	:	3,5	1,2
1978	0,0	1,0	0,8	:	0,4	−1,7	0,4	2,5	0,5	−0,6	0,7	−1,5	0,6	0,3	:	5,0	1,0
1979	1,2	1,2	1,7	:	0,6	−1,7	0,1	3,2	1,5	0,5	1,3	2,1	1,5	1,0	:	3,2	1,0
1980	0,0	−0,5	1,6	:	1,3	−3,0	0,1	1,0	1,9	0,7	0,7	−0,3	−0,3	0,4	:	0,2	0,7
1971-80	0,3	0,7	0,2	:	0,7	−0,6	0,4	0,9	1,1	1,2	0,2	−0,3	0,2	0,3	:	2,0	0,7
1981	−1,9	−1,3	−0,1	:	4,9	−2,6	−0,6	−0,9	0,0	0,3	−1,5	1,0	−3,9	−1,1	:	0,9	0,8
1982	−1,3	0,4	−1,2	:	−0,8	−0,9	0,2	0,2	0,6	−0,3	−2,5	−1,9	−1,8	−0,8	:	−1,6	0,8
1983	−1,0	0,3	−1,4	:	1,0	−0,5	−0,4	−2,1	0,6	−0,3	−1,9	−1,1	−1,2	−0,7	:	1,0	1,5
1984	−0,2	1,7	0,2	:	0,3	−2,4	−0,9	−1,9	0,4	0,6	−0,1	−1,5	1,9	0,1	:	4,9	0,3
1985	0,6	2,5	0,7	:	0,9	−1,3	−0,3	−2,2	0,9	1,4	1,5	0,0	1,3	0,5	:	2,4	0,6
1986	0,6	2,6	1,4	:	0,3	1,4	0,1	0,2	0,8	2,6	2,0	−2,7	−0,1	0,6	:	1,7	0,9
1987	0,5	0,9	0,7	:	−0,1	4,5	0,3	−0,1	0,4	2,8	1,4	0,5	1,8	1,1	:	2,9	0,9
1988	1,5	−0,6	0,8	:	1,6	3,5	0,7	1,0	1,0	3,1	1,4	0,1	3,2	1,5	:	2,8	1,7
1989	1,6	−0,7	1,4	:	0,4	3,6	1,1	−0,1	0,2	3,7	1,7	1,0	2,5	1,5	:	2,3	1,9
1990	1,1	−0,5	2,9	:	0,2	2,6	1,2	2,8	1,0	4,3	2,1	0,9	0,9	1,6	:	0,5	2,0
1981-90	0,1	0,5	0,5	:	0,9	0,8	0,1	−0,3	0,6	1,8	0,4	−0,4	0,4	0,4	:	1,8	1,1
1991	−0,3	−0,9	2,6	:	−2,0	0,2	0,4	−0,3	0,8	3,7	1,0	0,9	−3,0	0,2	:	−0,9	1,9
1992	−0,6	−0,5	1,0	−0,1	−0,5	0,3	0,2	0,3	0,4	2,0	−0,1	−0,2	−2,4	−0,1	−0,4	0,4	1,6

EUR 12−: including WD; EUR 12+: including D.

Table 3

Unemployment rate[1]

(Percentage of civilian labour force)

	B	DK	WD	GR	E	F	IRL	I	L	NL	P	UK	EUR 9[2]	EUR 12–	USA[3]	JAP[3]
1960	3,1	1,6	1,0	:	:	0,7	4,7	7,2	0,1	0,7	:	1,6	2,5	:	5,4	1,7
1961	2,5	1,2	0,7	:	:	0,6	4,3	6,6	0,1	0,5	:	1,4	2,2	:	6,5	1,5
1962	2,0	1,1	0,6	:	:	0,7	4,2	5,5	0,1	0,5	:	1,9	2,0	:	5,4	1,3
1963	1,5	1,5	0,7	:	:	0,7	4,5	5,1	0,2	0,6	:	2,3	2,1	:	5,5	1,3
1964	1,5	0,9	0,6	:	1,4	0,6	4,3	5,2	0,0	0,5	:	1,6	1,9	:	5,0	1,1
1964	1,4	1,2	0,5	4,6	2,8	1,2	5,2	4,0	0,0	0,5	2,5	1,4	1,6	1,9	5,2	1,2
1965	1,6	0,9	0,4	4,8	2,6	1,5	5,0	5,0	0,0	0,6	2,5	1,2	1,8	2,0	4,5	1,2
1966	1,7	1,1	0,5	5,0	2,2	1,6	5,1	5,4	0,0	0,8	2,5	1,1	1,9	2,0	3,8	1,3
1967	2,4	1,0	1,4	5,4	3,0	2,1	5,5	5,0	0,0	1,7	2,5	2,0	2,5	2,6	3,8	1,3
1968	2,8	1,0	1,0	5,6	3,0	2,6	5,8	5,3	0,0	1,5	2,6	2,1	2,6	2,7	3,6	1,2
1969	2,2	0,9	0,6	5,2	2,5	2,3	5,5	5,3	0,0	1,1	2,6	2,0	2,3	2,4	3,5	1,1
1970	1,8	0,6	0,5	4,2	2,6	2,4	6,3	5,1	0,0	1,0	2,6	2,2	2,3	2,4	4,9	1,2
1964-70	2,0	1,0	0,7	5,0	2,7	2,0	5,5	5,0	0,0	1,0	2,5	1,7	2,1	2,3	4,2	1,2
1971	1,7	0,9	0,6	3,1	3,4	2,7	6,0	5,1	0,0	1,3	2,5	2,7	2,5	2,6	6,0	1,2
1972	2,2	0,8	0,8	2,1	2,9	2,8	6,7	6,0	0,0	2,3	2,5	3,1	2,9	2,8	5,6	1,4
1973	2,2	0,7	0,8	2,0	2,6	2,7	6,2	5,9	0,0	2,4	2,6	2,2	2,7	2,6	4,9	1,3
1974	2,3	2,8	1,8	2,1	3,1	2,8	5,8	5,0	0,0	2,9	1,7	2,0	2,8	2,8	5,6	1,4
1975	4,2	3,9	3,3	2,3	4,5	4,0	7,9	5,5	0,0	5,5	4,4	3,2	4,0	4,0	8,5	1,9
1976	5,5	5,1	3,3	1,9	4,9	4,4	9,8	6,2	0,0	5,8	6,2	4,8	4,7	4,7	7,7	2,0
1977	6,3	5,9	3,2	1,7	5,3	4,9	9,7	6,7	0,0	5,6	7,3	5,1	5,0	5,1	7,1	2,0
1978	6,8	6,7	3,1	1,8	7,1	5,1	9,0	6,7	1,2	5,6	7,9	5,0	5,1	5,3	6,1	2,3
1979	7,0	4,8	2,7	1,9	8,8	5,8	7,8	7,2	2,4	5,7	7,9	4,6	5,0	5,4	5,8	2,2
1980	7,4	5,2	2,7	2,7	11,6	6,2	8,0	7,1	2,4	6,4	7,6	5,6	5,4	6,0	7,1	2,0
1971-80	4,6	3,7	2,2	2,2	5,4	4,1	7,7	6,1	0,6	4,4	5,1	3,8	4,0	4,1	6,4	1,8
1981	9,5	8,3	3,9	4,0	14,4	7,3	10,8	7,4	2,4	8,9	7,3	8,9	7,1	7,7	7,6	2,2
1982	11,2	8,9	5,6	5,8	16,3	8,0	12,5	8,0	2,4	11,9	7,2	10,3	8,3	9,0	9,7	2,4
1983	12,5	9,1	6,9	7,9	17,8	8,2	15,2	8,7	3,5	12,4	8,1	11,0	9,1	9,9	9,6	2,7
1984	12,5	8,7	7,1	8,1	20,6	9,7	16,8	9,3	3,1	12,3	8,7	11,0	9,6	10,6	7,5	2,7
1985	11,8	7,2	7,1	7,7	21,6	10,1	18,2	9,6	3,0	10,5	8,8	11,4	9,7	10,8	7,2	2,6
1986	11,7	5,5	6,5	7,4	20,9	10,3	18,2	10,5	2,6	10,3	8,3	11,4	9,7	10,7	7,0	2,8
1987	11,3	5,6	6,3	7,4	20,4	10,4	18,0	10,3	2,5	10,0	6,9	10,4	9,4	10,3	6,2	2,8
1988	10,2	6,4	6,3	7,6	19,3	9,9	17,3	10,8	2,0	9,3	5,7	8,5	8,8	9,8	5,5	2,5
1989	8,6	7,7	5,6	7,4	17,1	9,4	15,7	10,6	1,8	8,5	5,0	7,1	8,1	8,9	5,3	2,3
1990	7,8	8,0	4,8	7,0	16,2	9,0	14,5	9,8	1,7	7,5	4,6	7,0	7,6	8,3	5,5	2,1
1981-90	10,7	7,5	6,0	7,0	18,5	9,2	15,7	9,5	2,5	10,2	7,1	9,7	8,7	9,6	7,1	2,5
1991	8,3	8,6	4,3	7,0	16,3	9,5	16,1	10,2	1,6	7,0	4,0	9,1	8,3	8,8	6,7	2,1
1992	9,2	9,2	4,4	7,9	16,7	10,0	17,6	10,3	1,5	7,4	4,2	10,7	8,9	9,4	7,2	2,2

EUR 12–: including WD.

[1] Eurostat definition. From 1964 onwards, new definition.
[2] EUR 12 excluding Greece, Spain and Portugal.
[3] OECD.

Table 4

Gross domestic product at current market prices

(National currency; Mrd)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12− (PPS)	EUR 12+ (PPS)	USA	JAP
1960	557,0	41,15	302,7	:	105	706	300,7	0,631	24 792	26,11	44,42	71	25,86	213,0	:	513,4	16 011
1961	592,4	45,66	331,7	:	119	804	328,0	0,680	27 573	26,12	46,90	77	27,42	232,0	:	531,8	19 336
1962	633,7	51,45	360,8	:	126	929	366,2	0,736	30 979	27,50	50,49	82	28,82	253,7	:	572,2	21 943
1963	681,3	54,77	382,4	:	141	1 097	410,6	0,791	35 484	29,34	54,77	89	30,55	278,1	:	603,9	25 114
1964	762,5	62,60	420,2	:	158	1 238	455,4	0,901	38 843	33,50	64,45	96	33,39	307,7	:	646,4	29 541
1965	830,0	70,32	459,2	:	180	1 441	490,3	0,959	41 796	35,10	71,98	107	35,96	335,7	:	701,4	32 866
1966	892,1	77,18	488,2	:	200	1 667	530,7	1,010	45 286	36,88	78,38	118	38,28	362,7	:	768,3	38 170
1967	955,4	84,81	494,4	:	216	1 872	573,3	1,104	49 884	37,12	85,99	132	40,30	386,7	:	812,4	44 730
1968	1 022,3	94,36	533,3	:	235	2 099	623,1	1,245	54 071	40,61	95,35	146	43,67	420,7	:	887,7	52 976
1969	1 134,2	107,32	597,0	:	266	2 387	710,5	1,438	59 692	47,02	107,99	160	47,00	468,7	:	958,3	62 228
1970	1 262,1	118,63	675,3	:	299	2 654	793,5	1,620	67 178	55,04	121,18	178	51,61	523,9	:	1 008,6	73 345
1971	1 382,0	131,12	749,8	:	330	2 995	884,2	1,853	72 994	56,05	136,53	199	57,58	581,4	:	1 094,9	80 701
1972	1 545,4	150,73	823,1	:	378	3 514	987,9	2,238	79 810	63,21	154,26	232	64,46	649,1	:	1 203,1	92 395
1973	1 755,0	172,86	917,3	:	484	4 237	1 129,8	2,701	96 738	76,82	176,04	282	74,07	751,3	:	1 344,1	112 497
1974	2 056,8	193,63	983,9	:	564	5 189	1 303,0	2,988	122 190	93,64	199,78	339	83,70	867,1	:	1 455,2	134 244
1975	2 271,1	216,26	1 026,6	:	672	6 091	1 467,9	3,792	138 632	86,74	219,96	377	105,60	985,6	:	1 582,4	148 328
1976	2 578,9	251,21	1 120,5	:	825	7 329	1 700,6	4,653	174 869	99,81	251,93	469	125,03	1 153,5	:	1 763,4	166 573
1977	2 785,3	279,31	1 195,3	:	964	9 298	1 917,8	5,703	214 398	102,56	274,93	626	145,74	1 326,7	:	1 966,0	185 622
1978	2 987,5	311,38	1 283,6	:	1 161	11 376	2 182,6	6,757	253 536	112,22	297,01	787	168,13	1 511,0	:	2 217,2	204 404
1979	3 188,8	346,89	1 388,4	:	1 429	13 305	2 481,1	7,917	309 834	122,15	315,96	993	197,81	1 731,7	:	2 462,7	221 546
1980	3 451,2	373,79	1 472,0	:	1 711	15 379	2 808,3	9,361	387 669	132,93	336,74	1 256	231,23	1 978,6	:	2 686,2	240 177
1981	3 577,5	407,79	1 535,0	:	2 050	17 179	3 164,8	11,359	464 030	141,69	352,85	1 501	254,20	2 196,1	:	3 007,2	257 963
1982	3 889,0	464,47	1 588,1	:	2 575	19 786	3 626,0	13,382	545 124	158,79	368,86	1 850	278,09	2 445,4	:	3 118,6	270 602
1983	4 122,3	512,54	1 668,5	:	3 079	22 484	4 006,5	14,779	633 436	174,68	381,02	2 302	303,38	2 694,9	:	3 349,4	281 767
1984	4 429,0	565,28	1 750,9	:	3 806	25 392	4 361,9	16,407	725 760	193,67	400,25	2 816	324,08	2 944,2	:	3 717,8	300 543
1985	4 738,0	615,07	1 823,2	:	4 618	28 201	4 700,1	17,790	810 580	205,26	418,18	3 524	354,91	3 195,6	:	3 962,2	320 419
1986	4 986,0	666,50	1 925,3	:	5 515	32 324	5 069,3	18,877	899 903	223,30	428,61	4 420	381,73	3 468,6	:	4 176,1	334 609
1987	5 205,5	699,91	1 990,5	:	6 258	36 144	5 336,7	20,263	983 803	227,85	430,17	5 175	419,98	3 712,7	:	4 452,9	348 425
1988	5 542,7	732,06	2 096,0	:	7 526	40 164	5 723,2	21,815	1 091 837	248,39	449,82	6 003	466,48	4 034,5	:	4 809,1	371 428
1989	6 016,0	769,80	2 220,9	:	8 778	45 025	6 136,1	24,308	1 192 725	279,03	475,30	7 130	510,02	4 374,0	:	5 132,0	395 845
1990	6 429,3	800,01	2 404,5	:	10 455	50 074	6 484,1	25,693	1 306 833	291,51	508,31	8 507	549,18	4 736,9	:	5 392,2	426 107
1991	6 720,5	832,26	2 600,7	2 782,4	12 341	54 775	6 775,6	26,833	1 422 122	310,66	536,43	9 902	573,48	5 066,9	5 155,3	5 547,9	453 308
1992	7 055,6	869,68	2 770,0	2 999,5	14 452	59 803	7 109,6	28,523	1 521 925	328,72	558,70	11 254	607,57	5 397,2	5 507,6	5 807,8	469 312

EUR 12−: including WD; EUR 12+: including D.

Table 5

Gross domestic product at current market prices

(ECU; Mrd)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12–	EUR 12+	USA	JAP
1960	10,5	5,6	68,2	:	3,3	11,1	57,7	1,7	37,6	0,5	11,1	2,4	68,5	278,2	:	486,1	42,1
1961	11,1	6,2	77,0	:	3,7	12,6	62,2	1,8	41,3	0,5	12,0	2,5	71,9	302,9	:	498,2	50,3
1962	11,8	7,0	84,3	:	3,9	14,5	69,3	1,9	46,3	0,5	13,0	2,7	75,4	330,8	:	534,9	57,0
1963	12,7	7,4	89,4	:	4,4	17,1	77,7	2,1	53,1	0,5	14,1	2,9	80,0	361,4	:	564,5	65,2
1964	14,3	8,5	98,2	:	4,9	19,3	86,2	2,4	58,1	0,6	16,6	3,1	87,4	399,6	:	604,2	76,7
1965	15,5	9,5	107,3	:	5,6	22,5	92,8	2,5	62,5	0,7	18,6	3,5	94,1	435,1	:	655,6	85,3
1966	16,7	10,4	114,1	:	6,2	26,0	100,5	2,6	67,7	0,7	20,2	3,8	100,2	469,3	:	718,2	99,1
1967	17,9	11,4	116,1	:	6,8	28,8	109,1	2,8	75,0	0,7	22,3	4,3	104,0	499,1	:	762,9	116,7
1968	19,9	12,2	129,6	:	7,6	29,1	122,7	2,9	84,1	0,8	25,6	4,9	101,9	541,3	:	862,8	143,0
1969	22,2	14,0	148,3	:	8,7	33,4	134,3	3,4	93,4	0,9	29,2	5,4	110,3	603,5	:	937,5	169,1
1970	24,7	15,5	180,5	:	9,7	37,2	139,8	3,8	105,1	1,1	32,7	6,1	121,2	677,3	:	986,7	199,3
1971	27,2	16,9	205,7	:	10,5	41,3	153,2	4,3	112,7	1,1	37,3	6,7	134,3	751,3	:	1 045,0	221,8
1972	31,3	19,4	230,1	:	11,2	48,8	174,6	5,0	122,0	1,3	42,9	7,6	143,6	837,7	:	1 072,5	272,0
1973	36,7	23,3	280,0	:	13,1	59,0	206,6	5,4	135,0	1,6	51,3	9,3	147,5	968,9	:	1 091,3	337,7
1974	44,8	26,9	318,8	:	15,8	75,4	229,6	5,8	154,3	2,0	63,0	11,3	163,0	1 110,8	:	1 210,5	395,2
1975	49,8	30,4	336,7	:	16,8	86,7	276,0	6,8	171,2	1,9	70,2	12,0	188,6	1 247,0	:	1 275,4	411,2
1976	59,7	37,2	398,0	:	20,2	98,1	318,2	7,5	188,0	2,3	85,3	13,9	201,1	1 429,4	:	1 577,2	502,9
1977	68,1	40,7	451,3	:	22,9	107,1	342,1	8,7	213,0	2,5	98,2	14,3	222,9	1 591,9	:	1 722,9	607,0
1978	74,6	44,4	502,2	:	24,8	116,8	380,3	10,2	234,7	2,8	107,8	14,1	253,2	1 765,8	:	1 740,2	765,3
1979	79,4	48,1	552,9	:	28,1	144,7	425,6	11,8	272,2	3,0	114,9	14,8	306,1	2 001,7	:	1 797,0	737,4
1980	85,0	47,8	583,2	:	28,8	154,3	478,5	13,8	326,0	3,3	122,0	18,1	386,4	2 247,0	:	1 929,3	762,4
1981	86,6	51,5	610,6	:	33,3	167,3	524,0	16,4	367,4	3,4	127,1	21,9	459,6	2 469,1	:	2 693,5	1 051,3
1982	87,0	56,9	668,4	:	39,4	184,0	563,8	19,4	411,8	3,6	141,1	23,7	496,2	2 695,3	:	3 183,1	1 111,1
1983	90,7	63,0	734,9	:	39,4	176,3	591,7	20,7	469,2	3,8	150,2	23,3	516,8	2 880,2	:	3 762,4	1 333,2
1984	97,5	69,4	782,3	:	43,0	200,6	634,8	22,6	525,4	4,3	158,6	24,3	548,7	3 111,5	:	4 711,8	1 606,4
1985	105,5	76,7	818,9	:	43,7	218,4	691,7	24,9	559,8	4,6	166,5	27,1	602,6	3 340,3	:	5 192,4	1 774,6
1986	113,8	84,0	904,7	:	40,1	235,2	745,5	25,7	615,6	5,1	178,5	30,1	568,4	3 546,7	:	4 243,3	2 028,0
1987	120,9	88,8	960,9	:	40,0	254,2	770,2	26,1	658,1	5,3	184,3	31,8	596,1	3 736,8	:	3 857,2	2 091,4
1988	127,6	92,1	1 010,4	:	44,9	291,9	813,4	28,1	710,2	5,7	192,7	35,3	702,1	4 054,3	:	4 066,9	2 452,3
1989	138,7	95,6	1 072,8	:	49,1	345,3	873,6	31,3	789,6	6,4	203,5	41,1	757,5	4 404,6	:	4 658,0	2 605,3
1990	151,5	101,8	1 171,8	:	51,9	386,9	937,8	33,5	858,6	6,9	219,8	47,0	769,3	4 736,9	:	4 234,4	2 320,1
1991	159,2	105,2	1 268,2	1 356,8	54,8	426,4	971,6	34,9	927,5	7,4	232,1	55,4	818,1	5 060,9	5 149,4	4 477,2	2 722,7
1992	167,3	109,9	1 351,9	1 463,9	58,5	463,8	1 027,7	37,2	984,2	7,8	242,1	65,3	861,2	5 377,0	5 489,0	4 530,8	2 861,5

EUR 12–: including WD; EUR 12+: including D.

Table 6

Gross domestic product at current market prices

(PPS EUR 12– ; Mrd)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12–	EUR 12+	USA	JAP
1960	6,8	4,0	52,5	:	2,2	13,6	37,6	1,2	33,1	0,4	10,1	2,4	49,1	213,0	:	238,1	38,7
1961	7,4	4,4	56,7	:	2,5	15,7	40,9	1,4	37,0	0,4	10,8	2,6	52,3	232,0	:	252,6	44,8
1962	8,1	4,9	61,9	:	2,7	17,9	45,6	1,5	41,0	0,4	11,7	2,9	55,2	253,7	:	277,9	50,9
1963	8,9	5,1	66,7	:	3,1	20,4	50,3	1,6	45,4	0,4	12,7	3,2	60,1	278,1	:	303,8	57,9
1964	9,9	5,9	74,4	:	3,5	22,7	56,1	1,7	48,8	0,5	14,4	3,6	66,3	307,7	:	336,2	67,7
1965	10,7	6,4	82,0	:	4,0	25,2	61,4	1,9	52,7	0,5	15,8	4,0	71,1	335,7	:	372,4	74,9
1966	11,5	6,9	87,6	:	4,4	28,0	67,2	1,9	58,1	0,5	16,9	4,4	75,3	362,7	:	407,0	86,1
1967	12,3	7,3	90,1	:	4,8	30,2	72,5	2,1	64,2	0,6	18,4	4,9	79,4	386,7	:	429,3	98,6
1968	13,3	7,9	98,2	:	5,3	33,3	78,1	2,4	70,7	0,6	20,2	5,5	85,3	420,7	:	462,0	115,0
1969	14,9	8,8	110,9	:	6,1	38,1	87,8	2,6	78,8	0,7	22,6	6,0	91,5	468,7	:	499,4	135,9
1970	16,9	9,6	124,4	:	7,0	42,3	99,2	2,9	88,6	0,8	25,5	6,8	99,9	523,9	:	532,6	160,7
1971	18,8	10,6	137,8	:	8,1	47,6	111,7	3,2	96,8	0,8	28,6	7,9	109,6	581,4	:	591,4	180,2
1972	21,2	11,9	153,9	:	9,4	55,1	124,5	3,7	106,4	1,0	31,6	9,1	121,4	649,1	:	665,3	208,8
1973	24,5	13,5	175,9	:	11,0	64,7	143,1	4,2	124,3	1,2	36,1	11,0	142,0	751,3	:	759,9	245,0
1974	28,9	15,1	199,8	:	12,0	77,1	166,4	4,9	148,3	1,5	42,5	12,6	158,1	867,1	:	854,3	275,7
1975	32,6	17,2	226,1	:	14,6	89,0	190,4	6,0	165,7	1,4	48,7	13,8	180,0	985,6	:	970,6	325,5
1976	38,5	20,5	266,1	:	17,4	102,7	222,1	6,8	197,4	1,6	57,2	16,5	206,6	1 153,5	:	1 137,5	379,0
1977	43,2	23,3	305,8	:	20,1	118,2	257,0	8,2	228,0	1,8	65,4	19,5	236,2	1 326,7	:	1 327,6	443,5
1978	49,0	26,1	347,7	:	23,6	132,3	293,2	9,7	261,0	2,0	73,9	22,1	270,3	1 511,0	:	1 540,2	513,4
1979	55,4	29,9	400,8	:	27,1	146,3	335,0	11,1	306,3	2,3	83,8	25,9	307,8	1 731,7	:	1 739,1	599,9
1980	65,3	33,6	457,0	:	31,2	167,1	383,2	12,9	360,2	2,6	95,4	30,5	339,7	1 978,6	:	1 960,6	701,4
1981	71,6	36,9	507,7	:	34,6	184,9	430,0	14,8	401,6	2,9	105,1	34,4	371,7	2 196,1	:	2 223,3	805,6
1982	80,4	42,0	555,8	:	38,4	206,8	486,1	16,7	444,8	3,3	114,5	38,9	417,8	2 445,4	:	2 394,2	918,6
1983	87,5	46,7	612,4	:	41,8	228,4	531,5	18,1	487,2	3,6	125,9	42,1	469,8	2 694,9	:	2 698,9	1 023,3
1984	95,5	52,1	672,3	:	45,9	248,3	576,2	20,1	534,4	4,0	138,7	44,1	512,7	2 944,2	:	3 089,3	1 139,7
1985	102,0	57,5	725,9	:	50,1	269,3	621,7	22,0	581,0	4,4	150,8	48,1	562,7	3 195,6	:	3 397,5	1 268,0
1986	109,3	63,0	783,8	:	53,8	293,5	672,4	23,1	631,6	4,9	162,5	52,9	617,7	3 468,6	:	3 702,8	1 374,5
1987	116,3	65,8	827,3	:	55,6	322,7	715,0	25,2	677,9	5,1	170,4	57,9	673,6	3 712,7	:	3 989,2	1 489,1
1988	127,5	69,5	896,4	:	60,5	354,7	775,9	27,5	737,3	5,7	182,8	62,9	733,8	4 034,5	:	4 358,4	1 652,9
1989	138,7	73,6	971,6	:	65,7	390,0	843,6	30,7	797,2	6,4	199,5	69,4	787,7	4 374,0	:	4 701,1	1 814,7
1990	151,6	78,8	1 071,7	:	69,1	425,6	911,5	34,6	856,1	6,8	218,4	76,3	836,5	4 736,9	:	4 997,3	2 019,0
1991	162,2	84,1	1 170,0	1 251,7	74,2	459,8	974,1	37,2	916,6	7,4	235,6	81,9	863,7	5 066,9	5 148,6	5 236,1	2 224,8
1992	172,6	90,2	1 250,2	1 340,0	79,3	493,9	1 040,0	39,8	975,1	8,0	249,8	87,8	910,5	5 397,2	5 487,0	5 589,0	2 370,6

EUR 12–: including WD; EUR 12+: including D.

Table 7

Gross domestic product at current market prices

(National currency; annual percentage change)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12 − (PPS)	EUR 12 + (PPS)	USA	JAP
1961	6,4	11,0	9,6	:	12,8	13,9	9,1	7,7	11,2	0,0	5,6	7,6	6,0	8,9	:	3,6	20,8
1962	7,0	12,7	8,8	:	6,2	15,6	11,7	8,3	12,4	5,3	7,7	6,4	5,1	9,4	:	7,6	13,5
1963	7,5	6,4	6,0	:	11,7	18,0	12,1	7,5	14,5	6,7	8,5	8,5	6,0	9,6	:	5,5	14,5
1964	11,9	14,3	9,9	:	12,3	12,9	10,9	13,8	9,5	14,2	17,7	8,5	9,3	10,6	:	7,0	17,6
1965	8,8	12,3	9,3	:	13,8	16,4	7,6	6,5	7,6	4,8	11,7	11,7	7,7	9,1	:	8,5	11,3
1966	7,5	9,8	6,3	:	11,2	15,7	8,3	5,4	8,4	5,1	8,9	9,6	6,5	8,0	:	9,5	16,1
1967	7,1	9,9	1,3	:	8,1	12,3	8,0	9,2	10,2	0,6	9,7	11,8	5,3	6,6	:	5,7	17,2
1968	7,0	11,3	7,9	:	8,5	12,1	8,7	12,8	8,4	9,4	10,9	10,7	8,4	8,8	:	9,3	18,4
1969	10,9	13,7	11,9	:	13,6	13,7	14,0	15,5	10,4	15,8	13,3	9,7	7,6	11,4	:	8,0	17,5
1970	11,3	10,5	13,1	:	12,2	11,2	11,7	12,6	12,5	17,1	12,2	11,3	9,8	11,8	:	5,2	17,9
1961-70	8,5	11,2	8,4	:	11,0	14,2	10,2	9,9	10,5	7,7	10,6	9,5	7,2	9,4	:	7,0	16,4
1971	9,5	10,5	11,0	:	10,5	12,9	11,4	14,4	8,7	1,8	12,7	12,0	11,6	11,0	:	8,6	10,0
1972	11,8	15,0	9,8	:	14,4	17,3	11,7	20,7	9,3	12,8	13,0	16,4	12,0	11,6	:	9,9	14,5
1973	13,6	14,7	11,4	:	28,2	20,6	14,4	20,7	21,2	21,5	14,1	21,7	14,9	15,7	:	11,7	21,8
1974	17,2	12,0	7,3	:	16,5	22,5	15,3	10,6	26,3	21,9	13,5	20,2	13,0	15,4	:	8,3	19,3
1975	10,4	11,7	4,3	:	19,1	17,4	12,7	26,9	13,5	−7,4	10,1	11,2	26,2	13,7	:	8,7	10,5
1976	13,6	16,2	9,1	:	22,7	20,3	15,9	22,7	26,1	15,1	14,5	24,3	18,4	17,0	:	11,4	12,3
1977	8,0	11,2	6,7	:	16,8	26,9	12,8	22,6	22,6	2,8	9,1	33,5	16,6	15,0	:	11,5	11,4
1978	7,3	11,5	7,4	:	20,5	22,4	13,8	18,5	18,3	9,4	8,0	25,8	15,4	13,9	:	12,8	10,1
1979	6,7	11,4	8,2	:	23,0	17,0	13,7	17,2	22,2	8,8	6,4	26,2	17,7	14,6	:	11,1	8,4
1980	8,2	7,8	6,0	:	19,7	15,6	13,2	18,2	25,1	8,8	6,6	26,5	16,9	14,3	:	9,1	8,4
1971-80	10,6	12,2	8,1	:	19,1	19,2	13,5	19,2	19,2	9,2	10,8	21,6	16,2	14,2	:	10,3	12,6
1981	3,7	9,1	4,3	:	19,8	11,7	12,7	21,3	19,7	6,6	4,8	19,5	9,9	11,0	:	12,0	7,4
1982	8,7	13,9	3,5	:	25,6	15,2	14,6	17,8	17,5	12,1	4,5	23,3	9,4	11,4	:	3,7	4,9
1983	6,0	10,4	5,1	:	19,6	13,6	10,5	10,4	16,2	10,0	3,3	24,4	9,1	10,2	:	7,4	4,1
1984	7,4	10,3	4,9	:	23,6	12,9	8,9	11,0	14,6	10,9	5,0	22,3	6,8	9,3	:	11,0	6,7
1985	7,0	8,8	4,1	:	21,3	11,1	7,8	8,4	11,7	6,0	4,5	25,2	9,5	8,5	:	6,6	6,6
1986	5,2	8,4	5,6	:	19,4	14,6	7,9	6,1	11,0	8,8	2,5	25,4	7,6	8,5	:	5,4	4,4
1987	4,4	5,0	3,4	:	13,5	11,8	5,3	7,3	9,3	2,0	0,4	17,1	10,0	7,0	:	6,6	4,1
1988	6,5	4,6	5,3	:	20,3	11,1	7,2	7,7	11,0	9,0	4,6	16,0	11,1	8,7	:	8,0	6,6
1989	8,5	5,2	6,0	:	16,6	12,1	7,2	11,4	9,2	12,3	5,7	18,8	9,3	8,4	:	6,7	6,6
1990	6,9	3,9	8,3	:	19,1	11,2	5,7	5,7	9,6	4,5	6,9	19,3	7,7	8,3	:	5,1	7,6
1981-90	6,4	7,9	5,0	:	19,8	12,5	8,7	10,6	12,9	8,2	4,2	21,1	9,0	9,1	:	7,2	5,9
1991	4,5	4,0	8,2	:	18,0	9,4	4,5	4,4	8,8	6,6	5,5	16,4	4,4	7,0	:	2,9	6,4
1992	5,0	4,5	6,5	7,8	17,1	9,2	4,9	6,3	7,0	5,8	4,2	13,7	5,9	6,5	6,8	4,7	3,5

EUR 12−: including WD; EUR 12+: including D.

Table 8

Gross domestic product at current market prices per head of population

(ECU; EUR 12− = 100)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12−	EUR 12+	USA	JAP
1960	115,7	123,6	123,6	:	40,0	36,6	126,7	59,3	75,1	158,3	96,8	28,0	131,4	100,0	:	270,1	44,9
1961	112,5	125,0	127,6	:	41,1	37,9	125,5	58,9	76,2	143,8	96,2	27,7	126,8	100,0	:	252,5	49,3
1962	110,6	129,0	127,7	:	40,0	40,1	127,0	58,6	78,5	138,0	95,1	27,2	121,8	100,0	:	246,9	51,2
1963	109,1	125,9	123,9	:	41,1	43,3	129,3	57,8	82,5	134,6	94,1	27,1	118,6	100,0	:	237,3	53,6
1964	110,3	130,3	122,9	:	42,0	44,2	129,5	59,7	81,7	138,7	99,6	26,7	117,5	100,0	:	228,5	56,9
1965	110,2	134,5	123,1	:	44,0	47,1	128,0	58,7	80,9	133,1	101,7	27,6	116,4	100,0	:	226,9	58,1
1966	110,0	136,8	121,2	:	45,5	50,4	128,4	57,6	81,3	129,7	102,1	28,3	115,2	100,0	:	229,6	62,4
1967	111,4	140,4	116,4	:	46,1	52,1	130,8	58,4	84,6	123,7	105,3	30,1	112,5	100,0	:	228,3	68,8
1968	113,9	138,6	120,1	:	47,9	48,4	135,5	55,0	87,5	129,6	111,0	32,0	101,8	100,0	:	237,1	77,3
1969	114,6	142,5	123,0	:	49,3	49,5	133,0	57,5	87,3	135,8	112,9	31,9	99,1	100,0	:	230,4	81,6
1970	114,3	140,3	133,0	:	49,5	49,1	123,0	57,6	87,6	141,9	112,3	32,1	97,3	100,0	:	215,0	85,1
1971	114,0	138,4	136,2	:	48,3	49,0	121,3	58,9	84,7	130,7	114,9	32,5	97,5	100,0	:	204,3	85,2
1972	118,2	142,1	136,7	:	46,3	51,9	123,8	60,4	82,2	135,4	117,8	33,3	93,8	100,0	:	187,2	93,0
1973	120,2	147,9	144,0	:	46,8	54,1	126,4	55,8	78,6	146,1	121,8	35,5	83,6	100,0	:	164,1	99,0
1974	128,1	149,0	143,5	:	49,1	59,9	122,3	52,0	78,2	160,5	129,9	37,3	81,0	100,0	:	158,1	100,2
1975	127,1	149,9	136,0	:	46,4	61,0	130,8	53,3	77,2	132,5	128,3	34,3	83,8	100,0	:	147,5	92,1
1976	133,2	160,2	141,5	:	48,1	59,7	131,5	50,7	73,8	140,2	135,4	34,1	78,3	100,0	:	158,2	97,5
1977	136,7	157,8	144,9	:	48,4	58,1	126,9	52,6	75,0	136,8	139,7	31,3	78,2	100,0	:	154,2	105,1
1978	135,3	155,0	146,0	:	46,9	56,7	127,0	54,8	74,6	137,9	137,9	27,6	80,4	100,0	:	139,4	118,7
1979	127,4	148,5	142,3	:	46,5	61,6	125,3	55,4	76,3	132,3	129,3	25,5	85,9	100,0	:	126,1	100,5
1980	121,9	131,6	133,8	:	42,2	58,3	125,4	57,5	81,6	126,9	121,8	27,5	96,9	100,0	:	119,6	92,2
1981	113,4	129,7	127,7	:	44,1	57,2	124,8	61,6	83,9	121,2	115,1	30,2	105,2	100,0	:	151,0	115,3
1982	104,6	131,8	128,5	:	47,7	57,4	122,6	66,1	86,1	115,1	116,8	29,8	104,4	100,0	:	162,2	111,1
1983	102,3	136,9	132,9	:	44,5	51,4	120,1	65,5	91,8	116,8	116,1	27,3	101,9	100,0	:	178,0	124,2
1984	101,9	139,9	131,8	:	44,8	54,0	119,0	66,0	95,0	120,0	113,3	26,2	100,1	100,0	:	204,9	137,9
1985	103,0	144,3	129,1	:	42,3	54,6	120,6	67,6	94,3	119,9	110,6	27,0	102,4	100,0	:	208,8	141,4
1986	104,9	149,0	134,6	:	36,6	55,3	122,2	66,0	97,7	125,7	111,3	28,2	91,0	100,0	:	159,5	151,6
1987	105,9	149,6	136,0	:	34,7	56,8	119,7	63,8	99,2	123,4	108,6	28,3	90,5	100,0	:	136,7	148,1
1988	103,0	143,5	131,4	:	35,9	60,1	116,4	63,5	98,8	122,3	104,3	28,9	98,4	100,0	:	132,0	159,9
1989	103,1	137,7	127,7	:	36,2	65,6	115,0	65,8	101,4	125,9	101,3	31,0	97,8	100,0	:	138,4	156,4
1990	105,1	137,0	128,1	:	35,4	68,7	114,9	66,1	103,0	124,4	101,7	33,1	92,7	100,0	:	116,5	129,9
1991	103,9	132,8	128,7	110,1	35,1	71,1	111,5	64,6	104,4	125,2	100,3	36,8	92,5	100,0	97,0	114,7	142,9
1992	103,2	130,8	128,4	111,6	35,3	73,0	111,0	64,4	104,5	125,3	98,2	40,9	91,7	100,0	97,4	108,5	141,5

EUR 12−: including WD; EUR 12+: including D.

Table 9

Gross domestic product at current market prices per head of population

(PPS EUR 12–; EUR 12– = 100)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12–	EUR 12+	USA	JAP
1960	97,4	115,2	124,3	:	34,4	58,3	107,8	57,7	86,5	155,1	115,7	37,2	122,9	100,0	:	172,9	54,0
1961	97,5	116,5	122,6	:	36,3	61,7	107,7	58,3	88,9	146,0	112,5	37,4	120,5	100,0	:	167,2	57,3
1962	98,5	117,8	122,3	:	35,4	64,5	108,9	57,8	90,5	137,1	111,3	38,6	116,3	100,0	:	167,2	59,7
1963	98,6	113,6	120,2	:	37,5	67,2	108,8	58,1	91,7	134,3	109,9	39,2	116,0	100,0	:	166,0	61,9
1964	99,6	117,4	121,0	:	38,5	67,4	109,4	57,2	89,2	136,7	111,9	39,9	115,7	100,0	:	165,2	65,2
1965	98,8	117,8	121,9	:	40,6	68,5	109,7	56,1	88,4	132,9	112,3	41,4	113,9	100,0	:	167,0	66,0
1966	98,1	116,4	120,4	:	41,4	70,3	111,1	54,7	90,2	128,8	110,4	41,8	112,0	100,0	:	168,3	70,2
1967	98,7	116,2	116,6	:	42,0	70,5	112,3	56,1	93,5	126,2	111,9	44,0	110,8	100,0	:	165,8	75,1
1968	97,9	114,7	117,1	:	42,7	71,1	111,1	57,7	94,6	126,2	112,6	45,9	109,7	100,0	:	163,4	80,0
1969	98,8	115,2	118,4	:	44,4	72,8	112,0	57,8	94,8	134,9	112,5	45,1	105,8	100,0	:	158,0	84,4
1970	101,0	112,2	118,5	:	46,0	72,3	112,8	56,6	95,4	138,2	113,0	46,9	103,8	100,0	:	150,1	88,7
1971	102,0	111,7	118,0	:	47,9	73,1	114,3	56,6	94,0	127,8	113,6	49,1	102,8	100,0	:	149,4	89,4
1972	103,3	112,9	118,0	:	50,0	75,6	113,9	57,3	92,5	130,6	112,1	51,4	102,4	100,0	:	149,9	92,1
1973	103,4	110,2	116,7	:	50,6	76,4	112,8	56,0	93,2	138,6	110,3	54,1	103,8	100,0	:	147,4	92,7
1974	105,8	107,1	115,2	:	47,9	78,6	113,5	56,6	96,3	149,3	112,2	53,2	100,6	100,0	:	142,9	89,5
1975	105,3	107,6	115,6	:	51,1	79,2	114,2	59,6	94,5	123,7	112,6	50,1	101,2	100,0	:	142,1	92,2
1976	106,4	109,5	117,2	:	51,4	77,5	113,8	57,0	96,1	122,8	112,5	50,1	99,6	100,0	:	141,4	91,1
1977	104,1	108,1	117,8	:	51,0	76,9	114,3	59,3	96,4	116,4	111,6	51,0	99,4	100,0	:	142,6	92,1
1978	103,9	106,4	118,1	:	52,2	75,0	114,5	61,0	96,9	116,6	110,5	50,7	100,2	100,0	:	144,2	93,1
1979	102,9	106,6	119,2	:	51,9	72,0	114,0	60,0	99,3	115,9	109,0	51,4	99,9	100,0	:	141,0	94,5
1980	106,3	105,0	119,1	:	51,8	71,8	114,1	60,8	102,4	115,4	108,1	52,8	96,7	100,0	:	138,1	96,3
1981	105,5	104,4	119,4	:	51,5	71,1	115,1	62,2	103,1	114,3	107,0	53,4	95,7	100,0	:	140,1	99,3
1982	106,5	107,1	117,8	:	51,2	71,2	116,5	62,6	102,6	116,3	104,5	53,8	96,9	100,0	:	134,5	101,3
1983	105,5	108,4	118,4	:	50,4	71,1	115,3	61,2	101,8	116,2	104,0	52,6	99,0	100,0	:	136,5	101,9
1984	105,5	110,9	119,7	:	50,4	70,6	114,2	62,1	102,1	118,4	104,7	50,2	98,9	100,0	:	142,0	103,4
1985	104,1	113,2	119,6	:	50,7	70,4	113,3	62,5	102,3	120,0	104,7	50,1	100,0	100,0	:	142,8	105,6
1986	103,0	114,3	119,2	:	50,1	70,6	112,7	60,7	102,5	124,4	103,6	50,7	101,1	100,0	:	142,3	105,1
1987	102,5	111,6	117,8	:	48,4	72,5	111,8	61,8	102,9	119,0	101,1	51,8	102,9	100,0	:	142,3	106,1
1988	103,4	108,9	117,2	:	48,6	73,4	111,5	62,4	103,1	121,5	99,5	51,8	103,3	100,0	:	142,2	108,3
1989	103,8	106,7	116,5	:	48,7	74,6	111,8	64,9	103,1	126,9	100,0	52,7	102,4	100,0	:	140,6	109,7
1990	105,1	106,1	117,2	:	47,1	75,5	111,7	68,3	102,7	123,6	101,0	53,8	100,8	100,0	:	137,5	113,0
1991	105,7	106,0	118,6	101,5	47,4	76,6	111,7	68,7	103,0	126,1	101,7	54,3	97,5	100,0	96,9	133,9	116,6
1992	106,0	107,0	118,3	101,7	47,7	77,5	112,0	68,8	103,1	128,5	100,9	54,8	96,6	100,0	97,0	133,4	116,8

EUR 12–: including WD; EUR 12+: including D.

Table 10

Gross domestic product at constant market prices

(National currency; annual percentage change)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12– (PPS)	EUR 12+ (PPS)	USA	JAP
1961	5,0	6,4	4,5	:	11,1	11,8	5,5	5,0	8,2	3,8	3,1	5,2	3,3	5,5	:	2,8	12,0
1962	5,2	5,7	4,6	:	1,5	9,3	6,7	3,2	6,2	1,4	4,0	6,6	1,0	4,7	:	5,3	8,9
1963	4,4	0,6	2,8	:	10,1	8,8	5,3	4,7	5,6	3,4	3,6	5,9	3,8	4,5	:	4,3	8,5
1964	7,0	9,3	6,7	:	8,3	6,2	6,5	3,8	2,8	7,9	8,3	7,3	5,4	5,8	:	5,9	11,7
1965	3,6	4,6	5,4	:	9,4	6,3	4,8	1,9	3,3	1,9	5,2	7,6	2,5	4,4	:	5,9	5,8
1966	3,2	2,7	2,8	:	6,1	7,1	5,2	0,9	6,0	1,1	2,7	3,9	1,9	3,9	:	5,1	10,6
1967	3,9	3,4	−0,3	:	5,5	4,3	4,7	5,8	7,2	0,2	5,3	8,1	2,3	3,4	:	2,3	11,1
1968	4,2	4,0	5,5	:	6,7	6,8	4,3	8,2	6,5	4,2	6,4	9,2	4,1	5,3	:	4,2	12,9
1969	6,6	6,3	7,4	:	9,9	8,9	7,0	5,9	6,1	10,0	6,4	3,4	2,1	6,0	:	2,9	12,5
1970	6,4	2,0	5,1	:	8,0	4,1	5,7	2,7	5,3	1,7	5,7	7,6	2,3	4,7	:	−0,1	10,7
1961-70	4,9	4,5	4,4	:	7,6	7,3	5,6	4,2	5,7	3,5	5,1	6,4	2,9	4,8	:	3,8	10,5
1971	3,7	2,7	3,0	:	7,1	4,6	4,8	3,5	1,6	2,7	4,2	6,6	2,0	3,2	:	3,2	4,3
1972	5,3	5,3	4,3	:	8,9	8,0	4,1	6,5	2,7	6,6	3,3	8,0	3,5	4,3	:	5,1	8,2
1973	5,9	3,6	4,9	:	7,3	7,7	5,4	4,7	7,1	8,3	4,7	11,2	7,3	6,2	:	4,8	7,6
1974	4,1	−0,9	0,3	:	−3,6	5,3	2,7	4,3	5,4	4,2	4,0	1,1	−1,7	1,9	:	−0,7	−0,6
1975	−1,5	−0,7	−1,4	:	6,1	0,5	−0,3	5,7	−2,7	−6,6	−0,1	−4,3	−0,8	−1,0	:	−1,0	2,9
1976	5,6	6,5	5,3	:	6,4	3,3	4,4	1,4	6,6	2,5	5,1	6,9	2,7	4,7	:	4,9	4,2
1977	0,5	1,6	2,8	:	3,4	3,0	3,5	8,2	3,4	1,6	2,3	5,5	2,3	2,9	:	4,4	4,7
1978	2,7	1,5	3,0	:	6,7	1,4	3,4	7,2	3,7	4,1	2,5	2,8	3,6	3,2	:	5,1	4,9
1979	2,1	3,5	4,1	:	3,7	−0,1	3,2	3,1	6,0	2,3	2,4	5,6	2,9	3,5	:	2,0	5,5
1980	4,3	−0,4	1,1	:	1,8	1,2	1,4	3,1	4,2	0,8	0,9	4,6	−2,2	1,3	:	−0,1	3,6
1971-80	3,2	2,2	2,7	:	4,7	3,5	3,2	4,7	3,8	2,6	2,9	4,7	1,9	3,0	:	2,7	4,5
1981	−1,0	−0,9	0,2	:	0,1	−0,2	1,2	3,3	0,6	−0,6	−0,6	1,6	−1,3	0,1	:	2,3	3,6
1982	1,5	3,0	−0,9	:	0,4	1,2	2,3	2,3	0,2	1,1	−1,4	2,1	1,7	0,7	:	−2,6	3,2
1983	0,4	2,5	1,6	:	0,4	1,8	0,8	−0,2	1,0	3,0	1,4	−0,2	3,7	1,6	:	3,9	2,7
1984	2,1	4,4	2,8	:	2,8	1,8	1,5	4,4	2,7	6,2	3,1	−1,9	2,2	2,3	:	7,2	4,3
1985	0,8	4,3	1,9	:	3,1	2,3	1,8	3,1	2,6	2,9	2,6	2,8	3,6	2,4	:	3,8	5,0
1986	1,5	3,6	2,2	:	1,6	3,2	2,4	−0,5	2,9	4,8	2,0	4,1	3,9	2,8	:	3,2	2,6
1987	2,2	0,3	1,4	:	−0,7	5,6	2,2	4,6	3,1	2,7	0,8	5,3	4,8	2,9	:	3,5	4,1
1988	4,9	1,2	3,7	:	4,1	5,2	3,8	4,5	4,1	5,6	2,6	3,9	4,2	4,0	:	4,5	6,2
1989	3,6	0,8	3,3	:	3,5	4,8	3,6	6,4	3,0	6,3	4,0	5,2	2,3	3,3	:	2,8	4,6
1990	3,8	1,7	4,7	:	−0,2	3,6	2,6	7,1	2,0	2,3	3,9	4,4	0,8	2,8	:	0,9	5,6
1981-90	2,0	2,1	2,1	:	1,5	2,9	2,2	3,5	2,2	3,4	1,8	2,7	2,6	2,3	:	2,9	4,2
1991	1,4	1,0	3,4	:	1,8	2,4	1,2	1,9	1,4	2,9	2,2	1,8	−2,2	1,3	:	−0,7	4,4
1992	1,6	2,4	2,0	2,2	2,0	2,5	1,9	2,2	1,5	2,9	1,2	2,3	0,6	1,7	1,7	1,9	1,7

EUR 12–: including WD; EUR 12+: including D.

Table 11

Industrial production

Construction excluded

(Annual percentage change)

	B	DK	WD	GR	E	F	IRL	I	L	NL	P	UK	EUR 12–	USA	JAP
1961	6,1	5,1	6,2	:	:	5,6	8,7	10,9	2,9	3,8	:	0,3	–0,2	0,7	19,6
1962	5,8	8,9	8,4	:	10,1	5,1	7,0	9,6	–4,2	3,5	:	1,0	5,3	8,4	8,5
1963	7,4	1,2	3,6	10,7	12,0	7,2	5,9	8,8	0,9	5,0	:	3,5	5,8	5,9	11,2
1964	6,5	11,5	7,6	10,9	11,0	6,0	7,7	1,2	9,1	9,8	:	8,1	6,7	6,6	15,8
1965	2,5	6,6	5,2	8,4	14,4	1,8	4,3	4,6	0,9	4,3	:	2,8	4,8	10,0	3,8
1966	2,1	2,9	1,4	16,1	15,1	5,4	2,7	11,4	–3,2	4,2	:	1,6	4,9	8,8	13,5
1967	1,7	4,0	–2,5	4,3	6,1	2,5	8,3	8,2	–0,6	2,9	:	0,7	2,0	2,2	19,3
1968	5,6	7,4	9,7	7,8	7,3	3,7	10,3	6,5	6,0	9,1	:	7,6	6,6	5,6	15,4
1969	9,7	12,3	12,6	11,8	15,6	10,4	7,1	3,7	12,8	10,9	7,9	3,5	8,8	4,7	15,9
1970	3,1	2,6	6,1	10,6	10,2	5,2	4,4	6,4	0,5	8,7	6,4	0,5	5,2	–3,4	13,9
1961-70	5,0	6,2	5,7	:	:	5,3	6,6	7,1	2,4	6,2	:	2,9	5,0	4,9	13,6
1971	1,8	2,3	1,4	11,2	3,2	4,8	3,8	–0,5	–1,1	5,5	7,8	–0,6	1,9	1,4	2,5
1972	7,5	4,4	4,4	14,2	15,8	6,8	4,2	5,0	4,2	5,2	13,0	1,8	5,4	9,7	7,3
1973	6,0	3,3	7,1	15,2	15,2	6,7	9,8	9,7	11,9	7,6	11,9	9,0	8,5	8,2	15,0
1974	4,1	–0,7	–1,1	–1,4	9,3	2,3	3,0	3,9	3,5	4,7	2,8	–2,0	1,4	–1,5	–3,9
1975	–9,9	–6,0	–6,2	4,3	–6,6	–7,4	–6,0	–8,8	–21,8	–5,1	–4,9	–5,4	–6,7	–8,8	–11,1
1976	7,7	9,7	7,4	10,5	5,1	8,6	8,5	11,6	3,8	7,6	3,3	3,3	7,5	9,3	11,1
1977	0,6	0,8	2,1	1,6	5,2	2,0	8,0	0,0	0,5	0,4	13,1	5,1	2,5	8,0	4,1
1978	2,4	2,2	2,9	7,5	2,4	2,3	8,0	2,1	3,1	0,8	6,9	2,9	2,7	5,7	6,4
1979	4,5	3,7	4,9	5,9	0,7	4,1	7,7	6,7	3,4	3,2	7,2	3,8	4,5	3,8	7,3
1980	–1,3	0,2	0,5	0,9	1,3	1,9	–0,6	5,1	–3,4	–1,0	5,4	–6,5	0,1	–1,9	4,7
1971-80	2,2	1,9	2,3	6,9	5,0	3,1	4,5	3,3	0,0	2,8	6,5	1,0	2,7	3,2	4,1
1981	–2,7	0,0	–1,8	0,9	–1,0	–0,9	5,4	–2,2	–5,6	–1,2	0,6	–3,2	–1,9	1,9	0,9
1982	0,0	2,7	–3,0	1,1	–1,1	–0,8	–0,7	–3,1	0,9	–3,7	4,6	2,0	–1,3	–4,5	0,4
1983	1,9	3,2	0,8	0,0	2,7	–0,6	7,8	–2,4	5,4	2,9	1,6	3,6	1,0	3,7	3,3
1984	2,5	9,7	3,3	1,6	0,8	0,3	9,9	3,2	13,3	4,6	–0,1	0,1	2,1	9,3	9,3
1985	2,5	4,3	4,9	3,4	2,0	0,2	3,4	1,4	6,8	4,1	10,9	5,5	3,4	1,7	3,6
1986	0,8	6,5	2,4	–0,2	3,1	0,9	2,2	4,1	2,1	0,2	7,3	2,4	2,4	0,9	–0,2
1987	2,2	–3,5	0,3	–1,7	4,6	1,9	8,8	2,6	–0,9	0,9	4,4	3,3	2,0	5,0	3,5
1988	5,7	1,9	3,7	5,7	3,1	4,6	10,7	6,9	8,7	–0,1	3,8	3,5	4,2	5,5	9,2
1989	3,5	2,3	5,3	1,5	4,5	4,2	11,6	3,9	7,8	4,7	6,8	0,4	3,8	2,5	6,1
1990	5,1	0,6	5,2	–1,9	0,0	1,7	4,7	–0,7	–0,5	3,2	9,0	–0,5	1,9	1,0	4,7
1981-90	2,1	2,7	2,1	1,0	1,8	1,1	6,3	1,3	3,7	1,5	4,8	1,7	1,7	2,6	4,0
1991	–2,4	2,0	2,8	–1,9	–0,1	–0,5	3,3	–2,0	0,5	3,8	0,6	–2,9	–0,3	–2,0	2,3
1992	1,2	3,0	2,3	2,0	1,0	1,7	4,5	1,3	1,1	1,0	1,3	1,8	1,7	2,3	2,5

EUR 12–: including WD.

Table 12

Private consumption at current prices

(ECU; Mrd)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12−	EUR 12+	USA	JAP
1960	7,3	3,5	40,5	:	2,7	7,5	34,4	1,3	22,4	0,3	6,5	1,7	45,2	173,3	:	310,7	24,7
1961	7,5	3,8	45,8	:	2,8	8,4	37,3	1,3	24,2	0,3	7,2	1,8	47,1	187,7	:	317,4	28,7
1962	7,9	4,3	50,2	:	3,0	9,6	41,6	1,4	27,3	0,3	7,9	1,9	49,8	205,1	:	336,3	32,9
1963	8,6	4,6	53,2	:	3,3	11,5	47,0	1,5	31,9	0,3	8,7	2,0	53,0	225,7	:	354,7	38,4
1964	9,1	5,1	57,4	:	3,6	12,8	51,3	1,7	34,6	0,4	9,9	2,1	56,6	244,8	:	380,6	44,2
1965	10,0	5,6	63,5	:	4,1	15,1	54,8	1,8	37,0	0,4	11,0	2,4	60,3	265,9	:	409,8	50,0
1966	10,7	6,2	68,1	:	4,5	17,3	59,2	1,9	40,8	0,4	12,0	2,6	63,8	287,5	:	443,7	57,5
1967	11,3	6,8	70,6	:	4,9	19,1	64,4	2,0	45,4	0,4	13,1	2,8	66,1	306,9	:	470,3	66,3
1968	12,7	7,2	77,8	:	5,5	19,2	72,8	2,1	50,2	0,5	14,8	3,4	64,3	330,3	:	534,3	78,2
1969	13,8	8,0	87,7	:	6,0	21,4	79,3	2,4	55,4	0,5	17,1	3,8	68,7	364,0	:	581,6	90,5
1970	14,8	8,9	105,3	:	6,7	23,8	80,9	2,6	62,6	0,5	19,1	4,0	74,8	404,2	:	622,0	104,2
1971	16,4	9,4	120,7	:	7,1	26,5	88,6	2,9	67,4	0,6	21,6	4,6	83,4	449,4	:	657,0	118,8
1972	18,8	10,3	136,6	:	7,4	31,2	100,8	3,2	73,3	0,7	24,6	4,9	90,2	502,0	:	672,6	146,9
1973	22,2	12,7	164,7	:	8,3	37,5	118,0	3,5	81,6	0,8	29,1	6,0	92,2	576,6	:	676,9	181,0
1974	26,8	14,6	190,1	:	10,7	48,4	132,1	4,0	93,0	0,9	35,8	8,2	104,0	668,7	:	758,4	214,7
1975	30,5	16,8	211,7	:	11,4	55,7	162,1	4,3	106,2	1,1	41,1	9,3	117,4	767,6	:	810,6	235,0
1976	36,4	21,0	248,7	:	13,3	64,4	185,9	4,8	114,4	1,3	50,1	10,5	123,0	873,7	:	1 004,3	289,2
1977	42,2	23,2	284,6	:	15,1	69,7	199,3	5,6	128,3	1,5	58,7	10,3	133,6	972,0	:	1 095,4	350,1
1978	45,9	24,9	314,3	:	16,2	74,6	220,2	6,5	139,6	1,6	65,1	9,6	151,6	1 070,1	:	1 093,1	441,5
1979	49,9	27,2	344,3	:	17,8	93,2	247,4	7,7	162,5	1,8	70,0	10,0	184,7	1 216,5	:	1 134,4	432,9
1980	53,5	26,7	367,8	:	18,6	100,8	281,7	9,1	199,0	1,9	74,6	12,2	232,0	1 377,8	:	1 236,2	448,6
1981	56,5	28,9	390,9	:	22,4	111,2	315,8	10,8	224,9	2,1	76,8	15,3	279,4	1 535,0	:	1 710,5	611,3
1982	57,0	31,3	428,2	:	26,5	121,8	342,2	11,6	253,4	2,1	84,9	16,5	302,6	1 678,3	:	2 088,7	660,4
1983	59,1	34,4	468,6	:	26,3	115,8	359,7	12,3	286,8	2,3	90,6	16,2	316,5	1 788,7	:	2 497,9	802,9
1984	63,2	37,8	497,6	:	27,8	128,9	385,8	13,3	320,9	2,5	93,8	17,2	335,4	1 924,3	:	3 069,8	954,8
1985	69,1	42,1	518,8	:	28,6	140,0	422,5	14,8	344,0	2,7	98,7	18,4	366,9	2 066,6	:	3 427,9	1 045,4
1986	73,0	46,2	559,7	:	27,1	148,7	450,4	15,4	377,5	2,9	106,7	19,6	356,9	2 184,0	:	2 821,8	1 187,7
1987	77,9	47,9	597,9	:	27,8	160,8	469,0	15,5	406,0	3,1	113,1	20,5	373,6	2 313,1	:	2 581,3	1 228,0
1988	80,6	48,9	624,1	:	30,7	182,7	490,0	16,5	436,4	3,3	115,2	23,0	447,1	2 498,4	:	2 717,2	1 420,3
1989	86,3	50,5	650,8	:	34,5	217,0	523,8	17,7	489,9	3,6	120,4	26,1	482,2	2 702,8	:	3 108,8	1 503,5
1990	93,8	53,1	705,4	:	37,6	241,5	565,7	18,5	531,0	3,9	129,3	29,6	486,9	2 896,3	:	2 855,5	1 325,3
1991	98,9	55,2	749,2	855,8	40,6	266,5	586,5	19,3	578,0	4,2	137,9	35,1	522,3	3 093,7	3 200,4	3 049,0	1 538,9
1992	104,3	57,7	790,8	914,5	43,5	290,9	622,9	20,4	617,4	4,5	144,7	41,2	549,8	3 288,0	3 411,7	3 070,8	1 622,2

EUR 12−: including WD; EUR 12+: including D.

Table 13

Private consumption at current prices

(PPS EUR 12–; Mrd)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12–	EUR 12+	USA	JAP
1960	4,7	2,5	31,2	:	1,8	9,2	22,4	1,0	19,7	0,2	5,9	1,7	32,4	132,7	:	152,2	22,7
1961	5,0	2,7	33,7	:	1,9	10,5	24,5	1,0	21,7	0,2	6,4	1,9	34,2	143,9	:	160,9	25,5
1962	5,4	3,0	36,8	:	2,0	11,9	27,3	1,1	24,2	0,2	7,1	2,0	36,4	157,5	:	174,7	29,4
1963	5,9	3,2	39,8	:	2,3	13,8	30,4	1,2	27,3	0,2	7,9	2,2	39,9	174,1	:	190,9	34,1
1964	6,3	3,5	43,5	:	2,6	15,1	33,4	1,3	29,1	0,3	8,5	2,5	42,9	188,9	:	211,8	39,0
1965	6,9	3,8	48,5	:	2,9	16,9	36,2	1,3	31,2	0,3	9,4	2,7	45,5	205,7	:	232,8	43,8
1966	7,4	4,1	52,3	:	3,2	18,6	39,6	1,4	35,0	0,3	10,0	3,0	47,9	222,8	:	251,4	49,9
1967	7,8	4,4	54,8	:	3,5	20,0	42,9	1,5	38,9	0,3	10,8	3,2	50,4	238,4	:	264,6	56,0
1968	8,5	4,6	59,0	:	3,8	22,0	46,3	1,7	42,2	0,3	11,7	3,8	53,8	257,7	:	286,2	62,9
1969	9,3	5,1	65,6	:	4,2	24,4	51,9	1,8	46,7	0,4	13,2	4,1	56,9	283,5	:	309,8	72,7
1970	10,1	5,5	72,6	:	4,8	27,1	57,4	2,0	52,7	0,4	14,9	4,5	61,7	313,8	:	335,8	84,0
1971	11,3	5,9	80,9	:	5,5	30,6	64,6	2,2	57,9	0,5	16,5	5,4	68,1	349,3	:	371,8	96,5
1972	12,8	6,4	91,4	:	6,2	35,2	71,9	2,4	63,9	0,5	18,1	5,8	76,3	390,7	:	417,3	112,8
1973	14,8	7,3	103,5	:	7,0	41,1	81,7	2,7	75,1	0,6	20,4	7,1	88,8	450,1	:	471,3	131,3
1974	17,3	8,2	119,2	:	8,1	49,5	95,7	3,4	89,4	0,7	24,1	9,2	100,9	525,6	:	535,2	149,7
1975	20,0	9,5	142,1	:	9,9	57,2	111,8	3,8	102,8	0,8	28,5	10,7	112,1	609,3	:	617,0	186,0
1976	23,5	11,6	166,3	:	11,4	67,5	129,8	4,4	120,1	0,9	33,6	12,4	126,3	707,7	:	724,3	218,0
1977	26,8	13,2	192,9	:	13,2	76,9	149,7	5,3	137,4	1,1	39,1	14,0	141,6	811,1	:	844,1	255,8
1978	30,2	14,6	217,6	:	15,4	84,5	169,8	6,2	155,3	1,2	44,6	15,1	161,8	916,2	:	967,5	296,2
1979	34,8	16,9	249,6	:	17,2	94,3	194,7	7,2	182,9	1,3	51,0	17,5	185,7	1 053,2	:	1 097,9	352,2
1980	41,1	18,7	288,3	:	20,1	109,2	225,6	8,5	219,8	1,5	58,3	20,6	204,0	1 215,7	:	1 256,3	412,7
1981	46,7	20,7	325,0	:	23,3	122,9	259,1	9,7	245,8	1,8	63,5	24,0	226,0	1 368,6	:	1 411,9	468,4
1982	52,7	23,1	356,1	:	25,8	136,9	295,1	10,0	273,7	2,0	68,8	27,0	254,8	1 526,1	:	1 571,0	545,9
1983	57,0	25,5	390,5	:	27,9	149,9	323,1	10,8	297,8	2,1	75,9	29,2	287,7	1 677,5	:	1 791,8	616,3
1984	61,9	28,4	427,6	:	29,7	159,6	350,2	11,8	326,4	2,3	82,0	31,2	313,4	1 824,5	:	2 012,8	677,4
1985	66,9	31,6	459,9	:	32,8	172,6	379,8	13,1	357,0	2,6	89,3	32,6	342,7	1 980,9	:	2 243,0	747,0
1986	70,1	34,7	484,9	:	36,3	185,6	406,3	13,9	387,3	2,8	97,1	34,4	387,8	2 141,1	:	2 462,3	805,0
1987	74,9	35,5	514,7	:	38,6	204,1	435,4	14,9	418,2	3,0	104,5	37,3	422,2	2 303,4	:	2 669,6	874,4
1988	80,5	36,9	553,7	:	41,3	222,0	467,5	16,1	453,0	3,3	109,3	41,0	467,3	2 491,9	:	2 912,0	957,3
1989	86,3	38,9	589,4	:	46,2	245,1	505,8	17,3	494,6	3,6	118,0	44,1	501,4	2 690,6	:	3 137,5	1 047,3
1990	93,8	41,1	645,2	:	50,0	265,6	549,9	19,2	529,4	3,9	128,5	48,1	529,4	2 903,9	:	3 370,0	1 153,3
1991	100,8	44,1	691,2	789,6	55,0	287,4	588,0	20,5	571,2	4,3	140,0	51,9	551,5	3 105,7	3 204,1	3 565,8	1 257,5
1992	107,6	47,4	731,3	837,1	58,9	309,7	630,4	21,8	611,6	4,7	149,3	55,3	581,3	3 309,3	3 415,1	3 788,1	1 343,9

EUR 12–: including WD; EUR 12+: including D.

Table 14

Private consumption at current prices

(Percentage of GDP at market prices)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12− (ECU)	EUR 12+ (ECU)	USA	JAP
1960	69,2	62,0	59,4	:	80,3	67,5	59,7	76,6	59,7	54,0	58,5	73,1	66,0	62,3	:	63,9	58,7
1961	67,9	62,1	59,5	:	76,8	66,9	60,0	75,0	58,6	56,9	59,7	73,6	65,4	62,0	:	63,7	57,0
1962	66,6	61,9	59,5	:	76,4	66,4	60,0	74,7	58,9	56,9	60,3	69,7	66,0	62,0	:	62,9	57,7
1963	67,1	61,4	59,6	:	74,3	67,5	60,5	74,1	60,2	57,5	61,8	69,4	66,3	62,5	:	62,8	58,8
1964	64,1	60,3	58,4	:	73,6	66,5	59,5	72,6	59,6	56,7	59,4	68,2	64,8	61,2	:	63,0	57,6
1965	64,3	58,9	59,2	:	72,8	67,1	59,0	71,7	59,2	58,2	59,4	67,9	64,1	61,1	:	62,5	58,5
1966	63,9	59,6	59,7	:	72,3	66,5	58,9	71,8	60,3	58,2	59,3	67,9	63,6	61,3	:	61,8	58,0
1967	62,9	59,9	60,8	:	72,4	66,4	59,1	70,1	60,6	59,1	58,7	65,4	63,5	61,5	:	61,6	56,8
1968	63,7	58,8	60,1	:	71,9	66,0	59,3	71,0	59,7	57,7	57,9	68,5	63,1	61,0	:	61,9	54,7
1969	62,2	57,5	59,1	:	69,2	64,1	59,1	69,8	59,3	53,4	58,5	69,1	62,2	60,3	:	62,0	53,5
1970	59,8	57,4	58,4	:	69,2	64,0	57,9	68,9	59,5	50,5	58,4	65,9	61,8	59,7	:	63,0	52,3
1961-70	64,3	59,8	59,4	:	72,9	66,1	59,3	72,0	59,6	56,5	59,3	68,6	64,1	61,3	:	62,5	56,5
1971	60,3	55,8	58,7	:	68,0	64,3	57,8	68,0	59,8	54,8	57,8	68,3	62,1	59,8	:	62,9	53,6
1972	60,2	53,4	59,4	:	65,7	63,8	57,7	65,0	60,1	53,6	57,3	64,2	62,8	59,9	:	62,7	54,0
1973	60,6	54,5	58,8	:	63,4	63,5	57,1	64,4	60,5	48,9	56,7	64,8	62,5	59,5	:	62,0	53,6
1974	59,8	54,3	59,7	:	67,7	64,2	57,5	68,4	60,3	46,1	56,8	72,7	63,8	60,2	:	62,7	54,3
1975	61,2	55,5	62,9	:	67,5	64,3	58,7	64,1	62,0	57,8	58,6	77,1	62,2	61,6	:	63,6	57,1
1976	60,9	56,6	62,5	:	65,8	65,7	58,4	64,5	60,8	56,6	58,7	75,0	61,1	61,1	:	63,7	57,5
1977	61,9	56,9	63,1	:	65,9	65,0	58,2	64,1	60,3	59,6	59,8	72,0	59,9	61,1	:	63,6	57,7
1978	61,6	56,2	62,6	:	65,2	63,9	57,9	63,8	59,5	57,9	60,3	68,0	59,9	60,6	:	62,8	57,7
1979	62,8	56,4	62,3	:	63,3	64,5	58,1	65,3	59,7	57,8	60,9	67,5	60,3	60,8	:	63,1	58,7
1980	62,9	55,9	63,1	:	64,6	65,3	58,9	65,8	61,0	58,7	61,1	67,3	60,1	61,3	:	64,1	58,8
1971-80	61,2	55,5	61,3	:	65,7	64,5	58,0	65,3	60,4	55,2	58,8	69,7	61,5	60,6	:	63,1	56,3
1981	65,2	56,0	64,0	:	67,5	66,5	60,3	65,9	61,2	60,9	60,4	69,6	60,8	62,2	:	63,5	58,1
1982	65,6	55,0	64,1	:	67,4	66,2	60,7	59,8	61,5	60,3	60,1	69,6	61,0	62,3	:	65,6	59,4
1983	65,2	54,6	63,8	:	66,7	65,7	60,8	59,6	61,1	59,6	60,3	69,3	61,2	62,1	:	66,4	60,2
1984	64,9	54,5	63,6	:	64,7	64,3	60,8	58,8	61,1	58,1	59,2	70,7	61,1	61,8	:	65,2	59,4
1985	65,5	54,8	63,4	:	65,5	64,1	61,1	59,6	61,4	58,7	59,2	67,9	60,9	61,9	:	66,0	58,9
1986	64,1	55,0	61,9	:	67,4	63,2	60,4	59,9	61,3	56,5	59,8	65,1	62,8	61,6	:	66,5	58,6
1987	64,4	54,0	62,2	:	69,5	63,2	60,9	59,2	61,7	59,1	61,4	64,5	62,7	61,9	:	66,9	58,7
1988	63,1	53,1	61,8	:	68,3	62,6	60,2	58,5	61,4	58,3	59,8	65,1	63,7	61,6	:	66,8	57,9
1989	62,2	52,8	60,7	:	70,4	62,9	60,0	56,5	62,0	55,4	59,2	63,5	63,7	61,4	:	66,7	57,7
1990	61,9	52,1	60,2	:	72,3	62,4	60,3	55,4	61,8	57,1	58,8	63,1	63,3	61,1	:	67,4	57,1
1981-90	64,2	54,2	62,6	:	68,0	64,1	60,5	59,3	61,5	58,4	59,8	66,8	62,1	61,8	:	66,1	58,6
1991	62,1	52,5	59,1	63,1	74,1	62,5	60,4	55,1	62,3	57,6	59,4	63,3	63,8	61,1	62,1	68,1	56,5
1992	62,3	52,5	58,5	62,5	74,3	62,7	60,6	54,8	62,7	58,0	59,8	63,0	63,8	61,1	62,2	67,8	56,7

EUR 12−: including WD; EUR 12+: including D.

Table 15

Private consumption at current prices per head of population

(ECU; EUR 12− = 100)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12−	EUR 12+	USA	JAP
1960	128,5	122,9	117,9	:	51,6	39,6	121,5	72,9	71,9	137,3	90,8	32,9	139,2	100,0	:	277,1	42,3
1961	123,2	125,2	122,4	:	50,9	40,9	121,4	71,3	72,1	132,1	92,6	32,9	133,9	100,0	:	259,6	45,4
1962	118,9	128,8	122,6	:	49,3	42,9	122,9	70,5	74,5	126,7	92,6	30,6	129,6	100,0	:	250,3	47,6
1963	117,3	123,8	118,2	:	48,9	46,8	125,1	68,6	79,4	124,0	93,0	30,1	126,0	100,0	:	238,7	50,5
1964	115,5	128,2	117,3	:	50,4	48,0	125,9	70,8	79,5	128,4	96,6	29,7	124,3	100,0	:	235,0	53,6
1965	115,9	129,6	119,2	:	52,5	51,7	123,6	68,9	78,4	126,7	98,9	30,7	122,1	100,0	:	232,1	55,6
1966	114,7	133,0	118,1	:	53,6	54,7	123,5	67,5	80,0	123,1	98,9	31,4	119,7	100,0	:	231,4	59,1
1967	114,0	136,8	115,1	:	54,4	56,2	125,7	66,5	83,4	118,9	100,6	32,0	116,2	100,0	:	228,8	63,5
1968	119,0	133,5	118,3	:	56,4	52,3	131,7	63,9	85,6	122,6	105,3	35,9	105,2	100,0	:	240,6	69,3
1969	118,3	135,8	120,5	:	56,6	52,7	130,2	66,5	85,8	120,3	109,6	36,6	102,2	100,0	:	237,0	72,4
1970	114,6	134,9	130,0	:	57,4	52,7	119,4	66,5	87,4	120,1	110,0	35,4	100,7	100,0	:	227,2	74,5
1971	114,9	129,1	133,7	:	54,9	52,7	117,3	67,1	84,7	119,8	111,0	37,1	101,3	100,0	:	214,8	76,3
1972	118,7	126,5	135,5	:	50,7	55,3	119,3	65,5	82,4	121,1	112,7	35,7	98,3	100,0	:	196,0	83,8
1973	122,3	135,5	142,3	:	49,8	57,7	121,2	60,3	79,8	120,1	116,0	38,7	87,8	100,0	:	171,1	89,2
1974	127,3	134,5	142,2	:	55,3	63,9	116,8	59,1	78,3	122,9	122,5	45,1	85,8	100,0	:	164,6	90,4
1975	126,4	135,1	138,9	:	50,9	63,7	124,8	55,5	77,7	124,3	122,2	43,0	84,7	100,0	:	152,3	85,5
1976	132,8	148,3	144,6	:	51,8	64,2	125,7	53,5	73,5	129,8	130,1	41,9	78,3	100,0	:	164,8	91,8
1977	138,6	147,0	149,6	:	52,2	61,9	121,0	55,2	74,1	133,5	136,7	36,9	76,7	100,0	:	160,5	99,2
1978	137,4	143,6	150,8	:	50,5	59,7	121,4	57,6	73,2	131,9	137,3	31,0	79,4	100,0	:	144,5	113,0
1979	131,7	137,9	145,8	:	48,5	65,3	119,9	59,6	75,0	125,9	129,6	28,3	85,3	100,0	:	131,0	97,1
1980	125,1	119,9	137,6	:	44,4	62,1	120,4	61,7	81,2	121,6	121,4	30,1	94,9	100,0	:	125,0	88,5
1981	119,0	116,9	131,5	:	47,9	61,2	120,9	65,3	82,6	118,6	111,9	33,8	102,9	100,0	:	154,2	107,8
1982	110,1	116,5	132,2	:	51,6	61,1	119,5	63,4	85,1	111,5	112,8	33,3	102,3	100,0	:	170,9	106,1
1983	107,4	120,4	136,5	:	47,8	54,3	117,6	62,9	90,3	112,2	112,8	30,5	100,5	100,0	:	190,3	120,4
1984	106,9	123,2	135,5	:	46,9	56,1	117,0	62,8	93,8	112,8	108,4	29,9	99,0	100,0	:	215,8	132,6
1985	109,1	127,9	132,2	:	44,8	56,6	119,1	65,1	93,6	113,8	105,9	29,6	100,8	100,0	:	222,8	134,6
1986	109,2	133,1	135,2	:	40,1	56,8	119,9	64,2	97,3	115,4	108,0	29,8	92,7	100,0	:	172,3	144,2
1987	110,3	130,5	136,7	:	38,9	58,0	117,7	61,0	98,9	117,9	107,7	29,4	91,6	100,0	:	147,7	140,4
1988	105,6	123,7	131,7	:	39,8	61,1	113,8	60,3	98,6	115,6	101,2	30,6	101,6	100,0	:	143,1	150,3
1989	104,6	118,5	126,3	:	41,5	67,2	112,3	60,6	102,6	113,7	97,7	32,1	101,5	100,0	:	150,5	147,1
1990	106,4	116,8	126,2	:	41,9	70,1	113,4	59,8	104,2	116,2	97,9	34,2	95,9	100,0	:	128,5	121,3
1991	105,6	114,1	124,3	113,6	42,5	72,7	110,1	58,2	106,4	118,0	97,5	38,1	96,6	100,0	98,6	127,7	132,1
1992	105,2	112,3	122,8	114,0	42,9	74,9	110,1	57,7	107,2	118,8	96,0	42,2	95,8	100,0	99,0	120,3	131,2

EUR 12−: including WD; EUR 12+: including D.

Table 16

Private consumption at current prices per head of population

(PPS EUR 12– ; EUR 12– = 100)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12–	EUR 12+	USA	JAP
1960	108,1	114,6	118,5	:	44,4	63,1	103,4	70,9	82,8	134,4	108,5	43,6	130,2	100,0	:	177,4	50,8
1961	106,7	116,5	117,5	:	45,0	66,6	104,1	70,5	84,1	134,1	108,2	44,4	127,1	100,0	:	171,7	52,7
1962	105,8	117,5	117,2	:	43,5	69,0	105,2	69,5	85,9	125,7	108,2	43,3	123,6	100,0	:	169,3	55,4
1963	105,7	111,5	114,4	:	44,5	72,4	105,1	68,7	88,1	123,4	108,4	43,4	122,9	100,0	:	166,6	58,2
1964	103,9	115,3	115,1	:	46,2	73,0	106,0	67,6	86,5	126,2	108,2	44,3	122,1	100,0	:	169,4	61,2
1965	103,6	113,1	117,7	:	48,2	75,0	105,7	65,7	85,4	126,2	108,9	45,9	119,1	100,0	:	170,4	63,1
1966	102,1	112,8	117,0	:	48,7	76,1	106,6	64,0	88,5	121,9	106,7	46,2	116,0	100,0	:	169,3	66,3
1967	100,8	112,9	115,0	:	49,4	76,0	107,6	63,7	92,0	121,0	106,6	46,7	114,2	100,0	:	165,8	69,2
1968	101,8	110,1	114,9	:	50,1	76,6	107,6	66,9	92,2	119,0	106,5	51,3	113,0	100,0	:	165,2	71,5
1969	101,7	109,5	115,7	:	50,8	77,2	109,3	66,6	92,9	119,2	108,8	51,5	108,8	100,0	:	162,0	74,7
1970	100,9	107,5	115,5	:	53,1	77,3	109,1	65,0	94,8	116,5	110,2	51,6	107,0	100,0	:	157,9	77,4
1971	102,4	103,8	115,3	:	54,2	78,2	110,0	64,1	93,6	116,7	109,3	55,8	106,3	100,0	:	156,4	79,7
1972	103,3	100,1	116,4	:	54,6	80,1	109,2	61,9	92,3	116,2	106,8	54,7	106,8	100,0	:	156,2	82,7
1973	104,5	100,2	114,5	:	53,6	81,0	107,5	60,1	94,1	113,1	104,4	58,5	108,3	100,0	:	152,6	82,9
1974	104,4	96,0	113,4	:	53,5	83,2	107,7	63,9	95,7	113,6	105,0	63,8	105,9	100,0	:	147,8	80,2
1975	104,3	96,5	117,5	:	55,8	82,4	108,5	61,8	94,8	115,6	106,8	62,5	101,9	100,0	:	146,0	85,3
1976	105,7	100,9	119,4	:	55,0	83,0	108,3	59,9	95,2	113,3	107,7	61,3	99,3	100,0	:	146,8	85,4
1977	105,4	100,6	121,5	:	55,0	81,8	108,9	62,2	95,1	113,4	109,1	60,0	97,5	100,0	:	148,3	86,9
1978	105,5	98,5	121,9	:	56,1	79,0	109,3	64,2	95,1	111,5	110,0	56,8	98,9	100,0	:	149,4	88,6
1979	106,2	98,9	122,0	:	54,0	76,3	109,0	64,5	97,5	110,2	109,1	57,1	99,1	100,0	:	146,4	91,2
1980	108,9	95,5	122,2	:	54,5	76,3	109,3	65,1	101,7	110,3	107,5	57,8	94,5	100,0	:	144,0	92,2
1981	110,4	93,9	122,7	:	55,8	75,8	111,3	65,8	101,3	111,7	103,7	59,6	93,4	100,0	:	142,8	92,7
1982	111,9	94,5	120,9	:	55,2	75,5	113,3	60,0	101,1	112,4	100,7	60,0	94,7	100,0	:	141,4	96,5
1983	110,4	95,2	121,3	:	54,0	75,0	112,6	58,6	100,0	111,3	100,8	58,6	97,4	100,0	:	145,6	98,6
1984	110,5	97,5	122,8	:	52,6	73,2	112,0	59,0	100,7	111,0	100,0	57,2	97,5	100,0	:	149,2	99,2
1985	110,0	100,1	122,3	:	53,6	72,8	111,7	60,0	101,4	113,7	100,0	54,9	98,2	100,0	:	152,1	100,4
1986	106,9	101,9	119,5	:	54,8	72,3	110,4	58,9	101,9	113,9	100,3	53,4	102,8	100,0	:	153,3	99,7
1987	106,4	97,1	118,2	:	54,2	73,9	109,7	59,0	102,3	113,4	100,0	53,8	104,0	100,0	:	153,4	100,4
1988	105,7	93,6	117,2	:	53,7	74,4	108,8	59,1	102,6	114,7	96,3	54,6	106,5	100,0	:	153,8	101,6
1989	105,1	91,6	114,9	:	55,7	76,3	109,0	59,6	104,0	114,3	96,2	54,4	106,0	100,0	:	152,6	102,9
1990	106,1	90,2	115,1	:	55,6	76,9	109,9	61,7	103,6	115,2	97,0	55,4	104,0	100,0	:	151,2	105,3
1991	107,2	90,8	114,3	104,4	57,4	78,1	110,0	61,7	104,8	118,5	98,5	56,0	101,6	100,0	98,4	148,8	107,6
1992	107,8	91,6	112,8	103,7	57,7	79,2	110,7	61,5	105,5	121,5	98,4	56,3	100,6	100,0	98,5	147,4	108,0

EUR 12–: including WD; EUR 12+: including D.

Table 17

Private consumption at constant prices

(National currency; annual percentage change)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12− (PPS)	EUR 12+ (PPS)	USA	JAP
1961	1,6	7,3	6,0	:	6,8	11,0	5,9	3,1	7,5	5,0	5,2	7,8	2,2	5,5	:	2,0	10,4
1962	3,9	5,9	5,6	:	4,3	8,8	7,1	3,5	7,1	4,4	6,1	−1,2	2,2	5,4	:	4,4	7,5
1963	4,4	0,0	2,9	:	5,1	11,3	6,9	4,2	9,3	4,6	7,0	6,9	4,9	5,9	:	3,7	8,8
1964	2,6	7,8	5,4	:	8,8	4,3	5,6	4,3	3,3	9,2	5,9	5,8	3,0	4,5	:	5,7	10,8
1965	4,3	3,4	7,0	:	7,7	6,9	4,0	0,8	3,3	4,0	7,5	6,0	1,5	4,5	:	5,7	5,8
1966	2,7	4,3	3,7	:	6,8	6,9	4,8	1,5	7,2	1,6	3,2	4,0	1,7	4,3	:	5,0	10,0
1967	2,8	2,9	1,5	:	6,2	6,0	5,1	3,8	7,4	0,0	5,4	6,0	2,4	4,0	:	2,9	10,4
1968	5,3	1,9	4,9	:	6,9	6,0	4,0	9,0	5,2	4,3	6,6	11,1	2,8	4,6	:	5,1	8,5
1969	5,4	6,3	7,7	:	6,2	7,0	6,0	5,4	6,6	5,2	7,9	5,4	0,6	5,5	:	3,6	10,3
1970	4,4	3,5	7,4	:	8,8	4,2	4,3	−1,0	7,6	6,1	7,4	2,9	2,9	5,4	:	2,4	7,4
1961-70	3,7	4,3	5,2	:	6,7	7,2	5,4	3,4	6,4	4,4	6,2	5,4	2,4	5,0	:	4,0	9,0
1971	4,7	−0,8	5,8	:	5,6	5,1	4,7	3,2	3,5	5,6	3,3	8,4	3,2	4,4	:	3,3	5,6
1972	6,0	1,7	5,1	:	7,0	8,3	4,9	5,1	3,3	4,8	3,5	2,9	6,3	5,1	:	6,5	9,1
1973	7,8	4,8	3,5	:	7,6	7,8	5,1	7,2	7,0	5,8	4,0	13,0	5,3	5,5	:	4,2	9,1
1974	2,6	−2,9	1,2	:	0,7	5,1	0,9	1,6	3,7	4,5	3,7	9,1	−1,5	1,7	:	−1,1	−0,1
1975	0,6	3,7	3,7	:	5,5	1,8	2,6	0,8	0,2	5,3	3,3	1,7	−0,4	1,8	:	2,1	4,5
1976	4,8	7,9	4,0	:	5,3	5,6	4,7	2,8	5,0	3,1	5,3	2,3	0,4	4,0	:	5,5	3,1
1977	2,4	1,1	4,1	:	4,6	1,5	2,6	6,8	3,3	2,3	4,6	0,6	−0,5	2,5	:	4,5	4,1
1978	2,3	0,7	3,6	:	5,7	0,9	3,8	9,1	3,1	2,9	4,3	−2,0	5,6	3,6	:	4,1	5,4
1979	4,8	1,4	3,2	:	2,6	1,3	2,8	4,4	7,1	3,5	3,0	0,0	4,4	3,7	:	2,2	6,5
1980	2,0	−3,7	1,5	:	0,2	0,6	1,0	0,4	6,2	2,8	0,0	3,7	0,1	1,7	:	−0,3	1,1
1971-80	3,8	1,3	3,6	:	4,4	3,7	3,3	4,1	4,2	4,1	3,5	3,9	2,3	3,4	:	3,1	4,8
1981	−1,1	−2,3	−0,4	:	2,0	−0,6	1,8	1,7	1,8	1,7	−2,0	2,9	0,1	0,4	:	1,6	1,6
1982	1,3	1,4	−1,5	:	3,9	0,2	3,2	−7,1	0,9	0,4	−1,4	2,4	1,0	0,6	:	1,1	4,4
1983	−1,7	2,6	1,3	:	0,3	0,3	0,9	0,9	0,6	0,5	0,7	−1,4	4,5	1,3	:	5,0	3,4
1984	1,2	3,4	2,0	:	1,7	−0,4	0,9	2,0	2,2	1,4	0,8	−2,9	1,6	1,4	:	4,8	2,7
1985	2,0	5,0	1,6	:	3,9	2,4	2,2	4,6	3,1	2,7	2,4	0,7	3,5	2,5	:	4,7	3,4
1986	2,4	5,7	3,4	:	0,7	4,1	3,7	2,1	4,4	3,0	3,2	5,6	6,3	4,2	:	4,1	3,4
1987	3,2	−1,5	3,2	:	1,0	5,8	2,7	2,3	4,4	4,8	4,0	5,4	5,3	3,9	:	2,8	4,2
1988	3,1	−1,0	3,1	:	3,5	4,8	3,1	3,6	4,6	4,6	0,9	6,6	7,4	4,2	:	3,7	5,2
1989	3,3	−0,4	1,0	:	4,3	5,6	3,0	3,7	3,6	3,4	1,7	3,3	3,5	2,9	:	2,0	4,4
1990	2,6	0,4	4,6	:	2,0	3,7	3,0	1,1	2,6	3,4	3,6	5,3	1,0	3,0	:	0,9	4,0
1981-90	1,6	1,3	1,8	:	2,3	2,6	2,4	1,5	2,8	2,6	1,4	2,7	3,4	2,4	:	3,1	3,7
1991	1,7	2,2	2,5	:	1,2	3,0	1,5	0,9	2,8	4,1	3,0	4,4	−1,7	1,6	:	−0,1	2,6
1992	2,2	2,3	1,5	1,8	1,2	3,1	2,3	1,9	2,4	3,5	1,2	3,8	0,6	1,9	1,9	1,4	2,0

EUR 12−: including WD; EUR 12+: including D.

Table 18

Public consumption at current prices

(Percentage of GDP at market prices)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12– (ECU)	EUR 12+ (ECU)	USA	JAP
1960	12,4	13,3	10,7	:	11,7	8,3	14,2	12,5	12,0	9,8	12,6	10,5	16,4	13,1	:	16,6	8,0
1961	11,9	14,4	11,1	:	11,3	8,2	14,4	12,4	11,9	9,9	13,1	12,5	16,7	13,3	:	17,5	7,7
1962	12,3	15,2	11,9	:	11,6	8,1	14,5	12,5	12,3	10,9	13,7	12,9	17,0	13,7	:	17,8	8,0
1963	13,0	15,4	12,6	:	11,3	8,5	14,7	12,7	13,1	12,3	14,4	12,3	16,9	14,0	:	17,5	8,2
1964	12,5	15,6	11,9	:	11,7	8,2	14,5	13,3	13,5	10,8	14,6	12,3	16,4	13,7	:	17,2	8,0
1965	12,8	16,3	12,1	:	11,7	8,4	14,4	13,6	14,2	10,9	14,6	12,0	16,7	13,9	:	16,7	8,2
1966	13,1	17,1	12,1	:	11,8	8,7	14,2	13,6	14,0	11,4	14,9	12,1	17,1	14,0	:	17,7	8,0
1967	13,5	17,8	12,6	:	13,0	9,5	14,2	13,4	13,6	12,1	15,3	13,1	17,9	14,3	:	18,9	7,6
1968	13,6	18,6	11,8	:	12,9	9,2	14,8	13,4	13,6	12,1	14,9	13,1	17,6	14,1	:	18,8	7,4
1969	13,6	18,9	11,9	:	12,7	9,3	14,6	13,5	13,4	11,0	15,0	12,9	17,1	13,9	:	18,5	7,3
1970	13,4	20,0	12,0	:	12,6	9,6	14,7	14,6	13,0	10,5	15,4	13,8	17,5	14,0	:	18,8	7,4
1961-70	13,0	16,9	12,0	:	12,1	8,8	14,5	13,3	13,3	11,2	14,6	12,7	17,1	13,9	:	17,9	7,8
1971	14,1	21,3	12,7	:	12,5	9,7	14,9	15,2	14,6	11,7	16,0	13,5	17,9	14,6	:	18,1	8,0
1972	14,5	21,3	12,7	:	12,2	9,6	14,9	15,3	15,1	11,8	15,8	13,4	18,2	14,7	:	18,0	8,2
1973	14,5	21,3	13,0	:	11,5	9,6	14,8	15,7	14,4	11,3	15,6	12,8	18,1	14,5	:	17,4	8,3
1974	14,7	23,4	13,9	:	13,8	10,0	15,4	17,2	13,8	11,5	16,2	14,1	20,0	15,2	:	18,1	9,1
1975	16,4	24,6	14,4	:	15,2	10,6	16,6	18,6	14,1	14,9	17,4	15,0	21,9	16,3	:	18,6	10,0
1976	16,4	24,1	13,7	:	15,1	11,4	16,9	18,0	13,4	14,7	17,3	13,7	21,6	16,0	:	18,1	9,9
1977	16,8	23,9	13,7	:	16,0	11,6	17,2	17,1	13,8	15,9	17,4	14,0	20,2	15,9	:	17,6	9,8
1978	17,4	24,5	13,7	:	15,9	12,1	17,6	17,1	14,1	15,6	17,7	13,9	19,9	16,1	:	17,0	9,7
1979	17,6	25,0	13,7	:	16,3	12,6	17,6	18,1	14,5	16,0	18,1	13,9	19,6	16,2	:	17,0	9,7
1980	17,8	26,7	14,0	:	16,4	13,3	18,1	19,9	14,7	16,7	17,9	14,5	21,2	16,9	:	17,6	9,8
1971-80	16,0	23,6	13,6	:	14,5	11,1	16,4	17,2	14,3	14,0	16,9	13,9	19,9	15,6	:	17,8	9,2
1981	18,6	27,8	14,3	:	18,0	13,9	18,8	19,9	16,0	17,4	17,8	15,0	21,8	17,6	:	17,5	9,9
1982	18,0	28,2	14,2	:	18,3	14,1	19,3	19,8	16,0	16,4	17,7	14,9	21,7	17,6	:	18,4	9,9
1983	17,5	27,4	13,9	:	18,8	14,6	19,5	19,3	16,4	15,8	17,5	15,1	21,7	17,6	:	18,4	9,9
1984	17,0	25,9	13,6	:	19,5	14,4	19,6	18,7	16,3	15,4	16,6	15,0	21,5	17,4	:	18,0	9,8
1985	17,1	25,3	13,6	:	20,4	14,7	19,4	18,6	16,4	15,7	16,2	15,5	20,8	17,3	:	18,4	9,6
1986	16,8	23,9	13,4	:	19,4	14,7	18,9	18,8	16,2	15,7	16,0	15,4	20,8	16,9	:	18,7	9,7
1987	16,2	25,2	13,4	:	19,6	15,1	18,8	17,7	16,7	16,9	16,4	15,2	20,3	16,9	:	18,6	9,5
1988	15,2	25,7	13,0	:	20,0	14,8	18,5	16,4	16,9	16,3	15,8	16,0	19,7	16,7	:	18,3	9,2
1989	14,5	25,5	12,7	:	20,5	15,2	18,0	15,3	16,7	15,9	15,3	16,1	19,4	16,4	:	17,9	9,2
1990	14,3	25,2	12,3	:	21,2	15,2	18,0	15,7	17,3	16,3	14,8	16,7	19,9	16,4	:	18,1	9,0
1981-90	16,5	26,0	13,4	:	19,6	14,7	18,9	18,0	16,5	16,2	16,4	15,5	20,8	17,1	:	18,2	9,6
1991	14,5	24,6	12,0	13,6	20,4	15,4	18,2	16,3	17,4	16,5	14,5	17,8	21,2	16,6	16,9	18,3	9,0
1992	14,3	24,1	11,9	13,5	18,8	15,5	18,2	16,6	17,2	16,4	14,3	18,1	21,8	16,6	16,9	17,8	9,0

EUR 12–: including WD; EUR 12+: including D.

Table 19

Public consumption at constant prices

(National currency; annual percentage change)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12− (PPS)	EUR 12+ (PPS)	USA	JAP
1961	1,9	5,3	6,6	:	4,4	5,6	4,8	2,1	4,4	1,3	2,8	26,7	3,5	4,7	:	7,7	5,9
1962	8,6	9,9	10,6	:	6,7	6,7	4,7	3,1	3,9	2,4	3,3	8,5	3,1	5,6	:	5,2	8,7
1963	11,6	2,9	6,4	:	4,2	9,7	3,4	4,0	4,3	5,8	4,7	3,0	1,8	4,3	:	2,6	8,3
1964	4,2	7,3	0,7	:	9,3	1,3	4,2	3,0	4,2	−0,8	1,7	6,8	1,6	2,6	:	4,9	3,3
1965	5,5	3,4	4,0	:	9,0	3,7	3,2	3,7	4,0	2,5	1,5	7,4	2,6	3,4	:	3,2	3,8
1966	4,7	5,8	1,0	:	6,3	1,7	2,7	1,0	4,0	5,8	1,7	6,6	2,7	2,6	:	7,5	5,7
1967	5,7	7,6	3,0	:	8,5	2,3	4,3	4,5	4,4	4,2	2,4	13,6	5,7	4,4	:	5,4	4,0
1968	3,5	4,7	−1,4	:	1,3	1,8	5,6	5,8	5,2	5,6	2,2	8,4	0,4	2,3	:	3,4	6,4
1969	6,3	6,8	4,5	:	7,7	4,2	4,1	6,9	2,8	3,3	4,5	3,2	−1,8	2,7	:	2,3	5,9
1970	3,1	6,9	4,3	:	5,9	5,3	4,2	11,3	2,6	4,1	6,0	12,7	1,7	3,6	:	0,3	7,1
1961-70	5,5	6,0	3,9	:	6,3	4,2	4,1	4,5	4,0	3,4	3,1	9,5	2,1	3,6	:	4,2	5,9
1971	5,5	5,5	3,8	:	4,9	4,3	3,9	8,6	5,2	3,0	4,4	6,4	3,0	4,1	:	−0,4	5,3
1972	5,9	5,7	2,2	:	5,7	5,2	3,5	7,5	5,1	4,2	0,8	8,6	4,2	3,9	:	−1,2	5,4
1973	5,3	4,0	3,7	:	6,8	6,4	3,4	6,7	2,7	3,4	0,8	7,8	4,3	3,8	:	0,1	5,3
1974	3,4	3,5	2,4	:	12,1	9,3	1,2	7,6	2,4	3,8	2,2	17,3	1,9	2,8	:	2,3	3,2
1975	4,5	2,0	1,6	:	11,9	5,2	4,4	8,7	2,4	3,3	4,1	6,6	5,6	3,9	:	0,2	7,8
1976	3,7	4,5	−0,2	:	5,1	6,9	4,2	2,6	2,1	2,8	4,1	7,0	1,2	2,5	:	1,8	4,5
1977	2,3	2,4	1,7	:	6,5	3,9	2,4	2,1	3,0	2,9	3,4	12,2	−1,7	1,7	:	1,1	4,1
1978	6,0	6,2	3,8	:	3,5	5,4	5,1	7,9	3,5	1,8	3,9	3,3	2,3	3,9	:	2,3	5,1
1979	2,5	5,9	3,6	:	5,8	4,2	3,0	4,6	3,0	2,2	2,8	6,5	2,2	3,2	:	1,9	4,3
1980	1,5	4,3	2,2	:	0,2	4,2	2,5	7,1	2,1	3,1	0,6	7,9	1,6	2,3	:	1,3	3,3
1971-80	4,1	4,4	2,5	:	6,2	5,5	3,4	6,3	3,1	3,0	2,7	8,3	2,4	3,2	:	0,9	4,8
1981	0,3	2,6	1,1	:	6,8	1,9	3,1	0,3	2,3	1,4	2,5	5,2	0,3	1,8	:	1,1	4,8
1982	−1,4	3,1	−0,8	:	2,3	4,9	3,7	3,2	2,6	1,5	0,4	3,6	0,8	1,8	:	2,4	2,0
1983	0,1	0,0	0,1	:	2,7	3,9	2,0	−0,4	3,5	1,9	1,0	3,7	1,8	1,9	:	3,5	3,0
1984	0,2	−0,4	1,1	:	3,0	2,9	1,2	−0,7	2,2	2,2	−0,8	0,1	1,0	1,3	:	4,5	2,7
1985	2,4	2,5	1,5	:	3,2	4,6	2,2	1,8	3,4	2,0	1,3	0,1	0,0	2,0	:	5,3	1,7
1986	1,7	0,5	2,3	:	−0,8	5,8	1,7	2,5	2,6	3,1	2,5	7,2	1,8	2,3	:	4,9	4,5
1987	0,3	2,5	1,2	:	0,9	8,9	2,8	−4,4	3,5	2,7	2,9	4,9	1,2	2,6	:	3,4	0,4
1988	−1,0	0,9	0,2	:	4,7	4,0	2,8	−5,3	2,8	3,8	0,2	5,3	0,6	1,7	:	2,1	2,1
1989	−0,8	−0,3	0,3	:	4,2	8,3	0,2	−2,0	0,9	1,9	−0,4	2,8	0,9	1,2	:	0,3	2,1
1990	0,9	−1,0	1,1	:	0,6	4,2	3,4	3,5	1,0	3,2	0,0	1,5	2,8	2,1	:	1,7	1,4
1981-90	0,3	1,0	0,8	:	2,7	4,9	2,3	−0,2	2,5	2,4	0,9	3,4	1,1	1,9	:	2,9	2,5
1991	1,0	−2,2	0,8	:	−0,7	4,4	2,0	1,7	1,7	3,0	−0,9	4,2	2,4	1,8	:	0,8	3,4
1992	−0,2	0,1	0,9	0,3	−0,5	3,7	2,0	1,8	1,1	3,2	−0,3	1,0	3,1	1,8	1,6	−1,7	2,4

EUR 12−: including WD; EUR 12+: including D.

Table 20

Gross fixed capital formation at current prices

Total economy

(Percentage of GDP at market prices)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12– (ECU)	EUR 12+ (ECU)	USA	JAP
1960	19,3	21,6	24,3	:	19,0	20,4	20,9	14,4	26,0	20,9	24,1	23,2	16,4	21,3	:	18,0	29,0
1961	20,7	23,2	25,2	:	18,2	21,4	22,0	16,3	26,8	24,2	24,8	23,2	17,3	22,3	:	17,6	31,9
1962	21,3	23,1	25,7	:	20,1	21,9	22,2	17,9	27,2	25,9	24,5	22,4	17,0	22,6	:	17,6	32,2
1963	20,7	22,0	25,6	:	19,2	22,1	23,0	19,5	27,7	30,1	23,8	23,7	16,8	22,8	:	18,0	31,6
1964	22,4	24,5	26,6	:	21,0	23,6	23,8	20,5	25,6	33,7	25,5	22,8	18,3	23,5	:	18,1	31,7
1965	22,4	24,1	26,1	:	21,6	24,8	24,2	21,4	22,2	28,0	25,2	22,8	18,4	23,1	:	18,8	29,8
1966	22,9	24,1	25,4	:	21,7	25,1	24,6	19,8	21,6	26,6	26,3	25,1	18,4	23,0	:	18,5	30,3
1967	22,9	24,2	23,1	:	20,3	25,4	24,8	20,1	22,5	23,9	26,4	26,6	19,1	22,8	:	17,9	31,9
1968	21,5	23,4	22,4	:	23,2	26,0	24,3	20,9	23,4	22,1	26,9	22,2	19,5	22,8	:	18,1	33,2
1969	21,3	24,6	23,3	:	24,6	26,5	24,4	23,3	24,2	22,2	24,6	22,6	18,8	23,1	:	18,3	34,5
1970	22,7	24,7	25,5	:	23,6	26,4	24,3	22,7	24,6	23,1	25,9	23,2	18,9	23,8	:	17,7	35,5
1961-70	21,9	23,8	24,9	:	21,4	24,3	23,8	20,2	24,6	26,0	25,4	23,4	18,3	23,0	:	18,1	32,2
1971	22,1	24,2	26,2	:	25,2	24,2	24,7	23,6	23,9	28,4	25,4	24,7	18,9	23,9	:	18,2	34,2
1972	21,3	24,6	25,4	:	27,8	25,3	24,7	23,7	23,1	27,8	23,6	27,1	18,5	23,5	:	18,9	34,1
1973	21,4	24,8	23,9	:	28,0	26,8	25,2	25,3	24,9	27,3	23,1	26,8	19,9	23,9	:	19,1	36,4
1974	22,7	24,0	21,6	:	22,2	28,3	25,8	24,6	25,9	24,6	21,9	26,0	20,9	23,6	:	18,6	34,8
1975	22,5	21,1	20,4	:	20,8	26,8	24,1	22,7	24,9	27,7	21,1	25,9	19,9	22,4	:	17,2	32,5
1976	22,1	23,0	20,1	:	21,2	25,3	23,9	25,0	23,9	24,9	19,4	25,1	19,6	22,0	:	17,5	31,2
1977	21,6	22,1	20,3	:	23,0	24,3	22,9	24,8	23,5	25,1	21,1	26,5	18,6	21,6	:	18,8	30,2
1978	21,7	21,7	20,6	:	23,9	23,0	22,4	27,7	22,7	24,1	21,3	27,9	18,5	21,4	:	20,1	30,4
1979	20,7	20,9	21,7	:	25,8	21,9	22,4	30,5	22,8	24,4	21,0	26,6	18,7	21,6	:	20,4	31,7
1980	21,1	18,8	22,6	:	24,2	22,5	23,0	28,6	24,3	27,1	21,0	28,6	18,0	22,0	:	19,1	31,6
1971-80	21,7	22,5	22,3	:	24,2	24,8	23,9	25,6	24,0	26,1	21,9	26,5	19,1	22,6	:	18,8	32,7
1981	18,0	15,6	21,6	:	22,3	22,1	22,1	29,7	23,9	25,4	19,2	30,8	16,2	20,9	:	18,6	30,6
1982	17,3	16,1	20,4	:	19,9	21,6	21,4	26,5	22,3	25,0	18,2	31,1	16,1	20,0	:	17,2	29,5
1983	16,2	16,0	20,4	:	20,3	20,9	20,2	23,1	21,3	21,2	18,2	29,2	16,0	19,5	:	17,2	28,0
1984	16,0	17,2	20,0	:	18,5	19,0	19,3	21,4	21,0	20,0	18,6	23,6	17,0	19,2	:	18,0	27,7
1985	15,6	18,7	19,5	:	19,1	19,2	19,3	19,0	20,7	17,7	19,2	21,8	17,0	19,0	:	18,1	27,5
1986	15,7	20,8	19,4	:	18,5	19,5	19,3	18,0	19,7	22,1	20,1	22,1	16,9	19,0	:	17,8	27,3
1987	16,0	19,7	19,4	:	17,2	20,8	19,8	16,5	19,7	25,6	20,2	24,2	17,6	19,3	:	17,3	28,5
1988	17,7	18,1	19,6	:	17,5	22,6	20,6	16,7	20,1	26,9	21,3	26,8	19,1	20,0	:	17,1	29,9
1989	19,5	17,8	20,3	:	19,2	24,2	21,1	18,2	20,2	23,4	21,7	26,4	20,0	20,7	:	16,6	31,0
1990	20,3	17,7	21,2	:	19,7	24,6	21,2	19,1	20,2	25,3	21,5	26,4	19,2	20,9	:	16,1	32,6
1981-90	17,2	17,8	20,2	:	19,2	21,4	20,4	20,8	20,9	23,3	19,8	26,2	17,5	19,9	:	17,4	29,2
1991	19,9	17,1	21,9	23,1	19,3	24,1	20,5	17,9	19,8	26,1	20,8	25,5	16,5	20,3	20,7	14,7	32,5
1992	19,9	17,0	22,1	23,5	19,2	23,5	20,1	17,9	19,6	26,3	20,4	25,0	15,0	20,0	20,4	14,8	32,1

EUR 12–: including WD; EUR 12+: including D.

Table 21

Gross fixed capital formation at constant prices

Total economy

(National currency; annual percentage change)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12− (PPS)	EUR 12+ (PPS)	USA	JAP
1961	12,4	13,9	6,6	:	8,1	17,9	10,9	16,9	11,6	9,0	6,0	6,7	9,8	9,8	:	1,4	23,4
1962	5,9	6,7	3,9	:	8,4	11,4	8,5	14,8	9,8	7,8	3,4	1,7	0,7	5,9	:	6,7	14,1
1963	0,1	−2,4	1,2	:	5,5	11,4	8,8	12,0	8,1	14,2	1,1	15,3	1,4	4,8	:	7,3	11,9
1964	14,7	23,5	11,2	:	20,7	15,0	10,5	10,8	−5,8	22,1	19,2	4,0	16,6	9,0	:	6,6	15,7
1965	4,1	4,7	4,8	:	12,8	16,6	7,0	10,5	−8,4	−13,9	5,3	10,3	5,2	3,6	:	9,3	4,6
1966	6,8	4,3	1,2	:	3,2	12,7	7,3	−3,0	4,3	−5,1	8,0	17,9	2,6	4,7	:	4,0	14,0
1967	2,9	5,4	−6,9	:	−1,6	6,0	6,0	6,8	11,7	−7,9	8,5	5,2	8,7	3,9	:	−1,0	18,1
1968	−1,3	1,9	3,4	:	21,4	9,4	5,5	13,2	10,8	−4,2	11,2	−9,3	6,3	6,4	:	6,4	20,5
1969	5,3	11,8	9,9	:	18,6	9,8	9,2	20,5	7,8	10,5	−2,2	8,1	−0,6	7,0	:	1,8	18,9
1970	8,4	2,2	9,2	:	−1,4	3,0	4,6	−3,3	3,0	7,5	7,5	11,4	2,5	5,1	:	−3,7	16,9
1961-70	5,8	7,0	4,3	:	9,3	11,2	7,8	9,6	5,1	3,4	6,7	6,9	5,2	6,0	:	3,8	15,7
1971	−1,9	1,9	6,0	:	14,0	−3,0	7,3	8,9	0,2	10,7	1,5	10,2	1,8	3,4	:	5,8	4,4
1972	3,4	9,3	2,6	:	15,4	14,2	5,6	7,8	1,3	7,0	−2,3	14,0	−0,2	3,8	:	8,7	9,7
1973	7,0	3,5	−0,3	:	7,7	13,0	7,2	16,2	8,8	11,8	4,2	10,3	6,5	5,9	:	6,2	11,6
1974	6,9	−8,9	−9,7	:	−25,6	6,2	0,8	−11,6	2,0	−7,0	−4,0	−6,1	−2,4	−2,3	:	−6,0	−8,3
1975	−1,9	−12,4	−5,2	:	0,2	−4,5	−6,8	−3,6	−7,3	−7,4	−4,4	−10,6	−2,0	−5,4	:	−10,7	−1,0
1976	4,0	17,1	3,7	:	6,8	−0,8	2,8	13,6	0,0	−4,2	−2,2	1,3	1,7	2,0	:	6,9	2,7
1977	0,0	−2,4	3,8	:	7,8	−0,9	−1,6	4,1	1,8	−0,1	9,7	11,5	−1,8	1,3	:	11,4	2,8
1978	2,8	1,1	4,3	:	6,0	−2,7	2,3	18,9	0,6	1,1	2,5	6,2	3,0	2,3	:	9,5	7,8
1979	−2,7	−0,4	6,9	:	8,8	−4,4	3,2	13,6	5,7	3,8	−1,7	−1,3	2,8	3,3	:	2,4	6,2
1980	4,6	−12,6	2,3	:	−6,5	0,7	2,7	−4,7	8,7	12,7	−0,9	8,5	−5,4	1,9	:	−6,8	0,0
1971-80	2,2	−0,8	1,3	:	2,8	1,6	2,3	5,9	2,1	2,6	0,2	4,1	0,4	1,6	:	2,5	3,4
1981	−16,1	−19,2	−4,9	:	−7,5	−3,3	−1,9	9,5	−3,1	−7,4	−10,0	5,5	−9,6	−4,9	:	−0,1	2,4
1982	−1,7	7,1	−5,3	:	−1,9	0,5	−1,2	−3,4	−4,7	−0,5	−4,3	2,3	5,4	−1,9	:	−8,7	−0,1
1983	−4,4	1,9	3,3	:	−1,3	−2,5	−3,3	−9,3	−0,6	−11,8	1,9	−7,1	5,0	0,1	:	8,8	−1,0
1984	1,7	12,9	0,3	:	−5,7	−5,8	−2,6	−2,5	3,6	0,1	5,2	−17,4	8,5	0,9	:	15,9	4,7
1985	0,7	12,6	0,0	:	5,2	4,1	3,4	−7,7	0,6	−9,5	6,7	−3,5	4,0	2,2	:	6,9	5,3
1986	4,4	17,1	3,6	:	−6,2	10,1	4,6	−3,1	2,2	31,5	7,9	10,9	2,4	4,3	:	2,0	4,8
1987	5,6	−3,8	2,1	:	−5,1	14,0	5,0	−2,3	5,0	14,8	1,5	15,1	9,6	5,5	:	2,9	9,6
1988	15,2	−6,6	4,6	:	8,9	14,0	8,7	3,3	6,9	12,3	8,1	15,0	13,1	8,6	:	5,0	11,9
1989	14,5	−0,6	7,0	:	10,0	13,8	7,4	15,8	4,6	−6,5	3,9	5,6	6,8	7,3	:	2,7	8,9
1990	8,3	−0,5	8,8	:	4,8	6,9	3,5	9,5	3,0	9,4	4,0	5,9	−2,4	4,2	:	1,2	10,9
1981-90	2,4	1,5	1,9	:	−0,1	4,9	2,3	0,7	1,7	2,5	2,3	2,7	4,1	2,6	:	3,5	5,6
1991	−0,2	−2,1	6,7	:	−1,9	1,6	−1,5	−4,9	0,9	6,3	−0,7	2,8	−10,3	−0,1	:	−6,5	3,4
1992	1,4	0,9	2,8	4,6	3,0	1,6	0,2	3,5	1,3	4,7	−0,7	3,1	−4,4	0,7	1,2	4,0	0,5

EUR 12−: including WD; EUR 12+: including D.

Table 22

Net stockbuilding at current prices

Total economy

(Percentage of GDP at market prices)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12− (ECU)	EUR 12+ (ECU)	USA	JAP
1960	−0,1	4,4	3,0	:	−0,4	−0,5	3,0	2,0	2,1	2,4	3,3	1,4	2,2	2,4	:	0,7	3,9
1961	0,5	1,9	2,0	:	1,8	1,7	1,7	1,4	2,3	2,2	2,7	3,9	1,0	1,7	:	0,4	5,0
1962	0,0	2,9	1,6	:	1,1	3,6	2,3	1,6	1,7	5,6	1,5	1,8	0,0	1,4	:	1,1	2,0
1963	0,4	0,8	0,7	:	2,1	3,4	1,5	0,9	1,0	−0,1	1,1	2,0	0,5	1,0	:	0,9	2,2
1964	1,5	1,7	1,5	:	4,7	2,6	2,4	1,2	0,5	−1,2	3,0	3,3	2,1	1,8	:	0,7	2,9
1965	0,8	2,3	2,3	:	4,7	3,0	1,6	2,3	0,7	2,1	1,9	4,4	1,3	1,7	:	1,3	2,1
1966	1,0	0,8	1,1	:	0,6	2,9	2,0	0,8	0,8	1,7	1,3	1,8	0,8	1,3	:	1,5	2,1
1967	0,4	0,0	−0,1	:	2,0	1,4	1,8	−0,4	1,1	−3,0	0,9	0,6	0,7	0,8	:	1,2	3,4
1968	0,9	0,6	2,1	:	−0,1	0,8	1,8	1,1	0,0	−1,9	0,6	3,1	1,0	1,3	:	1,0	3,6
1969	1,9	1,3	2,9	:	1,3	2,5	2,6	2,4	0,7	−1,2	2,1	1,8	1,1	2,0	:	1,1	3,1
1970	1,6	1,0	2,1	:	4,5	0,8	2,5	1,7	2,8	3,2	2,0	5,9	0,7	2,0	:	0,1	3,5
1961-70	0,9	1,3	1,6	:	2,3	2,3	2,0	1,3	1,2	0,7	1,7	2,9	0,9	1,5	:	0,9	3,0
1971	1,4	0,6	0,6	:	2,7	0,9	1,5	0,3	1,0	1,7	1,1	3,2	0,2	0,9	:	0,7	1,5
1972	0,5	0,2	0,5	:	1,8	0,9	1,6	1,4	0,9	1,2	0,5	3,6	0,0	0,8	:	0,7	1,4
1973	1,3	1,3	1,3	:	7,8	0,8	2,0	1,6	2,3	0,2	1,4	5,9	2,1	1,8	:	1,2	1,7
1974	2,2	1,2	0,4	:	7,1	2,2	2,3	4,4	4,2	−3,0	2,3	5,2	1,2	1,9	:	0,9	2,5
1975	−0,6	−0,2	−0,6	:	6,2	2,1	−0,7	0,6	−1,0	−4,4	−0,4	−3,3	−1,3	−0,5	:	−0,3	0,3
1976	0,2	1,0	1,4	:	5,1	2,0	1,4	0,4	3,0	−1,7	1,2	1,8	0,7	1,5	:	1,0	0,7
1977	0,3	0,8	0,6	:	3,5	1,1	1,5	3,2	1,4	−4,2	0,6	2,5	1,3	1,1	:	1,3	0,7
1978	0,1	−0,2	0,6	:	3,7	0,2	0,8	1,4	1,4	1,4	0,6	2,6	1,1	0,8	:	1,4	0,5
1979	0,7	0,5	1,7	:	4,3	0,8	1,3	2,5	1,8	−1,9	0,5	2,9	1,1	1,4	:	0,5	0,8
1980	0,7	−0,3	0,8	:	4,4	1,2	1,2	−0,8	2,7	−1,9	0,5	4,2	−1,1	0,9	:	−0,2	0,7
1971-80	0,7	0,5	0,7	:	4,6	1,2	1,3	1,5	1,8	−1,3	0,8	2,9	0,5	1,1	:	0,7	1,1
1981	−0,1	−0,2	−0,7	:	3,1	−0,3	−0,2	−1,3	0,9	−0,9	−0,9	3,7	−1,1	−0,3	:	1,1	0,6
1982	0,1	0,2	−1,0	:	1,2	−0,1	0,5	1,3	1,2	−0,1	−0,3	3,0	−0,4	0,0	:	−0,4	0,4
1983	−0,7	0,0	−0,1	:	1,6	−0,5	−0,4	0,7	0,5	3,1	0,1	−0,9	0,5	0,1	:	−0,3	0,1
1984	0,3	1,2	0,3	:	1,0	0,0	−0,3	1,3	1,9	4,7	0,5	−1,3	0,4	0,5	:	1,8	0,3
1985	−0,8	0,8	0,1	:	2,2	0,0	−0,4	0,9	1,8	2,6	0,6	−1,2	0,2	0,3	:	0,6	0,7
1986	−0,7	0,8	0,2	:	1,4	0,5	0,3	0,7	1,2	1,3	−0,4	0,2	0,2	0,4	:	0,3	0,5
1987	0,2	−0,7	0,0	:	0,5	0,7	0,4	0,1	1,3	−0,8	−1,1	3,3	0,3	0,4	:	0,6	0,2
1988	0,1	−0,2	0,5	:	1,7	1,1	0,6	−0,6	1,4	−1,1	−1,2	2,8	1,0	0,7	:	0,2	0,7
1989	0,3	0,5	0,9	:	1,2	1,1	0,7	0,6	1,1	3,2	−0,4	2,7	0,6	0,8	:	0,5	0,8
1990	0,3	−0,2	0,8	:	0,3	1,1	0,5	1,8	0,6	1,8	−0,2	2,7	−0,1	0,5	:	−0,1	0,6
1981-90	−0,1	0,2	0,1	:	1,4	0,4	0,2	0,6	1,2	1,4	−0,3	1,5	0,2	0,3	:	0,4	0,5
1991	0,4	−0,4	0,3	0,4	−3,0	1,1	0,8	1,7	0,6	2,2	−0,2	2,6	−0,8	0,3	0,3	−0,3	:
1992	0,4	0,0	0,3	0,4	−3,0	1,1	0,6	0,0	0,6	2,2	−0,2	2,3	−0,1	0,4	0,4	0,0	:

EUR 12−: including WD; EUR 12+: including D.

Table 23

Price deflator gross domestic product at market prices

(National currency; annual percentage change)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12– (PPS)	EUR 12+ (PPS)	USA	JAP
1961	1,3	4,3	4,8	:	1,5	1,8	3,4	2,5	2,8	–3,7	2,4	2,3	2,7	3,2	:	0,8	7,8
1962	1,7	6,6	4,0	:	4,6	5,7	4,7	4,9	5,8	3,9	3,5	–0,2	4,0	4,5	:	2,2	4,2
1963	3,0	5,8	3,1	:	1,4	8,5	6,4	2,7	8,5	3,1	4,7	2,5	2,1	4,8	:	1,2	5,5
1964	4,6	4,6	3,0	:	3,7	6,3	4,1	9,7	6,5	5,8	8,7	1,1	3,7	4,5	:	1,1	5,3
1965	5,1	7,4	3,7	:	4,0	9,4	2,7	4,5	4,2	2,8	6,1	3,8	5,1	4,6	:	2,4	5,1
1966	4,2	6,8	3,4	:	4,9	8,1	2,9	4,4	2,2	3,9	6,0	5,5	4,5	4,0	:	4,2	5,0
1967	3,1	6,3	1,5	:	2,4	7,7	3,2	3,2	2,8	0,4	4,2	3,4	2,9	3,1	:	3,4	5,5
1968	2,7	7,0	2,2	:	1,7	5,0	4,2	4,2	1,7	5,0	4,2	1,4	4,1	3,3	:	4,9	4,9
1969	4,0	7,0	4,2	:	3,4	4,4	6,6	9,1	4,1	5,3	6,4	6,1	5,4	5,1	:	4,9	4,4
1970	4,6	8,3	7,6	:	3,9	6,8	5,6	9,7	6,9	15,1	6,2	3,4	7,4	6,8	:	5,3	6,5
1961-70	3,4	6,4	3,8	:	3,1	6,4	4,4	5,5	4,5	4,1	5,2	2,9	4,2	4,4	:	3,0	5,4
1971	5,6	7,7	7,8	:	3,2	7,9	6,4	10,5	6,9	–0,8	8,1	5,1	9,4	7,5	:	5,1	5,5
1972	6,2	9,2	5,3	:	5,0	8,6	7,4	13,4	6,5	5,8	9,4	7,8	8,2	7,1	:	4,6	5,8
1973	7,2	10,7	6,3	:	19,4	12,0	8,5	15,3	13,2	12,2	9,0	9,4	7,1	9,0	:	6,6	13,1
1974	12,6	13,1	7,0	:	20,9	16,3	12,3	6,1	19,8	17,0	9,2	18,9	15,0	13,3	:	9,1	20,1
1975	12,1	12,4	5,8	:	12,3	16,8	13,0	20,1	16,5	–0,9	10,2	16,2	27,1	14,7	:	9,9	7,4
1976	7,6	9,1	3,6	:	15,4	16,5	11,0	21,0	18,4	12,2	9,0	16,3	15,3	11,8	:	6,3	7,8
1977	7,5	9,4	3,7	:	13,0	23,2	8,9	13,3	18,6	1,2	6,7	26,5	13,9	11,7	:	6,7	6,4
1978	4,4	9,9	4,3	:	12,9	20,6	10,1	10,5	14,1	5,1	5,4	22,3	11,3	10,4	:	7,3	5,0
1979	4,5	7,6	3,9	:	18,6	17,1	10,2	13,7	15,3	6,4	3,9	19,4	14,4	10,7	:	8,9	2,7
1980	3,8	8,2	4,9	:	17,7	14,2	11,6	14,7	20,0	7,9	5,7	20,9	19,5	12,8	:	9,2	4,6
1971-80	7,1	9,7	5,2	:	13,7	15,2	9,9	13,8	14,8	6,5	7,6	16,1	14,0	10,9	:	7,4	7,7
1981	4,7	10,1	4,1	:	19,8	12,0	11,4	17,4	19,0	7,2	5,5	17,6	11,4	10,9	:	9,5	3,7
1982	7,1	10,6	4,4	:	25,1	13,8	12,0	15,2	17,2	10,8	6,1	20,7	7,6	10,5	:	6,4	1,7
1983	5,6	7,6	3,5	:	19,1	11,6	9,6	10,7	15,1	6,8	1,9	24,6	5,2	8,5	:	3,3	1,4
1984	5,2	5,7	2,1	:	20,3	10,9	7,3	6,4	11,6	4,4	1,9	24,7	4,6	6,8	:	3,6	2,3
1985	6,1	4,3	2,2	:	17,7	8,5	5,8	5,2	8,9	3,0	1,8	21,7	5,7	6,0	:	2,7	1,6
1986	3,7	4,6	3,3	:	17,5	11,1	5,3	6,6	7,9	3,8	0,5	20,5	3,5	5,6	:	2,1	1,8
1987	2,2	4,7	1,9	:	14,3	5,8	3,0	2,7	6,0	–0,6	–0,4	11,2	5,0	4,1	:	3,0	0,0
1988	1,5	3,4	1,6	:	15,6	5,7	3,3	3,1	6,6	3,2	1,9	11,6	6,6	4,5	:	3,3	0,4
1989	4,7	4,3	2,6	:	12,7	7,0	3,5	4,7	6,0	5,7	1,6	13,0	6,9	4,9	:	3,8	1,9
1990	3,0	2,1	3,4	:	19,3	7,3	3,0	–1,3	7,5	2,1	2,9	14,3	6,8	5,3	:	4,1	1,9
1981-90	4,4	5,7	2,9	:	18,1	9,3	6,4	6,9	10,5	4,6	2,3	17,9	6,3	6,7	:	4,2	1,7
1991	3,1	3,0	4,6	:	15,9	6,9	3,2	2,5	7,3	3,6	3,3	14,4	6,7	5,5	:	3,6	1,9
1992	3,4	2,0	4,4	5,5	14,9	6,5	3,0	4,0	5,4	2,9	2,9	11,1	5,3	4,8	5,0	2,8	1,8

EUR 12–: including WD; EUR 12+: including D.

Table 24

Price deflator private consumption

(National currency; annual percentage change)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12– (PPS)	EUR 12+ (PPS)	USA	JAP
1961	2,7	3,5	3,5	:	1,1	1,8	3,3	2,3	1,7	0,5	2,4	0,6	2,9	2,8	:	1,2	6,4
1962	1,1	6,2	3,0	:	1,3	5,3	4,4	4,1	5,3	0,8	2,6	2,0	3,7	3,9	:	1,8	6,7
1963	3,7	5,6	3,1	:	3,4	7,8	5,7	2,4	7,0	3,1	3,8	1,1	1,6	4,3	:	1,7	7,3
1964	4,2	4,0	2,3	:	2,2	6,7	3,4	7,0	4,9	3,0	6,8	0,8	3,6	3,8	:	1,5	4,1
1965	4,6	6,1	3,4	:	4,6	9,7	2,6	4,4	3,6	3,4	4,0	4,8	4,9	4,2	:	1,9	6,8
1966	4,1	6,5	3,5	:	3,5	7,3	3,2	3,9	2,9	3,4	5,4	5,5	4,0	3,9	:	3,1	4,6
1967	2,5	7,4	1,5	:	1,9	5,8	3,0	2,8	3,2	2,3	3,0	1,5	2,6	2,8	:	2,5	3,9
1968	2,9	7,1	1,6	:	0,7	5,1	5,0	4,8	1,5	2,5	2,6	4,3	4,7	3,3	:	4,4	5,1
1969	2,8	4,6	2,3	:	3,0	3,4	7,1	7,8	2,9	1,9	6,1	4,9	5,5	4,3	:	4,4	4,2
1970	2,5	6,6	4,0	:	3,1	6,6	5,0	12,4	5,0	4,3	4,4	3,2	5,9	5,0	:	4,4	7,2
1961-70	3,1	5,8	2,8	:	2,5	5,9	4,3	5,1	3,8	2,5	4,1	2,8	3,9	3,8	:	2,7	5,6
1971	5,3	8,3	5,5	:	2,9	7,8	6,2	9,4	5,5	4,7	7,9	7,0	8,7	6,6	:	4,8	6,8
1972	5,4	8,2	5,7	:	3,3	7,6	6,4	9,7	6,3	5,1	8,3	6,3	6,5	6,4	:	2,9	5,8
1973	6,1	11,7	6,7	:	15,0	11,4	7,6	11,6	13,9	4,9	8,5	8,9	8,6	9,2	:	6,0	10,8
1974	12,8	15,0	7,5	:	23,5	17,8	15,1	15,7	21,4	10,0	9,5	23,5	17,1	14,9	:	10,6	21,0
1975	12,3	9,9	6,1	:	12,7	15,5	12,1	18,0	16,5	10,2	10,1	16,0	23,6	13,8	:	8,0	11,2
1976	7,8	9,9	4,2	:	13,4	16,5	10,0	20,0	17,8	9,3	9,0	18,1	15,8	11,7	:	5,8	9,6
1977	7,2	10,6	3,4	:	11,9	23,7	9,6	14,1	17,6	5,7	6,1	27,3	14,8	11,8	:	6,6	7,4
1978	4,2	9,2	2,8	:	12,8	19,0	9,0	7,9	13,2	3,4	4,5	21,3	9,1	9,1	:	7,0	4,5
1979	3,9	10,4	4,3	:	16,5	16,5	10,9	14,9	14,5	4,9	4,3	25,2	13,7	10,8	:	9,3	3,6
1980	6,4	10,7	5,9	:	21,9	16,5	13,5	18,6	20,4	7,5	6,9	21,6	16,3	13,5	:	11,0	7,5
1971-80	7,1	10,4	5,2	:	13,2	15,1	10,0	13,9	14,6	6,5	7,5	17,3	13,3	10,7	:	7,2	8,7
1981	8,6	12,0	6,2	:	22,7	14,3	13,4	19,6	18,0	8,6	5,8	20,2	11,2	12,1	:	9,3	4,5
1982	7,8	10,2	5,1	:	20,7	14,5	11,8	14,9	17,1	10,6	5,5	20,3	8,7	10,8	:	6,0	2,7
1983	7,2	6,8	3,3	:	18,1	12,3	9,7	9,2	14,8	8,3	2,9	25,8	4,8	8,5	:	3,5	2,0
1984	5,7	6,4	2,6	:	17,9	11,0	7,9	7,3	12,1	6,5	2,2	28,5	4,9	7,3	:	3,9	2,5
1985	6,0	4,3	2,1	:	18,3	8,2	6,0	5,0	9,0	4,3	2,2	19,4	5,4	5,9	:	3,1	2,2
1986	0,5	2,9	−0,3	:	22,1	8,6	2,9	4,5	6,2	1,7	0,2	13,8	4,4	3,8	:	2,0	0,4
1987	1,7	4,6	0,8	:	15,7	5,7	3,3	3,7	5,3	1,8	−0,9	10,0	4,3	3,6	:	4,4	0,2
1988	1,2	4,0	1,4	:	14,3	5,0	2,9	2,6	5,7	2,7	1,0	10,0	5,0	3,8	:	4,0	−0,1
1989	3,6	5,0	3,0	:	15,2	6,6	3,6	3,7	6,5	3,3	2,8	12,1	5,6	4,9	:	4,5	1,8
1990	3,6	2,1	2,7	:	20,1	6,4	3,3	2,5	6,5	4,2	2,7	12,6	6,0	4,8	:	5,2	2,4
1981-90	4,6	5,8	2,7	:	18,5	9,2	6,4	7,2	10,0	5,2	2,4	17,1	6,0	6,5	:	4,6	1,8
1991	3,2	2,5	3,6	:	19,5	6,3	3,0	3,0	6,7	3,2	3,5	11,9	7,2	5,2	:	4,0	2,6
1992	3,1	2,2	3,9	4,9	16,0	6,3	3,0	3,8	5,2	2,8	3,5	9,0	5,3	4,6	4,8	2,8	1,8

EUR 12−: including WD; EUR 12+: including D.

Table 25

Price deflator exports of goods and services

(National currency; annual percentage change)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12– (PPS)	EUR 12+ (PPS)	USA	JAP
1961	0,6	−1,2	−1,1	:	0,2	2,0	0,3	−0,1	−0,8	−3,0	−1,7	−1,1	1,2	−0,1	:	1,4	−0,7
1962	1,0	2,5	2,0	:	1,1	4,8	1,2	1,9	0,9	−1,7	−0,1	−0,9	0,8	1,4	:	0,1	−1,5
1963	2,1	2,8	0,9	:	8,0	6,3	2,8	2,1	3,3	0,0	2,6	3,2	3,9	3,3	:	0,0	2,5
1964	4,2	3,4	2,5	:	0,9	2,8	4,4	4,7	4,1	2,2	2,5	3,9	2,4	2,9	:	0,8	1,6
1965	1,4	2,2	2,5	:	−1,1	5,6	1,1	1,9	0,0	1,4	2,3	3,0	2,0	1,8	:	4,0	−0,4
1966	3,7	3,0	2,5	:	3,9	5,7	2,0	1,9	0,2	0,8	0,7	−1,8	2,5	1,9	:	3,5	−0,2
1967	0,5	1,2	−0,3	:	−2,7	7,9	−0,4	0,6	1,1	0,4	0,0	3,7	2,7	1,2	:	3,0	0,2
1968	0,2	3,0	−0,3	:	−1,3	9,2	−0,4	6,2	0,3	1,3	−0,5	2,3	7,7	2,0	:	6,8	0,1
1969	4,6	6,7	3,7	:	0,5	1,6	4,8	6,1	2,7	6,5	2,2	−1,5	2,2	3,2	:	3,3	1,5
1970	5,7	6,5	4,7	:	3,1	5,0	7,8	−6,1	6,1	13,2	5,8	5,4	8,0	6,2	:	5,1	2,9
1961-70	2,4	3,0	1,7	:	1,2	5,1	2,3	1,9	1,8	2,0	1,3	1,6	3,3	2,4	:	2,8	0,6
1971	2,1	3,5	4,1	:	1,7	6,0	5,4	7,3	4,6	−2,9	3,2	2,9	5,0	4,3	:	5,5	2,8
1972	1,7	6,9	2,1	:	5,7	6,1	1,4	11,5	4,3	0,9	1,8	5,2	4,1	2,9	:	−2,4	−0,6
1973	8,3	12,0	6,6	:	26,1	9,4	8,3	19,7	14,8	14,9	7,2	9,4	11,8	10,1	:	12,9	9,7
1974	24,5	20,5	15,5	:	31,6	22,4	24,5	23,0	38,2	26,9	26,0	39,5	24,9	25,2	:	22,6	31,3
1975	5,5	7,7	4,2	:	12,9	10,7	4,9	18,4	13,5	−0,9	5,1	1,0	20,7	10,0	:	10,7	5,0
1976	5,8	7,0	3,6	:	10,0	16,4	9,7	23,0	23,0	8,6	6,6	7,1	19,8	12,4	:	3,7	2,0
1977	3,7	6,7	1,8	:	9,9	19,4	9,2	14,8	15,8	−2,8	3,6	35,5	15,4	10,6	:	4,6	−3,6
1978	1,2	6,3	1,5	:	8,2	15,8	6,3	6,6	9,0	2,0	−1,3	25,9	7,6	6,5	:	6,6	−6,3
1979	9,0	8,2	4,9	:	14,5	9,3	9,9	9,6	16,4	7,9	8,3	27,6	11,4	10,8	:	13,0	8,1
1980	9,3	14,6	6,2	:	34,0	19,3	12,0	10,8	23,6	7,5	12,3	25,2	13,9	14,2	:	10,4	9,7
1971-80	6,9	9,2	5,0	:	15,0	13,3	9,0	14,3	15,9	5,9	7,1	17,2	13,3	10,6	:	8,6	5,4
1981	9,6	12,7	5,7	:	25,5	17,9	14,1	16,4	20,0	9,6	13,4	18,5	8,4	13,0	:	7,7	2,6
1982	13,1	10,6	3,7	:	20,7	13,8	12,7	10,8	16,9	15,5	4,2	19,8	6,9	10,5	:	0,6	2,8
1983	7,3	5,2	1,8	:	19,3	16,8	9,9	9,1	9,1	5,9	0,1	30,0	7,9	7,9	:	−0,6	−4,8
1984	8,1	7,7	3,4	:	15,7	12,6	9,6	8,1	9,6	5,2	5,5	30,2	7,7	8,5	:	0,6	0,0
1985	2,9	3,6	2,8	:	17,0	6,7	4,6	3,1	8,7	3,9	1,5	17,6	5,1	5,3	:	−3,6	−2,5
1986	−8,4	−5,4	−1,4	:	10,6	−1,4	−3,1	−6,3	−2,7	−2,4	−15,3	4,5	−8,1	−4,3	:	−1,7	−13,5
1987	−3,8	−1,9	−1,1	:	7,5	2,5	−0,3	0,4	1,1	−6,1	−6,3	11,4	3,0	0,2	:	−2,1	−5,0
1988	2,9	0,7	2,0	:	7,5	3,0	2,7	5,6	4,2	3,6	0,8	8,9	0,7	2,9	:	3,6	−3,3
1989	7,1	5,6	2,7	:	10,6	4,5	4,8	7,3	6,2	7,0	6,3	10,7	9,2	6,2	:	1,5	3,6
1990	−1,6	−1,8	0,5	:	11,9	1,7	−1,2	−8,4	3,5	−1,5	−0,4	6,0	4,2	1,6	:	0,7	1,0
1981-90	3,5	3,5	2,0	:	14,5	7,6	5,2	4,4	7,4	3,9	0,7	15,4	4,4	5,1	:	0,6	−2,1
1991	−0,2	1,8	1,9	:	13,9	1,9	0,4	0,1	2,7	3,1	0,1	1,6	0,7	1,9	:	1,0	−0,3
1992	1,3	1,1	1,7	1,7	13,1	3,0	1,1	2,3	2,1	0,5	0,5	1,5	1,2	1,9	1,9	0,0	0,2

EUR 12–: including WD; EUR 12+: including D.

Table 26

Price deflator imports of goods and services

(National currency; annual percentage change)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12− (PPS)	EUR 12+ (PPS)	USA	JAP
1961	2,6	0,1	−2,5	:	−1,7	2,0	0,1	1,1	−2,2	1,4	−1,9	1,0	0,0	−0,7	:	−1,4	1,2
1962	0,8	−0,1	−0,2	:	−0,7	2,0	2,7	0,5	0,4	0,8	−0,9	−1,3	−0,2	0,6	:	−1,2	−2,2
1963	4,0	1,9	2,4	:	3,0	2,0	1,1	1,9	1,5	1,2	1,4	1,6	4,5	2,8	:	3,0	1,8
1964	3,2	1,3	1,8	:	3,0	2,4	0,9	1,3	3,4	2,1	2,4	2,2	2,4	2,2	:	2,2	1,5
1965	0,2	1,6	2,9	:	0,3	0,2	1,4	2,6	0,6	1,7	0,5	2,8	1,1	1,3	:	2,6	−0,7
1966	3,2	1,6	1,9	:	3,3	0,2	3,2	0,2	1,9	1,4	0,7	0,0	1,3	1,2	:	4,4	2,3
1967	0,5	2,5	−1,9	:	−3,0	2,8	−1,3	−0,3	0,7	−0,7	−0,9	−2,4	1,4	−0,3	:	2,4	−0,1
1968	0,6	5,0	0,0	:	0,2	10,7	−1,1	7,9	0,7	0,0	−2,9	−2,5	10,6	2,7	:	2,3	0,7
1969	3,2	2,9	2,0	:	0,0	3,0	4,9	4,2	1,4	3,1	3,3	0,9	2,5	2,2	:	2,6	2,9
1970	5,1	5,6	−1,0	:	4,0	5,1	9,7	0,7	3,7	7,4	6,6	9,3	6,3	4,6	:	6,1	2,1
1961-70	2,3	2,2	0,5	:	0,8	3,0	2,1	2,0	1,2	1,8	0,8	1,1	2,9	1,6	:	2,3	1,0
1971	3,4	6,1	1,2	:	2,9	5,4	4,8	5,4	4,9	5,4	4,3	1,4	4,1	3,7	:	5,0	−3,0
1972	0,4	2,0	1,7	:	7,7	1,5	0,4	5,7	4,5	−0,2	−0,4	3,4	2,7	1,7	:	5,4	−4,7
1973	7,5	16,8	8,4	:	21,9	10,4	7,2	13,9	27,1	9,6	7,5	14,1	23,3	14,3	:	11,4	18,5
1974	27,5	32,7	24,1	:	41,6	41,9	48,6	44,4	55,9	22,3	32,7	43,8	41,5	39,0	:	44,5	64,2
1975	6,7	4,9	2,1	:	17,4	7,0	2,6	20,5	9,9	10,8	4,3	13,9	13,6	7,0	:	7,4	9,5
1976	6,4	8,5	6,0	:	11,2	14,9	12,0	19,0	25,3	6,5	6,4	11,2	21,1	13,6	:	3,1	5,3
1977	3,1	7,7	1,7	:	5,8	22,1	12,2	16,8	14,9	1,8	3,2	30,7	13,7	10,4	:	7,7	−3,8
1978	1,1	2,7	−1,9	:	9,7	7,6	3,0	4,7	7,7	3,1	−1,6	22,1	2,9	3,6	:	9,8	−15,7
1979	8,9	13,7	8,4	:	17,7	7,2	11,4	13,7	19,7	7,5	10,9	30,5	9,3	12,5	:	17,7	27,7
1980	13,6	21,7	12,6	:	35,2	37,9	22,0	18,0	29,0	7,8	14,5	31,3	9,6	19,3	:	26,4	37,5
1971-80	7,6	11,3	6,2	:	16,5	14,9	11,7	15,7	19,1	7,3	7,8	19,5	13,7	12,1	:	13,3	11,4
1981	13,9	17,7	12,0	:	19,5	29,8	19,3	18,6	24,7	10,1	14,3	25,6	7,7	17,3	:	5,2	2,1
1982	13,3	10,1	2,7	:	24,0	13,0	12,8	7,5	11,9	13,8	1,3	18,1	7,0	9,1	:	−2,8	6,6
1983	7,4	3,7	0,6	:	17,6	21,5	8,5	5,2	4,8	7,9	0,4	29,9	7,5	6,9	:	−3,4	−5,4
1984	8,1	7,9	4,9	:	22,8	11,5	10,1	9,4	9,8	7,4	5,7	31,2	8,8	9,2	:	−1,0	−2,6
1985	2,1	3,2	2,4	:	17,8	3,8	2,3	2,6	8,2	3,1	1,2	13,0	4,0	4,2	:	−2,2	−2,3
1986	−12,3	−9,2	−11,6	:	8,4	−14,8	−12,3	−10,2	−13,5	−4,4	−16,2	−6,8	−4,4	−10,5	:	−0,5	−31,9
1987	−4,6	−2,4	−4,8	:	0,4	0,8	−0,5	1,1	0,7	−2,3	−4,6	12,6	2,6	−0,9	:	3,5	−5,7
1988	2,6	2,2	1,8	:	6,4	1,1	2,5	6,3	4,3	2,5	−0,3	11,6	−0,6	2,3	:	3,1	−2,8
1989	6,6	6,6	5,0	:	10,7	2,3	6,6	6,7	8,0	4,9	6,1	8,5	6,4	6,2	:	0,4	7,6
1990	−1,1	−1,8	−0,8	:	9,5	−1,2	−1,4	−4,5	4,2	0,2	−2,0	6,5	2,1	0,6	:	1,8	8,3
1981-90	3,3	3,6	1,0	:	13,5	6,1	4,5	4,0	5,9	4,2	0,3	14,5	4,0	4,2	:	0,4	−3,3
1991	0,1	1,2	1,3	:	11,7	−0,3	−0,5	1,0	−0,1	3,3	−0,2	0,5	−2,0	0,2	:	−0,7	−8,2
1992	1,3	1,4	0,6	0,5	10,8	1,4	0,9	1,8	1,0	0,3	1,0	0,4	0,4	1,0	1,0	−0,9	−6,5

EUR 12−: including WD; EUR 12+: including D.

Table 27

Terms of trade

Goods and services

(1980 = 100)

	B	DK	WD	GR	E	F	IRL	I	L	NL	P	UK	USA	JAP
1960	106,0	112,1	99,7	109,8	93,9	125,3	114,7	123,4	112,1	101,9	116,8	99,7	145,3	181,5
1961	103,9	110,7	101,2	111,9	93,9	125,6	113,3	125,3	107,2	102,1	114,4	100,9	149,3	178,0
1962	104,1	113,5	103,4	114,0	96,4	123,6	114,9	125,9	104,6	102,9	114,9	102,0	151,3	179,1
1963	102,2	114,5	101,9	119,6	100,5	125,7	115,0	128,0	103,3	104,1	116,7	101,4	147,0	180,4
1964	103,2	116,9	102,7	117,1	100,9	130,0	118,9	128,9	103,4	104,2	118,6	101,3	144,9	180,5
1965	104,4	117,5	102,3	115,5	106,3	129,5	118,1	128,1	103,1	106,0	118,9	102,2	146,9	181,0
1966	105,0	119,1	103,0	116,1	112,1	128,0	120,0	126,0	102,5	106,0	116,7	103,5	145,7	176,6
1967	105,0	117,6	104,6	116,5	117,6	129,3	121,1	126,5	103,6	106,9	124,0	104,8	146,5	177,1
1968	104,5	115,4	104,3	114,7	116,0	130,1	119,3	126,0	104,9	109,4	130,1	102,1	152,9	176,0
1969	106,0	119,7	106,1	115,2	114,4	130,0	121,4	127,6	108,4	108,2	126,9	101,8	154,0	173,6
1970	106,6	120,7	112,2	114,2	114,3	127,6	113,2	130,6	114,3	107,3	122,3	103,5	152,5	174,9
1971	105,3	117,8	115,5	112,8	114,9	128,3	115,2	130,1	105,3	106,2	124,1	104,4	153,3	185,3
1972	106,7	123,5	115,9	110,7	120,2	129,6	121,5	129,9	106,5	108,6	126,2	105,8	141,9	193,1
1973	107,5	118,5	114,0	114,5	119,1	131,0	127,7	117,3	111,6	108,2	121,0	96,0	143,8	178,8
1974	104,9	107,6	106,1	106,4	102,7	109,7	108,8	104,0	115,9	102,8	117,3	84,7	122,0	143,0
1975	103,8	110,4	108,3	102,3	106,4	112,2	106,9	107,4	103,7	103,6	104,1	90,0	125,8	137,1
1976	103,2	108,9	105,9	101,2	107,7	109,9	110,5	105,4	105,7	103,7	100,3	89,0	126,5	132,9
1977	103,8	107,8	106,0	105,2	105,4	107,0	108,5	106,1	100,9	104,1	103,9	90,3	122,8	133,1
1978	103,8	111,5	109,6	103,7	113,4	110,4	110,5	107,4	99,9	104,4	107,2	94,4	119,2	148,0
1979	103,9	106,2	106,1	100,9	115,6	108,9	106,5	104,4	100,3	101,9	104,8	96,2	114,5	125,3
1980	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
1981	96,2	95,7	94,4	105,0	90,8	95,6	98,1	96,2	99,6	99,3	94,4	100,6	102,3	100,5
1982	96,0	96,1	95,4	102,2	91,5	95,5	101,1	100,5	101,0	102,0	95,7	100,5	105,9	96,9
1983	95,9	97,5	96,5	103,7	88,0	96,8	104,8	104,7	99,1	101,7	95,8	100,9	108,9	97,5
1984	95,9	97,3	95,1	97,6	88,9	96,4	103,5	104,5	97,1	101,5	95,1	99,9	110,7	100,0
1985	96,6	97,6	95,4	97,0	91,4	98,5	104,1	104,9	97,9	101,7	98,9	100,9	109,1	99,7
1986	100,9	101,8	106,3	99,0	105,7	108,9	108,6	117,8	99,9	102,9	110,9	96,9	107,8	126,6
1987	101,8	102,3	110,5	105,9	107,6	109,1	107,8	118,3	96,1	101,0	109,7	97,3	102,0	127,6
1988	102,0	100,8	110,7	107,1	109,7	109,2	107,1	118,1	97,1	102,1	107,1	98,6	102,5	127,0
1989	102,5	99,9	108,2	107,0	112,0	107,3	107,7	116,1	99,1	102,3	109,2	101,2	103,7	122,2
1990	101,9	99,8	109,7	109,3	115,2	107,5	103,4	115,3	97,4	103,9	108,8	103,2	102,5	114,0
1991	101,6	100,4	110,4	111,5	117,8	108,4	102,4	118,5	97,2	104,3	110,0	106,0	104,3	123,9
1992	101,7	100,2	111,6	113,8	119,7	108,7	102,9	119,8	97,4	103,8	111,1	106,9	105,2	132,7

Table 28

Nominal compensation per employee

Total economy

(National currency; annual percentage change)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12– (PPS)	EUR 12+ (PPS)	USA	JAP
1961	3,2	12,9	10,2	:	5,2	12,9	10,6	8,3	8,2	2,9	7,4	5,1	6,8	8,8	:	3,2	13,2
1962	7,2	11,1	9,1	:	6,9	15,2	11,6	8,5	13,5	4,8	6,8	4,9	4,7	9,1	:	4,3	14,1
1963	8,0	4,6	6,1	:	7,9	21,1	11,4	5,2	19,7	8,0	9,3	8,6	5,0	9,9	:	4,0	13,2
1964	9,7	10,7	8,2	:	13,6	13,7	9,2	13,7	12,3	13,3	16,5	8,3	7,1	9,7	:	5,1	13,1
1965	9,5	13,8	9,5	:	12,5	15,6	6,5	5,3	7,7	4,2	11,7	10,5	6,8	8,6	:	3,7	11,9
1966	8,6	10,2	7,6	:	12,8	18,1	6,0	8,5	7,9	5,0	11,1	10,5	6,4	8,0	:	5,1	11,2
1967	7,4	10,9	3,3	:	9,7	14,7	6,9	8,0	8,4	2,8	9,3	13,8	6,2	6,9	:	4,3	12,1
1968	6,3	10,0	6,7	:	10,0	8,8	11,3	10,6	7,4	5,9	8,6	3,6	7,8	8,2	:	7,4	13,7
1969	8,4	11,0	9,5	:	9,9	11,8	11,1	13,9	7,6	5,6	13,2	10,0	6,8	9,3	:	7,4	15,8
1970	9,2	11,0	16,0	:	9,1	9,4	10,3	16,8	15,7	15,1	12,4	18,2	13,4	13,2	:	7,6	16,7
1961-70	7,7	10,6	8,6	:	9,7	14,1	9,5	9,8	10,8	6,7	10,6	9,3	7,1	9,2	:	5,2	13,5
1971	11,7	11,6	11,4	:	8,4	13,6	11,3	14,8	11,0	7,8	13,8	15,3	11,3	11,6	:	7,2	14,6
1972	14,0	8,0	9,6	:	12,9	17,7	10,1	15,8	10,6	9,7	12,8	16,0	13,1	11,6	:	7,4	14,2
1973	13,0	13,1	11,9	:	17,5	18,3	12,2	18,8	17,7	11,4	15,4	17,5	13,2	14,2	:	7,0	21,0
1974	18,2	18,4	11,4	:	19,6	21,3	18,1	18,0	22,6	22,9	15,7	34,9	18,8	17,9	:	8,1	25,7
1975	16,5	13,9	7,0	:	20,6	22,5	18,8	28,9	20,8	12,3	13,3	38,1	31,3	18,8	:	9,0	16,2
1976	16,0	11,7	7,7	:	20,7	23,4	14,9	19,6	20,9	11,1	10,8	24,3	14,8	14,9	:	8,2	11,1
1977	8,8	9,7	6,6	:	22,3	26,8	12,4	14,9	20,8	9,9	8,5	23,2	10,7	13,3	:	7,5	10,1
1978	7,2	9,2	5,5	:	23,3	24,8	12,6	15,5	16,5	5,9	7,2	18,7	13,4	12,5	:	7,6	7,5
1979	5,5	9,4	5,8	:	23,4	19,0	13,0	18,9	19,9	6,7	6,0	20,0	15,3	13,0	:	8,8	6,0
1980	9,6	10,0	6,8	:	16,1	17,3	15,3	21,1	21,4	9,0	5,5	25,6	19,7	14,9	:	10,0	6,5
1971-80	12,0	11,5	8,3	:	18,4	20,4	13,8	18,6	18,1	10,6	10,8	23,1	16,0	14,3	:	8,1	13,1
1981	6,3	9,2	4,8	:	21,5	15,3	14,3	18,1	22,6	8,5	3,5	21,0	14,0	13,0	:	9,4	6,4
1982	7,8	11,9	4,2	:	27,7	13,7	14,1	14,2	16,2	6,9	5,8	21,6	8,5	11,0	:	7,7	3,8
1983	6,3	8,2	3,6	:	21,4	13,8	10,1	12,8	16,0	6,9	3,2	21,8	8,7	9,7	:	5,1	2,2
1984	6,5	5,5	3,4	:	20,7	10,0	8,2	10,7	11,8	7,1	0,2	21,2	5,6	7,4	:	4,1	3,9
1985	4,6	4,7	2,9	:	23,4	9,4	6,6	8,9	10,1	4,2	1,4	22,5	7,3	6,9	:	4,1	2,9
1986	4,7	4,4	3,6	:	12,5	9,5	4,6	5,3	7,5	3,6	1,6	21,6	8,4	6,4	:	4,1	3,2
1987	1,7	7,9	3,2	:	9,8	6,7	3,7	5,4	8,2	4,8	1,5	17,9	7,5	5,6	:	4,0	3,2
1988	2,2	5,0	3,0	:	21,1	6,3	4,5	6,1	8,8	3,1	1,4	13,4	7,9	5,8	:	5,2	3,6
1989	3,6	3,8	2,9	:	18,1	6,3	5,0	6,0	8,7	7,0	0,8	12,8	9,2	6,0	:	3,4	4,2
1990	6,4	3,4	4,3	:	20,3	7,6	4,8	4,2	10,4	6,7	3,6	18,7	10,7	7,4	:	4,9	4,2
1981-90	5,0	6,4	3,6	:	19,5	9,8	7,5	9,1	11,9	5,9	2,3	19,2	8,7	7,9	:	5,2	3,8
1991	5,0	3,5	5,8	:	15,0	8,5	4,4	5,1	8,7	4,0	4,6	19,0	8,5	7,1	:	4,2	2,8
1992	5,0	3,3	5,2	5,4	11,3	8,2	3,7	4,9	5,9	4,3	4,6	15,2	5,6	5,6	5,6	3,5	2,9

EUR 12–: including WD; EUR 12+: including D.

Table 29

Real compensation per employee

Total economy, deflator GDP

(Annual percentage change)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12– (PPS)	EUR 12+ (PPS)	USA	JAP
1961	1,9	8,2	5,1	:	3,6	10,9	6,9	5,6	5,3	6,8	4,9	2,8	4,0	5,4	:	2,4	5,1
1962	5,5	4,2	4,9	:	2,2	8,9	6,6	3,4	7,3	0,9	3,2	5,1	0,6	4,4	:	2,1	9,5
1963	4,8	−1,1	2,9	:	6,5	11,6	4,7	2,4	10,4	4,7	4,4	6,0	2,8	4,8	:	2,8	7,3
1964	4,8	5,8	5,0	:	9,5	6,9	4,8	3,7	5,5	7,1	7,2	7,1	3,2	4,9	:	3,9	7,4
1965	4,2	5,9	5,6	:	8,2	5,6	3,7	0,8	3,4	1,3	5,2	6,5	1,7	3,9	:	1,2	6,4
1966	4,3	3,1	4,1	:	7,6	9,3	3,0	3,9	5,5	1,0	4,8	4,8	1,9	3,9	:	0,8	5,9
1967	4,1	4,4	1,7	:	7,1	6,5	3,6	4,6	5,5	2,3	4,8	10,0	3,1	3,6	:	0,9	6,2
1968	3,5	2,8	4,4	:	8,2	3,7	6,8	6,1	5,5	0,8	4,2	2,2	3,6	4,7	:	2,4	8,4
1969	4,2	3,7	5,1	:	6,3	7,1	4,2	4,4	3,4	0,3	6,3	3,7	1,3	4,0	:	2,3	10,9
1970	4,4	2,4	7,8	:	5,0	2,4	4,5	6,5	8,2	0,0	5,9	14,3	5,6	6,0	:	2,2	9,6
1961-70	4,2	3,9	4,6	:	6,4	7,3	4,9	4,1	6,0	2,5	5,1	6,2	2,8	4,6	:	2,1	7,7
1971	5,7	3,7	3,4	:	5,1	5,3	4,6	3,8	3,8	8,7	5,3	9,7	1,8	3,8	:	2,0	8,6
1972	7,3	−1,1	4,1	:	7,5	8,4	2,5	2,1	3,9	3,7	3,2	7,6	4,6	4,2	:	2,7	8,0
1973	5,4	2,2	5,3	:	−1,6	5,7	3,4	3,1	4,0	−0,7	5,8	7,4	5,7	4,8	:	0,4	6,9
1974	5,0	4,7	4,1	:	−1,1	4,3	5,2	11,2	2,3	5,1	6,0	13,5	3,4	4,1	:	−0,8	4,7
1975	4,0	1,3	1,1	:	7,3	4,9	5,1	7,3	3,7	13,3	2,8	18,8	3,3	3,5	:	−0,8	8,2
1976	7,8	2,3	3,9	:	4,6	5,9	3,5	−1,2	2,2	−1,0	1,7	6,9	−0,4	2,9	:	1,8	3,1
1977	1,2	0,3	2,8	:	8,3	2,9	3,2	1,4	1,8	8,6	1,7	−2,6	−2,9	1,4	:	0,7	3,5
1978	2,7	−0,6	1,2	:	9,2	3,5	2,3	4,5	2,1	0,7	1,6	−3,0	1,9	2,0	:	0,2	2,3
1979	1,0	1,7	1,8	:	4,0	1,6	2,6	4,6	4,0	0,3	2,0	0,5	0,8	2,1	:	−0,2	3,2
1980	5,6	1,7	1,8	:	−1,3	2,7	3,3	5,6	1,2	1,0	−0,2	3,9	0,2	1,9	:	0,8	1,8
1971-80	4,6	1,6	2,9	:	4,1	4,5	3,6	4,2	2,9	3,9	3,0	6,1	1,8	3,0	:	0,7	5,0
1981	1,5	−0,8	0,7	:	1,4	3,0	2,7	0,6	3,0	1,2	−1,9	2,9	2,3	1,9	:	0,0	2,6
1982	0,7	1,2	−0,2	:	2,1	−0,1	1,9	−0,8	−0,9	−3,5	−0,3	0,7	0,8	0,4	:	1,2	2,1
1983	0,6	0,5	0,1	:	1,9	1,9	0,5	1,9	0,8	0,1	1,3	−2,3	3,3	1,1	:	1,7	0,8
1984	1,3	−0,1	1,3	:	0,3	−0,9	0,9	4,1	0,2	2,6	−1,6	−2,8	1,0	0,6	:	0,5	1,6
1985	−1,4	0,4	0,7	:	4,8	0,8	0,7	3,5	1,1	1,2	−0,4	0,6	1,5	0,9	:	1,4	1,3
1986	0,9	−0,2	0,3	:	−4,3	−1,4	−0,7	−1,3	−0,3	−0,2	1,2	0,9	4,7	0,7	:	1,9	1,4
1987	−0,5	3,0	1,2	:	−3,9	0,8	0,6	2,6	2,1	5,5	1,9	6,0	2,4	1,4	:	0,9	3,1
1988	0,8	1,5	1,4	:	4,8	0,6	1,1	2,9	2,0	−0,2	−0,5	1,5	1,3	1,2	:	1,8	3,3
1989	−1,1	−0,5	0,3	:	4,8	−0,6	1,5	1,2	2,6	1,2	−0,7	−0,2	2,1	1,1	:	−0,4	2,3
1990	3,3	1,3	0,9	:	0,8	0,2	1,8	5,6	2,7	4,5	0,7	3,9	3,6	2,0	:	0,8	2,3
1981-90	0,6	0,6	0,7	:	1,2	0,4	1,1	2,0	1,3	1,2	0,0	1,1	2,3	1,1	:	1,0	2,1
1991	1,9	0,5	1,2	:	−0,8	1,6	1,1	2,5	1,3	0,4	1,3	4,0	1,6	1,4	:	0,5	0,9
1992	1,6	1,3	0,7	−0,1	−3,1	1,6	0,7	0,9	0,4	1,4	1,6	3,7	0,3	0,8	0,5	0,7	1,1

EUR 12–: including WD; EUR 12+: including D.

Table 30

Real compensation per employee

Total economy, deflator private consumption

(Annual percentage change)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12− (PPS)	EUR 12+ (PPS)	USA	JAP
1961	0,6	9,0	6,5	:	4,0	10,9	7,0	5,9	6,4	2,4	4,9	4,5	3,7	5,8	:	2,0	6,5
1962	6,1	4,7	5,9	:	5,6	9,3	7,0	4,2	7,8	4,0	4,1	2,9	0,9	5,0	:	2,5	7,0
1963	4,2	−0,9	2,9	:	4,4	12,4	5,4	2,7	11,8	4,7	5,3	7,4	3,3	5,4	:	2,3	5,5
1964	5,3	6,4	5,8	:	11,1	6,6	5,6	6,3	7,1	10,0	9,1	7,4	3,3	5,6	:	3,5	8,7
1965	4,7	7,3	5,9	:	7,6	5,4	3,9	0,9	4,0	0,8	7,4	5,4	1,8	4,2	:	1,8	4,7
1966	4,3	3,4	4,0	:	9,0	10,0	2,8	4,4	4,8	1,6	5,4	4,8	2,4	4,0	:	2,0	6,3
1967	4,7	3,2	1,7	:	7,6	8,4	3,7	5,1	5,1	0,5	6,1	12,0	3,5	3,9	:	1,7	7,8
1968	3,3	2,7	5,0	:	9,2	3,5	6,0	5,5	5,8	3,3	5,9	−0,7	3,1	4,7	:	2,8	8,2
1969	5,4	6,1	7,0	:	6,6	8,1	3,7	5,7	4,5	3,7	6,7	4,9	1,2	4,8	:	2,8	11,2
1970	6,5	4,1	11,5	:	5,8	2,7	5,0	4,0	10,1	10,3	7,7	14,5	7,0	7,8	:	3,1	8,9
1961-70	4,5	4,6	5,6	:	7,1	7,7	5,0	4,4	6,7	4,1	6,3	6,2	3,0	5,1	:	2,4	7,5
1971	6,0	3,1	5,6	:	5,4	5,4	4,8	4,9	5,2	3,0	5,4	7,8	2,4	4,7	:	2,3	7,3
1972	8,2	−0,2	3,7	:	9,3	9,4	3,5	5,6	4,0	4,4	4,2	9,1	6,2	4,8	:	4,3	7,9
1973	6,5	1,3	4,8	:	2,2	6,2	4,3	6,5	3,3	6,2	6,3	7,9	4,3	4,6	:	1,0	9,2
1974	4,9	3,0	3,6	:	−3,2	3,0	2,5	1,9	0,9	11,7	5,6	9,2	1,5	2,7	:	−2,2	3,9
1975	3,8	3,6	0,9	:	7,0	6,0	6,0	9,3	3,7	1,9	2,9	19,0	6,3	4,4	:	0,9	4,5
1976	7,6	1,6	3,3	:	6,4	5,9	4,4	−0,4	2,6	1,7	1,7	5,2	−0,9	2,9	:	2,2	1,4
1977	1,5	−0,8	3,1	:	9,3	2,4	2,6	0,6	2,7	4,0	2,2	−3,2	−3,6	1,4	:	0,9	2,6
1978	2,9	−0,1	2,6	:	9,3	4,8	3,3	7,0	2,9	2,4	2,5	−2,2	4,0	3,2	:	0,5	2,9
1979	1,6	−0,9	1,5	:	5,9	2,1	1,9	3,5	4,7	1,6	1,6	−4,1	1,5	2,0	:	−0,5	2,4
1980	3,0	−0,6	0,9	:	−4,7	0,6	1,6	2,1	0,8	1,4	−1,3	3,3	3,0	1,3	:	−0,9	−0,9
1971-80	4,6	1,0	3,0	:	4,6	4,6	3,5	4,1	3,1	3,8	3,1	5,0	2,4	3,2	:	0,8	4,1
1981	−2,2	−2,5	−1,3	:	−1,0	0,8	0,9	−1,3	3,9	−0,1	−2,2	0,7	2,5	0,9	:	0,2	1,9
1982	0,0	1,5	−0,8	:	5,8	−0,7	2,0	−0,6	−0,8	−3,3	0,2	1,1	−0,2	0,2	:	1,6	1,1
1983	−0,8	1,3	0,3	:	2,8	1,3	0,4	3,2	1,1	−1,2	0,2	−3,2	3,7	1,1	:	1,6	0,2
1984	0,8	−0,8	0,7	:	2,4	−0,9	0,4	3,2	−0,3	0,5	−1,9	−5,6	0,7	0,1	:	0,2	1,4
1985	−1,3	0,4	0,8	:	4,3	1,1	0,6	3,7	1,0	0,0	−0,8	2,6	1,8	1,0	:	0,9	0,7
1986	4,1	1,5	3,9	:	−7,9	0,8	1,7	0,7	1,3	1,9	1,4	6,8	3,8	2,5	:	2,0	2,8
1987	0,0	3,1	2,4	:	−5,1	0,9	0,4	1,6	2,8	2,9	2,4	7,2	3,0	1,9	:	−0,4	3,0
1988	1,0	1,0	1,6	:	6,0	1,2	1,5	3,3	2,9	0,3	0,4	3,1	2,7	1,9	:	1,1	3,7
1989	0,0	−1,2	−0,2	:	2,5	−0,3	1,3	2,2	2,1	3,5	−1,9	0,6	3,4	1,1	:	−1,0	2,4
1990	2,7	1,3	1,6	:	0,2	1,1	1,5	1,6	3,7	2,4	0,9	5,4	4,4	2,5	:	−0,2	1,7
1981-90	0,4	0,5	0,9	:	0,9	0,5	1,1	1,8	1,8	0,7	−0,1	1,8	2,6	1,3	:	0,6	1,9
1991	1,8	1,0	2,1	:	−3,8	2,1	1,3	2,0	1,9	0,8	1,1	6,4	1,2	1,7	:	0,2	0,2
1992	1,8	1,1	1,2	0,4	−4,1	1,7	0,7	1,1	0,6	1,4	1,1	5,7	0,3	1,0	0,7	0,7	1,1

EUR 12−: including WD; EUR 12+: including D.

Table 31

Adjusted wage share[1]

Total economy

(Percentage of GDP at factor cost)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12− (PPS)	EUR 12+ (PPS)	USA	JAP
1960	69,0	71,4	70,6	:	97,0	71,1	72,8	87,4	75,2	66,1	63,7	70,2	71,2	73,8	:	72,5	80,0
1961	68,2	72,4	72,1	:	91,1	70,5	73,6	87,0	73,6	68,9	65,9	69,2	72,4	74,3	:	72,0	76,0
1962	69,5	73,0	72,5	:	91,2	70,8	73,7	87,4	73,3	68,3	66,8	69,0	72,8	74,3	:	71,3	77,1
1963	70,3	73,4	72,6	:	87,3	72,9	74,1	86,6	75,4	68,7	68,3	68,8	72,1	74,5	:	70,9	76,8
1964	69,8	72,6	71,4	:	87,2	74,0	74,1	87,4	76,7	68,9	68,7	68,9	71,7	74,3	:	70,9	74,5
1965	70,0	75,4	71,6	:	85,6	74,0	73,3	86,5	75,4	69,4	69,4	68,5	72,1	74,1	:	69,8	75,9
1966	71,7	76,6	72,2	:	86,5	76,2	72,4	89,9	73,8	69,5	71,6	68,9	73,0	74,2	:	69,6	73,9
1967	72,0	77,4	71,5	:	87,0	78,4	71,4	87,9	73,8	70,3	71,2	70,3	72,7	73,9	:	70,6	71,9
1968	71,2	78,0	70,0	:	88,0	76,4	72,1	86,4	72,7	67,7	70,8	65,4	72,3	73,1	:	71,2	70,0
1969	70,6	77,1	70,5	:	85,3	76,1	71,8	86,2	70,9	62,7	71,3	65,5	73,1	72,8	:	72,7	69,4
1970	68,7	78,1	72,1	:	82,5	75,4	71,4	88,6	72,8	63,3	72,6	73,7	74,7	73,8	:	74,0	69,6
1961-70	70,2	75,4	71,6	:	87,2	74,5	72,8	87,4	73,8	67,8	69,7	68,8	72,7	73,9	:	71,3	73,5
1971	70,7	79,4	72,7	:	80,5	75,9	71,5	88,7	74,5	69,9	74,2	75,7	73,0	74,1	:	73,0	73,0
1972	71,2	76,0	72,8	:	79,5	76,5	71,0	84,9	74,4	70,4	73,5	75,0	72,9	73,9	:	72,8	73,1
1973	71,3	75,2	73,6	:	72,7	76,9	70,3	84,4	73,6	65,6	73,9	71,8	72,7	73,7	:	72,7	74,4
1974	73,2	78,0	75,2	:	73,4	75,8	72,3	90,0	72,8	67,1	74,9	79,4	75,3	75,0	:	73,8	77,5
1975	75,7	78,9	75,0	:	75,8	77,4	75,5	88,2	75,7	83,6	76,8	96,4	77,9	77,1	:	72,3	81,1
1976	77,0	77,6	73,6	:	76,2	78,5	75,8	87,7	74,3	80,0	74,2	96,6	75,2	76,0	:	72,0	81,0
1977	77,3	77,9	73,7	:	81,0	77,8	75,4	80,5	74,3	85,4	74,5	89,6	72,4	75,3	:	71,6	81,3
1978	77,4	77,9	73,0	:	83,3	77,2	75,2	78,5	73,4	82,8	74,5	81,9	71,6	74,6	:	71,4	80,0
1979	77,3	78,3	72,7	:	84,5	77,5	75,3	81,7	72,6	81,0	74,8	79,4	72,4	74,5	:	71,9	79,5
1980	78,3	79,3	74,5	:	81,2	76,2	76,8	86,6	72,2	82,7	74,6	79,8	74,5	75,4	:	72,9	78,6
1971-80	74,9	77,9	73,7	:	78,8	77,0	73,9	85,1	73,8	76,9	74,6	82,6	73,8	75,0	:	72,4	78,0
1981	78,9	78,3	74,8	:	84,8	77,2	77,1	85,3	73,7	83,7	72,5	81,6	75,0	75,9	:	72,2	78,6
1982	77,4	76,4	74,3	:	86,5	75,5	77,3	83,8	73,3	80,3	71,1	80,4	73,3	75,2	:	73,6	78,5
1983	76,7	75,2	72,3	:	89,7	75,8	76,6	84,0	74,1	78,9	69,7	78,7	71,8	74,5	:	72,8	78,0
1984	75,7	73,4	71,3	:	88,3	72,3	75,6	81,7	72,6	77,1	66,4	76,5	72,1	73,2	:	71,6	76,6
1985	74,4	72,9	70,7	:	89,4	70,8	74,6	79,2	72,2	77,3	65,6	75,1	71,5	72,5	:	71,7	74,6
1986	74,4	73,1	70,0	:	85,6	69,8	72,1	79,0	70,6	75,5	66,6	73,1	72,8	71,7	:	71,9	74,2
1987	73,4	75,5	70,4	:	83,8	69,6	71,3	77,3	70,7	79,7	68,4	73,0	72,5	71,7	:	72,0	74,7
1988	71,5	74,7	69,3	:	85,6	68,5	70,3	76,5	70,5	78,2	67,1	72,3	72,8	71,0	:	72,1	74,0
1989	69,6	72,4	68,5	:	85,3	67,5	69,5	74,8	70,5	77,9	65,3	68,9	74,2	70,6	:	71,5	73,8
1990	69,9	71,3	68,1	:	87,3	66,8	69,7	74,0	72,2	83,4	64,9	69,2	75,7	71,0	:	71,8	72,9
1981-90	74,2	74,3	71,0	:	86,6	71,4	73,4	79,6	72,0	79,2	67,8	74,9	73,2	72,7	:	72,1	75,6
1991	69,8	70,2	68,8	63,6	85,6	66,3	69,7	73,8	72,9	84,7	65,1	71,1	76,7	71,3	69,6	72,3	71,8
1992	69,6	68,7	68,8	62,2	82,3	66,1	69,1	73,0	72,5	85,2	65,3	73,2	74,9	70,7	68,7	71,8	72,5

EUR 12−: including WD; EUR 12+: including D.

[1] Compensation of employees adjusted for the share of self-employed in occupied population.

Table 32

Nominal unit labour costs[1]

Total economy

(National currency; 1980 = 100)

	B	DK	WD	GR	E	F	IRL	I	L	NL	P	UK	EUR 12– (PPS)	USA	JAP
1960	31,2	20,1	38,4	24,1	12,0	23,5	15,6	16,1	29,2	24,9	15,1	17,5	22,4	35,9	27,9
1961	31,0	21,6	41,1	22,9	12,1	24,7	16,1	16,2	29,2	26,3	15,2	18,4	23,2	35,9	28,6
1962	32,1	23,0	43,0	23,9	12,9	25,8	17,0	17,1	30,3	27,6	15,0	19,1	24,3	36,3	30,3
1963	33,4	24,3	44,5	23,1	14,4	27,6	17,2	19,1	31,5	29,5	15,4	19,4	25,5	36,5	31,9
1964	34,7	25,1	45,2	24,0	15,5	28,6	18,9	20,7	33,7	32,3	15,5	19,9	26,6	36,9	32,8
1965	36,8	27,8	47,2	24,5	16,9	29,2	19,5	21,2	34,7	34,6	16,0	20,9	27,7	37,4	35,2
1966	39,0	30,0	49,3	25,8	18,8	29,6	20,9	21,3	36,2	37,7	16,9	22,0	28,8	39,0	36,1
1967	40,1	31,9	49,4	26,6	20,8	30,3	21,2	21,8	36,7	39,0	17,7	22,5	29,6	40,8	37,1
1968	40,9	34,0	50,0	27,1	21,4	32,3	21,7	21,9	37,2	40,1	16,7	23,2	30,4	43,1	38,0
1969	42,3	36,0	51,7	27,0	22,1	34,0	23,5	22,4	36,2	43,4	17,7	24,3	31,6	46,1	39,4
1970	43,2	39,4	57,8	27,3	23,4	36,0	26,4	24,5	41,8	46,7	20,4	26,8	34,4	49,3	42,0
1971	47,0	43,1	62,8	27,6	25,6	38,4	29,2	27,0	45,3	51,2	22,1	29,0	37,2	51,0	46,5
1972	50,8	45,1	66,2	28,8	28,0	40,9	31,8	28,9	47,9	55,4	23,7	31,6	39,9	53,4	49,3
1973	55,0	49,9	71,4	31,8	31,3	44,1	36,6	32,4	50,2	61,1	24,9	34,1	43,6	56,9	56,7
1974	63,3	59,4	78,4	39,6	36,3	51,2	42,0	38,4	60,9	68,1	33,0	41,4	50,6	62,9	71,4
1975	73,9	67,3	82,8	45,0	43,5	60,4	50,8	47,7	74,0	76,7	46,4	54,5	60,0	67,9	80,5
1976	80,7	71,8	84,2	52,2	51,5	67,0	59,4	55,0	80,2	80,9	53,8	60,4	65,9	72,0	86,5
1977	87,2	78,2	87,4	62,3	62,9	73,3	64,2	64,9	86,7	86,0	63,3	65,4	72,8	76,6	92,0
1978	91,1	85,0	90,2	72,3	76,0	80,2	70,8	73,3	87,7	90,6	72,0	72,0	79,7	82,4	95,2
1979	95,2	90,9	93,2	86,5	89,0	87,9	84,3	84,2	91,9	94,9	83,5	81,9	87,8	90,7	96,7
1980	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
1981	105,3	108,8	104,5	127,4	112,6	112,3	113,3	121,9	109,4	102,6	120,3	111,0	111,7	108,0	103,5
1982	110,4	118,7	108,7	160,9	125,3	125,4	126,8	142,1	115,4	107,4	140,5	116,3	122,1	117,4	105,1
1983	115,7	125,6	109,3	196,5	139,4	136,5	140,3	164,3	119,5	107,2	169,4	120,4	130,9	120,0	106,1
1984	120,5	129,1	110,1	231,6	147,0	144,3	146,1	179,5	121,2	104,1	206,1	126,9	137,6	122,2	106,1
1985	125,7	132,9	112,1	279,7	155,1	150,6	151,0	194,4	124,5	104,5	245,5	133,1	144,4	125,5	104,6
1986	130,5	137,4	115,2	310,6	166,8	153,9	160,0	204,7	126,3	106,2	278,8	138,7	150,4	128,9	106,1
1987	130,5	149,1	118,1	343,1	176,0	156,6	161,0	215,6	132,5	108,4	314,0	144,7	156,1	133,2	106,0
1988	129,0	153,8	118,2	405,4	184,1	158,8	165,2	227,5	133,2	108,6	342,7	154,6	161,3	137,8	105,2
1989	131,0	157,1	119,3	464,3	193,6	162,6	164,4	240,6	139,0	107,1	371,3	169,2	168,0	141,9	106,8
1990	135,8	158,9	122,3	560,6	206,2	168,1	164,3	263,1	151,2	109,0	426,0	187,4	178,3	148,2	107,5
1991	140,3	161,3	128,4	620,2	219,2	174,0	169,0	284,0	158,4	112,7	502,5	201,6	188,6	154,1	107,9
1992	144,1	161,9	133,8	673,4	231,9	177,4	174,0	297,3	163,9	116,4	564,9	206,6	195,7	157,1	110,9

EUR 12–: including WD.

[1] Compensation of employees adjusted for the share of self-employed in occupied population per unit of GDP at constant prices.

Table 33

Real unit labour costs[1]

Total economy

(1980 = 100)

	B	DK	WD	GR	E	F	IRL	I	L	NL	P	UK	EUR 12– (PPS)	USA	JAP
1960	86,9	94,3	92,7	119,0	91,4	92,9	96,8	99,9	81,4	86,5	89,5	97,8	96,5	98,4	99,6
1961	85,1	97,3	94,5	111,4	90,8	94,2	97,1	97,5	84,6	89,3	87,9	99,7	97,1	97,7	94,7
1962	86,7	97,4	95,1	111,1	91,3	94,3	98,0	97,4	84,5	90,4	87,1	99,9	97,1	96,7	96,5
1963	87,7	96,9	95,4	105,9	94,2	94,7	96,3	100,3	85,2	92,3	87,1	99,0	97,5	96,1	96,3
1964	87,1	95,7	94,0	105,9	95,3	94,2	96,7	102,3	86,0	92,9	86,8	98,1	97,1	96,1	93,8
1965	87,8	98,8	94,8	104,0	95,2	93,5	95,4	100,7	86,2	93,7	86,3	98,2	96,8	94,9	95,8
1966	89,2	99,7	95,6	104,5	97,6	92,3	98,0	98,7	86,6	96,4	86,5	98,8	96,8	95,1	93,6
1967	89,1	100,0	94,3	104,9	100,4	91,6	96,4	98,2	87,5	95,7	87,5	98,2	96,3	96,2	91,2
1968	88,4	99,6	93,4	105,2	98,3	93,5	94,7	97,3	84,4	94,6	81,5	97,1	95,7	96,8	89,1
1969	87,8	98,4	92,8	101,4	97,5	92,5	93,7	95,2	78,0	96,1	81,2	96,8	94,7	98,7	88,5
1970	85,9	99,5	96,4	98,5	96,6	92,7	96,0	97,8	78,2	97,3	90,8	99,2	96,5	100,2	88,5
1971	88,4	101,1	97,1	96,8	97,7	93,0	95,9	100,5	85,5	98,8	93,7	98,0	97,3	98,5	92,9
1972	90,1	96,9	97,3	96,0	98,3	92,1	92,3	101,1	85,4	97,7	93,0	98,9	97,3	98,7	93,1
1973	90,8	96,8	98,7	88,9	98,4	91,6	92,1	100,3	79,8	98,9	89,3	99,7	97,5	98,6	94,6
1974	92,9	102,0	101,3	91,3	98,2	94,6	99,6	99,2	82,7	101,0	99,7	105,1	100,0	100,1	99,2
1975	96,8	102,7	101,1	92,5	100,8	98,9	100,3	105,8	101,4	103,3	120,6	108,9	103,3	98,2	104,1
1976	98,2	100,5	99,2	93,1	102,2	98,9	96,9	103,0	97,9	99,9	120,3	104,7	101,5	98,0	103,8
1977	98,7	100,0	99,3	98,2	101,4	99,3	92,5	102,4	104,6	99,5	111,9	99,5	100,4	97,8	103,8
1978	98,7	98,9	98,3	100,9	101,6	98,6	92,4	101,5	100,6	99,5	104,0	98,4	99,5	97,9	102,3
1979	98,8	98,4	97,8	101,8	101,7	98,1	96,7	101,1	99,1	100,3	101,0	97,9	99,1	99,0	101,1
1980	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
1981	100,6	98,8	100,4	106,4	100,5	100,8	96,5	102,4	102,1	97,3	102,3	99,7	100,7	98,6	99,9
1982	98,5	97,5	100,0	107,4	98,3	100,6	93,7	101,8	97,2	96,0	99,0	97,0	99,6	100,7	99,7
1983	97,7	95,9	97,2	110,1	98,0	99,8	93,7	102,3	94,2	94,1	95,8	95,5	98,5	99,6	99,3
1984	96,7	93,3	95,9	107,9	93,1	98,3	91,7	100,2	91,5	89,7	93,5	96,2	96,9	98,0	97,0
1985	95,1	92,1	95,5	110,7	90,6	97,0	90,1	99,6	91,2	88,4	91,4	95,4	95,9	98,0	94,2
1986	95,2	91,0	95,0	104,6	87,7	94,1	89,5	97,3	89,2	89,4	86,2	96,1	94,6	98,5	93,9
1987	93,2	94,3	95,5	101,2	87,4	93,0	87,8	96,7	94,1	91,7	87,3	95,5	94,3	98,8	93,8
1988	90,8	94,1	94,2	103,5	86,6	91,2	87,4	95,7	91,7	90,1	85,4	95,8	93,3	99,0	92,7
1989	88,1	92,2	92,7	105,1	85,0	90,3	83,1	95,4	90,6	87,5	81,9	98,1	92,6	98,1	92,4
1990	88,6	91,3	91,9	106,4	84,4	90,7	84,1	97,1	96,5	86,6	82,2	101,7	93,3	98,5	91,3
1991	88,8	90,0	92,2	101,6	83,9	90,9	84,4	97,7	97,6	86,7	84,8	102,5	93,5	98,8	89,9
1992	88,2	88,5	92,0	96,0	83,4	90,0	83,5	97,0	98,1	86,9	85,7	99,7	92,6	98,0	90,8

EUR 12–: including WD.

[1] Nominal unit labour costs deflated by the GDP price deflator.

Table 34

Relative nominal unit labour costs in a common currency[1]

Total economy

Relative to 19 industrial countries, double export weights

(USD; 1980 = 100)

	B	DK	WD	GR	E	F	IRL	I	NL	P	UK	EUR 12−[2]	USA	JAP
1960	95,0	77,9	81,0	166,6	66,4	101,2	95,6	110,0	66,0	123,4	98,2	76,5	168,1	67,7
1961	89,5	80,2	87,4	151,8	64,7	102,1	94,6	105,5	69,5	119,4	99,5	79,9	162,9	67,5
1962	89,0	82,2	88,1	151,9	66,3	102,9	96,6	107,2	70,3	113,9	100,6	81,4	160,0	70,0
1963	88,7	83,6	87,3	141,8	71,5	105,6	95,5	115,5	72,4	112,3	97,9	82,9	155,1	72,0
1964	89,0	83,6	85,4	142,4	74,5	105,7	101,9	121,2	76,8	109,4	96,9	83,7	151,6	72,0
1965	90,9	89,0	85,1	139,8	78,4	103,3	100,4	119,4	79,0	108,5	98,2	84,4	146,3	75,3
1966	91,9	91,7	85,1	141,7	83,5	100,1	102,8	114,7	82,3	110,0	98,9	84,4	147,1	73,9
1967	92,4	94,1	82,6	141,9	88,3	99,4	100,5	114,1	83,6	111,8	96,1	82,2	148,5	73,3
1968	91,9	93,8	82,2	143,1	78,4	104,7	93,5	113,4	84,9	106,0	84,5	78,1	156,2	73,7
1969	90,7	94,5	83,5	136,9	77,4	100,7	96,1	110,0	88,2	108,0	84,7	77,5	160,1	73,0
1970	85,8	95,5	95,0	125,9	75,6	90,8	99,4	111,0	86,4	115,2	86,4	81,1	157,7	72,0
1971	86,5	96,0	98,7	115,7	76,0	87,5	102,4	112,4	88,6	115,4	87,1	83,0	147,3	76,6
1972	90,3	94,8	100,1	106,0	79,6	89,3	101,8	112,3	91,4	114,3	86,1	85,5	135,1	85,2
1973	91,1	102,7	109,3	99,2	83,5	91,3	100,8	104,3	95,8	112,6	76,3	87,5	120,7	95,6
1974	93,4	107,3	109,4	108,0	86,7	86,2	96,7	97,8	98,4	128,1	77,9	86,2	116,0	98,9
1975	97,3	108,7	100,9	97,5	88,5	98,0	92,5	103,1	99,7	150,6	83,6	91,6	107,7	96,0
1976	101,2	109,1	99,1	99,5	89,0	97,2	89,5	92,0	100,5	147,1	73,4	83,3	110,8	100,8
1977	107,4	109,1	102,1	107,0	88,2	93,7	86,5	93,3	104,5	125,5	70,3	84,0	108,6	110,5
1978	107,9	110,7	103,3	105,4	90,0	94,6	89,1	92,7	105,7	105,7	72,6	85,8	99,8	130,0
1979	106,1	109,5	103,1	110,7	106,5	96,7	97,3	96,0	104,7	96,0	81,6	93,9	99,8	112,1
1980	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
1981	91,1	92,3	89,6	105,1	93,0	93,7	94,7	98,8	90,2	106,0	102,4	85,8	111,9	107,6
1982	80,5	89,8	89,9	113,4	89,9	89,2	97,9	99,9	92,4	100,1	95,0	80,3	127,4	95,6
1983	78,7	90,7	89,2	108,3	79,1	86,4	99,9	107,1	90,1	91,0	87,8	75,8	132,9	103,4
1984	77,7	87,0	85,1	105,7	78,6	84,2	96,3	107,1	83,1	88,5	85,6	70,0	142,3	106,3
1985	79,1	87,5	83,6	103,8	78,2	85,8	97,2	106,6	80,7	90,1	86,9	70,0	148,3	104,2
1986	83,9	92,5	91,7	87,8	80,1	88,2	103,1	112,7	85,2	91,1	81,1	77,0	119,4	130,1
1987	84,7	101,2	97,3	84,8	82,0	87,9	98,4	116,6	88,8	92,3	81,4	82,6	105,7	136,0
1988	80,7	99,4	93,8	90,8	86,1	84,6	96,4	116,1	86,5	93,1	89,9	81,2	100,2	144,1
1989	78,9	95,4	90,2	93,3	91,3	82,7	91,0	119,6	81,7	94,3	92,6	78,8	104,6	135,2
1990	82,3	98,4	92,8	98,9	97,2	86,2	91,1	129,9	82,4	101,6	97,7	88,6	98,1	116,2
1991	80,8	93,3	91,7	92,2	98,0	83,0	88,0	131,3	80,5	114,8	101,0	86,7	97,4	121,0
1992	81,1	91,7	93,9	89,0	100,9	83,3	88,7	133,5	81,1	130,8	101,0	89,5	94,6	126,2

EUR 12−: including WD.

NB: For a detailed commentary on the method used see *European Economy* No 8, March 1981.

1 Compensation of employees adjusted for the share of self-employed in occupied population per unit of GDP at constant prices.

2 Against nine industrial non-member countries.

Table 35

Exports of goods and services at current prices

National accounts

(Percentage of GDP at market prices)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12– (ECU)	EUR 12+ (ECU)	USA	JAP
1960	39,9	32,2	19,0	:	9,1	9,9	14,5	31,8	13,0	86,7	47,7	17,5	20,9	19,6	:	5,2	10,7
1961	41,2	29,9	18,0	:	9,3	9,6	14,0	34,6	13,3	86,9	45,5	16,4	20,6	19,1	:	5,1	9,3
1962	42,8	28,5	17,4	:	9,7	9,8	12,9	32,3	13,2	79,9	44,8	18,7	20,1	18,5	:	5,0	9,4
1963	44,0	30,3	17,8	:	10,0	9,2	12,7	33,6	12,7	77,7	44,9	19,1	20,0	18,4	:	5,0	9,0
1964	44,9	29,7	18,1	:	9,2	10,5	12,7	33,4	13,3	78,8	43,5	25,6	19,4	18,5	:	5,3	9,5
1965	44,3	29,2	18,0	:	9,0	10,2	13,3	34,8	14,9	80,7	42,9	26,8	19,2	18,8	:	5,2	10,5
1966	46,1	28,4	19,2	:	11,3	10,7	13,4	37,2	15,3	77,2	41,7	27,1	19,4	19,2	:	5,2	10,6
1967	45,1	27,2	20,4	:	10,7	9,8	13,2	37,8	15,0	78,5	40,5	27,2	19,1	19,2	:	5,2	9,6
1968	47,3	27,5	21,4	:	9,6	11,3	13,3	38,8	15,8	80,5	41,0	25,0	21,4	20,2	:	5,3	10,1
1969	51,5	27,4	21,7	:	9,7	11,6	14,1	37,3	16,5	84,3	42,5	24,4	22,3	21,0	:	5,3	10,5
1970	53,9	27,9	21,2	:	10,0	12,9	15,8	37,0	16,4	88,9	44,8	24,4	23,1	21,8	:	5,8	10,8
1961-70	46,1	28,6	19,3	:	9,8	10,5	13,5	35,7	14,6	81,3	43,2	23,5	20,5	19,5	:	5,2	9,9
1971	52,5	27,6	20,8	:	10,3	13,8	16,4	36,1	16,9	88,1	45,4	25,1	23,2	22,0	:	5,6	11,7
1972	53,1	27,1	20,6	:	11,7	14,2	16,7	34,6	17,7	82,9	45,0	27,2	21,8	21,9	:	5,8	10,6
1973	57,8	28,5	21,8	:	14,2	14,2	17,6	38,0	17,4	89,3	47,4	26,7	23,7	23,2	:	6,9	10,0
1974	63,7	31,8	26,4	:	16,1	14,0	20,7	42,6	20,2	102,6	53,9	26,9	28,0	27,0	:	8,5	13,6
1975	55,8	30,1	24,7	:	16,9	13,2	19,1	42,7	20,5	92,5	49,9	20,4	25,9	25,1	:	8,5	12,8
1976	58,7	28,8	25,7	:	17,6	13,4	19,6	46,3	22,1	88,1	51,0	17,4	28,5	26,4	:	8,2	13,6
1977	57,6	28,8	25,5	:	16,8	14,1	20,5	49,4	23,2	86,9	47,6	18,4	30,1	26,8	:	7,8	13,1
1978	55,6	27,8	24,8	:	17,6	14,8	20,4	49,9	23,4	83,8	44,9	20,1	28,5	26,2	:	8,1	11,1
1979	60,8	29,2	25,1	:	17,5	14,6	21,2	49,7	24,3	90,9	49,1	27,1	28,0	26,9	:	9,0	11,6
1980	62,9	32,7	26,4	:	20,9	15,4	21,5	49,6	21,9	88,5	52,5	27,4	27,3	27,2	:	10,1	13,7
1971-80	57,8	29,2	24,2	:	16,0	14,2	19,4	43,9	20,8	89,4	48,7	23,7	26,5	25,3	:	7,9	12,2
1981	68,2	36,5	28,7	:	20,6	17,6	22,6	48,5	23,3	86,6	58,0	25,9	26,7	28,6	:	9,7	14,7
1982	71,9	36,4	29,9	:	18,4	18,2	21,8	48,1	23,0	89,0	57,6	26,4	26,3	28,6	:	8,6	14,6
1983	74,7	36,4	28,7	:	19,8	20,7	22,5	52,4	22,1	90,2	57,7	31,3	26,5	28,8	:	7,8	13,9
1984	79,1	36,7	30,6	:	21,7	23,0	24,1	59,5	22,8	101,1	62,1	37,2	28,5	30,6	:	7,5	15,0
1985	76,9	36,7	32,5	:	21,2	22,7	23,9	60,4	22,8	108,6	63,5	37,3	28,9	31,1	:	7,0	14,5
1986	70,8	32,0	30,2	:	22,4	19,9	21,2	54,8	20,2	100,7	54,2	33,2	25,9	28,0	:	7,3	11,4
1987	69,5	31,4	29,0	:	24,6	19,4	20,6	58,2	19,5	98,2	52,7	34,3	25,6	27,2	:	7,8	10,4
1988	72,9	32,6	29,6	:	23,9	18,9	21,3	62,0	19,2	100,4	54,7	35,5	23,3	27,2	:	8,9	10,1
1989	77,2	34,4	31,6	:	23,0	18,1	23,0	65,8	20,4	102,2	58,1	37,5	24,2	28,6	:	9,4	10,7
1990	74,3	35,1	32,0	:	21,8	17,1	22,6	62,0	21,0	98,4	56,6	36,4	24,6	28,5	:	9,8	11,1
1981-90	73,5	34,8	30,3	:	21,7	19,5	22,4	57,2	21,4	97,5	57,5	33,5	26,1	28,7	:	8,4	12,6
1991	73,8	36,4	33,9	25,3	24,5	17,3	22,6	62,5	19,7	98,0	56,0	31,6	23,9	28,6	26,4	10,2	11,0
1992	73,8	37,1	33,8	24,6	25,4	17,5	22,7	63,8	19,3	96,0	56,0	29,7	23,7	28,5	26,1	10,4	11,1

EUR 12–: including WD; EUR 12+: including D.

Table 36

Exports of goods and services at constant prices

National accounts

(National currency; annual percentage change)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12– (PPS)	EUR 12+ (PPS)	USA	JAP
1961	9,2	4,3	5,2	:	14,5	7,9	5,1	17,2	14,7	3,5	2,3	1,9	3,1	5,8	:	0,6	5,3
1962	10,1	4,9	2,7	:	10,0	12,8	1,8	−1,0	10,3	−1,6	6,2	22,7	1,8	4,7	:	5,2	17,2
1963	8,2	10,0	7,9	:	6,7	3,8	7,1	9,6	6,5	3,8	6,0	7,2	1,5	5,8	:	7,0	7,0
1964	9,4	8,5	8,4	:	1,6	25,5	6,7	8,2	10,8	13,3	11,3	39,9	3,5	8,7	:	11,8	21,7
1965	6,1	7,9	6,5	:	12,7	6,9	11,5	8,9	20,0	5,8	7,6	13,5	4,4	8,5	:	1,9	23,7
1966	7,7	3,9	10,1	:	34,4	15,2	6,6	10,6	11,2	−0,2	5,2	12,8	5,2	8,2	:	6,4	17,0
1967	4,3	4,0	8,3	:	5,1	−4,7	7,3	10,3	7,2	1,9	6,6	8,3	1,0	5,2	:	3,1	6,7
1968	12,2	9,3	13,1	:	−1,0	18,4	9,4	9,0	13,9	10,7	12,8	−0,5	12,7	12,2	:	3,2	23,9
1969	15,3	6,2	9,6	:	14,6	15,6	15,7	4,6	11,8	13,8	14,9	8,7	9,3	11,7	:	4,8	20,8
1970	10,2	5,6	5,5	:	12,4	17,4	16,1	18,8	5,8	9,0	11,9	5,4	5,4	8,6	:	9,5	17,5
1961-70	9,2	6,4	7,7	:	10,7	11,6	8,6	9,5	11,1	5,9	8,4	11,5	4,7	7,9	:	5,3	15,9
1971	4,5	5,6	4,6	:	11,9	14,2	9,8	4,1	7,0	4,0	10,7	11,9	6,8	7,3	:	0,0	16,0
1972	11,1	5,6	6,8	:	22,9	13,4	12,1	3,6	9,5	5,1	10,0	20,2	0,8	8,1	:	15,2	4,1
1973	14,2	7,8	10,7	:	23,4	10,0	11,0	10,9	3,9	14,0	12,1	9,2	11,9	10,5	:	18,7	5,2
1974	3,8	3,5	12,3	:	0,1	−1,0	9,1	0,7	5,9	10,3	2,6	−13,3	6,9	6,6	:	7,9	23,2
1975	−8,2	−1,8	−6,4	:	10,6	−0,4	−1,1	7,6	1,8	−15,8	−3,1	−16,4	−3,2	−3,4	:	−0,9	−1,0
1976	12,9	4,1	9,6	:	16,4	5,0	8,5	8,1	10,2	1,0	9,9	−0,8	8,8	9,2	:	3,8	16,6
1977	2,2	4,1	3,9	:	1,8	12,1	8,0	14,0	11,6	4,2	−1,8	4,1	6,5	5,7	:	1,6	11,7
1978	2,3	1,2	2,9	:	16,4	10,7	6,6	12,3	9,4	3,4	3,3	9,1	1,6	4,8	:	9,7	−0,3
1979	7,0	8,4	4,3	:	6,7	5,6	7,7	6,5	8,7	9,4	7,4	33,0	3,8	6,5	:	8,7	4,3
1980	2,5	5,2	5,2	:	6,9	2,3	2,4	6,4	−8,5	−1,4	1,5	2,2	−0,2	1,0	:	10,8	17,0
1971-80	5,0	4,3	5,3	:	11,4	7,0	7,4	7,3	5,8	3,1	5,1	5,0	4,3	5,6	:	7,4	9,4
1981	2,6	8,2	7,2	:	−5,9	8,4	3,6	2,0	6,3	−4,8	2,1	−4,4	−0,8	3,8	:	−0,4	12,5
1982	1,3	2,5	3,7	:	−7,2	4,8	−1,8	5,5	−1,2	−0,3	−0,3	4,7	0,9	1,0	:	−8,3	0,9
1983	2,7	4,9	−0,7	:	8,0	10,1	3,7	10,5	2,6	5,3	3,3	13,6	2,0	2,8	:	−2,4	4,8
1984	5,3	3,5	8,2	:	16,9	11,7	6,7	16,6	7,7	18,0	7,2	11,6	6,6	7,7	:	6,5	14,8
1985	1,1	5,0	7,6	:	1,3	2,7	2,0	6,6	3,1	9,5	5,3	6,7	5,8	4,6	:	2,7	5,4
1986	5,6	0,0	−0,6	:	14,0	1,6	−1,3	2,9	1,1	3,4	3,4	6,8	4,7	1,8	:	12,0	−4,9
1987	6,6	5,1	0,4	:	16,0	6,3	2,8	13,4	4,3	6,0	4,0	8,6	5,7	4,1	:	16,4	0,1
1988	8,6	7,8	5,3	:	9,0	5,1	7,9	8,7	5,1	7,6	7,8	10,2	0,1	5,5	:	18,7	7,0
1989	7,3	5,0	10,2	:	1,3	3,0	10,4	10,1	9,0	6,8	5,5	13,3	4,3	7,7	:	11,9	9,1
1990	4,6	8,0	9,1	:	0,9	3,2	5,1	8,8	9,2	2,2	4,7	9,5	4,9	6,5	:	8,4	10,9
1981-90	4,6	5,0	5,0	:	5,1	5,6	3,9	8,4	4,7	5,2	4,3	7,9	3,4	4,5	:	6,2	5,9
1991	4,0	5,8	12,4	:	16,4	8,4	4,0	5,2	−0,8	2,9	4,3	−0,6	0,7	5,2	:	6,4	5,0
1992	3,7	5,3	4,6	3,0	7,4	7,5	4,4	6,0	3,0	3,2	3,4	5,4	4,1	4,3	4,0	6,0	5,0

EUR 12–: including WD; EUR 12+: including D.

Table 37

Intra-Community exports of goods at current prices

Foreign trade statistics

(Percentage of GDP at market prices)

	B/L	DK	WD	GR	E	F	IRL	I	NL	P	UK	EUR 12– (ECU)
1960	19,6	14,1	6,4	2,5	3,6	4,3	19,6	3,7	21,1	5,1	3,3	6,0
1961	20,1	12,7	6,6	2,3	3,1	4,7	21,6	4,0	20,9	4,8	3,6	6,2
1962	21,7	12,0	6,6	2,8	2,7	4,6	18,5	4,3	21,2	5,3	3,7	6,3
1963	23,9	12,8	7,4	2,6	2,3	4,7	19,5	4,1	22,1	5,5	4,0	6,6
1964	25,0	12,3	7,4	2,7	2,7	4,9	20,3	4,7	22,6	6,5	3,8	6,9
1965	26,2	11,6	7,3	2,6	2,2	5,3	19,3	5,5	22,3	6,8	3,8	7,0
1966	26,2	10,9	7,9	2,7	2,2	5,4	19,0	5,7	21,4	6,6	3,8	7,2
1967	25,3	9,8	8,4	3,3	2,1	5,2	20,5	5,4	20,9	6,6	3,7	7,1
1968	27,5	9,5	8,9	3,2	2,3	5,3	20,8	5,9	22,1	6,4	4,2	7,7
1969	31,9	9,2	9,6	3,3	2,5	6,2	19,6	6,3	24,0	6,8	4,6	8,5
1970	33,1	9,1	9,2	3,5	3,1	7,2	20,3	6,4	25,5	6,7	5,0	8,9
1971	31,4	8,9	9,1	3,4	3,4	7,5	21,4	6,8	26,5	6,9	5,1	9,1
1972	33,4	8,9	9,1	3,7	3,4	8,0	22,2	7,4	27,0	7,5	5,0	9,4
1973	35,8	10,3	9,9	5,1	3,7	8,5	25,0	7,4	28,5	8,3	5,9	10,3
1974	36,1	10,7	11,3	5,7	4,0	9,6	28,8	8,2	31,5	8,5	7,2	11,6
1975	32,6	10,7	10,1	5,6	3,4	8,1	30,5	8,1	29,3	7,0	6,6	10,4
1976	35,8	10,1	11,2	5,8	4,0	8,6	30,6	9,1	31,1	6,3	7,9	11,6
1977	34,0	9,6	11,0	5,1	4,1	8,9	34,3	9,4	28,3	6,7	9,0	11,6
1978	33,3	10,0	10,8	5,5	4,4	8,9	34,5	9,7	26,6	7,9	9,0	11,5
1979	37,0	10,9	11,6	5,0	4,7	9,6	35,0	10,4	30,2	10,0	9,6	12,4
1980	38,3	12,6	12,1	6,2	5,1	9,2	33,5	8,8	32,0	10,8	9,6	12,3
1981	39,3	12,9	12,6	5,0	5,0	9,0	30,3	8,4	35,2	9,7	8,7	12,1
1982	42,3	13,1	13,5	5,3	5,5	8,8	30,7	8,8	35,5	10,9	8,8	12,5
1983	44,0	13,3	13,0	6,7	6,3	9,2	33,1	8,4	36,2	13,9	9,3	12,7
1984	45,0	12,3	13,9	7,9	7,5	9,8	37,8	8,4	38,6	16,8	10,3	13,4
1985	44,8	12,2	14,6	7,4	7,6	9,9	37,8	8,9	39,8	17,2	10,7	13,8
1986	43,0	11,3	13,9	9,1	7,1	9,4	35,8	8,6	34,4	16,5	9,2	12,9
1987	42,4	11,3	14,0	9,4	7,4	9,7	39,0	8,6	32,7	17,8	9,4	13,0
1988	42,2	11,9	14,7	6,2	7,7	10,4	41,8	8,7	31,9	18,9	8,8	13,0
1989	46,6	12,6	15,9	8,8	7,8	11,0	44,6	9,1	34,0	20,3	9,3	13,9
1990	44,1	13,1	14,6	7,8	7,8	11,0	41,8	9,0	33,8	20,3	10,0	13,6
1991	43,0	13,8	13,7	8,3	8,1	11,1	41,7	8,6	33,7	17,9	10,4	13,3
1992	41,5	13,6	13,1	8,0	8,0	10,8	41,3	8,2	32,4	16,2	9,8	12,8

EUR 12–: including WD.

Table 38

Extra-Community exports of goods at current prices

Foreign trade statistics

(Percentage of GDP at market prices)

	B/L	DK	WD	GR	E	F	IRL	I	NL	P	UK	EUR 12– (ECU)
1960	12,7	10,6	9,5	3,3	2,6	6,9	4,6	5,5	13,4	8,1	11,0	8,7
1961	11,6	10,2	8,9	3,4	2,2	6,2	4,9	5,5	12,7	7,4	10,4	8,1
1962	11,0	9,9	8,1	3,1	2,0	5,3	4,4	5,1	11,6	7,7	9,4	7,3
1963	10,1	10,8	7,9	3,6	1,7	5,0	4,6	4,8	10,7	8,0	9,4	7,0
1964	10,1	10,7	8,0	3,1	1,9	4,9	3,8	4,9	10,0	8,9	8,9	6,9
1965	10,7	10,7	8,3	2,9	1,9	4,9	3,5	5,2	9,8	8,6	9,3	7,1
1966	10,6	10,6	8,6	3,4	2,3	4,7	4,3	5,3	9,8	8,6	9,3	7,2
1967	10,2	10,6	9,2	3,6	2,4	4,6	4,5	5,5	9,8	8,7	8,8	7,2
1968	10,9	11,0	9,7	2,7	3,0	4,7	5,2	5,9	9,5	8,6	10,0	7,6
1969	10,7	11,4	9,5	3,0	3,0	4,6	5,4	6,0	9,4	8,6	10,3	7,6
1970	10,9	11,7	9,3	3,0	3,2	5,2	5,3	5,9	9,6	8,6	10,6	7,8
1971	10,4	11,4	9,0	2,6	3,4	5,2	6,9	6,0	9,1	8,1	10,8	7,8
1972	10,5	11,0	8,8	3,2	3,6	5,2	6,1	6,1	9,1	7,7	10,1	7,6
1973	11,7	11,0	9,6	3,9	3,4	5,5	7,2	6,0	9,5	7,9	10,9	8,0
1974	13,8	13,1	12,0	5,0	3,8	6,8	8,8	8,1	11,7	8,3	12,6	9,8
1975	12,2	12,3	11,4	5,3	3,7	7,0	7,4	8,3	10,9	6,0	12,1	9,4
1976	11,5	11,5	11,7	5,6	4,0	7,0	9,0	8,4	11,0	5,4	12,5	9,6
1977	12,4	11,7	11,9	5,4	4,2	7,4	9,9	9,2	10,7	5,6	13,6	10,1
1978	12,1	10,6	11,4	5,1	4,5	6,9	9,3	9,0	9,9	5,5	13,2	9,7
1979	12,6	10,8	11,0	5,0	4,5	7,2	9,2	9,0	10,2	6,6	11,9	9,5
1980	13,8	12,1	11,5	6,6	4,6	7,4	10,5	8,3	11,5	7,6	11,7	9,7
1981	15,6	14,4	13,1	6,4	5,9	8,3	12,1	10,0	13,2	7,4	11,2	10,7
1982	16,0	13,7	13,3	5,8	5,8	7,9	11,7	9,4	12,6	7,0	11,1	10,5
1983	17,3	14,5	12,8	5,9	6,3	8,1	13,7	9,0	12,9	8,3	10,7	10,5
1984	19,0	16,0	13,8	6,4	7,2	8,8	16,2	9,3	14,0	10,3	11,5	11,3
1985	18,7	15,9	14,7	6,2	7,0	8,5	16,9	9,6	14,0	10,3	11,3	11,4
1986	15,7	13,6	13,4	5,2	4,7	6,8	13,9	7,5	11,5	7,7	9,9	9,7
1987	14,5	12,8	12,5	4,6	4,2	6,4	13,9	6,7	11,0	7,2	9,6	9,1
1988	14,2	13,6	12,3	3,5	4,0	6,4	14,6	6,5	13,4	7,4	8,7	8,9
1989	16,5	14,0	12,9	4,8	3,9	6,9	15,4	7,0	14,0	8,0	9,1	9,4
1990	14,4	13,7	12,1	4,4	3,5	6,5	14,0	6,4	13,1	7,2	8,9	8,8
1991	14,0	13,5	11,1	4,9	3,3	6,5	14,3	6,0	12,7	5,9	8,0	8,3
1992	13,6	13,1	10,6	4,7	3,1	6,3	14,3	5,7	12,4	5,1	7,6	7,9

EUR 12–: including WD.

Table 39

Imports of goods and services at current prices

National accounts

(Percentage of GDP at market prices)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12– (ECU)	EUR 12+ (ECU)	USA	JAP
1960	40,8	33,4	16,5	:	16,7	7,2	12,4	37,3	13,5	73,7	45,9	23,7	22,3	19,0	:	4,4	10,2
1961	42,1	31,5	15,8	:	16,4	9,1	12,2	39,8	13,5	80,2	45,4	27,7	20,9	18,5	:	4,2	10,9
1962	43,0	31,6	16,1	:	16,9	10,8	12,0	38,9	13,9	79,2	44,5	23,5	20,3	18,4	:	4,3	9,3
1963	45,2	30,0	16,3	:	18,0	11,5	12,3	40,8	15,1	77,5	45,6	24,3	20,4	18,7	:	4,3	9,8
1964	45,3	31,8	16,5	:	19,0	11,8	12,9	41,0	13,4	78,8	45,6	29,9	21,1	19,0	:	4,3	9,7
1965	44,5	30,7	17,8	:	20,3	13,5	12,4	43,9	12,7	79,9	43,6	31,5	20,0	18,9	:	4,4	9,1
1966	46,9	30,0	17,5	:	18,8	13,9	13,1	43,2	13,7	75,1	43,1	31,0	19,5	19,0	:	4,8	9,0
1967	44,7	29,2	16,8	:	18,0	12,3	13,0	40,9	14,2	70,6	41,4	29,5	20,2	18,7	:	4,9	9,4
1968	47,0	28,9	17,7	:	18,4	13,2	13,3	45,2	14,0	70,4	41,0	29,8	22,2	19,5	:	5,2	9,0
1969	50,4	29,6	18,9	:	18,7	13,8	14,6	46,3	15,3	69,7	42,7	28,6	21,8	20,5	:	5,2	8,9
1970	51,3	30,9	19,1	:	18,4	13,9	15,3	45,0	16,3	76,1	46,6	30,9	22,2	21,3	:	5,5	9,5
1961-70	46,1	30,4	17,3	:	18,3	12,4	13,1	42,5	14,2	75,8	43,9	28,7	20,9	19,2	:	4,7	9,5
1971	50,2	29,4	19,0	:	18,4	13,1	15,3	43,4	16,2	84,8	45,7	32,1	21,7	21,0	:	5,6	9,0
1972	49,4	26,5	18,6	:	20,0	14,1	15,7	39,9	16,9	77,2	42,2	31,9	21,8	20,9	:	6,1	8,3
1973	55,4	30,4	18,9	:	25,2	15,1	16,7	44,8	19,4	77,0	44,2	33,7	26,1	22,8	:	6,7	10,0
1974	63,0	34,7	22,0	:	25,6	18,8	21,7	57,2	24,3	81,7	51,2	42,2	33,0	27,8	:	8,6	14,3
1975	55,3	31,0	21,8	:	26,9	17,0	17,9	48,8	20,6	88,5	46,5	32,8	27,6	24,7	:	7,6	12,8
1976	58,2	33,5	23,4	:	25,8	17,8	20,3	54,2	23,2	82,7	47,6	30,9	29,6	26,7	:	8,4	12,8
1977	58,2	32,5	23,1	:	25,2	16,2	20,4	58,5	22,2	83,2	46,3	33,5	29,3	26,4	:	9,1	11,5
1978	56,3	29,9	22,3	:	24,6	14,1	19,1	59,8	21,2	82,8	44,9	32,5	27,1	25,0	:	9,4	9,4
1979	62,6	32,1	24,4	:	25,3	14,4	20,6	66,1	23,2	87,2	49,6	37,9	27,7	26,8	:	10,1	12,5
1980	65,4	33,8	26,9	:	26,2	17,8	22,7	63,0	24,6	89,2	53,0	42,0	25,0	28,2	:	10,7	14,6
1971-80	57,4	31,4	22,0	:	24,3	15,9	19,0	53,6	21,2	83,4	47,1	34,9	26,9	25,0	:	8,2	11,5
1981	69,8	35,8	27,9	:	27,1	19,8	23,5	62,7	25,3	89,5	54,5	45,2	23,8	28,8	:	10,3	13,9
1982	72,9	35,9	27,5	:	28,7	20,2	23,7	55,4	24,0	90,6	53,4	45,0	24,5	28,6	:	9,5	13,8
1983	72,9	34,4	26,7	:	30,1	21,4	22,6	55,2	21,4	90,0	53,9	44,1	25,6	28,0	:	9,5	12,2
1984	77,4	35,5	28,2	:	29,9	20,9	23,5	59,8	23,0	99,3	56,9	45,2	28,7	29,6	:	10,5	12,3
1985	74,4	36,3	29,0	:	32,8	20,8	23,2	58,4	23,2	103,3	58,7	41,4	27,9	29,7	:	10,1	11,1
1986	66,7	32,5	25,0	:	30,9	17,7	20,2	52,2	18,7	96,3	49,7	35,9	26,5	25,9	:	10,6	7,4
1987	66,3	29,6	23,9	:	31,9	19,2	20,5	51,7	18,8	99,0	49,6	41,5	26,7	25,8	:	11,2	7,2
1988	69,0	29,4	24,3	:	30,4	20,0	21,3	53,0	19,1	100,7	50,4	46,3	26,8	26,2	:	11,2	7,8
1989	73,7	31,0	26,2	:	32,0	21,4	22,9	56,3	20,4	100,0	53,8	46,2	28,0	27,9	:	11,2	9,3
1990	71,1	30,0	26,4	:	33,0	20,5	22,7	53,9	21,0	98,9	51,6	45,4	26,9	27,5	:	11,3	10,4
1981-90	71,4	33,0	26,5	:	30,7	20,2	22,4	55,9	21,5	96,8	53,2	43,6	26,6	27,8	:	10,5	10,5
1991	70,6	30,2	27,7	25,5	35,3	20,4	22,3	53,3	19,8	100,0	50,6	41,4	24,6	27,1	26,5	10,9	8,8
1992	70,7	30,6	27,2	24,4	34,7	20,4	22,1	52,9	19,6	98,6	50,3	38,8	24,3	26,7	26,0	10,7	8,2

EUR 12–: including WD; EUR 12+: including D.

Table 40

Imports of goods and services at constant prices

National accounts

(National currency; annual percentage change)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12– (PPS)	EUR 12+ (PPS)	USA	JAP
1961	7,2	4,4	7,8	:	12,7	40,1	6,9	13,7	13,7	7,3	6,4	24,9	−0,6	7,0	:	0,7	26,4
1962	8,2	13,4	11,1	:	10,1	34,4	6,7	5,4	14,9	3,2	6,5	−8,7	2,1	8,3	:	11,5	−1,1
1963	8,6	−1,1	4,9	:	15,4	23,5	14,1	10,6	22,5	3,1	9,8	10,4	2,0	9,3	:	1,6	19,5
1964	8,9	19,6	9,3	:	15,3	13,0	15,1	12,9	−6,1	13,6	14,9	30,8	10,5	9,5	:	5,2	13,7
1965	6,6	6,9	14,3	:	21,2	33,1	2,2	11,0	2,0	4,5	6,1	14,3	1,1	7,3	:	9,4	5,6
1966	9,9	5,4	2,6	:	−0,5	19,0	10,6	3,5	14,0	−2,5	7,0	8,1	2,5	7,1	:	12,6	12,2
1967	1,6	4,5	−0,8	:	7,1	−3,3	8,3	3,7	13,5	−4,8	6,3	8,9	7,2	5,2	:	5,1	22,7
1968	11,7	4,9	13,9	:	10,3	8,1	12,9	15,7	5,9	9,1	13,0	14,6	7,9	10,5	:	14,0	12,1
1969	15,5	13,1	16,9	:	15,5	15,7	19,5	13,4	19,3	11,2	14,1	4,3	2,9	13,9	:	5,8	13,7
1970	7,6	9,3	15,9	:	6,2	7,0	6,3	8,6	16,0	19,0	14,7	9,9	5,1	10,6	:	4,1	22,9
1961-70	8,5	7,9	9,4	:	11,2	18,3	10,2	9,8	11,3	6,1	9,8	11,3	4,0	8,8	:	6,9	14,5
1971	3,6	−0,7	8,7	:	7,6	0,7	6,7	4,7	2,9	7,6	6,1	14,6	5,2	5,7	:	6,5	7,0
1972	9,6	1,5	5,9	:	15,4	24,3	13,7	5,1	9,1	2,8	4,8	12,1	9,4	9,4	:	13,0	10,5
1973	18,5	12,8	4,5	:	32,2	16,7	13,7	19,0	9,3	10,6	11,0	12,7	11,5	11,3	:	10,4	24,3
1974	4,4	−3,8	0,4	:	−16,3	8,0	0,8	−2,3	1,4	5,9	−0,8	4,6	0,8	1,1	:	−3,9	4,2
1975	−9,0	−4,8	1,2	:	6,3	−0,9	−9,5	−10,2	−12,5	−9,4	−4,1	−24,2	−6,9	−6,3	:	−10,5	−10,3
1976	12,2	15,6	10,8	:	6,1	9,8	17,6	14,7	13,4	0,9	10,1	5,2	4,7	11,1	:	19,4	6,7
1977	4,8	0,0	3,4	:	8,0	−5,5	0,8	13,3	1,9	1,5	2,9	10,8	1,4	2,2	:	12,0	4,1
1978	2,6	0,1	5,6	:	7,2	−1,0	3,5	15,7	4,9	5,7	6,3	0,2	3,8	4,2	:	5,9	6,9
1979	9,0	5,0	9,3	:	7,2	11,4	10,4	13,9	11,5	6,7	6,0	12,6	9,7	9,6	:	1,3	12,9
1980	−0,4	−6,8	3,7	:	−8,0	3,3	2,3	−4,5	3,1	3,2	−0,4	6,9	−3,5	1,0	:	−8,2	−7,8
1971-80	5,3	1,7	5,3	:	5,9	6,3	5,7	6,5	4,3	3,4	4,1	4,9	3,5	4,8	:	4,2	5,4
1981	−2,9	−1,7	−3,3	:	3,6	−4,2	−2,3	1,7	−1,4	−2,9	−5,8	2,3	−2,8	−2,7	:	2,4	0,4
1982	0,2	3,8	−0,9	:	7,0	3,9	2,3	−3,1	−0,2	−0,3	1,1	3,9	4,9	1,5	:	−2,2	−2,5
1983	−1,3	1,8	1,6	:	6,6	−0,6	−2,7	4,7	−1,3	1,2	3,9	−6,1	6,3	1,0	:	12,2	−3,0
1984	5,6	5,5	5,4	:	0,2	−1,0	2,6	9,9	12,4	13,9	5,0	−4,4	9,9	6,0	:	23,0	10,4
1985	0,7	8,1	4,7	:	12,8	6,2	4,2	3,2	4,0	7,0	6,5	1,4	2,5	4,2	:	5,0	−1,4
1986	7,6	6,8	2,8	:	3,8	14,8	6,7	5,6	3,2	6,0	3,6	16,9	6,8	5,8	:	10,9	2,4
1987	8,8	−2,0	4,2	:	16,6	20,1	7,6	5,0	9,4	7,5	4,9	20,0	7,9	8,0	:	8,8	7,8
1988	8,0	1,5	5,1	:	8,0	14,4	8,5	3,9	7,5	8,2	6,6	16,1	12,4	8,5	:	5,6	18,7
1989	8,8	4,4	8,4	:	10,8	17,2	8,1	10,9	8,4	6,4	6,4	9,1	7,3	8,7	:	5,9	17,6
1990	4,2	2,1	10,4	:	12,0	7,8	6,2	6,0	8,0	3,1	4,5	10,1	1,3	6,4	:	3,9	11,9
1981-90	3,9	3,0	3,8	:	8,0	7,6	4,0	4,7	4,9	4,9	3,6	6,6	5,6	4,7	:	7,4	6,0
1991	3,7	3,8	11,8	:	13,2	9,4	3,2	2,2	2,9	4,3	3,7	5,7	−2,9	4,8	:	0,3	−2,8
1992	3,7	4,3	4,0	2,6	3,8	7,7	3,4	3,6	4,7	4,0	2,6	6,1	4,4	4,3	4,0	3,5	3,5

EUR 12–: including WD; EUR 12+: including D.

Table 41

Intra-Community imports of goods at current prices

Foreign trade statistics

(Percentage of GDP at market prices)

	B/L	DK	WD	GR	E	F	IRL	I	NL	P	UK	EUR 12– (ECU)
1960	19,2	16,5	5,6	9,0	2,2	3,6	22,9	4,4	21,0	11,3	3,9	6,0
1961	20,3	15,5	5,5	9,1	2,9	3,8	25,3	4,5	23,1	13,8	3,8	6,2
1962	20,8	15,1	5,7	9,5	4,2	4,2	25,1	4,9	22,6	11,0	3,8	6,4
1963	22,3	13,8	5,8	9,2	4,8	4,6	26,5	5,6	23,8	10,7	3,9	6,7
1964	23,2	14,5	6,1	9,2	5,2	5,0	26,3	4,8	24,1	11,5	4,2	7,0
1965	23,4	13,8	7,1	9,9	6,1	4,8	26,3	4,2	23,2	12,8	4,1	7,1
1966	25,0	13,2	6,9	9,7	6,3	5,4	24,8	4,7	22,9	13,1	4,3	7,3
1967	23,3	12,3	6,7	9,1	5,3	5,4	23,6	5,1	21,7	12,3	4,6	7,3
1968	25,1	12,2	7,4	9,7	5,1	6,0	27,0	5,1	22,0	12,1	5,2	7,9
1969	28,0	13,0	8,4	9,5	5,4	7,2	28,7	5,9	23,6	12,6	5,0	8,7
1970	28,6	13,5	8,4	10,0	5,1	7,4	29,1	6,6	25,3	13,6	5,0	9,0
1971	30,8	12,1	8,6	9,9	4,8	7,6	27,5	6,6	23,4	13,6	5,2	9,1
1972	31,0	11,1	8,7	10,4	5,3	8,0	26,5	7,2	22,5	13,3	5,8	9,4
1973	33,4	12,9	8,6	11,1	5,7	8,5	30,8	8,5	23,1	13,5	7,5	10,3
1974	35,3	14,3	9,1	10,2	6,2	9,6	37,9	9,7	24,9	16,4	9,7	11,5
1975	32,6	13,0	9,3	11,5	5,3	8,2	31,5	8,0	22,7	11,6	8,9	10,5
1976	35,0	14,5	10,0	11,1	5,2	9,5	35,3	9,3	23,2	12,8	9,6	11,6
1977	34,3	13,9	10,0	11,8	5,0	9,5	37,4	8,8	22,9	14,7	10,2	11,6
1978	34,4	13,2	9,8	11,1	4,4	9,3	39,1	8,8	22,7	15,0	10,4	11,5
1979	36,6	14,3	10,7	11,2	4,7	9,8	44,2	9,7	24,8	15,2	11,2	12,2
1980	37,3	14,4	11,2	10,7	4,9	10,0	41,7	10,1	24,8	16,7	9,5	12,1
1981	38,4	14,5	11,8	12,1	5,1	9,9	41,7	9,4	25,0	18,3	8,9	12,0
1982	41,6	14,9	11,8	12,3	5,5	10,7	36,3	9,3	25,2	19,4	9,6	12,4
1983	44,2	14,1	11,9	13,2	6,1	10,8	34,3	8,5	25,4	17,9	10,4	12,5
1984	46,9	14,4	12,4	13,8	6,2	11,3	35,9	9,2	27,3	17,9	11,6	13,3
1985	46,6	15,1	12,9	14,7	6,6	11,4	35,1	10,0	29,9	16,9	11,6	13,7
1986	42,3	14,2	11,2	16,7	7,7	10,5	30,7	9,2	27,5	18,7	11,7	12,7
1987	41,2	12,8	10,8	17,1	9,1	10,8	29,6	9,3	27,5	23,2	11,8	12,8
1988	42,3	12,4	10,8	14,1	10,0	11,1	31,0	9,5	27,9	28,8	12,0	13,0
1989	44,5	12,5	11,6	18,6	10,7	11,9	33,1	10,0	29,0	28,6	12,5	13,8
1990	43,6	12,5	12,0	19,1	10,6	11,6	32,4	9,4	28,3	29,2	12,0	13,6
1991	42,6	13,0	12,8	18,2	10,6	11,1	31,4	9,0	27,8	27,8	10,7	13,3
1992	41,0	12,7	12,0	17,4	10,3	10,7	30,1	8,6	26,9	24,7	10,3	12,7

EUR 12–: including WD.

Table 42

Extra-Community imports of goods at current prices

Foreign trade statistics

(Percentage of GDP at market prices)

	B/L	DK	WD	GR	E	F	IRL	I	NL	P	UK	EUR 12– (ECU)
1960	14,7	13,7	8,5	11,0	4,0	6,7	12,9	7,5	17,8	10,6	13,6	9,9
1961	13,8	12,7	7,9	9,0	5,3	6,2	13,1	7,4	16,7	10,7	12,2	9,1
1962	13,7	13,4	7,9	7,2	5,9	6,0	12,1	7,3	15,7	9,6	11,8	8,9
1963	13,7	12,9	7,8	8,0	5,9	5,9	12,2	7,7	15,6	10,6	11,9	8,9
1964	14,0	14,3	7,8	7,6	5,7	6,0	12,3	6,9	15,5	11,6	12,4	8,9
1965	13,4	13,8	8,1	9,1	6,4	5,6	12,4	6,8	14,4	11,9	11,9	8,8
1966	13,6	13,5	7,8	8,7	6,6	5,6	12,1	7,2	14,1	11,9	11,3	8,6
1967	12,8	13,4	7,4	7,3	6,0	5,2	11,8	7,1	13,4	10,8	11,4	8,3
1968	14,1	13,3	7,7	8,1	6,6	5,0	12,3	6,8	13,2	11,1	12,9	8,5
1969	14,3	13,6	8,0	8,5	7,0	5,3	12,3	7,2	13,3	10,7	12,7	8,8
1970	14,5	14,2	7,8	9,6	7,3	5,8	11,2	7,3	14,7	12,1	12,5	9,0
1971	12,6	13,8	7,4	9,1	6,6	5,6	13,0	6,9	14,7	12,3	11,8	8,5
1972	11,7	12,1	6,8	8,2	7,0	5,6	11,1	6,9	13,3	12,8	11,5	8,1
1973	13,0	14,0	7,2	10,4	7,4	6,1	11,4	8,3	14,4	13,2	13,9	9,0
1974	17,0	16,1	8,9	12,9	10,7	9,3	16,7	12,3	18,0	17,7	17,9	12,1
1975	14,5	14,4	8,5	14,0	9,7	7,5	13,3	9,8	16,8	14,4	13,9	10,4
1976	15,7	15,3	9,7	15,8	10,5	8,5	14,8	11,0	18,2	14,9	15,3	11,5
1977	15,5	14,6	9,6	14,5	9,5	8,5	16,7	10,4	17,7	15,6	14,8	11,2
1978	14,5	12,9	9,0	13,1	8,1	7,6	15,7	9,6	15,9	14,2	13,9	10,3
1979	16,7	13,6	10,1	13,6	8,1	8,5	16,6	10,7	17,9	16,8	13,2	11,1
1980	20,6	14,6	11,7	15,6	10,8	10,2	16,1	11,5	20,5	20,3	12,4	12,4
1981	22,7	16,0	12,1	11,6	12,1	10,6	16,0	12,3	21,6	22,4	10,8	12,6
1982	22,9	15,3	11,7	13,6	11,8	10,2	14,7	11,5	20,1	21,9	10,8	12,2
1983	19,5	14,7	11,3	13,8	12,3	9,2	15,5	10,2	20,7	21,9	11,2	11,7
1984	21,3	15,8	12,4	14,5	11,9	9,4	18,3	10,6	22,3	23,7	12,8	12,5
1985	19,6	15,7	12,4	15,8	11,4	9,0	17,8	10,7	21,4	20,1	12,2	12,2
1986	15,8	13,3	10,1	11,8	7,6	7,0	14,9	7,2	15,5	13,1	10,8	9,5
1987	15,5	11,9	9,7	10,9	7,6	6,9	15,5	6,8	15,4	13,4	10,6	9,2
1988	15,5	11,9	10,0	8,4	7,6	7,3	15,8	6,7	15,9	14,1	10,9	9,4
1989	17,6	12,8	11,1	11,2	8,0	7,9	17,4	7,2	17,5	13,4	11,4	10,2
1990	15,8	11,8	10,9	10,7	7,2	7,8	16,2	6,7	16,7	13,1	10,9	9,7
1991	15,6	11,8	11,5	9,7	7,0	8,0	16,5	6,3	16,1	11,0	10,0	9,6
1992	15,2	11,6	10,8	9,6	6,8	7,6	15,9	6,1	15,4	9,8	9,4	9,1

EUR 12–: including WD.

Table 43

Balance on current transactions with the rest of the world

National accounts

(Percentage of GDP at market prices)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 12− (ECU)	EUR 12+ (ECU)	USA	JAP
1960	0,1	−1,1	1,6	:	−2,9	3,8	1,5	−0,1	0,8	12,5	3,0	−4,0	−1,0	0,8	:	0,6	0,5
1961	−0,1	−1,7	1,0	:	−2,2	1,9	1,1	0,2	1,2	6,5	1,4	−10,0	0,0	0,6	:	0,8	−1,6
1962	0,6	−3,2	−0,1	:	−1,6	−0,1	1,0	−1,8	0,6	0,6	1,0	−3,4	0,4	0,3	:	0,7	0,1
1963	−0,5	0,1	0,2	:	−2,2	−1,5	0,3	−2,8	−1,4	0,2	0,7	−3,3	0,3	−0,1	:	0,8	−1,0
1964	0,2	−2,2	0,2	:	−4,3	0,1	−0,3	−3,5	1,1	−0,1	−1,1	0,0	−1,3	−0,3	:	1,2	−0,5
1965	0,6	−1,8	−1,3	:	−5,8	−2,1	0,8	−4,4	3,6	0,7	0,1	−0,4	−0,4	0,1	:	0,9	1,1
1966	−0,3	−1,9	0,2	:	−2,0	−2,1	0,1	−1,6	3,2	1,7	−1,0	0,8	0,1	0,3	:	0,5	1,3
1967	0,8	−2,4	2,2	:	−2,2	−1,5	0,0	1,4	2,2	7,4	−0,3	3,7	−0,9	0,6	:	0,4	0,0
1968	0,9	−1,7	2,3	:	−3,6	−0,8	−0,5	−1,3	3,3	9,7	0,3	1,5	−0,8	0,7	:	0,2	0,8
1969	1,2	−2,8	1,4	:	−4,0	−1,1	−1,1	−4,8	2,7	14,0	0,2	3,6	0,6	0,5	:	0,2	1,3
1970	2,8	−3,9	0,6	:	−3,1	0,2	0,8	−4,0	0,8	15,0	−1,4	1,9	1,3	0,6	:	0,4	1,0
1961-70	0,6	−2,1	0,7	:	−3,1	−0,7	0,2	−2,3	1,7	5,6	0,0	−0,6	−0,1	0,3	:	0,6	0,2
1971	2,1	−2,4	0,4	:	−1,5	2,2	0,9	−3,8	1,4	6,2	−0,3	2,5	1,8	0,9	:	0,0	2,5
1972	3,6	−0,4	0,6	:	−1,2	1,5	1,0	−2,2	1,6	10,1	2,8	5,5	0,1	1,0	:	−0,3	2,2
1973	2,0	−1,7	1,5	:	−3,8	0,8	0,6	−3,5	−1,6	16,1	3,8	3,0	−1,9	0,3	:	0,7	0,0
1974	0,4	−3,1	2,7	:	−2,8	−3,5	−1,3	−9,9	−4,2	26,1	3,1	−6,2	−4,5	−0,9	:	0,5	−1,0
1975	−0,1	−1,5	1,2	:	−3,7	−2,9	0,8	−1,5	−0,2	16,5	2,5	−5,5	−2,0	0,0	:	1,4	−0,1
1976	0,3	−4,9	0,8	:	−1,9	−3,9	−0,9	−5,3	−1,2	21,1	2,9	−8,0	−1,6	−0,7	:	0,5	0,7
1977	−1,1	−4,0	0,8	:	−1,9	−1,7	−0,1	−5,4	1,1	21,2	0,8	−9,4	0,0	0,0	:	−0,4	1,5
1978	−1,3	−2,7	1,4	:	−1,3	1,0	1,4	−6,8	2,2	19,2	−0,9	−5,7	0,5	0,9	:	−0,5	1,7
1979	−2,9	−4,7	−0,5	:	−1,9	0,5	0,9	−13,4	1,6	21,3	−1,2	−1,7	0,2	0,0	:	0,1	−0,9
1980	−4,3	−3,7	−1,7	:	0,5	−2,4	−0,6	−11,8	−2,2	19,0	−1,5	−5,9	1,5	−1,2	:	0,4	−1,0
1971-80	−0,1	−2,9	0,7	:	−1,9	−0,8	0,3	−6,3	−0,1	17,7	1,2	−3,1	−0,6	0,0	:	0,2	0,6
1981	−3,8	−3,0	−0,6	:	−0,7	−2,7	−0,8	−14,7	−2,2	21,3	2,2	−12,2	2,5	−0,6	:	0,3	0,5
1982	−3,7	−4,2	0,8	:	−4,4	−2,5	−2,1	−10,6	−1,6	34,4	3,2	−13,5	1,5	−0,6	:	0,0	0,7
1983	−0,8	−2,6	0,9	:	−5,0	−1,5	−0,8	−6,9	0,3	39,5	3,1	−8,3	0,9	0,1	:	−1,0	1,8
1984	−0,6	−3,3	1,4	:	−4,0	1,4	0,0	−5,8	−0,6	39,1	4,2	−3,4	−0,2	0,3	:	−2,4	2,8
1985	0,3	−4,6	2,4	:	−8,2	1,4	0,1	−3,9	−0,9	43,8	4,1	0,4	0,5	0,7	:	−2,9	3,6
1986	2,1	−5,4	4,3	:	−5,3	1,6	0,5	−2,9	0,5	38,7	2,7	2,4	−0,8	1,3	:	−3,3	4,3
1987	1,3	−2,9	4,1	:	−3,1	0,1	−0,2	1,2	−0,2	30,3	1,4	−0,4	−2,0	0,7	:	−3,5	3,6
1988	1,7	−1,3	4,3	:	−2,0	−1,1	−0,3	1,7	−0,7	31,3	2,4	−4,4	−4,6	0,1	:	−2,5	2,8
1989	1,7	−1,5	4,9	:	−5,0	−3,2	−0,3	1,2	−1,3	34,3	3,7	−2,3	−5,1	−0,1	:	−1,9	2,0
1990	1,2	0,5	3,2	:	−6,2	−3,7	−0,6	2,5	−1,5	33,8	3,8	−2,5	−3,5	−0,3	:	−1,6	1,3
1981-90	−0,1	−2,8	2,6	:	−4,4	−1,0	−0,5	−3,8	−0,8	34,6	3,1	−4,4	−1,1	0,2	:	−1,9	2,4
1991	1,4	1,3	0,8	−1,3	−5,1	−3,5	−0,6	4,9	−1,8	25,9	3,8	−1,0	−1,7	−0,6	−1,1	0,2	2,2
1992	1,4	1,7	0,3	−0,9	−3,4	−3,3	−0,4	5,8	−2,0	27,7	3,9	−1,0	−1,9	−0,7	−1,0	−0,4	3,0

EUR 12−: including WD; EUR 12+: including D.

Table 44

Structure of EC exports by country and region, 1958 and 1991

Foreign trade statistics

(Percentage of total exports)

Export of	B/L		DK		D		GR		E		F		IRL		I		NL		P		UK		EUR 12	
to	1958	1991	1958	1991	1958	1991	1958	1991	1958	1991	1958	1991	1958	1991	1958	1991	1958	1991	1958	1991	1958	1991	1958	1991
B/L	—	—	1,2	2,1	6,6	7,3	1,0	2,3	2,1	2,9	6,3	8,5	0,8	4,9	2,2	3,4	15,0	14,2	3,7	3,2	1,9	5,7	4,8	6,4
DK	1,6	0,8	—	—	3,0	1,9	0,2	0,8	1,7	0,8	0,7	0,9	0,1	1,0	0,8	0,8	2,6	1,6	1,2	2,1	2,4	1,3	2,0	1,3
D	11,6	23,7	20,0	22,4	—	—	20,5	23,9	10,2	15,0	10,4	20,7	2,2	12,7	14,1	21,0	19,0	29,3	7,7	19,1	4,2	13,7	7,6	14,5
GR	0,8	0,6	0,3	0,8	1,3	1,0	—	—	0,1	0,7	0,6	0,7	0,1	0,6	1,9	1,8	0,6	1,0	0,6	0,4	0,7	0,6	0,8	0,9
E	0,7	2,5	0,8	1,9	1,2	4,0	0,2	1,7	—	—	1,6	6,4	0,8	2,3	0,7	5,1	0,8	2,5	0,7	14,9	0,8	4,1	1,0	4,1
F	10,6	19,1	3,0	5,9	7,6	13,1	12,8	7,5	10,1	18,8	—	—	0,8	9,5	5,3	15,2	4,9	10,6	6,6	14,4	2,4	11,0	4,7	11,2
IRL	0,3	0,4	0,3	0,5	0,3	0,4	0,4	0,1	0,3	0,3	0,2	0,4	—	—	0,1	0,3	0,4	0,6	0,3	0,5	3,5	5,1	1,1	1,0
I	2,3	6,0	5,3	4,8	5,0	9,1	6,0	16,7	2,7	10,7	3,4	11,1	0,4	4,3	—	—	2,7	6,4	4,3	4,0	2,1	5,8	3,1	7,2
NL	20,7	13,7	2,2	4,8	8,1	8,4	2,0	3,4	3,2	3,9	2,0	4,7	0,5	6,6	2,0	3,2	—	—	2,5	5,7	3,2	7,9	5,3	6,3
P	1,1	0,7	0,3	0,6	0,9	1,1	0,3	0,3	0,4	6,2	0,8	1,4	0,1	0,5	0,7	1,5	0,4	0,7	—	—	0,4	1,0	0,8	1,3
UK	5,7	7,7	25,9	10,3	3,9	7,6	7,6	6,8	15,9	7,1	4,9	8,9	76,8	32,0	6,8	6,7	11,9	9,3	11,3	10,8	—	—	5,9	7,4
Total intra-EC trade	55,4	75,2	59,3	54,1	37,9	53,8	50,9	63,5	46,8	66,4	30,9	63,6	82,4	74,4	34,5	59,0	58,3	76,2	38,9	75,1	21,7	56,3	37,2	61,6
Other European OECD countries	8,7	6,4	16,6	23,8	22,7	17,9	10,3	9,7	12,4	5,2	9,0	7,4	0,9	5,7	18,9	11,6	11,9	7,5	5,1	9,9	9,1	9,4	13,7	11,4
USA	9,4	3,8	9,3	4,8	7,3	6,3	13,6	5,6	10,1	4,6	5,9	6,0	5,7	8,7	9,9	6,9	5,6	3,8	8,3	3,8	8,8	11,0	7,9	6,4
Canada	1,1	0,3	0,7	0,5	1,2	0,8	0,3	0,6	1,3	0,6	0,8	1,0	0,7	1,0	1,2	0,8	0,8	0,4	1,1	0,8	5,8	1,6	2,3	0,8
Japan	0,6	1,2	0,2	3,6	0,9	2,5	1,4	1,0	1,7	0,8	0,3	2,0	0,0	2,3	0,3	2,2	0,4	0,9	0,5	0,9	0,6	2,2	0,6	2,0
Australia	0,5	0,2	0,3	0,4	1,0	0,5	0,1	0,8	0,3	0,2	0,5	0,5	0,1	0,6	0,8	0,6	0,7	0,4	0,6	0,2	7,2	1,3	2,4	0,6
Developing countries	18,0	10,0	9,3	9,0	20,9	11,0	7,2	13,5	18,4	18,6	46,9	16,7	1,6	5,4	26,2	14,3	17,6	7,8	42,3	7,4	33,6	15,8	27,4	12,8
of which:																								
OPEC	3,3	2,1	2,3	2,1	4,8	3,2	0,9	3,7	2,6	3,3	21,3	4,2	0,2	1,3	7,5	4,8	4,5	2,1	2,0	0,6	7,0	4,9	7,6	3,5
Other developing countries	14,7	7,9	7,0	6,9	16,1	7,8	6,3	9,8	15,8	15,3	25,6	12,5	1,4	4,1	18,7	9,5	13,1	5,7	40,3	6,8	26,6	10,9	19,8	9,3
Rest of the world and unspecified	6,3	2,6	4,3	3,1	8,1	5,4	16,2	5,9	9,0	3,7	5,7	2,6	8,6	2,2	8,2	4,6	4,7	3,0	3,2	2,3	13,2	2,9	8,5	3,8
World (excluding EC)	44,6	24,8	40,7	45,9	62,1	46,2	49,1	36,5	53,2	33,6	69,1	36,4	17,6	25,6	65,5	41,0	41,7	23,8	61,1	24,9	78,3	43,7	62,8	38,4
World (including EC)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Table 45

Structure of EC imports by country and region, 1958 and 1991

Foreign trade statistics

(Percentage of total imports)

Import of	B/L		DK		D		GR		E		F		IRL		I		NL		P		UK		EUR 12	
from	1958	1991	1958	1991	1958	1991	1958	1991	1958	1991	1958	1991	1958	1991	1958	1991	1958	1991	1958	1991	1958	1991	1958	1991
B/L	—	—	3,8	3,3	4,5	7,9	3,3	3,4	1,8	2,9	5,4	10,2	1,8	2,2	2,0	4,9	17,8	13,0	7,3	4,1	1,6	4,4	4,4	6,6
DK	0,5	0,6	—	—	3,4	2,2	0,7	1,1	1,3	0,7	0,6	0,9	0,7	0,9	2,2	1,0	0,7	1,1	0,8	0,8	3,1	1,9	2,0	1,4
D	17,2	22,3	19,9	23,1	—	—	20,3	19,4	8,7	16,1	11,6	20,7	4,0	8,0	12,0	20,9	19,5	23,5	17,6	14,8	3,6	14,7	8,7	14,3
GR	0,1	0,2	0,0	0,2	0,7	0,6	—	—	0,2	0,2	0,6	0,3	0,2	0,1	0,4	0,8	0,2	0,2	0,1	0,1	0,2	0,3	0,4	0,4
E	0,5	1,4	0,7	1,1	1,6	2,5	0,1	2,2	—	—	1,2	4,9	0,4	0,8	0,4	3,5	0,4	1,4	0,4	15,8	1,0	2,2	0,9	2,8
F	11,6	14,9	3,4	5,9	7,6	12,2	5,4	7,8	6,8	15,5	—	—	1,6	4,2	4,8	14,2	2,8	7,0	7,7	11,9	2,7	9,2	4,4	9,6
IRL	0,1	0,6	0,0	0,6	0,1	0,8	0,0	0,6	0,6	0,5	0,0	1,0	—	—	0,0	0,7	0,0	0,8	0,1	0,4	2,9	3,7	0,9	1,2
I	2,1	4,3	1,7	4,0	5,5	9,2	8,8	14,2	1,8	9,8	2,4	11,0	0,8	2,3	—	—	1,8	3,4	3,7	10,3	2,1	5,4	2,7	6,8
NL	15,7	17,9	7,3	7,2	8,1	11,8	4,8	6,0	2,6	3,9	2,5	6,6	2,9	5,1	2,6	5,7	—	—	2,9	6,1	4,2	7,6	5,2	8,2
P	0,4	0,4	0,3	1,1	0,4	0,8	0,3	0,3	0,3	2,8	0,4	1,0	0,2	0,4	0,4	0,4	0,2	0,6	—	—	0,4	0,9	0,3	0,8
UK	7,4	7,9	22,8	7,8	4,3	6,4	9,9	5,4	7,8	7,3	3,5	7,6	56,3	45,4	5,5	5,7	7,4	8,0	12,9	7,5	—	—	5,4	6,5
Total intra-EC trade	55,5	70,5	60,0	54,2	36,3	54,5	53,7	60,3	31,8	59,8	28,3	64,2	68,9	69,1	30,2	57,7	50,7	59,0	53,4	71,9	21,8	50,1	35,2	58,6
Other European OECD countries	7,7	5,8	18,6	23,6	15,2	14,9	11,5	7,6	8,4	6,0	6,7	7,3	3,4	4,8	13,1	10,9	7,2	6,8	8,6	6,3	8,7	11,8	10,1	10,4
USA	9,9	6,1	9,1	5,8	13,6	6,1	13,7	4,3	21,6	7,9	10,0	8,3	7,0	15,1	16,4	5,6	11,3	8,1	7,0	3,4	9,4	12,5	11,4	7,7
Canada	1,4	0,6	0,2	0,5	3,1	0,7	0,8	0,3	0,5	0,5	1,0	0,8	3,0	0,7	1,5	0,8	1,4	0,9	0,5	0,6	8,2	1,6	3,6	0,8
Japan	0,6	3,7	1,5	3,1	0,6	5,3	2,0	6,7	0,7	4,4	0,2	2,9	1,1	3,8	0,4	2,4	0,8	5,4	0,0	2,9	0,9	5,7	0,7	4,3
Australia	1,7	0,3	0,0	0,3	1,2	0,3	0,3	0,1	0,8	0,2	2,4	0,3	1,2	0,1	3,0	0,5	0,2	0,4	0,9	0,1	5,4	0,7	2,6	0,4
Developing countries	19,2	8,9	5,9	7,7	23,9	10,8	9,6	14,8	32,0	18,2	45,6	12,8	9,3	4,3	29,4	15,0	24,4	15,6	27,6	13,1	34,7	12,3	29,5	12,5
of which:																								
OPEC	5,7	1,9	0,3	0,6	6,7	2,3	1,7	7,3	17,7	6,9	19,7	4,5	0,7	0,5	13,9	7,1	11,5	6,1	6,3	4,8	11,3	2,2	10,8	3,9
Other developing countries	13,5	7,0	5,6	7,1	17,2	8,5	7,9	7,5	14,3	11,3	25,9	8,3	8,6	3,8	15,5	7,9	12,9	9,5	21,3	8,3	23,4	10,1	18,7	8,6
Rest of the world and unspecified	4,0	4,1	4,7	4,8	6,1	7,4	8,4	5,9	4,2	3,0	5,8	3,4	6,1	2,1	6,0	7,1	4,0	3,8	2,0	1,7	10,9	5,3	6,9	5,3
World (excluding EC)	44,5	29,3	40,0	46,2	63,7	45,7	46,3	35,9	68,2	40,9	71,7	35,2	31,1	29,2	69,8	42,6	49,3	40,1	46,6	30,9	78,2	49,0	64,8	41,2
World (including EC)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Table 46

Money supply (M2/M3)

(End year; annual percentage change)

	B/L	DK	WD	GR	E	F	IRL	I	NL	P	UK	EUR 10-[1]	EUR 12-	USA	JAP
1960	4,3	8,0	11,1	20,2	:	16,7	5,5	19,6	7,0	:	:	:	:	4,9	20,1
1961	9,9	9,8	12,9	17,0	:	17,2	7,3	14,9	5,4	:	:	:	:	7,4	20,2
1962	7,4	8,5	10,4	21,5	:	18,7	9,6	17,0	6,6	:	:	:	:	8,1	20,3
1963	10,3	12,5	9,9	21,4	:	14,1	5,8	13,5	9,8	:	:	:	:	8,4	24,0
1964	7,6	11,1	9,4	16,1	:	9,8	9,4	12,7	10,4	:	7,6	9,7	:	8,0	18,7
1965	9,6	9,7	10,6	12,9	:	10,9	6,7	15,2	6,2	:	9,4	10,8	:	8,1	18,0
1966	8,2	12,8	8,3	18,2	:	10,6	10,6	13,0	5,9	:	6,5	9,3	:	4,5	16,3
1967	7,1	9,8	12,0	16,1	:	13,1	12,7	13,7	10,9	11,7	12,8	12,5	:	9,2	15,5
1968	8,6	14,5	11,8	17,8	:	11,6	16,9	13,1	14,8	14,1	8,5	11,5	:	8,0	14,8
1969	7,0	10,2	9,4	16,2	:	6,1	11,2	12,5	10,2	17,8	5,1	8,4	:	4,1	18,5
1970	10,0	3,3	9,1	19,3	15,4	15,3	14,0	15,9	11,0	12,4	12,0	12,3	12,5	6,6	16,9
1961-70	8,6	10,2	10,4	17,6	:	12,7	10,4	14,1	9,1	:	:	:	:	7,2	18,3
1971	12,9	8,5	13,5	22,4	23,4	18,0	12,9	17,2	9,0	21,0	16,2	15,3	15,8	13,5	24,3
1972	17,0	15,0	14,4	23,6	23,4	18,8	14,2	19,0	11,9	23,4	23,2	17,8	18,2	13,0	24,7
1973	15,4	12,6	10,1	14,5	25,8	14,7	26,0	23,1	21,9	28,9	21,8	16,1	16,8	6,9	16,8
1974	14,0	8,9	8,5	20,9	19,9	15,6	20,6	15,7	20,0	12,1	10,8	12,8	13,3	5,5	11,5
1975	15,1	25,1	8,6	26,5	19,2	18,1	18,9	23,7	5,7	13,1	11,7	14,5	14,8	12,6	16,5
1976	14,3	10,9	8,4	26,7	18,6	12,3	14,5	20,8	22,7	16,4	11,3	13,1	13,5	13,7	15,4
1977	10,3	9,8	11,2	22,7	19,2	14,2	17,1	21,7	3,6	21,8	14,8	13,6	14,0	10,6	13,4
1978	10,2	8,3	11,0	26,0	19,9	12,4	29,0	22,6	4,2	26,0	15,0	13,4	13,9	8,0	14,0
1979	8,2	9,7	6,0	18,4	19,3	14,0	18,7	20,8	6,9	31,0	14,4	12,0	12,6	7,8	10,8
1980	6,5	8,8	6,2	24,7	16,6	9,6	17,7	12,7	4,4	28,4	17,1	10,3	10,9	8,9	9,5
1971-80	12,4	11,8	9,8	22,6	20,5	14,8	19,0	19,7	11,0	22,2	15,6	13,9	14,4	10,1	15,7
1981	5,9	10,0	5,0	34,7	16,6	11,1	17,4	10,0	5,3	24,0	20,4	11,0	11,5	10,0	11,0
1982	5,4	11,4	7,1	29,0	17,9	12,4	13,0	18,0	7,6	24,2	12,0	11,5	12,1	8,9	7,9
1983	9,0	25,4	5,3	20,3	15,6	13,1	5,6	12,3	10,7	17,0	13,3	10,9	11,3	12,0	7,3
1984	5,8	17,8	4,7	29,4	15,6	11,0	10,1	12,1	6,9	24,8	13,6	10,0	10,5	8,6	7,8
1985	7,8	15,8	5,0	26,8	13,8	7,4	5,3	11,1	10,7	28,5	13,0	9,2	9,6	8,3	8,7
1986	12,7	8,4	6,6	19,0	14,0	6,8	−1,0	10,6	5,1	26,3	15,9	9,3	9,7	9,4	9,2
1987	10,2	4,1	5,9	24,0	15,4	9,8	10,9	7,2	4,4	19,7	16,4	9,1	9,6	3,5	10,8
1988	7,7	3,5	6,9	23,2	14,4	8,4	6,3	7,6	10,6	17,8	17,6	9,7	10,1	5,5	10,2
1989	13,2	8,3	5,5	24,2	14,6	9,6	5,0	9,9	13,7	10,5	19,1	10,8	11,1	5,1	12,0
1990	4,5	7,1	4,2	15,3	15,3	8,9	15,5	8,2	8,2	11,2	11,5	7,8	8,5	3,5	7,4
1981-90	8,2	11,2	5,6	24,6	15,3	9,8	8,8	10,7	8,3	20,4	15,3	9,9	10,4	7,5	9,2
1991	4,9	6,4	6,3	11,8	10,9	2,3	3,1	9,1	4,7	19,0	5,8	5,8	6,4	3,0	2,3

EUR 12−: including WD.

NB: B: M3H; DK: M2; D: M3, until 1990 WD, from 1991 onwards D; GR: M3; E: ALP; F: M3; IRL: M3; I: M2; NL: M2, breaks in series 1976, 1977, 1978 and 1982; P: L- ; UK: M4; EUR: chain weighted arithmetic mean; weights: GDP at current market prices and in ecus; USA: M2; J: M2 plus certificates of deposit.

[1] EUR 12 excluding Spain and Portugal.

Table 47

Nominal short-term interest rates

(%)

	B	DK	WD	GR	E	F	IRL	I	NL	P	UK	EUR 12–	USA	JAP
1960	:	:	5,1	:	:	4,1	:	3,5	2,1	:	:	:	:	:
1961	4,6	6,3	3,6	:	:	3,7	:	3,5	1,1	:	5,2	4,0	2,4	:
1962	3,4	6,5	3,4	:	:	3,6	:	3,5	1,9	:	4,1	3,6	2,8	:
1963	3,6	6,1	4,0	:	:	4,0	:	3,5	2,0	:	3,7	3,8	3,2	:
1964	4,9	6,2	4,1	:	:	4,7	:	3,5	3,5	:	5,0	4,4	3,6	:
1965	5,0	6,5	5,1	:	:	4,2	:	3,5	4,0	:	6,8	5,0	4,0	:
1966	5,6	6,5	6,6	:	:	4,8	:	3,5	4,9	3,0	7,0	5,6	4,9	:
1967	5,5	6,6	4,3	:	:	4,8	:	3,5	4,7	3,1	6,3	4,8	4,3	:
1968	4,5	6,6	3,8	:	:	6,2	:	3,5	4,6	3,4	7,9	5,3	5,4	:
1969	7,3	8,2	5,8	:	:	9,3	:	3,7	5,7	3,4	9,2	7,0	6,7	:
1970	8,1	9,0	9,4	:	:	8,6	:	5,3	6,2	4,0	8,1	8,0	6,3	:
1961-70	5,2	6,8	5,0	:	:	5,4	:	3,7	3,8	:	6,3	5,2	4,3	:
1971	5,4	7,6	7,1	:	:	6,0	6,6	5,7	4,5	4,3	6,2	6,2	4,3	6,5
1972	4,2	7,3	5,7	:	:	5,3	7,1	5,2	2,7	4,4	6,8	5,5	4,2	5,2
1973	6,6	7,6	12,2	:	:	9,3	12,2	7,0	7,5	4,4	11,8	9,9	7,2	8,3
1974	10,6	10,0	9,8	:	:	13,0	14,6	14,9	10,4	5,3	13,4	11,9	7,9	14,7
1975	7,0	8,0	4,9	:	:	7,6	10,9	10,4	5,4	6,8	10,6	7,6	5,8	10,1
1976	10,1	8,9	4,3	:	:	8,7	11,7	16,0	7,4	8,4	11,6	8,8	5,0	7,3
1977	7,3	14,5	4,3	:	15,5	9,1	8,4	14,0	4,8	11,1	8,0	8,4	5,3	6,4
1978	7,3	15,4	3,7	:	17,6	7,8	9,9	11,5	7,0	15,5	9,4	8,1	7,4	5,1
1979	10,9	12,5	6,9	:	15,5	9,7	16,0	12,0	9,6	16,1	13,9	10,5	10,1	5,9
1980	14,2	16,9	9,5	:	16,5	12,0	16,2	16,9	10,6	16,3	16,8	13,4	11,6	10,7
1971-80	8,4	10,9	6,9	:	:	8,8	11,4	11,3	7,0	9,3	10,8	9,0	6,9	8,0
1981	15,6	14,9	12,4	16,8	16,2	15,3	16,7	19,3	11,8	16,0	14,1	14,8	14,0	7,4
1982	14,1	16,4	8,8	18,9	16,3	14,6	17,5	19,9	8,2	16,8	12,2	13,4	10,6	6,9
1983	10,5	12,0	5,8	16,6	20,1	12,5	14,0	18,3	5,7	20,9	10,1	11,4	8,7	6,5
1984	11,5	11,5	6,0	15,7	14,9	11,7	13,2	17,3	6,1	22,5	10,0	10,9	9,5	6,3
1985	9,6	10,0	5,4	17,0	12,2	10,0	12,0	15,0	6,3	21,0	12,2	10,2	7,5	6,5
1986	8,1	9,1	4,6	19,8	11,7	7,7	12,4	12,8	5,7	15,6	10,9	8,7	6,0	5,0
1987	7,1	9,9	4,0	14,9	15,8	8,3	11,1	11,4	5,4	13,9	9,7	8,4	5,9	3,9
1988	6,7	8,3	4,3	15,9	11,6	7,9	8,1	11,3	4,8	13,0	10,3	8,2	6,9	4,0
1989	8,7	9,4	7,1	18,7	15,0	9,4	9,8	12,7	7,4	14,9	13,9	10,6	8,4	5,4
1990	9,8	10,8	8,4	19,9	15,2	10,3	11,4	12,3	8,7	16,9	14,8	11,4	7,8	7,7
1981-90	10,2	11,2	6,7	17,4	14,9	10,8	12,6	15,0	7,0	17,2	11,8	10,8	8,5	6,0
1991	9,4	9,5	9,2	22,7	13,2	9,6	10,4	12,2	9,3	17,7	11,5	10,8	5,5	7,4
1992	9,6	9,9	9,7	18,7	12,6	10,0	10,3	12,4	9,5	16,7	10,2	10,7	3,8	4,8

EUR 12–: including WD.

NB: B: 1961-84: four-month certificates of fonds des rentes; 1985-88: three-month Treasury certificates; 1989-1992: three-month interbank deposits.DK: 1961-76: discount rate; 1977-92: call money, monthly averages. D: three-month interbank deposits. GR: 1960 to April 1980: credit for working capital to industry; May 1980-87: interbank sight deposits; 1988-92: three-month interbank deposits. E: three-month interbank deposits. F: 1960-68: call money; 1969-81: one-month sale and repurchase agreements on private sector paper; 1982-92: three-month sale and repurchase agreements on private sector paper. IRL: 1961-70: three-month interbank deposits in London; 1971-92: three-month interbank deposits in Dublin. I: 1960-70: 12-month Treasury bills; 1971-92: interbank sight deposits. NL: 1960 to September 1972: three-month Treasury bills; October 1972-92: three-month interbank deposits. P: 1966 to July 1985: six-month deposits; August 1985-92; three-month Treasury bills. UK: 1961 to September 1964: three-month Treasury bills; October 1964-92: three-month interbank deposits. EUR12: Weighted geometric mean; weights: gross domestic product at current market prices and in ecus. USA: three-month Treasury bills. JAP: Bonds traded with three-month repurchase agreements; certificate of deposit three-months since January 1989.

Table 48

Nominal long-term interest rates

(%)

	B	DK	WD	GR	E	F	IRL	I	L	NL	P	UK	EUR 12–	USA	JAP
1960	:	:	6,3	:	:	5,7	:	5,3	:	4,2	:	5,4	:	:	:
1961	5,9	6,6	5,9	:	:	5,5	:	5,2	:	3,9	:	6,3	5,7	3,9	:
1962	5,2	6,6	5,9	:	:	5,4	:	5,8	:	4,2	:	5,9	5,7	3,9	:
1963	5,0	6,5	6,1	:	:	5,3	:	6,1	:	4,2	:	5,4	5,6	4,0	:
1964	5,6	7,1	6,2	:	:	5,5	:	7,4	:	4,9	:	6,0	6,1	4,1	:
1965	6,4	8,6	7,1	:	:	6,2	:	6,9	:	5,2	:	6,6	6,6	4,2	:
1966	6,7	8,7	8,1	:	:	6,6	:	6,5	:	6,2	:	6,9	7,1	4,7	:
1967	6,7	9,1	7,0	:	:	6,7	:	6,6	:	6,0	:	6,8	6,8	4,9	:
1968	6,6	8,7	6,5	:	:	7,0	:	6,7	:	6,2	:	7,6	6,9	5,3	:
1969	7,3	9,7	6,8	:	:	7,9	:	6,9	:	7,0	:	9,1	7,6	6,2	:
1970	7,8	11,1	8,3	:	:	8,6	:	9,0	:	7,8	:	9,3	8,7	6,6	:
1961-70	6,3	8,3	6,8	:	:	6,5	:	6,7	:	5,6	:	7,0	6,7	4,8	:
1971	7,3	11,0	8,0	:	:	8,4	9,2	8,3	:	7,1	:	8,9	8,3	5,7	:
1972	7,0	11,0	7,9	:	:	8,0	9,1	7,5	:	6,7	:	9,0	8,0	5,6	6,9
1973	7,5	12,6	9,3	9,3	:	9,0	10,7	7,4	6,8	7,3	:	10,8	9,1	6,3	7,0
1974	8,8	15,9	10,4	10,5	:	11,0	14,6	9,9	7,3	10,7	:	15,0	11,3	7,0	8,1
1975	8,5	12,7	8,5	9,4	:	10,3	14,0	11,5	6,7	9,2	:	14,5	10,5	7,0	8,4
1976	9,1	14,9	7,8	10,2	:	10,5	14,6	13,1	7,2	9,2	:	14,6	10,6	6,8	8,2
1977	8,8	16,2	6,2	9,5	:	11,0	12,9	14,6	7,0	8,5	:	12,5	10,1	7,1	7,4
1978	8,5	16,8	5,7	10,0	:	10,6	12,8	13,7	6,6	8,1	:	12,6	9,7	7,9	6,3
1979	9,7	16,7	7,4	11,2	13,3	10,9	15,1	14,1	6,8	9,2	:	13,0	10,8	8,7	8,3
1980	12,2	18,7	8,5	17,1	16,0	13,1	15,4	16,1	7,4	10,7	:	13,9	12,7	10,8	8,9
1971-80	8,7	14,6	8,0	:	:	10,3	12,8	11,6	:	8,7	:	12,5	10,1	7,3	:
1981	13,8	19,3	10,4	17,7	15,8	15,9	17,3	20,6	8,7	12,2	:	14,8	14,8	12,9	8,4
1982	13,5	20,5	9,0	15,4	16,0	15,7	17,0	20,9	10,4	10,5	:	12,7	13,9	12,2	8,3
1983	11,8	14,4	7,9	18,2	16,9	13,6	13,9	18,0	9,8	8,8	:	10,8	12,3	10,8	7,8
1984	12,0	14,0	7,8	18,5	16,5	12,5	14,6	15,0	10,3	8,6	:	10,7	11,5	12,0	7,3
1985	10,6	11,6	6,9	15,8	13,4	10,9	12,7	14,3	9,5	7,3	25,4	10,6	10,6	10,8	6,5
1986	7,9	10,6	5,9	15,8	11,4	8,4	11,1	11,7	8,7	6,4	17,9	9,8	8,9	8,1	5,2
1987	7,8	11,9	5,8	17,4	12,8	9,4	11,3	11,3	8,0	6,4	15,4	9,5	9,0	8,7	4,7
1988	7,9	10,6	6,1	16,6	11,8	9,0	9,4	12,1	7,1	6,3	14,2	9,3	9,1	9,0	4,7
1989	8,7	10,2	7,0	:	13,8	8,8	9,0	12,9	7,7	7,2	14,9	9,6	9,6	8,5	5,2
1990	10,1	11,0	8,9	:	14,7	9,9	10,1	13,4	8,6	9,0	16,8	11,1	10,9	8,6	7,5
1981-90	10,4	13,4	7,6	:	14,3	11,4	12,6	15,0	8,9	8,3	:	10,9	11,1	10,2	6,6
1991	9,3	10,1	8,6	:	12,4	9,0	9,2	13,0	8,2	8,9	17,1	9,9	10,2	8,1	6,7
1992	8,8	9,9	8,2	:	11,3	8,5	8,7	12,8	7,8	8,5	15,0	9,0	9,7	7,9	5,8

EUR 12–: including WD.

NB: B: State bonds over five years, secondary market. DK: State bonds. D: Public sector bonds outstanding. GR: State bonds. E: State bonds over more than two years. F: 1960-79: public sector bonds; 1980-92: State bonds over seven years. IRL: 1960-70: State bonds 20 years in London; 1971-92: State bonds 15 years in Dublin. I: 1960-84: Crediop bonds; 1985-91: rate of specialized industrial credit institutions (gross rate). From January 1992: public sector bonds outstanding. NL: 1960-73: 3,25% State bond 1948; 1974-84: private loans to public enterprises; 1985-92: five State bonds with the longest maturity. P: Weighted average of public and private bonds over five years. UK: State bonds 20 years. EUR12: Weighted geometric mean; weights: gross domestic product at current market prices and in ecus. USA: 1960-88: Federal government bonds over 10 years; 1989-92: Federal government bonds over 30 years. JAP: 1961-78: State bonds; 1979 to June 1987: over-the-counter sales of State bonds; 1987 to April 1989: Benchmark: bonds Nos 111-1988; 1989-92: Benchmark: bond Nos 119-1999.

Table 49

Gross official reserves

(End year, Mrd ECU)

	B/L	DK	WD	GR	E	F	IRL	I	NL	P	UK	EUR 12–
1960	1,44	0,27	6,67	0,23	0,51	2,17	0,31	3,10	1,78	0,61	3,55	20,62
1961	1,69	0,26	6,68	0,25	0,83	3,14	0,32	3,55	1,83	0,52	3,10	22,15
1962	1,64	0,24	6,49	0,27	0,97	3,78	0,33	3,79	1,81	0,63	3,09	23,03
1963	1,84	0,44	7,13	0,27	1,07	4,58	0,38	3,38	1,96	0,68	2,94	24,66
1964	2,08	0,60	7,36	0,26	1,41	5,35	0,42	3,57	2,19	0,81	2,16	26,21
1965	2,18	0,55	6,94	0,23	1,33	5,93	0,38	4,48	2,26	0,88	2,81	27,97
1966	2,21	0,56	7,53	0,26	1,18	6,32	0,46	4,60	2,30	1,01	2,91	29,33
1967	2,52	0,52	7,92	0,28	1,07	6,80	0,43	5,30	2,55	1,20	2,62	31,20
1968	2,42	0,46	10,55	0,34	1,27	4,83	0,55	5,76	2,72	1,49	2,64	33,03
1969	2,35	0,44	7,01	0,31	1,26	3,78	0,68	4,96	2,49	1,42	2,48	27,17
1970	2,87	0,48	13,54	0,31	1,81	5,07	0,68	5,41	3,28	1,53	2,85	37,82
1971	3,37	0,66	17,47	0,48	3,03	7,98	0,90	6,59	3,71	1,89	8,10	54,18
1972	4,56	0,82	24,44	1,02	4,90	11,54	1,03	7,53	5,66	2,75	5,64	69,91
1973	6,82	1,23	35,07	1,09	6,58	13,21	0,89	10,34	8,77	4,04	6,73	94,76
1974	9,10	0,95	39,32	1,16	6,81	18,63	1,06	14,99	11,78	5,07	7,95	116,81
1975	8,58	0,91	36,70	1,27	6,45	19,43	1,35	11,14	10,75	3,68	6,49	106,74
1976	8,12	0,96	40,61	1,22	5,87	17,03	1,66	12,76	11,07	3,46	5,50	108,24
1977	8,95	1,56	44,29	1,36	6,83	18,49	1,98	17,79	12,05	3,55	19,42	136,27
1978	9,89	2,60	54,76	1,57	9,74	23,52	2,02	21,75	12,71	4,27	15,41	158,23
1979	10,41	2,59	57,59	1,47	12,28	29,44	1,62	26,69	14,52	5,32	17,39	179,33
1980	20,54	3,28	76,57	2,49	15,26	57,10	2,25	45,94	27,50	10,03	23,69	284,62
1981	18,28	3,01	79,81	2,19	15,84	52,52	2,59	45,48	26,26	9,41	22,13	277,53
1982	16,24	2,94	82,14	2,31	13,27	46,30	2,84	39,02	26,52	8,57	19,71	259,85
1983	20,94	5,17	98,20	2,95	15,92	63,69	3,33	56,31	33,25	10,21	23,17	333,13
1984	21,97	4,99	100,90	3,21	23,51	66,18	3,03	59,67	32,89	9,95	22,51	348,82
1985	19,02	6,78	88,94	2,63	19,62	62,53	3,45	44,24	29,55	9,74	21,02	307,52
1986	17,70	4,79	84,32	2,64	17,97	59,71	3,16	43,35	26,52	8,69	23,44	292,28
1987	20,55	8,30	96,13	3,38	28,31	57,53	3,83	49,45	29,44	10,27	37,64	344,84
1988	19,92	9,80	85,10	4,36	36,71	50,82	4,41	53,44	29,27	10,07	45,32	349,21
1989	19,09	5,89	82,27	3,86	39,99	47,42	3,46	61,17	28,34	13,66	39,09	344,24
1990	17,60	8,31	77,74	3,56	42,62	50,75	3,88	66,08	25,40	15,18	34,06	345,19
1991	17,21	5,96	72,11	4,81	53,06	44,89	4,26	60,69	24,70	19,51	37,85	345,05

EUR 12–: including WD.

Source: IMF: international financial statistics and Commission departments. Gold is valued at market-related prices.

Table 50

Exchange rates

(Annual average; national currency units per ECU)

	B/L	DK	WD	GR	E	F	IRL	I	NL	P	UK	USA	JAP
1960	52,810	7,2954	4,4361	31,69	63,37	5,2145	0,37722	660,1	4,0136	30,37	0,37722	1,0562	380,23
1961	53,367	7,3722	4,3074	32,02	64,04	5,2695	0,38119	667,1	3,8985	30,69	0,38119	1,0673	384,24
1962	53,490	7,3893	4,2792	32,09	64,14	5,2817	0,38207	668,6	3,8727	30,76	0,38207	1,0698	385,13
1963	53,490	7,393	4,2792	32,09	64,14	5,2817	0,38207	668,6	3,8727	30,76	0,38207	1,0698	385,13
1964	53,490	7,3893	4,2792	32,09	64,14	5,2817	0,38207	668,6	3,8727	30,76	0,38207	1,0698	385,13
1965	53,490	7,3893	4,2792	32,09	64,14	5,2817	0,38207	668,6	3,8727	30,76	0,38207	1,0698	385,13
1966	53,490	7,3893	4,2792	32,09	64,14	5,2817	0,38207	668,6	3,8727	30,76	0,38207	1,0698	385,13
1967	53,240	7,4229	4,2592	31,94	65,11	5,2570	0,38765	665,5	3,8546	30,61	0,38765	1,0648	383,33
1968	51,444	7,7166	4,1155	30,87	72,02	5,0797	0,42870	643,1	3,7246	29,58	0,42870	1,0289	370,40
1969	51,109	7,6664	4,0262	30,67	71,55	5,2903	0,42591	638,9	3,7003	29,39	0,42591	1,0222	367,99
1970	51,112	7,6668	3,7414	30,67	71,36	5,6777	0,42593	638,9	3,7005	29,38	0,42593	1,0222	368,00
1971	50,866	7,7526	3,6457	31,43	72,57	5,7721	0,42858	647,4	3,6575	29,64	0,42858	1,0478	363,83
1972	49,361	7,7891	3,5768	33,65	72,00	5,6572	0,44894	654,3	3,5999	30,48	0,44894	1,1218	339,72
1973	47,801	7,4160	3,2764	36,95	71,81	5,4678	0,50232	716,5	3,4285	30,27	0,50232	1,2317	333,17
1974	45,912	7,1932	3,0867	35,78	68,84	5,6745	0,51350	791,7	3,1714	29,93	0,51350	1,2021	339,68
1975	45,569	7,1227	3,0494	39,99	70,27	5,3192	0,55981	809,5	3,1349	31,44	0,56003	1,2408	360,73
1976	43,166	6,7618	2,8155	40,88	74,74	5,3449	0,62192	930,2	2,9552	33,62	0,62158	1,1180	331,21
1977	40,883	6,8557	2,6483	42,16	86,82	5,6061	0,65370	1 006,8	2,8001	43,62	0,65370	1,1411	305,81
1978	40,061	7,0195	2,5561	46,80	97,42	5,7398	0,66389	1 080,2	2,7541	55,87	0,66391	1,2741	267,08
1979	40,165	7,2079	2,5110	50,76	91,97	5,8298	0,66945	1 138,4	2,7488	67,01	0,64630	1,3705	300,46
1980	40,598	7,8274	2,5242	59,42	99,70	5,8690	0,67600	1 189,2	2,7603	69,55	0,59849	1,3923	315,04
1981	41,295	7,9226	2,5139	61,62	102,68	6,0399	0,69102	1 263,2	2,7751	68,49	0,55311	1,1164	245,38
1982	44,712	8,1569	2,3760	65,34	107,56	6,4312	0,68961	1 323,8	2,6139	78,01	0,56046	0,9797	243,55
1983	45,438	8,1319	2,2705	78,09	127,50	6,7708	0,71496	1 349,9	2,5372	98,69	0,58701	0,8902	211,35
1984	45,442	8,1465	2,2381	88,42	126,57	6,8717	0,72594	1 381,4	2,5234	115,68	0,59063	0,7890	187,09
1985	44,914	8,0188	2,2263	105,74	129,13	6,7950	0,71517	1 448,0	2,5110	130,25	0,58898	0,7631	180,56
1986	43,798	7,9357	2,1282	137,42	137,46	6,7998	0,73353	1 461,9	2,4009	147,09	0,67154	0,9842	165,00
1987	43,041	7,8847	2,0715	156,27	142,16	6,9291	0,77545	1 494,9	2,3342	162,62	0,70457	1,1544	166,60
1988	43,429	7,9515	2,0744	167,58	137,60	7,0364	0,77567	1 537,3	2,3348	170,06	0,66443	1,1825	151,46
1989	43,381	8,0493	2,0702	178,84	130,41	7,0239	0,77682	1 510,5	2,3353	173,41	0,67330	1,1017	151,94
1990	42,426	7,8565	2,0521	201,41	129,41	6,9141	0,76777	1 522,0	2,3121	181,11	0,71385	1,2734	183,66
1991	42,223	7,9086	2,0508	225,22	128,47	6,9733	0,76781	1 533,2	2,3110	178,61	0,70101	1,2392	166,49
1992	42,169	7,9110	2,0489	247,07	128,93	6,9179	0,76769	1 546,3	2,3076	172,30	0,70549	1,2819	164,01

Table 51

Central rates against the ECU

(National currency units per ECU)

	B/L	DK	D	GR	E	F	IRL	I	NL	P	UK
13.3.1979	39,4582	7,08592	2,51064	–	–	5,79831	0,662638	1 148,18	2,72077	–	(0,663247)
24.9.1979	39,8456	7,36594	2,48557	–	–	5,85522	0,669141	1 159,42	2,74748	–	(0,649821)
30.11,1979	39,7897	7,72336	2,48208	–	–	5,84700	0,668201	1 157,79	2,74362	–	(0,648910)
23.3.1981	40,7985	7,91917	2,54502	–	–	5,99526	0,685145	1 262,92	2,81318	–	(0,542122)
5.10,1981	40,7572	7,91117	2,40989	–	–	6,17443	0,684452	1 300,67	2,66382	–	(0,601048)
22.2.1982	44,6963	8,18382	2,41815	–	–	6,19564	0,686799	1 305,13	2,67296	–	(0,557037)
14.6.1982	44,9704	8,23400	2,33379	–	–	6,61387	0,691011	1 450,27	2,57971	–	(0,560453)
21.3.1983	44,3662	8,04412	2,21515	–	–	6,79271	0,717050	1 386,78	2,49587	–	(0,629848)
18.5.1983	44,9008	8,14104	2,24184	–	–	6,87456	0,725690	1 403,49	2,52595	–	(0,587087)
17.9.1984	44,9008	8,14104	2,24184	(87,4813)	–	6,87456	0,725690	1 403,49	2,52595	–	(0,585992)
22.7.1985	44,8320	8,12857	2,23840	(100,719)	–	6,86402	0,724578	1 520,60	2,52208	–	(0,555312)
7.4.1986	43,6761	7,91896	2,13834	(135,659)	–	6,96280	0,712956	1 496,21	2,40935	–	(0,630317)
4.8.1986	43,1139	7,81701	2,11083	(137,049)	–	6,87316	0,764976	1 476,95	2,37833	–	(0,679256)
12.1.1987	42,4582	7,85212	2,05853	(150,792)	–	6,90403	0,768411	1 483,58	2,31943	–	(0,739615)
19.6.1989	42,4582	7,85212	2,05853	(150,792)	133,804	6,90403	0,768411	1 483,58	2,31943	–	(0,739615)
21.9.1989	42,4582	7,85212	2,05853	(150,792)	133,804	6,90403	0,768411	1 483,58	2,31943	(172,085)	(0,728627)
8.1.1990	42,1679	7,79845	2,04446	(187,934)	132,889	6,85684	0,763159	1 529,70	2,30358	(177,743)	(0,728615)
8.10.1990	42,4032	7,84195	2,05586	(205,311)	133,631	6,89509	0,767417	1 538,24	2,31643	(178,735)	0,696904
6.4.1992	42,4032	7,84195	2,05586	(205,311)	133,631	6,89509	0,767417	1 538,24	2,31643	178,735	0,696904

The drachma does not participate in the exchange-rate mechanism. Its notional central ECU rate is 205,311.

Table 52

Bilateral central rates since 6 April 1992

		BFR/LFR (Brussels)	DKR (Copenhagen)	DM (Frankfurt)	PTA (Madrid)	FF (Paris)	IRL (Dublin)	LIT (Rome)	HFL (Amsterdam)	ESC (Lisbon)	UKL (London)
BFR/LFR 100	± 2,25	100	18,4938	4,84837	315,143	16,2608	1,80981	3 627,64	5,46286	421,513	1,64352
DKR 100	± 2,25	540,723	100	26,2162	1 704,05	87,9257	9,78604	19 615,4	29,5389	2 279,22	8,88687
DM 100	± 2,25	2 062,55	381,443	100	6 500	335,386	37,3281	74 821,7	112,673	8 693,93	33,8984
PTA 100	± 6,00	31,7316	5,86837	1,53847	100	5,15981	0,574281	1 151,11	1,73345	133,753	0,521514
FF 100	± 2,25	614,977	113,732	29,8164	1 938,06	100	11,1299	22 309,1	33,5953	2 592,21	10,1073
IRL 1	± 2,25	55,2545	10,2186	2,67894	174,131	8,9848	1	2 004,43	3,01848	232,905	0,908116
LIT 1 000	± 2,25	27,5661	5,09803	1,33651	86,8726	4,48247	0,498895	1 000	1,5059	116,194	0,453053
HFL 100	± 2,25	1 830,54	338,537	88,7526	5 768,83	297,661	33,1293	66 405,3	100	7 715,97	30,0853
ESC 100	± 6,00	23,7241	4,38747	1,15023	74,7649	3,85772	0,42936	860,626	1,29601	100	0,389909
UKL 1	± 6,00	60,8451	11,2526	2,95	191,75	9,89389	1,10118	2 207,25	3,32389	256,570	1

The drachma does not participate in the exchange-rate mechanism. Its notional central ECU rate is 205,311.

Table 53

Nominal effective exchange rates

Relative to 19 industrial countries, double export weights

(1980 = 100)

	B	DK	WD	GR	E	F	IRL	I	NL	P	UK	EUR 12–[1]	USA	JAP
1960	82,6	104,1	52,8	192,6	150,4	117,1	149,7	196,9	74,8	214,5	158,6	98,4	125,0	71,8
1961	81,7	103,1	54,7	191,1	149,6	116,1	149,4	195,2	77,1	213,4	157,8	99,9	125,3	71,4
1962	81,7	103,1	54,9	190,9	150,0	116,1	149,8	195,0	77,6	213,8	158,3	100,5	126,3	71,5
1963	81,5	103,2	55,2	191,0	150,1	116,2	149,7	194,8	77,7	213,4	158,0	100,6	126,6	71,5
1964	81,7	103,0	55,3	191,0	150,1	116,2	149,5	193,9	77,5	212,9	157,5	100,5	126,7	71,4
1965	82,0	103,1	55,1	191,2	150,2	116,2	149,6	193,9	77,7	213,1	157,8	100,4	126,7	71,5
1966	81,9	103,3	55,1	191,4	150,2	116,1	149,6	194,3	77,4	213,3	157,8	100,3	126,8	71,4
1967	82,1	102,6	55,4	191,8	147,9	116,2	148,6	194,8	77,9	214,1	155,3	100,1	127,2	71,6
1968	82,9	99,0	56,4	195,1	132,2	117,9	139,5	198,7	79,1	222,8	137,1	96,5	130,0	73,1
1969	83,1	98,6	57,9	195,4	132,3	112,1	139,6	198,3	79,2	224,6	137,2	96,2	130,2	73,7
1970	83,2	97,8	62,8	192,6	131,8	103,1	139,4	196,1	78,0	223,4	136,7	97,5	128,5	73,3
1971	83,1	96,9	64,7	188,2	130,2	100,8	139,5	194,3	78,7	222,0	136,7	98,3	125,1	74,5
1972	85,5	97,6	66,4	176,2	132,6	103,2	136,7	193,0	79,8	219,6	131,8	100,3	116,7	82,8
1973	86,7	103,6	73,4	162,2	134,7	106,7	127,3	173,3	82,4	223,5	118,0	103,0	107,4	87,4
1974	87,9	104,0	77,4	162,6	138,7	99,5	124,1	156,4	86,7	220,5	113,9	101,1	109,6	81,6
1975	89,2	107,6	78,6	146,7	135,2	109,3	117,0	149,9	88,8	213,9	104,8	102,5	108,7	79,3
1976	91,3	110,0	83,1	138,7	124,2	105,2	105,1	124,3	91,2	195,4	89,7	92,8	114,4	83,3
1977	96,5	109,4	89,7	134,7	108,7	100,2	101,5	114,4	96,0	153,1	85,5	91,9	113,6	92,4
1978	99,3	109,4	95,0	122,4	98,3	98,9	102,0	107,3	98,3	121,9	85,7	92,4	103,1	112,5
1979	100,5	108,5	99,6	115,5	107,4	99,6	102,2	103,7	99,8	103,3	90,9	98,4	100,2	104,2
1980	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
1981	94,2	92,5	94,4	89,8	90,4	91,2	91,3	87,6	95,7	96,2	100,2	83,9	112,8	113,6
1982	85,5	88,4	99,1	82,7	84,9	83,6	90,3	81,6	100,5	83,8	95,8	78,0	126,3	107,9
1983	83,1	87,9	103,1	67,7	70,3	77,6	86,6	78,5	102,6	66,1	89,1	71,4	133,6	119,7
1984	81,3	84,7	101,4	58,0	68,6	73,9	82,9	73,9	101,0	54,6	84,9	64,8	144,0	126,6
1985	82,0	85,7	101,7	48,8	67,1	74,7	83,9	70,1	101,2	48,3	84,8	63,5	149,9	130,5
1986	86,5	91,1	112,6	38,4	66,0	78,0	87,0	72,7	109,0	44,6	78,6	69,7	121,3	166,0
1987	90,0	95,0	120,4	34,6	66,2	78,9	85,2	73,5	114,6	41,4	77,8	74,5	106,7	179,7
1988	88,9	93,2	119,5	32,1	68,2	77,0	84,0	70,9	114,1	39,3	82,3	73,3	100,2	198,4
1989	88,1	90,7	118,0	29,7	71,0	76,0	83,0	71,2	112,9	38,1	79,5	71,1	105,1	189,7
1990	92,7	97,6	124,7	27,3	74,7	80,7	87,8	73,9	117,3	37,6	78,8	79,3	98,6	170,3
1991	92,4	95,7	123,3	24,2	74,4	79,0	86,7	72,4	116,4	37,8	79,1	76,7	97,9	185,1
1992	93,1	96,6	124,8	22,2	74,7	80,5	87,4	72,5	117,4	39,5	79,5	78,4	95,9	192,6

EUR 12–: including WD.

NB: For a detailed commentary on the method used see *European Economy* No 8, March 1981.

[1] Against nine industrial non-member countries.

Table 54

Current receipts

General government

(Percentage of GDP at market prices)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 9−[1] (ECU)	EUR 9+[1] (ECU)	EUR 12− (ECU)	EUR 12+ (ECU)
1960	27,5	27,3	35,5	:	21,1	:	34,9	24,8	28,8	32,5	33,9	:	30,1	32,4	:	:	:
1961	28,4	26,6	36,6	:	22,0	:	36,2	25,7	28,2	34,1	34,9	:	31,3	33,3	:	:	:
1962	29,2	28,2	37,0	:	23,2	:	36,3	25,2	29,1	33,5	34,4	:	32,9	34,0	:	:	:
1963	29,4	29,9	37,3	:	23,2	:	37,1	26,1	29,5	33,6	35,6	:	31,5	34,1	:	:	:
1964	30,0	29,7	36,8	:	24,0	:	38,0	26,9	30,6	33,5	35,7	:	31,5	34,4	:	:	:
1965	30,7	31,2	36,1	:	23,7	:	38,4	27,9	30,1	35,2	37,3	:	33,2	34,7	:	:	:
1966	32,4	33,5	36,7	:	25,3	:	38,4	30,0	30,1	35,8	39,2	:	34,4	35,4	:	:	:
1967	33,2	34,1	37,4	:	26,2	:	38,2	30,6	31,0	35,7	40,6	:	36,3	36,2	:	:	:
1968	33,8	36,9	38,4	:	27,3	:	38,8	31,0	31,6	34,5	42,4	:	37,7	37,2	:	:	:
1969	34,3	37,2	39,8	:	27,2	:	39,8	31,6	30,7	34,3	43,2	:	39,6	38,1	:	:	:
1970	35,2	41,7	38,9	:	26,8	:	39,0	35,3	30,4	35,0	44,5	:	40,5	38,1	:	:	:
1961-70	31,7	32,9	37,5	:	24,9	:	38,0	29,0	30,1	34,5	38,8	:	34,9	35,5	:	:	:
1970	35,9	46,1	38,9	:	:	22,1	39,0	33,2	28,8	36,4	41,2	:	39,8	37,5	:	:	:
1971	36,4	46,8	40,1	:	:	22,3	38,6	34,1	29,5	39,7	42,9	:	38,1	37,8	:	:	:
1972	36,2	46,4	40,4	:	:	22,7	38,9	32,9	29,4	39,8	44,0	:	36,0	37,6	:	:	:
1973	37,1	46,0	42,9	:	:	23,4	39,0	32,2	28,5	40,2	45,3	:	35,4	38,5	:	:	:
1974	38,5	47,9	43,4	:	26,7	22,7	39,7	36,8	28,0	41,3	46,3	:	39,3	39,6	:	:	:
1975	41,3	45,7	43,4	:	27,1	24,3	41,4	34,4	28,5	49,9	48,7	:	40,0	40,3	:	:	:
1976	41,1	46,1	44,7	:	29,2	25,2	43,5	38,0	29,7	51,4	49,0	:	39,4	41,6	:	:	:
1977	42,7	46,6	45,8	:	29,6	26,4	43,2	36,7	30,6	55,4	49,9	:	38,5	41,9	:	:	:
1978	43,6	48,4	45,4	:	29,9	27,1	43,1	35,1	31,8	56,5	50,2	:	37,1	41,9	:	:	:
1979	44,3	49,8	45,2	:	30,4	28,3	44,7	34,6	31,3	53,4	50,9	:	37,8	42,1	:	:	:
1980	43,8	51,6	45,6	:	30,2	29,7	46,5	37,8	33,3	55,1	52,5	30,9	39,7	43,2	:	42,1	:
1971-80	40,5	47,5	43,7	:	:	25,2	41,9	35,3	30,1	48,3	48,0	:	38,1	40,4	:	:	:
1981	44,6	51,7	45,7	:	28,8	31,2	47,3	38,7	34,3	55,8	53,1	32,4	41,7	43,9	:	42,8	:
1982	46,4	50,9	46,4	:	32,0	31,4	48,2	41,2	36,1	55,7	53,4	33,4	42,2	44,7	:	43,6	:
1983	45,7	53,2	46,0	:	33,2	33,5	48,8	42,7	37,9	58,3	54,7	37,0	41,5	45,0	:	44,1	:
1984	46,9	54,8	46,2	:	34,2	33,2	49,8	43,3	37,7	56,4	53,4	34,6	41,5	45,1	:	44,2	:
1985	47,2	56,1	46,5	:	34,2	34,1	49,9	42,5	38,3	57,9	53,7	33,4	41,4	45,4	:	44,5	:
1986	46,4	57,7	45,8	:	35,1	35,9	49,4	42,6	39,1	55,6	52,5	37,3	40,4	45,1	:	44,3	:
1987	46,8	58,2	45,5	:	36,0	37,7	49,8	42,6	39,2	57,3	53,5	36,2	39,7	45,1	:	44,4	:
1988	45,7	58,6	44,8	:	34,1	37,7	49,2	43,4	39,6	56,3	52,5	37,6	39,5	44,6	:	43,9	:
1989	44,4	57,6	45,7	:	31,7	39,4	48,9	39,7	41,5	54,6	50,2	39,5	39,2	44,8	:	44,1	:
1990	44,6	55,8	44,1	:	34,3	39,3	49,0	39,9	42,4	55,5	49,8	38,4	39,0	44,5	:	43,9	:
1981-90	45,9	55,5	45,7	:	33,4	35,3	49,0	41,7	38,6	56,3	52,7	36,0	40,6	44,8	:	44,0	:
1991	44,4	55,1	45,7	46,3	37,8	39,9	49,2	40,2	43,5	52,8	51,3	39,7	38,4	45,1	45,3	44,5	44,7
1992	45,1	54,9	:	46,8	37,2	40,4	49,2	39,7	44,2	52,9	51,3	41,5	37,2	:	45,4	:	44,8

EUR 12−: including WD; EUR 12+: including D.

[1] EUR 12 excluding Greece, Spain and Portugal.

Table 55

Total expenditure

General government

(Percentage of GDP at market prices)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 9–[1] (ECU)	EUR 9+[1] (ECU)	EUR 12– (ECU)	EUR 12+ (ECU)
1960	30,3	24,8	32,5	:	:	:	34,6	28,0	30,1	30,5	33,7	:	32,4	32,4	:	:	:
1961	29,8	27,1	33,8	:	:	:	35,7	29,7	29,4	30,3	35,4	:	33,1	33,2	:	:	:
1962	30,5	28,1	35,6	:	:	:	37,0	29,5	30,5	32,2	35,6	:	34,0	34,4	:	:	:
1963	31,5	28,6	36,4	:	:	:	37,8	30,5	31,1	32,1	37,6	:	35,4	35,3	:	:	:
1964	30,8	28,4	36,1	:	:	:	38,0	31,8	31,8	32,3	37,8	:	33,7	35,0	:	:	:
1965	32,3	29,9	36,7	:	:	:	38,4	33,1	34,3	33,3	38,7	:	36,2	36,3	:	:	:
1966	33,5	31,7	36,9	:	:	:	38,5	33,6	34,3	35,0	40,7	:	35,4	36,4	:	:	:
1967	34,5	34,3	38,8	:	:	:	39,0	34,8	33,7	37,5	42,5	:	38,3	37,8	:	:	:
1968	36,3	36,3	39,2	:	:	:	40,3	35,2	34,7	37,3	43,9	:	39,3	38,8	:	:	:
1969	36,1	36,3	38,8	:	:	:	39,6	36,6	34,2	34,1	44,4	:	41,3	38,8	:	:	:
1970	36,5	40,2	38,7	:	:	:	38,9	39,6	34,2	33,1	46,0	:	39,2	38,4	:	:	:
1961-70	33,2	32,1	37,1	:	:	:	38,3	33,5	32,8	33,7	40,3	:	36,6	36,4	:	:	:
1970	38,3	42,0	38,7	:	:	21,3	38,1	37,4	32,1	33,2	42,4	:	36,8	37,4	:	:	:
1971	40,1	42,9	40,2	:	:	22,8	38,0	38,3	34,3	37,1	43,9	:	36,7	38,3	:	:	:
1972	41,0	42,5	40,9	:	:	22,4	38,3	37,0	36,4	37,5	44,4	:	37,3	39,1	:	:	:
1973	41,3	40,8	41,7	:	:	22,3	38,4	36,8	35,0	36,4	44,6	:	38,1	39,4	:	:	:
1974	41,6	44,8	44,7	:	:	22,4	39,4	45,0	34,4	36,0	46,6	:	43,1	41,6	:	:	:
1975	46,8	47,0	49,0	:	:	24,2	43,8	47,0	39,1	48,7	51,5	:	44,5	45,5	:	:	:
1976	47,4	46,4	48,1	:	:	25,4	44,3	46,6	37,8	49,4	51,7	:	44,4	45,2	:	:	:
1977	49,0	47,2	48,2	:	:	27,0	44,1	44,3	37,7	52,1	51,6	:	41,7	44,9	:	:	:
1978	50,4	48,7	47,9	:	:	28,8	45,2	44,8	40,4	51,5	52,9	:	41,5	45,6	:	:	:
1979	51,9	51,5	47,8	:	:	30,0	45,6	46,0	39,7	52,6	54,6	:	41,0	45,6	:	:	:
1980	53,2	54,8	48,5	:	:	32,3	46,6	50,5	41,9	55,9	56,5	:	43,1	46,8	:	:	:
1971-80	46,3	46,7	45,7	:	:	25,8	42,3	43,6	37,7	45,7	49,8	:	41,1	43,2	:	:	:
1981	58,1	58,6	49,4	:	39,9	35,1	49,2	52,1	45,8	59,8	58,6	41,7	44,4	48,8	:	47,8	:
1982	57,9	60,0	49,7	:	39,7	37,0	50,9	55,0	47,4	57,3	60,5	43,8	44,7	49,8	:	48,8	:
1983	57,5	60,4	48,5	:	41,5	38,3	52,0	54,4	48,6	56,9	61,0	46,1	44,8	50,0	:	49,1	:
1984	56,4	58,9	48,1	:	44,3	38,7	52,5	53,6	49,4	53,6	59,6	46,6	45,4	50,1	:	49,3	:
1985	56,0	58,1	47,7	:	48,1	41,0	52,7	54,2	50,9	51,9	58,5	43,5	44,3	50,0	:	49,4	:
1986	55,6	54,3	47,1	:	47,7	41,9	52,2	54,2	50,7	51,2	58,5	44,6	42,8	49,4	:	48,8	:
1987	54,1	55,7	47,4	:	48,2	40,8	51,7	51,9	50,2	54,8	60,1	43,0	41,1	49,0	:	48,4	:
1988	52,3	58,0	46,9	:	48,5	41,0	51,0	48,5	50,3	53,0	57,7	43,0	38,4	47,9	:	47,4	:
1989	50,9	58,1	45,5	:	50,0	42,2	50,1	41,9	51,4	49,1	55,4	42,9	38,0	47,2	:	46,8	:
1990	49,9	57,2	46,0	:	53,9	43,3	50,6	42,5	53,4	49,9	55,1	44,2	39,8	48,2	:	47,9	:
1981-90	54,9	57,9	47,6	:	46,2	39,9	51,3	50,8	49,8	53,7	58,5	43,9	42,4	49,0	:	48,4	:
1991	50,7	57,2	48,8	49,1	54,5	44,3	51,0	42,5	53,7	50,3	55,2	46,1	40,5	49,3	49,4	48,9	49,0
1992	51,1	57,0	:	50,1	50,5	44,8	51,2	42,2	54,1	50,3	55,3	47,0	42,2	:	50,1	:	49,6

EUR 12–: including WD; EUR 12+: including D.

[1] EUR 12 excluding Greece, Spain and Portugal.

Table 56

Net lending (+) or net borrowing (−)

General government

(Percentage of GDP at market prices)

	B	DK	WD	D	GR	E	F	IRL	I	L	NL	P	UK	EUR 9−[1] (ECU)	EUR 9+[1] (ECU)	EUR 12− (ECU)	EUR 12+ (ECU)
1960	−2,8	3,1	3,0	:	:	:	0,9	−2,4	−0,9	3,1	0,8	:	−1,0	0,6	:	:	:
1961	−1,3	0,1	2,8	:	:	:	1,0	−3,2	−0,8	4,8	0,1	:	−0,7	0,6	:	:	:
1962	−1,3	0,6	1,4	:	:	:	−0,1	−3,6	−1,0	2,3	−0,6	:	0,0	0,1	:	:	:
1963	−2,1	1,9	0,9	:	:	:	−0,1	−3,6	−1,2	2,6	−1,3	:	−2,8	−0,7	:	:	:
1964	−0,8	1,8	0,7	:	:	:	0,7	−4,1	−0,8	2,2	−1,5	:	−1,1	−0,1	:	:	:
1965	−1,6	1,8	−0,6	:	:	:	0,7	−4,3	−3,8	2,9	−0,8	:	−2,0	−1,1	:	:	:
1966	−1,0	2,3	−0,1	:	:	:	0,6	−2,8	−3,8	1,9	−0,9	:	0,0	−0,5	:	:	:
1967	−1,3	0,4	−1,4	:	:	:	0,0	−3,3	−2,2	−0,7	−1,3	:	−1,0	−1,1	:	:	:
1968	−2,5	1,1	−0,8	:	:	:	−0,8	−3,3	−2,8	−1,7	−0,9	:	−0,5	−1,1	:	:	:
1969	−1,8	1,4	1,1	:	:	:	0,9	−4,2	−3,1	1,2	−0,5	:	−0,6	−0,2	:	:	:
1970	−1,3	2,1	0,2	:	:	:	0,9	−3,7	−3,5	2,8	−0,8	:	2,5	0,1	:	:	:
1961-70	−1,5	1,3	0,4	:	:	:	0,4	−3,6	−2,3	1,8	−0,8	:	−0,6	−0,4	:	:	:
1970	−2,4	4,1	0,2	:	:	0,7	0,9	−4,3	−3,3	3,2	−1,2	:	3,0	0,2	:	:	:
1971	−3,7	3,9	−0,2	:	:	−0,6	0,6	−4,2	−4,8	2,6	−1,0	:	1,3	−0,6	:	:	:
1972	−4,8	3,9	−0,5	:	:	0,3	0,6	−4,1	−7,0	2,3	−0,4	:	−1,3	−1,5	:	:	:
1973	−4,2	5,2	1,2	:	:	1,1	0,6	−4,6	−6,5	3,8	0,8	:	−2,7	−0,9	:	:	:
1974	−3,1	3,1	−1,3	:	:	0,2	0,3	−8,2	−6,4	5,3	−0,2	:	−3,8	−2,0	:	:	:
1975	−5,5	−1,4	−5,6	:	:	0,0	−2,4	−12,5	−10,6	1,1	−2,9	:	−4,5	−5,1	:	:	:
1976	−6,3	−0,3	−3,4	:	:	−0,3	−0,7	−8,6	−8,1	2,0	−2,6	:	−4,9	−3,7	:	:	:
1977	−6,4	−0,6	−2,4	:	:	−0,6	−0,8	−7,6	−7,0	3,3	−1,8	:	−3,2	−3,0	:	:	:
1978	−6,8	−0,4	−2,4	:	:	−1,7	−2,1	−9,7	−8,5	5,0	−2,8	:	−4,4	−3,7	:	:	:
1979	−7,6	−1,7	−2,6	:	:	−1,7	−0,8	−11,4	−8,3	0,7	−3,7	:	−3,3	−3,5	:	:	:
1980	−9,4	−3,3	−2,9	:	:	−2,6	0,0	−12,7	−8,6	−0,8	−4,0	:	−3,4	−3,6	:	:	:
1971-80	−5,8	0,9	−2,0	:	:	−0,6	−0,5	−8,4	−7,6	2,5	−1,9	:	−3,0	−2,8	:	:	:
1981	−13,5	−6,9	−3,7	:	−11,0	−3,9	−1,9	−13,4	−11,4	−3,9	−5,5	−9,3	−2,6	−4,9	:	−5,0	:
1982	−11,5	−9,1	−3,3	:	−7,7	−5,6	−2,8	−13,8	−11,3	−1,6	−7,1	−10,4	−2,5	−5,1	:	−5,2	:
1983	−11,8	−7,2	−2,6	:	−8,3	−4,8	−3,2	−11,8	−10,6	1,5	−6,4	−9,0	−3,3	−5,0	:	−5,1	:
1984	−9,5	−4,1	−1,9	:	−10,0	−5,5	−2,8	−10,4	−11,6	2,8	−6,3	−12,0	−4,0	−4,9	:	−5,1	:
1985	−8,8	−2,0	−1,2	:	−13,8	−6,9	−2,9	−11,7	−12,6	6,0	−4,8	−10,1	−2,8	−4,5	:	−4,9	:
1986	−9,2	3,4	−1,3	:	−12,6	−6,0	−2,7	−11,6	−11,6	4,4	−6,0	−7,2	−2,4	−4,3	:	−4,5	:
1987	−7,3	2,4	−1,9	:	−12,2	−3,1	−1,9	−9,3	−11,0	2,5	−6,6	−6,8	−1,3	−3,9	:	−4,0	:
1988	−6,6	0,6	−2,1	:	−14,4	−3,3	−1,8	−5,1	−10,7	3,3	−5,2	−5,4	1,1	−3,3	:	−3,5	:
1989	−6,5	−0,5	0,2	:	−18,3	−2,8	−1,2	−2,2	−9,9	5,5	−5,2	−3,4	1,2	−2,5	:	−2,7	:
1990	−5,3	−1,4	−1,9	:	−19,6	−4,0	−1,6	−2,6	−11,0	5,6	−5,3	−5,8	−0,8	−3,7	:	−4,0	:
1981-90	−9,0	−2,5	−2,0	:	−12,8	−4,6	−2,3	−9,2	−11,2	2,6	−5,8	−7,9	−1,7	−4,2	:	−4,4	:
1991	−6,3	−2,0	−3,1	−2,9	−16,7	−4,4	−1,7	−2,3	−10,3	2,6	−3,9	−6,4	−2,1	−4,2	−4,1	−4,4	−4,3
1992	−6,0	−2,1	:	−3,4	−13,3	−4,3	−2,0	−2,5	−9,9	2,6	−4,0	−5,4	−5,0	:	−4,7	:	−4,8

EUR 12−: including WD; EUR 12+: including D.

[1] EUR 12 excluding Greece, Spain and Portugal.

Table 57

Budgetary expenditure of the European Communities

(Mio u.a./EUA/ECU)[1]

	ECSC operational budget	European Development Fund	Euratom[2]	EC general budget							Total
				EAGGF[3]	Social Fund	Regional Fund	Industry, energy, research	Amministration[4]	Other	Total EC	
1958	21,7	—	7,9	—	—	—	—	8,6	0,0	8,6	35,5
1959	30,7	51,2	39,1	—	—	—	—	20,3	4,9	25,2	146,2
1960	23,5	63,2	20,0	—	—	—	—	23,4	4,9	28,3	135,0
1961	26,5	172,0	72,5	—	8,6	—	—	27,9	2,9	39,4	305,0
1962	13,6	162,3	88,6	—	11,3	—	—	34,2	46,8	92,3	356,8
1963	21,9	55,5	106,4	—	4,6	—	—	37,2	42,3	84,1	267,9
1964	18,7	35,0	124,4	—	7,2	—	—	43,0	42,9	93,1	271,1
1965	37,3	248,8	120,0	102,7	42,9	—	—	48,1	7,4	201,1	607,2
1966	28,1	157,8	129,2	310,3	26,2	—	—	55,4	10,4	402,3	717,3
1967	10,4	105,8	158,5	562,0	35,6	—	—	60,4	17,1	675,1	949,8
1968	21,2	121,0	73,4	2 250,4	43,0	—	—	91,8	23,5	2 408,7	2 624,2
1969	40,7	104,8	59,2	3 818,0	50,5	—	—	105,6	77,1	4 051,2	4 255,9
1970	56,2	10,5	63,4	5 228,3	64,0	—	—	114,7	41,4	5 448,4	5 578,5
1971	37,4	236,1	—	1 883,6	56,5	—	65,0	132,1	152,2	2 289,3	2 562,8
1972	43,7	212,7	—	2 477,6	97,5	—	75,1	177,2	247,1	3 074,5	3 330,9
1973	86,9	210,0	—	3 768,8	269,2	—	69,1	239,4	294,4	4 641,0	4 937,9
1974	92,0	157,0	—	3 651,3	292,1	—	82,8	336,7	675,2	5 038,2	5 287,2
1975	127,4	71,0	—	4 586,6	360,2	150,0	99,0	375,0	642,8	6 213,6	6 412,0
1976	94,0	320,0	—	6 033,3	176,7	300,0	113,3	419,7	909,5	7 952,6	8 366,6
1977	93,0	244,7	—	6 463,5	325,2	372,5	163,3	497,0	883,4	8 704,9	9 042,6
1978	159,1	394,5	—	9 602,2	284,8	254,9	227,2	676,7	1 302,4	12 348,2	12 901,8
1979	173,9	480,0	—	10 735,5	595,7	671,5	288,0	863,9	1 447,9	14 602,5	15 256,4
1980	175,7	508,5	—	11 596,1	502,0	751,8	212,8	938,8	2 056,1	16 057,5[5]	16 741,7
1981	261,0	658,0	—	11 446,0	547,0	2 264,0	217,6	1 035,4	3 024,6	18 546,0[6]	19 465,0
1982	243,0	750,0	—	12 792,0	910,0	2 766,0[7]	346,0	1 103,3	3 509,7	21 427,0[8]	22 420,0
1983	300,0	752,0	—	16 331,3	801,0	2 265,5	1 216,2	1 161,6	2 989,9	24 765,5[9]	25 817,5
1984	408,0	703,0	—	18 985,8	1 116,4	1 283,3	1 346,4	1 236,6	2 150,8	26 119,3[10]	27 230,3
1985	453,0	698,0	—	20 546,4	1 413,0	1 624,3	706,9	1 332,6	2 599,8	28 223,0[11]	29 374,0
1986	439,0	846,7	—	23 067,7	2 533,0	2 373,0	760,1	1 603,2	4 526,2	34 863,2	36 148,9
1987	399,3	837,9	—	23 939,4	2 542,2	2 562,3	964,8	1 740,0	3 720,5	35 469,2	36 706,4
1988	567,0	1 196,3	—	27 531,9	2 298,8	3 092,8	1 203,7	1 947,0	6 186,8	42 261,0	44 024,3
1989	404,0	1 297,0	—	25 868,8	2 676,1	3 920,0	1 353,0	2 063,0	9 978,9[12]	45 899,8	47 600,8
1990	488,0	1 371,0	—	29 525,5	3 677,4	5 007,5	1 763,5	2 362,1	4 341,3	46 677,3[13]	48 536,3
1991	495,0	1 467,0	—	35 458,0	4 069,0	6 309,0	2 077,1	2 827,7	6 681,2	57 422,0[14]	59 382,0
1992	—	—	—	36 008,0	4 872,2	7 702,8	2 154,3	2 932,0	8 738,0	62 407,3[15]	62 407,3

1 u.a. until 1977, EUA/ECU from 1978 onwards.
2 Incorporated in the EC-Budget from 1971.
3 This column includes, for the years to 1970, substantial amounts carried forward to following years.
4 Commission, Council, Parliament, Court of Justice and Court of Auditors.
5 Including surplus of ECU 82,4 million carried forward to 1981.
6 Including ECU 1 173 million carried forward to 1982.
7 Including ECU 1 819 million UK special measures.
8 Including ECU 2 211 million carried forward to 1983.
9 Including ECU 1 707 million carried forward to 1984.
10 There was a small deficit in 1984 in respect of EC Budget due largely to late payment of advances by some Member States.
11 There was a cash deficit in 1985 of ECU 25 million due to late payment of advances by some Member States.
12 Includes a surplus of ECU 5 080 million carried forward to 1990.
13 Rectifying and supplementary budget No 2 of 1990.
14 Rectifying and supplementary budget No 1 of 1991.
15 Draft general budget for 1992.

Source: 1958-89: management accounts.

Table 58

Budgetary receipts of the European Communities

(Mio u.a./EUA/ECU)[1]

	ECSC levies and other	European Development Fund contributions	Euratom contributions (research only)	EC budget						Total
				Miscellaneous and contributions under special keys	Own resources				Total EC	
					Miscellaneous	Agricultural levies	Import duties	GNP contributions or VAT[2, 3]		
1958	44,0	116,0	7,9	0,02	—	—	—	5,9	5,9	173,8
1959	49,6	116,0	39,1	0,1	—	—	—	25,1	25,2	229,9
1960	53,3	116,0	20,0	0,2	—	—	—	28,1	28,3	217,6
1961	53,1	116,0	72,5	2,8	—	—	—	31,2	34,0	275,6
1962	45,3	116,0	88,6	2,1	—	—	—	90,2	92,3	342,2
1963	47,1	—	106,4	6,7	—	—	—	77,4	84,1	237,5
1964	61,3	—	124,4	2,9	—	—	—	90,1	93,1	278,7
1965	66,1	—	98,8	3,5	—	—	—	197,6	201,1	366,0
1966	71,2	—	116,5	3,9	—	—	—	398,3	402,2	590,0
1967	40,3	40,0	158,5	4,2	—	—	—	670,9	675,1	913,9
1968	85,4	90,0	82,0	—	—	—	—	—	2 408,6	2 666,0
1969	106,8	110,0	62,7	78,6	—	—	—	3 972,6	4 051,2	4 330,7
1970	100,0	130,0	67,7	121,1	—	—	—	5 327,3	5 448,4	5 746,1
1971	57,9	170,0	—	—	69,5	713,8	582,2	923,8	2 289,3	2 517,2
1972	61,1	170,0	—	—	80,9	799,6	957,4	1 236,6	3 074,5	3 305,6
1973	120,3	150,0	—	—	511,0	478,0	1 564,7	2 087,3	4 641,0	4 911,3
1974	124,6	150,0	—	—	65,3	323,6	2 684,4	1 964,8	5 038,2	5 312,8
1975	189,5	220,1	—	—	320,5	590,0	3 151,0	2 152,0	6 213,6	6 623,1
1976	129,6	311,0	—	—	282,8	1 163,7	4 064,6	2 482,1	7 993,1[4]	8 433,7
1977	123,0	410,0	—	—	504,7	1 778,5	3 927,2	2 494,5	8 704,9	9 237,9
1978	164,9	147,5	—	—	344,4	2 283,3	4 390,9	5 329,7	12 348,2	12 660,6
1979	168,4	480,0	—	—	230,3	2 143,4	5 189,1	7 039,8	14 602,5	15 251,0
1980	226,2	555,0	—	—	1 055,9[5]	2 002,3	5 905,8	7 093,5	16 057,5[6]	16 838,7
1981	264,0	658,0	—	—	1 219,0	1 747,0	6 392,0	9 188,0	18 546,0[7]	19 468,0
1982	243,0	750,0	—	—	187,0	2 228,0	6 815,0	12 197,0	21 427,0	22 420,0
1983	300,0	700,0	—	—	1 565,0	2 295,0	6 988,7	13 916,8	24 765,5[8]	25 765,5
1984	408,0	703,0	—	—	1 060,7[9]	2 436,3	7 960,8	14 594,6	26 052,4[10]	27 163,4
1985	453,0	698,0	—	—	2 491,0[11]	2 179,0	8 310,0	15 218,0	28 198,0	29 349,0
1986	439,0	846,7	—	—	396,5	2 287,0	8 172,9	22 810,8	33 667,2	34 952,9
1987	399,3	837,9	—	—	74,8	3 097,9	8 936,5	23 674,1	35 783,3	37 020,5
1988	567,0	1 196,3	—	—	1 377,0	2 606,0	9 310,0	28 968,0	42 261,0	44 024,3
1989	404,0	1 297,0	—	—	4 018,4	2 397,9	10 312,9	29 170,6	45 899,8	47 600,8
1990	488,0	1 371,0	—	—	5 419,0	2 283,2	11 349,9	27 625,2	46 677,3[12]	48 536,3
1991	495,0	1 467,0	—	—	4 356,0	2 295,4	11 949,7	38 821,8	57 420,0[13]	59 382,0
1992	—	—	—	—	413,2	2 328,6	11 599,9	48 065,6	62 407,3[14]	62 407,3

NB: From 1988 onwards agricultural levies, sugar levies and customs duties are net of 10% collection costs previously included as an expenditure item.

1 u.a. until 1977, EUA/ECU from 1978 onwards.
2 GNP until 1978, VAT from 1979 until 1987; GNP from 1988 onwards.
3 This column includes, for the years to 1970, surplus revenue from previous years carried forward to following years.
4 As a result of the calculations to establish the relative shares of the Member States in the 1976 budget, an excess of revenue over expenditure occurred amounting to 40,5 million u.a. This was carried forward to 1977.
5 Including surplus brought forward from 1979 and balance of 1979 VAT and financial contributions.
6 Including surplus of ECU 82,4 million carried forward to 1981.
7 Including surplus of ECU 661 million.
8 Includes surplus of ECU 307 million.
9 Includes ECU 593 million of repayable advances by Member States.
10 See note 10 to Table 57.
11 Includes non-repayable advances by Member States of 1981, ECU 6 million.
12 Rectifying and supplementary budget No 2 1990.
13 Rectifying and supplementary budget No 1 of 1991.
14 Draft general budget for 1992.

Source: 1958-89: management accounts.

Table 59

Borrowing operations of the European Communities and of the European Investment Bank

(Mio u.a./EUA/ECU)[1]

	ECEC	EIB	Euratom	EEC[2]	EEC-NCI[3]	Total
1958	50	—	—	—	—	50
1959	—	—	—	—	—	—
1960	35	—	—	—	—	35
1961	23	21	—	—	—	44
1962	70	32	—	—	—	102
1963	33	35	5[4]	—	—	73
1964	128	67	8[4]	—	—	203
1965	54	65	11[4]	—	—	130
1966	103	139	14[4]	—	—	256
1967	58	195	3[4]	—	—	256
1968	108	213	—	—	—	321
1969	52	146	—	—	—	198
1970	60	169	—	—	—	229
1971	102	413	1[4]	—	—	516
1972	230	462	—	—	—	692
1973	263	608	—	—	—	871
1974	528	826	—	—	—	1 354
1975	731	814	—	—	—	1 545
1976	956	732	—	1 249	—	2 937
1977	729	1 030	99	571	—	2 429
1978	981	1 863	72	—	—	2 916
1979	837	2 437	153	—	178	3 605
1980	1 004	2 384	181	—	305	3 874
1981	325	2 243	373	—	339	3 280
1982	712	3 146	363	—	773	4 994
1983	750	3 508	369	4 247	1 617	10 491
1984	822	4 339[5]	214	—	967	6 342
1985	1 265	5 699[5]	344	—	860	8 168
1986	1 517	6 786	488	862	541	10 194
1987	1 487	5 593	853	860	611	9 404
1988	880[6]	7 666	93	—	945[6]	9 584
1989	913	9 034	—	—	522	10 469
1990	1 086	10 996	—	350[7]	76	12 508
1991	1 446	13 672	—	1 695[7]	49	16 862

[1] ECSC: 1958-74 u.a., 1975-89 EUA/ECU. EIB: 1961-73 u.a., 1974-89 EUA/ECU. Euratom: 1963-73 u.a., 1974-89 EUA/ECU.
[2] EEC balance-of-payments financing.
[3] EEC new Community instrument (for investment).
[4] Drawings under credit lines opened with Eximbank (USA).
[5] Including short-term borrowing.
[6] Including the Community loan 'Jean Monnet' of ECU 500 million which has been divided equally under the headings ECSC and NCI.
[7] EEC balance of payments financing and financial assistance to non-member countries.

Source: European Economy: report on the borrowing and lending activities of the Community.

Table 60

Net outstanding borrowing of the European Communities and of the European Investment Bank

(Mio u.a./EUA/ECU)[1]

	ECEC	EIB	Euratom	EEC[2]	EEC-NCI[3]	Total
1958	212	—	—	—	—	212
1959	209	—	—	—	—	209
1960	236	—	—	—	—	236
1961	248	21	—	—	—	269
1962	304	54	—	—	—	358
1963	322	88	—	—	—	410
1964	436	154	—	—	—	590
1965	475	217	—	—	—	692
1966	560	355	—	—	—	915
1967	601	548	—	—	—	1 149
1968	686	737	—	—	—	1 423
1969	719	883	—	—	—	1 602
1970	741	1 020	—	—	—	1 761
1971	802	1 423	—	—	—	2 225
1972	963	1 784	—	—	—	2 747
1973	1 157	2 287	—	—	—	3 444
1974	1 615	3 124	—	—	—	4 739
1975	2 391	3 926	—	—	—	6 317
1976	3 478	4 732	—	1 161	—	9 371
1977	3 955	5 421	99	1 500	—	10 975
1978	4 416	6 715	172	1 361	—	12 664
1979	4 675	8 541	323	965	178	14 682
1980	5 406	10 604	502	1 016	491	18 019
1981	5 884	13 482	902	1 062	894	22 224
1982	6 178	16 570	1 272	591	1 747	26 358
1983	6 539	20 749	1 680	4 610	3 269	36 847
1984	7 119	25 007	1 892	4 932	4 432	43 382
1985	7 034	26 736	2 013	3 236	4 960	43 979
1986	6 761	30 271	2 168	1 890	5 202	46 292
1987	6 689	31 957	2 500	2 997	5 229	49 372
1988	6 825	36 928	2 164	2 459	5 514	53 890
1989[5]	6 738	42 330	1 945	2 075	5 122	58 210
1990[5]	6 673	48 459	1 687	2 045[4]	4 542	63 406
1991[5]	7 139	58 893	1 563	3 516[4]	3 817	74 928

[1] ECSC: 1958-74 u.a., 1975-89 EUA/ECU. EIB: 1961-73 u.a., 1974-89 EUA/ECU. Euratom: 1963-73 u.a., 1974-89 EUA/ECU.
[2] EEC balance-of-payments financing.
[3] EEC new Community instrument (for investment).
[4] EEC balance-of-payments financing and financial assistance to non-member countries.
[5] Including short-term, new EIB approach.

Source: European Economy: report on the borrowing and lending activities of the Community.

Table 61

Main economic indicators 1961-92[1]

EUR 12 – [2]

(Annual percentage change, unless otherwise stated)

	1961-73	1974-83	1984	1985	1986	1987	1988	1989	1990	1991	1992
1. Gross domestic product											
— at current prices	10,2	13,6	9,3	8,5	8,5	7,0	8,7	8,4	8,3	7,0	6,5
— at constant prices											
including West Germany	4,8	1,9	2,3	2,4	2,8	2,9	4,0	3,3	2,8	1,3	1,7
including unified Germany	:	:	:	:	:	:	:	:	:	:	1,7
2. Gross fixed capital formation at constant prices											
— total	5,6	−0,4	0,9	2,2	4,3	5,5	8,6	7,3	4,2	−0,1	0,7
— construction[3]	:	:	−0,3	−1,7	3,9	3,1	6,3	5,8	4,5	0,5	1,3
— equipment[3]	:	:	3,4	8,0	4,1	8,4	11,5	8,3	5,2	−0,2	0,3
3. Gross fixed capital formation at current prices (% of GDP)											
— total	23,2	21,5	19,2	19,0	19,0	19,3	20,0	20,7	20,9	20,3	20,0
— general government[4]	:	3,3	2,8	2,8	2,8	2,7	2,6	2,8	2,9	2,9	2,8
— other sectors[4]	:	18,2	16,4	16,2	16,2	16,6	17,4	17,9	18,0	17,4	17,1
4. Final national uses including stocks											
— at constant prices	4,9	1,5	1,7	2,3	4,0	3,9	4,9	3,6	2,8	1,2	1,7
— relative against nine other OECD countries	−0,6	−0,6	−3,5	−1,7	0,1	−0,3	0,0	−0,2	1,0	1,6	0,4
5. Inflation											
— price deflator private consumption	4,6	11,7	7,3	5,9	3,8	3,6	3,8	4,9	4,8	5,2	4,6
— price deflator GDP	5,2	11,5	6,8	6,0	5,6	4,1	4,5	4,9	5,3	5,5	4,8
6. Compensation per employee											
— nominal	9,9	13,9	7,4	6,9	6,4	5,6	5,8	6,0	7,4	7,1	5,6
— real, deflator private consumption	5,0	2,0	0,1	1,0	2,5	1,9	1,9	1,1	2,5	1,7	1,0
— real, deflator GDP	4,5	2,1	0,6	0,9	0,7	1,4	1,2	1,1	2,0	1,4	0,8
7. GDP at constant market prices per person employed	4,4	2,0	2,2	1,9	2,1	1,7	2,4	1,8	1,2	1,2	1,8
8. Real unit labour costs											
— 1961-73 = 100	100,0	103,6	100,1	99,1	97,8	97,5	96,4	95,7	96,4	96,7	95,7
— annual percentage change	0,1	0,1	−1,6	−1,0	−1,4	−0,3	−1,1	−0,7	0,8	0,2	−1,0
9. Relative unit labour costs in common currency against nine other OECD countries											
— 1961-73 = 100	100,0	105,1	85,0	84,9	93,3	100,2	98,5	95,6	107,5	105,1	108,5
— annual percentage change	1,0	−1,4	−7,5	0,0	9,9	7,4	−1,8	−2,9	12,4	−2,2	3,2
10. Employment	0,3	−0,1	0,1	0,5	0,6	1,1	1,5	1,5	1,6	0,2	−0,1
11. Unemployment rate[5] (percentage of civilian labour force)	2,1	6,0	10,6	10,8	10,7	10,3	9,8	8,9	8,3	8,8	9,4
12. Current balance (% of GDP)											
including West Germany	0,4	−0,3	0,3	0,7	1,3	0,7	0,1	−0,1	−0,3	−0,6	−0,7
including unified Germany	:	:	:	:	:	:	:	:	:	−1,1	−1,0
13. Net lending (+) or net borrowing (−) of general government (% of GDP)[6]											
including West Germany	−0,5	−4,0	−5,1	−4,9	−4,5	−4,0	−3,5	−2,7	−4,0	−4,4	−4,9
including unified Germany	:	:	:	:	:	:	:	:	:	−4,3	−4,8
14. Gross debt of general government (% of GDP)[6]	:	45,1	56,1	58,6	59,4	60,9	60,4	59,7	59,5	61,3	63,5
15. Interest payments by general government (% of GDP)[6]	:	3,1	4,7	4,9	4,9	4,7	4,6	4,7	4,9	5,1	5,2
16. Money supply (end of year)[7]	12,6	12,8	10,5	9,6	9,7	9,6	10,1	11,1	8,5	6,4	:
17. Long-term interest rate (%)	7,1	11,7	11,5	10,6	8,9	9,0	9,1	9,6	10,9	10,2	9,7
18. Profitability (1961-73 = 100)	100,0	71,0	73,2	76,2	82,0	84,1	88,6	91,2	90,0	89,3	91,5

1 1961-90: Eurostat and Commission services; 1991 – 92: Economic forecasts April-May 1992.
2 Including West Germany, unless otherwise stated.
3 1974-83: EUR 12 excluding Portugal.
4 EUR 12 excluding Greece and Portugal.
5 1961-73: EUR 12 excluding Greece, Spain and Portugal.
6 1961-73, 1974-83: EUR 12 excluding Greece, Spain, the Netherlands and Portugal.
7 Broad money supply M2 or M3 according to country; 1961-73: EUR 12 excluding Spain, Portugal and the United Kingdom.

Table 62

Main economic indicators 1961-92[1]

Belgium

(Annual percentage change, unless otherwise stated)

	1961-73	1974-83	1984	1985	1986	1987	1988	1989	1990	1991	1992
1. Gross domestic product											
— at current prices	9,2	8,9	7,4	7,0	5,2	4,4	6,5	8,5	6,9	4,5	5,0
— at constant prices	4,9	1,8	2,1	0,8	1,5	2,2	4,9	3,6	3,8	1,4	1,6
2. Gross fixed capital formation at constant prices											
— total	5,1	−1,0	1,7	0,7	4,4	5,6	15,2	14,5	8,3	−0,2	1,4
— construction	:	−2,4	−6,1	−0,6	3,0	3,3	13,2	8,9	6,7	−1,6	1,4
— equipment	:	2,4	13,6	2,3	5,3	7,2	13,8	18,2	10,3	1,5	1,4
3. Gross fixed capital formation at current prices (% of GDP)											
— total	21,8	20,4	16,0	15,6	15,7	16,0	17,7	19,5	20,3	19,9	19,9
— general government	:	3,9	2,7	2,2	2,0	1,8	1,8	1,6	1,5	1,5	1,5
— other sectors	:	16,5	13,3	13,4	13,7	14,2	15,9	17,9	18,8	18,4	18,4
4. Final national uses including stocks											
— at constant prices	4,8	1,1	2,3	0,5	2,8	3,9	4,4	4,9	3,4	1,2	1,6
— relative against 19 competitors	−0,1	−0,5	−0,5	−2,1	−0,8	0,6	0,3	1,5	0,5	0,3	0,2
— relative against other member countries	0,0	−0,3	0,5	−1,6	−0,8	0,7	0,3	1,6	0,2	−0,2	0,2
5. Inflation											
— price deflator private consumption	3,7	7,8	5,7	6,0	0,5	1,7	1,2	3,6	3,6	3,2	3,1
— price deflator GDP	4,1	6,9	5,2	6,1	3,7	2,2	1,5	4,7	3,0	3,1	3,4
6. Compensation per employee											
— nominal	8,9	10,1	6,5	4,6	4,7	1,7	2,2	3,6	6,4	5,0	5,0
— real, deflator private consumption	5,0	2,2	0,8	−1,3	4,1	0,0	1,0	0,0	2,7	1,8	1,8
— real, deflator GDP	4,6	3,0	1,3	−1,4	0,9	−0,5	0,8	−1,1	3,3	1,9	1,6
7. GDP at constant market prices per person employed	4,3	2,2	2,3	0,2	0,8	1,7	3,4	2,0	2,7	1,7	2,2
8. Real unit labour costs											
— 1961-73 = 100	100,0	111,4	109,9	108,1	108,2	105,9	103,2	100,0	100,6	100,8	100,3
— annual percentage change	0,3	0,7	−1,0	−1,7	0,1	−2,1	−2,6	−3,0	0,6	0,2	−0,6
9. Relative unit labour costs in common currency											
against 19 competitors											
— 1961-73 = 100	100,0	107,3	86,5	88,1	93,4	94,3	89,9	87,9	91,6	90,0	90,3
— annual percentage change	−0,3	−1,5	−1,2	1,8	6,0	0,9	−4,7	−2,2	4,2	−1,8	0,3
against other member countries											
— 1961-73 = 100	100,0	104,9	89,6	91,4	94,5	93,7	89,6	88,3	89,5	88,4	87,9
— annual percentage change	−0,7	−1,1	1,0	1,9	3,5	−0,9	−4,3	−1,4	1,3	−1,3	−0,5
10. Employment	0,6	−0,4	−0,2	0,6	0,6	0,5	1,5	1,6	1,1	−0,3	−0,6
11. Unemployment rate (percentage of civilian labour force)	:	7,3	12,5	11,8	11,7	11,3	10,2	8,6	7,8	8,3	9,2
12. Current balance (% of GDP)	1,1	−1,7	−0,6	0,3	2,1	1,3	1,7	1,7	1,2	1,4	1,4
13. Net lending (+) or net borrowing (−) of general government (% of GDP)	:	−8,2	−9,5	−8,8	−9,2	−7,3	−6,6	−6,5	−5,3	−6,3	−6,0
14. Gross debt of general government (% of GDP)	:	75,6	112,6	119,8	124,0	131,2	132,6	128,7	127,5	129,7	130,6
15. Interest payments by general government (% of GDP)	3,1	5,8	10,0	10,8	11,4	10,8	10,3	10,6	10,9	10,6	10,9
16. Money supply (end of year)[2]	10,1	9,9	5,8	7,8	12,7	10,2	7,7	13,2	4,5	4,9	:
17. Long-term interest rate (%)	6,5	10,5	12,0	10,6	7,9	7,8	7,9	8,7	10,1	9,3	8,8
18. Profitability (1961-73 = 100)	100,0	65,6	63,8	68,0	69,7	75,2	81,9	89,7	89,6	87,8	87,5

[1] 1961-90: Eurostat and Commission services; 1991-92: Economic forecasts April-May 1992.
[2] M3H.

Table 63

Main economic indicators 1961-92[1]

Denmark

(Annual percentage change, unless otherwise stated)

	1961-73	1974-83	1984	1985	1986	1987	1988	1989	1990	1991	1992
1. Gross domestic product											
— at current prices	11,7	11,5	10,3	8,8	8,4	5,0	4,6	5,2	3,9	4,0	4,5
— at constant prices	4,3	1,5	4,4	4,3	3,6	0,3	1,2	0,8	1,7	1,0	2,4
2. Gross fixed capital formation at constant prices											
— total	6,5	−3,4	12,9	12,6	17,1	−3,8	−6,6	−0,6	−0,5	−2,1	0,9
— construction	:	−5,7	8,8	8,9	18,0	1,1	−4,5	−4,6	−4,6	−8,2	−0,1
— equipment	:	1,0	17,9	16,2	16,6	−8,9	−9,8	6,3	4,3	4,3	1,7
3. Gross fixed capital formation at current prices (% of GDP)											
— total	24,0	19,9	17,2	18,7	20,8	19,7	18,1	17,8	17,7	17,1	17,0
— general government	:	3,4	1,9	2,2	1,6	1,8	1,9	1,7	1,7	1,8	1,7
— other sectors	:	16,5	15,3	16,6	19,1	17,9	16,2	16,1	16,0	15,3	15,3
4. Final national uses including stocks											
— at constant prices	4,6	0,5	5,1	5,4	6,1	−2,2	−1,2	0,4	−0,8	−0,1	1,8
— relative against 19 competitors	0,1	−1,1	1,6	2,4	2,3	−5,5	−5,2	−2,8	−3,1	−0,4	0,6
— relative against other member countries	0,2	−0,8	3,2	3,3	2,3	−5,5	−5,5	−2,9	−3,8	−1,3	0,3
5. Inflation											
— price deflator private consumption	6,6	10,5	6,4	4,3	2,9	4,6	4,0	5,0	2,1	2,5	2,2
— price deflator GDP	7,0	9,8	5,7	4,3	4,6	4,7	3,4	4,3	2,1	3,0	2,0
6. Compensation per employee											
— nominal	10,7	11,1	5,5	4,7	4,4	7,9	5,0	3,8	3,4	3,5	3,3
— real, deflator private consumption	3,8	0,6	−0,8	0,4	1,5	3,1	1,0	−1,2	1,3	1,0	1,1
— real, deflator GDP	3,4	1,2	−0,1	0,4	−0,2	3,0	1,5	−0,5	1,3	0,5	1,3
7. GDP at constant market prices per person employed	3,2	1,3	2,6	1,7	1,0	−0,6	1,8	1,5	2,3	2,0	2,9
8. Real unit labour costs											
— 1961-73 = 100	100,0	101,2	94,9	93,6	92,5	95,9	95,7	93,8	92,8	91,5	90,0
— annual percentage change	0,2	−0,1	−2,7	−1,3	−1,2	3,6	−0,2	−2,0	−1,0	−1,4	−1,6
9. Relative unit labour costs in common currency against 19 competitors											
— 1961-73 = 100	100,0	113,0	95,7	96,2	101,7	111,3	109,3	104,9	108,3	102,6	100,8
— annual percentage change	2,2	−1,2	−4,1	0,6	5,7	9,4	−1,7	−4,1	3,2	−5,3	−1,7
against other member countries											
— 1961-73 = 100	100,0	110,1	99,5	100,4	102,3	109,0	108,2	105,4	104,3	99,5	96,4
— annual percentage change	1,7	−0,9	−0,8	0,9	1,9	6,5	−0,8	−2,5	−1,0	−4,7	−3,1
10. Employment	1,1	0,2	1,7	2,5	2,6	0,9	−0,6	−0,7	−0,5	−0,9	−0,5
11. Unemployment rate (percentage of civilian labour force)	:	6,1	8,7	7,2	5,5	5,6	6,4	7,7	8,0	8,6	9,2
12. Current balance (% of GDP)	−2,0	−3,4	−3,3	−4,6	−5,4	−2,9	−1,3	−1,5	0,5	1,3	1,7
13. Net lending (+) or net borrowing (−) of general government (% of GDP)	:	−2,8	−4,1	−2,0	3,4	2,4	0,6	−0,5	−1,4	−2,0	−2,1
14. Gross debt of general government (% of GDP)	:	32,9	79,8	76,8	69,0	65,8	66,4	66,1	66,5	71,7	72,7
15. Interest payments by general government (% of GDP)	:	3,5	9,6	9,9	8,8	8,3	8,0	7,5	7,3	7,3	7,2
16. Money supply (end of year)[2]	10,6	12,8	17,8	15,8	8,4	4,1	3,5	8,3	7,1	6,4	:
17. Long-term interest rate (%)	9,0	16,6	14,0	11,6	10,6	11,9	10,6	10,2	11,0	10,1	9,9
18. Profitability (1961-73 = 100)	100,0	71,6	80,9	84,2	89,7	81,1	80,7	82,7	82,1	83,8	86,5

[1] 1961-90: Eurostat and Commission services; 1991-92: Economic forecasts April-May 1992.
[2] M2.

Table 64

Main economic indicators 1961-92[1]

Germany[2]

(Annual percentage change, unless otherwise stated)

	1961-73	1974-83	1984	1985	1986	1987	1988	1989	1990	1991	1992
1. Gross domestic product											
— at current prices	8,9	6,2	4,9	4,1	5,6	3,4	5,3	6,0	8,3	8,2	6,5
— at constant prices											
West Germany	4,3	1,6	2,8	1,9	2,2	1,4	3,7	3,3	4,7	3,4	2,0
unified Germany	:	:	:	:	:	:	:	:	:	:	2,2
2. Gross fixed capital formation at constant prices											
— total	4,0	−0,2	0,3	0,0	3,6	2,1	4,6	7,0	8,8	6,7	2,8
— construction	:	−1,0	1,6	−5,6	2,7	−0,3	3,3	5,1	5,3	4,1	4,2
— equipment	:	1,5	−0,2	9,9	4,3	5,6	7,7	10,0	12,9	9,4	1,4
3. Gross fixed capital formation at current prices (% of GDP)											
— total	24,9	21,0	20,0	19,5	19,4	19,4	19,6	20,3	21,2	21,9	22,1
— general government	4,2	3,4	2,4	2,4	2,5	2,4	2,3	2,4	2,4	2,3	2,3
— other sectors	20,8	17,6	17,6	17,2	16,9	17,0	17,2	18,0	18,8	19,6	19,8
4. Final national uses including stocks											
— at constant prices	4,5	1,3	1,9	0,9	3,3	2,6	3,6	2,6	5,0	3,0	1,7
— relative against 19 competitors	−0,5	−0,4	−1,5	−2,1	−0,3	−1,0	−0,8	−0,9	2,8	2,7	0,4
— relative against other member countries	−0,3	−0,2	0,0	−1,6	−0,5	−1,0	−1,0	−1,0	2,8	2,4	0,2
5. Inflation											
— price deflator private consumption	3,5	4,9	2,6	2,1	−0,3	0,8	1,4	3,0	2,7	3,6	3,9
— price deflator GDP	4,4	4,5	2,1	2,2	3,3	1,9	1,6	2,6	3,4	4,6	4,4
6. Compensation per employee											
— nominal	9,1	6,3	3,4	2,9	3,6	3,2	3,0	2,9	4,3	5,8	5,2
— real, deflator private consumption	5,4	1,4	0,7	0,8	3,9	2,4	1,6	−0,2	1,6	2,1	1,2
— real, deflator GDP	4,5	1,7	1,3	0,7	0,3	1,2	1,4	0,3	0,9	1,2	0,7
7. GDP at constant market prices per person employed	4,0	1,9	2,6	1,1	0,8	0,7	2,9	1,9	1,8	0,8	0,9
8. Real unit labour costs											
— 1961-73 = 100	100,0	104,3	100,6	100,2	99,7	100,2	98,8	97,2	96,4	96,7	96,5
— annual percentage change	0,5	−0,2	−1,3	−0,4	−0,5	0,5	−1,4	−1,6	−0,8	0,4	−0,2
9. Relative unit labour costs in common currency against 19 competitors											
— 1961-73 = 100	100,0	109,6	94,5	92,9	101,9	108,1	104,3	100,2	103,1	101,9	104,4
— annual percentage change	2,3	−2,0	−4,6	−1,7	9,7	6,1	−3,6	−3,9	2,9	−1,2	2,5
against other member countries											
— 1961-73 = 100	100,0	109,2	101,7	99,8	106,3	110,1	106,2	102,9	100,9	100,5	101,8
— annual percentage change	2,2	−1,6	−1,6	−1,9	6,5	3,6	−3,5	−3,2	−2,0	−0,4	1,3
10. Employment	0,3	−0,3	0,2	0,7	1,4	0,7	0,8	1,4	2,9	2,6	1,0
11. Unemployment rate (percentage of civilian labour force)	:	3,7	7,1	7,1	6,5	6,3	6,3	5,6	4,8	4,3	4,4
12. Current balance (% of GDP)											
West Germany	0,7	0,6	1,4	2,4	4,3	4,1	4,3	4,9	3,2	0,8	0,3
unified Germany	:	:	:	:	:	:	:	:	:	−1,3	−0,9
13. Net lending (+) or net borrowing (−) of general government (% of GDP)											
West Germany	0,4	−3,0	−1,9	−1,2	−1,3	−1,9	−2,1	0,2	−1,9	−3,1	−3,4
unified Germany	:	:	:	:	:	:	:	:	:	−2,9	−3,4
14. Gross debt of general government (% of GDP)	:	31,1	41,7	42,5	42,5	43,8	44,4	43,3	43,8	44,9	47,6
15. Interest payments by general government (% of GDP)	0,9	1,9	3,0	3,0	3,0	2,9	2,9	2,7	2,6	2,9	3,1
16. Money supply (M3; end of year)	10,9	7,7	4,7	5,0	6,6	5,9	6,9	5,5	4,2	6,3	:
17. Long-term interest rate (%)	7,2	8,2	7,8	6,9	5,9	5,8	6,1	7,0	8,9	8,6	8,2
18. Profitability (1961-73 = 100)	100,0	73,0	71,9	73,3	76,8	75,9	80,5	84,5	88,3	88,1	87,6

[1] 1961-90: Eurostat and Commission services; 1991-92: Economic forecasts April-May 1992.
[2] West Germany, unless otherwise stated.

Table 65

Main economic indicators 1961-92[1]

Greece

(Annual percentage change, unless otherwise stated)

	1961-73	1974-83	1984	1985	1986	1987	1988	1989	1990	1991	1992
1. Gross domestic product											
— at current prices	12,5	20,3	23,6	21,3	19,4	13,5	20,3	16,6	19,1	18,0	17,1
— at constant prices	7,7	2,5	2,8	3,1	1,6	−0,7	4,1	3,5	−0,2	1,8	2,0
2. Gross fixed capital formation at constant prices											
— total	10,0	−1,9	−5,7	5,2	−6,2	−5,1	8,9	10,0	4,8	−1,9	3,0
— construction	:	−3,4	−6,9	3,1	−0,8	−7,7	8,3	2,0	5,5	−6,4	2,0
— equipment	:	0,5	−4,2	7,7	−12,6	−9,9	9,5	17,4	5,7	3,3	4,0
3. Gross fixed capital formation at current prices (% of GDP)											
— total	22,7	22,4	18,5	19,1	18,5	17,2	17,5	19,2	19,7	19,3	19,2
— general government	:	:	4,1	4,4	4,1	3,2	3,2	3,4	3,1	3,7	3,7
— other sectors	:	:	14,3	14,7	14,3	14,0	14,3	15,9	16,6	15,6	15,5
4. Final national uses including stocks											
— at constant prices	8,1	1,7	0,0	5,4	−1,1	−1,5	6,7	3,8	0,8	2,3	1,2
— relative against 19 competitors	3,1	0,0	−3,2	2,7	−4,6	−4,8	2,3	0,5	−1,9	1,2	−0,3
— relative against other member countries	3,3	0,2	−2,0	3,3	−4,7	−4,7	2,3	0,5	−2,2	0,8	−0,4
5. Inflation											
— price deflator private consumption	3,5	17,3	17,9	18,3	22,1	15,7	14,3	15,2	20,1	19,5	16,0
— price deflator GDP	4,5	17,4	20,3	17,7	17,5	14,3	15,6	12,7	19,3	15,9	14,9
6. Compensation per employee											
— nominal	10,4	21,6	20,7	23,4	12,5	9,8	21,1	18,1	20,3	15,0	11,3
— real, deflator private consumption	6,7	3,7	2,4	4,3	−7,9	−5,1	6,0	2,5	0,2	−3,8	−4,1
— real, deflator GDP	5,7	3,6	0,3	4,8	−4,3	−3,9	4,8	4,8	0,8	−0,8	−3,1
7. GDP at constant market prices per person employed	8,1	1,4	2,4	2,2	1,3	−0,6	2,5	3,1	−0,4	4,0	2,5
8. Real unit labour costs											
— 1961-73 = 100	100,0	97,6	105,1	107,9	101,9	98,6	100,8	102,4	103,7	98,9	93,5
— annual percentage change	−2,2	2,2	−2,0	2,6	−5,5	−3,3	2,3	1,6	1,2	−4,6	−5,5
9. Relative unit labour costs in common currency against 19 competitors											
— 1961-73 = 100	100,0	78,9	79,1	77,7	65,7	63,4	67,9	69,8	73,9	68,9	66,6
— annual percentage change	−3,9	0,9	−2,4	−1,8	−15,5	−3,4	7,1	2,7	6,0	−6,8	−3,4
against other member countries											
— 1961-73 = 100	100,0	77,0	83,7	82,2	67,4	63,7	68,5	71,1	72,6	68,1	65,2
— annual percentage change	−4,4	1,5	0,4	−1,7	−18,0	−5,5	7,6	3,7	2,2	−6,2	−4,3
10. Employment	−0,4	1,1	0,3	0,9	0,3	−0,1	1,6	0,4	0,2	−2,0	−0,5
11. Unemployment rate (percentage of civilian labour force)	:	3,2	8,1	7,7	7,4	7,4	7,6	7,4	7,0	7,0	7,9
12. Current balance (% of GDP)	−2,9	−2,3	−4,0	−8,2	−5,3	−3,1	−2,0	−5,0	−6,2	−5,1	−3,4
13. Net lending (+) or net borrowing (−) of general government (% of GDP)	:	:	−10,0	−13,8	−12,6	−12,2	−14,4	−18,3	−19,6	−16,7	−13,3
14. Gross debt of general government (% of GDP)	:	29,7	53,2	62,6	65,0	72,5	80,2	86,0	96,3	103,3	104,0
15. Interest payments by general government (% of GDP)	:	2,1	4,6	5,3	5,7	7,2	7,9	8,2	12,1	13,3	12,5
16. Money supply (end of year)[2]	18,2	25,0	29,4	26,8	19,0	24,0	23,2	24,2	15,3	11,8	:
17. Long-term interest rate (%)	:	12,9	18,5	15,8	15,8	17,4	16,6	:	:	:	:
18. Profitability (1961-73 = 100)	100,0	71,4	41,5	34,7	44,3	51,2	49,8	44,4	41,2	50,3	62,4

[1] 1961-90: Eurostat and Commission services; 1991-92: Economic forecasts April-May 1992.
[2] M3.

Table 66

Main economic indicators 1961-92[1]

Spain

(Annual percentage change, unless otherwise stated)

	1961-73	1974-83	1984	1985	1986	1987	1988	1989	1990	1991	1992
1. Gross domestic product											
— at current prices	14,8	18,2	12,9	11,1	14,6	11,8	11,1	12,1	11,2	9,4	9,2
— at constant prices	7,2	1,7	1,8	2,3	3,2	5,6	5,2	4,8	3,6	2,4	2,5
2. Gross fixed capital formation at constant prices											
— total	10,4	−1,2	−5,8	4,1	10,1	14,0	14,0	13,8	6,9	1,6	1,6
— construction	:	−1,4	−5,2	2,0	6,5	9,9	12,2	14,9	10,8	4,3	1,7
— equipment	:	−0,7	−7,3	9,1	15,8	21,2	16,7	13,0	1,4	−2,5	1,4
3. Gross fixed capital formation at current prices (% of GDP)											
— total	24,6	23,7	19,0	19,2	19,5	20,8	22,6	24,2	24,6	24,1	23,5
— general government[2]	:	2,4	3,0	3,7	3,6	3,4	3,8	4,4	4,9	5,2	5,1
— other sectors[2]	:	21,0	15,7	15,5	15,8	17,4	18,8	19,7	19,7	18,9	18,4
4. Final national uses including stocks											
— at constant prices	7,6	1,2	−0,7	2,9	6,0	8,2	7,1	7,8	4,7	2,9	2,9
— relative against 19 competitors	2,7	−0,5	−3,8	0,1	2,2	4,4	2,6	4,4	2,0	2,2	1,4
— relative against other member countries	2,9	−0,3	−2,4	0,8	2,2	4,6	2,6	4,4	1,7	1,7	1,3
5. Inflation											
— price deflator private consumption	6,6	16,6	11,0	8,2	8,6	5,7	5,0	6,6	6,4	6,3	6,3
— price deflator GDP	7,1	16,2	10,9	8,5	11,1	5,8	5,7	7,0	7,3	6,9	6,5
6. Compensation per employee											
— nominal	14,6	19,7	10,0	9,4	9,5	6,7	6,3	6,3	7,6	8,5	8,2
— real, deflator private consumption	7,5	2,6	−0,9	1,1	0,8	0,9	1,2	−0,3	1,1	2,1	1,7
— real, deflator GDP	7,1	3,0	−0,9	0,8	−1,4	0,8	0,6	−0,6	0,2	1,6	1,6
7. GDP at constant market prices per person employed	6,5	3,1	4,3	3,7	1,8	1,1	1,6	1,1	1,0	2,1	2,2
8. Real unit labour costs											
— 1961-73 = 100	100,0	104,2	96,7	94,1	91,1	90,8	89,9	88,3	87,7	87,2	86,6
— annual percentage change	0,6	0,0	−4,9	−2,8	−3,2	−0,3	−1,0	−1,7	−0,8	−0,5	−0,6
9. Relative unit labour costs in common currency against 19 competitors											
— 1961-73 = 100	100,0	118,7	102,4	101,9	104,3	106,9	112,2	118,9	126,7	127,7	131,4
— annual percentage change	1,8	−0,5	−0,6	−0,4	2,3	2,4	5,0	6,0	6,6	0,8	2,9
against other member countries											
— 1961-73 = 100	100,0	113,7	107,3	106,9	105,2	104,9	110,6	118,7	121,3	123,1	125,4
— annual percentage change	1,3	0,0	2,6	−0,3	−1,6	−0,4	5,5	7,3	2,3	1,5	1,8
10. Employment	0,7	−1,3	−2,4	−1,3	1,4	4,5	3,5	3,6	2,6	0,2	0,3
11. Unemployment rate (percentage of civilian labour force)	:	9,4	20,6	21,6	20,9	20,4	19,3	17,1	16,2	16,3	16,7
12. Current balance (% of GDP)	−0,2	−2,0	1,4	1,4	1,6	0,1	−1,1	−3,2	−3,7	−3,5	−3,3
13. Net lending (+) or net borrowing (−) of general government (% of GDP)[2]	:	−2,1	−5,5	−6,9	−6,0	−3,1	−3,3	−2,8	−4,0	−4,4	−4,3
14. Gross debt of general government (% of GDP)	:	18,1	39,9	45,2	46,2	46,6	42,9	44,2	44,5	45,6	46,6
15. Interest payments by general government (% of GDP)[2]	:	0,7	2,0	3,1	4,0	3,5	3,4	3,5	3,5	3,9	4,0
16. Money supply (end of year)[3]	:	18,3	15,6	13,8	14,0	15,4	14,4	14,6	15,3	10,9	:
17. Long-term interest rate (%)	:	:	16,5	13,4	11,4	12,8	11,8	13,8	14,7	12,4	11,3
18. Profitability (1961-73 = 100)	100,0	71,3	75,9	84,5	101,8	108,6	113,7	123,1	126,1	126,4	127,6

[1] 1961-90: Eurostat and Commission services; 1991-92: Economic forecasts April-May 1992.
[2] Break in 1986.
[3] ALP: Liquid assets held by the public.

Table 67

Main economic indicators 1961-92[1]

France

(Annual percentage change, unless otherwise stated)

	1961-73	1974-83	1984	1985	1986	1987	1988	1989	1990	1991	1992
1. Gross domestic product											
— at current prices	10,7	13,5	8,9	7,8	7,9	5,3	7,2	7,2	5,7	4,5	4,9
— at constant prices	5,4	2,2	1,5	1,8	2,4	2,2	3,8	3,6	2,6	1,2	1,9
2. Gross fixed capital formation at constant prices											
— total	7,5	−0,3	−2,6	3,4	4,6	5,0	8,7	7,4	3,5	−1,5	0,2
— construction	:	−0,9	−2,9	−0,4	3,6	3,2	6,7	7,2	2,3	1,1	1,8
— equipment	:	0,4	−0,6	10,0	4,3	6,7	10,8	6,4	5,1	−3,4	−1,0
3. Gross fixed capital formation at current prices (% of GDP)											
— total	24,0	22,8	19,3	19,3	19,3	19,8	20,6	21,1	21,2	20,5	20,1
— general government	:	3,4	3,0	3,2	3,2	3,0	3,3	3,3	3,3	3,4	3,4
— other sectors	:	19,4	16,2	16,0	16,1	16,7	17,3	17,8	17,8	17,1	16,7
4. Final national uses including stocks											
— at constant prices	5,6	1,7	0,5	2,3	4,3	3,3	4,1	3,2	2,9	1,1	1,7
— relative against 19 competitors	0,7	0,1	−2,9	−0,4	0,6	−0,3	−0,4	−0,4	0,2	0,2	0,2
— relative against other member countries	0,9	0,3	−1,6	0,3	0,7	−0,2	−0,5	−0,3	−0,1	−0,3	0,1
5. Inflation											
— price deflator private consumption	4,8	11,5	7,9	6,0	2,9	3,3	2,9	3,6	3,3	3,0	3,0
— price deflator GDP	5,1	11,0	7,3	5,8	5,3	3,0	3,3	3,5	3,0	3,2	3,0
6. Compensation per employee											
— nominal	9,9	14,3	8,2	6,6	4,6	3,7	4,5	5,0	4,8	4,4	3,7
— real, deflator private consumption	4,8	2,6	0,4	0,6	1,7	0,4	1,5	1,3	1,5	1,3	0,7
— real, deflator GDP	4,6	3,0	0,9	0,7	−0,7	0,6	1,1	1,5	1,8	1,1	0,7
7. GDP at constant market prices per person employed	4,7	2,1	2,4	2,1	2,3	1,9	3,1	2,5	1,4	0,8	1,7
8. Real unit labour costs											
— 1961-73 = 100	100,0	106,3	105,6	104,2	101,1	99,9	98,0	97,0	97,4	97,7	96,7
— annual percentage change	−0,1	0,9	−1,5	−1,4	−2,9	−1,2	−1,9	−1,0	0,4	0,3	−1,0
9. Relative unit labour costs in common currency against 19 competitors											
— 1961-73 = 100	100,0	94,8	85,2	86,9	89,4	89,0	85,7	83,8	87,4	84,0	84,4
— annual percentage change	−0,8	−0,5	−2,6	1,9	2,9	−0,4	−3,7	−2,3	4,3	−3,8	0,4
against other member countries											
— 1961-73 = 100	100,0	93,3	91,4	93,3	92,6	89,7	86,7	85,6	85,6	82,8	82,2
— annual percentage change	−1,2	0,1	0,5	2,1	−0,7	−3,2	−3,3	−1,3	0,0	−3,2	−0,8
10. Employment	0,7	0,1	−0,9	−0,3	0,1	0,3	0,7	1,1	1,2	0,4	0,2
11. Unemployment rate (percentage of civilian labour force)	:	5,7	9,7	10,1	10,3	10,4	9,9	9,4	9,0	9,5	10,0
12. Current balance (% of GDP)	0,4	−0,3	0,0	0,1	0,5	−0,2	−0,3	−0,3	−0,6	−0,6	−0,4
13. Net lending (+) or net borrowing (−) of general government (% of GDP)	:	−1,4	−2,8	−2,9	−2,7	−1,9	−1,8	−1,2	−1,6	−1,7	−2,0
14. Gross debt of general government (% of GDP)	:	39,1	43,8	45,5	45,7	47,2	46,9	47,2	46,4	48,4	49,1
15. Interest payments by general government (% of GDP)	:	1,5	2,7	2,9	2,9	2,8	2,8	2,8	3,1	3,2	3,3
16. Money supply (end of year)[2]	13,7	13,3	11,0	7,4	6,8	9,8	8,4	9,6	8,9	2,3	:
17. Long-term interest rate (%)	6,9	12,3	12,5	10,9	8,4	9,4	9,0	8,8	9,9	9,0	8,5
18. Profitability (1961-73 = 100)	100,0	69,4	64,8	68,8	76,6	78,8	84,2	88,0	87,6	86,0	87,7

[1] 1961-90: Eurostat and Commission services; 1991-92: Economic forecasts April-May 1992.
[2] M3.

Table 68

Main economic indicators 1961-92[1]

Ireland

(Annual percentage change, unless otherwise stated)

	1961-73	1974-83	1984	1985	1986	1987	1988	1989	1990	1991	1992
1. Gross domestic product											
— at current prices	11,8	18,5	11,0	8,4	6,1	7,3	7,7	11,4	5,7	4,4	6,3
— at constant prices	4,4	3,8	4,4	3,1	−0,5	4,6	4,5	6,4	7,1	1,9	2,2
2. Gross fixed capital formation at constant prices											
— total	9,9	2,2	−2,5	−7,7	−3,1	−2,3	3,3	15,8	9,5	−4,9	3,5
— construction	:	1,7	−2,0	−7,1	−2,7	−8,3	−0,7	9,8	11,7	−4,8	1,5
— equipment	:	2,7	−2,0	−6,7	1,1	1,3	4,8	15,3	8,5	−5,0	5,5
3. Gross fixed capital formation at current prices (% of GDP)											
— total	21,2	26,3	21,4	19,0	18,0	16,5	16,7	18,2	19,1	17,9	17,9
— general government	:	5,2	4,0	4,0	3,7	2,7	1,9	1,9	2,2	2,4	2,5
— other sectors	:	21,1	17,4	15,0	14,3	13,7	14,8	16,3	16,8	15,5	15,5
4. Final national uses including stocks											
— at constant prices	5,1	2,4	1,1	1,1	1,1	−0,7	1,1	6,6	5,0	−0,6	−0,1
— relative against 19 competitors	1,1	0,9	−2,1	−1,6	−2,6	−4,3	−3,5	3,1	2,8	−0,7	−1,4
— relative against other member countries	1,3	1,2	−0,8	−1,1	−2,7	−4,2	−3,7	3,1	2,5	−1,1	−1,5
5. Inflation											
— price deflator private consumption	6,3	15,2	7,3	5,0	4,5	3,7	2,6	3,7	2,5	3,0	3,8
— price deflator GDP	7,2	14,2	6,4	5,2	6,6	2,7	3,1	4,7	−1,3	2,5	4,0
6. Compensation per employee											
— nominal	11,3	18,1	10,7	8,9	5,3	5,4	6,1	6,0	4,2	5,1	4,9
— real, deflator private consumption	4,7	2,5	3,2	3,7	0,7	1,6	3,3	2,2	1,6	2,0	1,1
— real, deflator GDP	3,9	3,4	4,1	3,5	−1,3	2,6	2,9	1,2	5,6	2,5	0,9
7. GDP at constant market prices per person employed	4,3	3,3	6,3	5,4	−0,6	4,7	3,4	6,5	4,2	2,2	1,9
8. Real unit labour costs											
— 1961-73 = 100	100,0	100,7	96,0	94,3	93,7	91,9	91,4	86,9	88,0	88,3	87,4
— annual percentage change	−0,4	0,2	−2,1	−1,8	−0,6	−1,9	−0,5	−5,0	1,3	0,4	−1,0
9. Relative unit labour costs in common currency against 19 competitors											
— 1961-73 = 100	100,0	95,4	97,4	98,2	104,2	99,5	97,5	92,0	92,1	88,9	89,7
— annual percentage change	0,4	−0,1	−3,6	0,8	6,1	−4,5	−2,0	−5,6	0,1	−3,5	0,9
against other member countries											
— 1961-73 = 100	100,0	93,4	101,7	102,6	105,4	98,3	96,5	92,0	88,9	86,2	86,1
— annual percentage change	0,2	0,3	−1,0	0,9	2,7	−6,8	−1,8	−4,6	−3,4	−3,0	−0,1
10. Employment	0,1	0,5	−1,9	−2,2	0,2	−0,1	1,0	−0,1	2,8	−0,3	0,3
11. Unemployment rate (percentage of civilian labour force)	:	9,7	16,8	18,2	18,2	18,0	17,3	15,7	14,5	16,1	17,6
12. Current balance (% of GDP)	−2,5	−8,6	−5,8	−3,9	−2,9	1,2	1,7	1,2	2,5	4,9	5,8
13. Net lending (+) or net borrowing (−) of general government (% of GDP)	:	−11,0	−10,4	−11,7	−11,6	−9,3	−5,1	−2,2	−2,6	−2,3	−2,5
14. Gross debt of general government (% of GDP)	:	73,2	104,8	107,9	119,9	120,7	118,5	108,4	102,9	99,8	96,4
15. Interest payments by general government (% of GDP)	:	6,3	9,4	10,3	9,7	9,6	9,2	8,5	8,5	8,2	7,7
16. Money supply (end of year)[2]	12,1	17,2	10,1	5,3	−1,0	10,9	6,3	5,0	15,5	3,1	:
17. Long-term interest rate (%)	:	14,7	14,6	12,7	11,1	11,3	9,4	9,0	10,1	9,2	8,7
18. Profitability (1961-73 = 100)	100,0	76,4	93,4	100,7	102,2	112,9	116,1	139,8	135,8	132,5	137,2

[1] 1961-90: Eurostat and Commission services; 1991-92: Economic forecasts April-May 1992.
[2] M3.

Table 69

Main economic indicators 1961-92[1]

Italy

(Annual percentage change, unless otherwise stated)

	1961-73	1974-83	1984	1985	1986	1987	1988	1989	1990	1991	1992
1. Gross domestic product											
— at current prices	11,0	20,7	14,6	11,7	11,0	9,3	11,0	9,2	9,6	8,8	7,0
— at constant prices	5,3	2,8	2,7	2,6	2,9	3,1	4,1	3,0	2,0	1,4	1,5
2. Gross fixed capital formation at constant prices											
— total	4,7	0,2	3,6	0,6	2,2	5,0	6,9	4,6	3,0	0,9	1,3
— construction	:	−1,5	−0,8	−0,5	1,9	−0,7	2,3	3,9	3,4	1,2	0,4
— equipment	:	3,0	9,6	1,9	2,6	11,9	11,6	5,1	3,1	0,7	2,2
3. Gross fixed capital formation at current prices (% of GDP)											
— total	24,4	23,6	21,0	20,7	19,7	19,7	20,1	20,2	20,2	19,8	19,6
— general government	:	3,2	3,6	3,7	3,5	3,5	3,4	3,4	3,4	3,3	3,1
— other sectors	:	20,4	17,4	16,9	16,2	16,2	16,7	16,8	16,9	16,5	16,5
4. Final national uses including stocks											
— at constant prices	5,3	2,2	3,6	2,8	3,4	4,3	4,7	3,0	1,8	2,3	2,0
— relative against 19 competitors	0,4	0,6	0,4	0,1	−0,3	0,8	0,3	−0,4	−0,9	1,6	0,6
— relative against other member countries	0,6	0,9	2,1	0,8	−0,4	1,0	0,3	−0,3	−1,4	1,1	0,5
5. Inflation											
— price deflator private consumption	4,9	17,1	12,1	9,0	6,2	5,3	5,7	6,5	6,5	6,7	5,2
— price deflator GDP	5,5	17,4	11,6	8,9	7,9	6,0	6,6	6,0	7,5	7,3	5,4
6. Compensation per employee											
— nominal	11,3	19,7	11,8	10,1	7,5	8,2	8,8	8,7	10,4	8,7	5,9
— real, deflator private consumption	6,1	2,2	−0,3	1,0	1,3	2,8	2,9	2,1	3,7	1,9	0,6
— real, deflator GDP	5,5	2,0	0,2	1,1	−0,3	2,1	2,0	2,6	2,7	1,3	0,4
7. GDP at constant market prices per person employed	5,5	1,8	2,3	1,7	2,1	2,7	3,1	2,8	1,0	0,7	1,1
8. Real unit labour costs											
— 1961-73 = 100	100,0	102,9	101,2	100,6	98,2	97,6	96,6	96,3	98,0	98,6	98,0
— annual percentage change	0,0	0,2	−2,1	−0,5	−2,4	−0,6	−1,0	−0,3	1,7	0,6	−0,7
9. Relative unit labour costs in common currency against 19 competitors											
— 1961-73 = 100	100,0	87,3	95,3	94,9	100,3	103,8	103,3	106,4	115,6	116,8	118,8
— annual percentage change	−0,4	0,3	0,0	−0,4	5,7	3,5	−0,5	3,0	8,6	1,1	1,7
against other member countries											
— 1961-73 = 100	100,0	85,0	102,6	102,1	103,8	104,4	104,4	109,1	113,5	115,8	116,2
— annual percentage change	−0,9	1,0	3,6	−0,4	1,6	0,6	0,1	4,5	4,0	2,0	0,4
10. Employment	−0,2	1,0	0,4	0,9	0,8	0,4	1,0	0,2	1,0	0,8	0,4
11. Unemployment rate (percentage of civilian labour force)	:	6,9	9,3	9,6	10,5	10,3	10,8	10,6	9,8	10,2	10,3
12. Current balance (% of GDP)	1,4	−0,6	−0,6	−0,9	0,5	−0,2	−0,7	−1,3	−1,5	−1,8	−2,0
13. Net lending (+) or net borrowing (−) of general government (% of GDP)	:	−9,1	−11,6	−12,6	−11,6	−11,0	−10,7	−9,9	−11,0	−10,3	−9,9
14. Gross debt of general government (% of GDP)	:	59,5	75,2	82,2	86,2	90,4	92,6	95,6	98,2	101,7	105,4
15. Interest payments by general government (% of GDP)	:	5,1	8,0	8,0	8,5	7,9	8,1	8,9	9,6	10,2	10,7
16. Money supply (end of year)[2]	15,4	17,8	12,1	11,1	10,6	7,2	7,6	9,9	8,2	9,1	:
17. Long-term interest rate (%)	7,0	15,2	15,0	14,3	11,7	11,3	12,1	12,9	13,4	13,0	12,8
18. Profitability (1961-73 = 100)	100,0	66,3	68,0	68,9	79,1	83,1	88,4	89,6	84,9	83,6	85,1

[1] 1961-90: Eurostat and Commission services; 1991-92: Economic forecasts April-May 1992.
[2] M2.

Table 70

Main economic indicators 1961-92[1]

Luxembourg

(Annual percentage change, unless otherwise stated)

	1961-73	1974-83	1984	1985	1986	1987	1988	1989	1990	1991	1992
1. Gross domestic product											
— at current prices	8,7	8,6	10,9	6,0	8,8	2,0	9,0	12,3	4,5	6,6	5,8
— at constant prices	4,0	1,2	6,2	2,9	4,8	2,7	5,6	6,3	2,3	2,9	2,9
2. Gross fixed capital formation at constant prices											
— total	4,9	−2,3	0,1	−9,5	31,5	14,8	12,3	−6,5	9,4	6,3	4,7
— construction	:	−3,0	−3,7	−2,1	5,7	8,9	8,8	4,6	5,9	6,0	4,9
— equipment	:	−1,2	2,7	−20,5	87,2	18,7	16,1	−16,9	13,7	6,6	4,5
3. Gross fixed capital formation at current prices (% of GDP)											
— total	26,4	24,9	20,0	17,7	22,1	25,6	26,9	23,4	25,3	26,1	26,3
— general government	:	6,3	4,9	4,6	4,3	4,9	5,0	4,7	4,8	4,9	5,0
— other sectors	:	18,6	15,1	13,1	17,8	20,6	21,8	18,8	20,4	21,1	21,3
4. Final national uses including stocks											
— at constant prices	4,0	1,5	2,5	0,1	7,7	4,2	6,2	5,8	3,4	4,4	3,8
— relative against 19 competitors	:	:	:	:	:	:	:	:	:	:	:
— relative against other member countries	:	:	:	:	:	:	:	:	:	:	:
5. Inflation											
— price deflator private consumption	3,0	7,8	6,5	4,3	1,7	1,8	2,7	3,3	4,2	3,2	2,8
— price deflator GDP	4,4	7,3	4,4	3,0	3,8	−0,6	3,2	5,7	2,1	3,6	2,9
6. Compensation per employee											
— nominal	7,4	9,9	7,1	4,2	3,6	4,8	3,1	7,0	6,7	4,0	4,3
— real, deflator private consumption	4,2	1,9	0,5	0,0	1,9	2,9	0,3	3,5	2,4	0,8	1,4
— real, deflator GDP	2,8	2,5	2,6	1,2	−0,2	5,5	−0,2	1,2	4,5	0,4	1,4
7. GDP at constant market prices per person employed	3,0	0,8	5,6	1,5	2,1	−0,1	2,5	2,5	−1,9	−0,7	0,9
8. Real unit labour costs											
— 1961-73 = 100	100,0	116,6	109,0	108,6	106,2	112,1	109,2	107,8	114,8	116,2	116,8
— annual percentage change	−0,2	1,7	−2,8	−0,3	−2,3	5,6	−2,6	−1,3	6,5	1,2	0,5
9. Relative unit labour costs in common currency against 19 competitors											
— 1961-73 = 100	:	:	:	:	:	:	:	:	:	:	:
— annual percentage change	:	:	:	:	:	:	:	:	:	:	:
against other member countries											
— 1961-73 = 100	:	:	:	:	:	:	:	:	:	:	:
— annual percentage change	:	:	:	:	:	:	:	:	:	:	:
10. Employment	1,1	0,4	0,6	1,4	2,6	2,8	3,1	3,7	4,3	3,7	2,0
11. Unemployment rate (percentage of civilian labour force)	:	1,4	3,1	3,0	2,6	2,5	2,0	1,8	1,7	1,6	1,5
12. Current balance (% of GDP)	6,8	24,0	39,1	43,8	38,7	30,3	31,3	34,3	33,8	25,9	27,7
13. Net lending (+) or net borrowing (−) of general government (% of GDP)	:	1,3	2,8	6,0	4,4	2,5	3,3	5,5	5,6	2,6	2,6
14. Gross debt of general government (% of GDP)	:	15,5	15,0	14,0	13,5	11,9	9,9	8,4	7,3	6,3	5,3
15. Interest payments by general government (% of GDP)	:	1,1	1,7	1,1	1,1	1,2	1,0	0,7	0,7	0,6	0,5
16. Money supply (end of year)	:	:	:	:	:	:	:	:	:	:	:
17. Long-term interest rate (%)	:	7,8	10,3	9,5	8,7	8,0	7,1	7,7	8,6	8,2	7,8
18. Profitability (1961-73 = 100)	100,0	50,7	62,7	63,6	71,9	57,1	65,8	71,5	56,2	53,0	51,5

[1] 1961-90: Eurostat and Commission services; 1991-92: Economic forecasts April-May 1992.

Table 71

Main economic indicators 1961-92[1]

Netherlands

(Annual percentage change, unless otherwise stated)

	1961-73	1974-83	1984	1985	1986	1987	1988	1989	1990	1991	1992
1. Gross domestic product											
— at current prices	11,2	8,0	5,0	4,5	2,5	0,4	4,6	5,7	6,9	5,5	4,2
— at constant prices	4,8	1,6	3,1	2,6	2,0	0,8	2,6	4,0	3,9	2,2	1,2
2. Gross fixed capital formation at constant prices											
— total	5,3	−1,5	5,2	6,7	7,9	1,5	8,1	3,9	4,0	−0,7	−0,7
— construction	:	−2,6	3,8	−0,1	5,0	1,9	10,3	2,3	1,3	−1,3	−0,1
— equipment	:	0,6	8,8	15,5	10,1	1,9	5,0	5,3	7,7	0,1	−1,4
3. Gross fixed capital formation at current prices (% of GDP)											
— total	25,1	20,2	18,6	19,2	20,1	20,2	21,3	21,7	21,5	20,8	20,4
— general government	:	3,3	2,8	2,6	2,5	2,4	2,3	2,4	2,3	2,3	2,3
— other sectors	:	16,9	15,8	16,6	17,6	17,9	18,9	19,3	19,2	18,5	18,1
4. Final national uses including stocks											
— at constant prices	4,9	1,2	1,7	3,2	2,1	1,2	1,6	4,5	3,8	1,8	0,5
— relative against 19 competitors	0,1	−0,3	−1,2	0,8	−1,6	−2,2	−2,7	1,2	0,9	0,8	−0,9
— relative against other member countries	0,3	−0,2	−0,2	1,3	−1,6	−2,2	−2,8	1,2	0,6	0,4	−1,1
5. Inflation											
— price deflator private consumption	5,0	6,4	2,2	2,2	0,2	−0,9	1,0	2,8	2,7	3,5	3,5
— price deflator GDP	6,0	6,3	1,9	1,8	0,5	−0,4	1,9	1,6	2,9	3,3	2,9
6. Compensation per employee											
— nominal	11,4	7,9	0,2	1,4	1,6	1,5	1,4	0,8	3,6	4,6	4,6
— real, deflator private consumption	6,0	1,3	−1,9	−0,8	1,4	2,4	0,4	−1,9	0,9	1,1	1,1
— real, deflator GDP	5,0	1,5	−1,6	−0,4	1,2	1,9	−0,5	−0,7	0,7	1,3	1,6
7. GDP at constant market prices per person employed	3,9	2,0	3,2	1,0	0,0	−0,6	1,2	2,3	1,8	1,2	1,3
8. Real unit labour costs											
— 1961-73 = 100	100,0	104,4	94,5	93,2	94,2	96,6	94,9	92,1	91,2	91,3	91,6
— annual percentage change	1,0	−0,5	−4,6	−1,4	1,1	2,5	−1,7	−3,0	−1,0	0,1	0,3
9. Relative unit labour costs in common currency against 19 competitors											
— 1961-73 = 100	100,0	119,9	101,0	98,1	103,6	107,9	105,2	99,4	100,2	97,9	98,6
— annual percentage change	2,9	−0,6	−7,7	−2,9	5,6	4,1	−2,6	−5,5	0,8	−2,3	0,8
against other member countries											
— 1961-73 = 100	100,0	118,5	105,2	102,2	105,4	107,9	105,6	100,5	98,6	96,8	96,7
— annual percentage change	2,7	−0,3	−5,9	−2,9	3,2	2,3	−2,1	−4,8	−1,9	−1,8	0,0
10. Employment	0,9	−0,4	−0,1	1,5	2,0	1,4	1,4	1,7	2,1	1,0	−0,1
11. Unemployment rate (percentage of civilian labour force)	:	7,1	12,3	10,5	10,3	10,0	9,3	8,5	7,5	7,0	7,4
12. Current balance (% of GDP)	0,5	1,4	4,2	4,1	2,7	1,4	2,4	3,7	3,8	3,8	3,9
13. Net lending (+) or net borrowing (−) of general government (% of GDP)	:	−3,7	−6,3	−4,8	−6,0	−6,6	−5,2	−5,2	−5,3	−3,9	−4,0
14. Gross debt of general government (% of GDP)	:	:	68,1	73,3	74,8	77,4	80,1	80,4	80,0	79,7	80,6
15. Interest payments by general government (% of GDP)	:	3,7	6,0	6,3	6,2	6,1	6,1	5,9	5,9	5,9	6,1
16. Money supply (end of year)[2]	10,3	9,1	6,9	10,7	5,1	4,4	10,6	13,7	8,2	4,7	:
17. Long-term interest rate (%)	5,9	9,7	8,6	7,3	6,4	6,4	6,3	7,2	9,0	8,9	8,5
18. Profitability (1961-73 = 100)	100,0	74,6	83,5	87,0	85,6	78,7	81,6	85,4	89,5	89,1	87,2

[1] 1961-90: Eurostat and Commission services; 1991-92: Economic forecasts April-May 1992.
[2] M2.

Table 72

Main economic indicators 1961-92[1]

Portugal

(Annual percentage change, unless otherwise stated)

	1961-73	1974-83	1984	1985	1986	1987	1988	1989	1990	1991	1992
1. Gross domestic product											
— at current prices	11,1	23,4	22,3	25,2	25,4	17,1	16,0	18,8	19,3	16,4	13,7
— at constant prices	6,9	2,5	−1,9	2,8	4,1	5,3	3,9	5,2	4,4	1,8	2,3
2. Gross fixed capital formation at constant prices											
— total	7,9	0,8	−17,4	−3,5	10,9	15,1	15,0	5,6	5,9	2,8	3,1
— construction	:	:	−9,2	−6,0	8,7	9,4	10,1	3,5	37,6	4,5	5,0
— equipment	:	:	−29,6	−4,5	14,2	26,8	23,2	10,0	26,5	1,0	1,2
3. Gross fixed capital formation at current prices (% of GDP)											
— total	24,1	27,8	23,6	21,8	22,1	24,2	26,8	26,4	26,4	25,5	25,0
— general government	:	:	2,6	2,5	2,6	2,7	2,9	3,1	3,0	2,9	3,0
— other sectors	:	:	21,0	19,3	19,5	21,5	23,9	23,3	23,4	22,6	22,0
4. Final national uses including stocks											
— at constant prices	7,3	2,0	−6,7	0,9	8,3	10,4	7,4	4,3	5,4	4,0	3,0
— relative against 19 competitors	2,5	0,4	−9,5	−1,7	4,3	6,6	3,0	0,8	2,8	3,4	1,6
— relative against other member countries	2,7	0,6	−8,4	−1,2	4,3	6,7	2,8	0,7	2,4	2,8	1,4
5. Inflation											
— price deflator private consumption	3,9	21,9	28,5	19,4	13,8	10,0	10,0	12,1	12,6	11,9	9,0
— price deflator GDP	3,9	20,3	24,7	21,7	20,5	11,2	11,6	13,0	14,3	14,4	11,1
6. Compensation per employee											
— nominal	10,8	24,8	21,2	22,5	21,6	17,9	13,4	12,8	18,7	19,0	15,2
— real, deflator private consumption	6,7	2,4	−5,6	2,6	6,8	7,2	3,1	0,6	5,4	6,4	5,7
— real, deflator GDP	6,7	3,7	−2,8	0,6	0,9	6,0	1,5	−0,2	3,9	4,0	3,7
7. GDP at constant market prices per person employed	6,7	3,0	−0,4	2,8	7,0	4,7	3,9	4,1	3,5	0,8	2,5
8. Real unit labour costs											
— 1961-73 = 100	100,0	120,4	106,7	104,4	98,4	99,7	97,4	93,5	93,8	96,8	97,9
— annual percentage change	0,0	0,7	−2,4	−2,2	−5,7	1,3	−2,2	−4,1	0,4	3,1	1,2
9. Relative unit labour costs in common currency against 19 competitors											
— 1961-73 = 100	100,0	102,6	79,0	80,4	81,3	82,4	83,0	84,1	90,7	102,4	116,7
— annual percentage change	−0,7	−2,1	−2,7	1,8	1,0	1,4	0,8	1,3	7,8	13,0	13,9
against other member countries											
— 1961-73 = 100	100,0	99,8	81,5	83,1	81,6	81,1	82,1	84,1	88,2	100,1	113,0
— annual percentage change	−1,2	−1,8	−0,2	2,0	−1,8	−0,7	1,3	2,4	4,8	13,6	12,9
10. Employment	0,2	−0,4	−1,5	0,0	−2,7	0,5	0,1	1,0	0,9	0,9	−0,2
11. Unemployment rate (percentage of civilian labour force)	:	6,6	8,7	8,8	8,3	6,9	5,7	5,0	4,6	4,0	4,2
12. Current balance (% of GDP)	0,4	−7,7	−3,4	0,4	2,4	−0,4	−4,4	−2,3	−2,5	−1,0	−1,0
13. Net lending (+) or net borrowing (−) of general government (% of GDP)	:	:	−12,0	−10,1	−7,2	−6,8	−5,4	−3,4	−5,8	−6,4	−5,4
14. Gross debt of general government (% of GDP)	:	37,6	62,4	70,9	69,5	72,9	75,2	72,1	68,4	68,6	66,7
15. Interest payments by general government (% of GDP)	:	:	7,1	7,9	9,2	7,8	7,8	7,2	8,2	8,5	8,7
16. Money supply (end of year)[2]	:	21,4	24,8	28,5	26,3	19,7	17,8	10,5	11,2	19,0	:
17. Long-term interest rate (%)	:	:	:	25,4	17,9	15,4	14,2	14,9	16,8	17,1	15,0
18. Profitability (1961-73 = 100)	100,0	37,7	42,5	44,9	53,6	53,0	54,9	60,4	60,8	58,4	57,3

[1] 1961-90: Eurostat and Commission services; 1991-92: Economic forecasts April-May 1992.
[2] L−: Liquid assets of the residents.

Table 73

Main economic indicators 1961-92[1]

United Kingdom

(Annual percentage change, unless otherwise stated)

	1961-73	1974-83	1984	1985	1986	1987	1988	1989	1990	1991	1992
1. Gross domestic product											
— at current prices	8,4	15,1	6,8	9,5	7,6	10,0	11,1	9,3	7,7	4,4	5,9
— at constant prices	3,2	1,1	2,2	3,6	3,9	4,8	4,2	2,3	0,8	−2,2	0,6
2. Gross fixed capital formation at constant prices											
— total	4,6	−0,4	8,5	4,0	2,4	9,6	13,1	6,8	−2,4	−10,3	−4,4
— construction	:	−1,3	6,1	−2,4	5,8	11,1	9,8	2,5	−1,0	−8,7	−4,8
— equipment	:	0,5	11,3	10,7	−1,7	8,4	17,5	8,3	−3,8	−11,8	−4,0
3. Gross fixed capital formation at current prices (% of GDP)											
— total	18,5	18,2	17,0	17,0	16,9	17,6	19,1	20,0	19,2	16,5	15,0
— general government	:	3,1	2,2	2,1	1,9	1,7	1,3	1,8	2,3	2,1	2,0
— other sectors	:	15,1	14,8	14,9	15,0	16,0	17,7	18,1	16,8	14,4	13,0
4. Final national uses including stocks											
— at constant prices	3,2	0,9	2,5	2,7	4,6	5,3	7,8	3,3	−0,1	−3,1	0,8
— relative against 19 competitors	−1,9	−0,8	−1,1	−0,2	1,1	1,9	3,7	−0,2	−2,8	−3,9	−0,6
— relative against other member countries	−1,8	−0,6	0,7	0,7	1,1	2,3	4,0	−0,2	−3,6	−5,1	−0,8
5. Inflation											
— price deflator private consumption	4,9	13,4	4,9	5,4	4,4	4,3	5,0	5,6	6,0	7,2	5,3
— price deflator GDP	5,1	13,9	4,6	5,7	3,5	5,0	6,6	6,9	6,8	6,7	5,3
6. Compensation per employee											
— nominal	8,3	15,3	5,6	7,3	8,4	7,5	7,9	9,2	10,7	8,5	5,6
— real, deflator private consumption	3,3	1,7	0,7	1,8	3,8	3,0	2,7	3,4	4,4	1,2	0,3
— real, deflator GDP	3,1	1,2	1,0	1,5	4,7	2,4	1,3	2,1	3,6	1,6	0,3
7. GDP at constant market prices per person employed	2,9	1,7	0,2	2,3	4,0	3,0	1,0	−0,2	−0,1	0,9	3,1
8. Real unit labour costs											
— 1961-73 = 100	100,0	102,1	97,6	96,8	97,5	96,9	97,1	99,5	103,1	103,9	101,2
— annual percentage change	0,1	−0,4	0,8	−0,8	0,7	−0,6	0,3	2,4	3,7	0,8	−2,7
9. Relative unit labour costs in common currency against 19 competitors											
— 1961-73 = 100	100,0	92,0	93,3	94,7	88,4	88,7	98,0	100,9	106,4	110,1	110,0
— annual percentage change	−1,9	1,4	−2,4	1,4	−6,6	0,4	10,4	3,0	5,5	3,4	−0,1
against other member countries											
— 1961-73 = 100	100,0	86,9	99,1	100,7	87,9	84,7	95,1	100,2	99,8	104,5	102,7
— annual percentage change	−3,0	2,3	1,6	1,7	−12,7	−3,7	12,3	5,3	−0,4	4,8	−1,8
10. Employment	0,3	−0,6	1,9	1,3	−0,1	1,8	3,2	2,5	0,9	−3,0	−2,4
11. Unemployment rate (percentage of civilian labour force)	:	6,1	11,0	11,4	11,4	10,4	8,5	7,1	7,0	9,1	10,7
12. Current balance (% of GDP)	−0,1	−0,1	−0,2	0,5	−0,8	−2,0	−4,6	−5,1	−3,5	−1,7	−1,9
13. Net lending (+) or net borrowing (−) of general government (% of GDP)	:	−3,6	−4,0	−2,8	−2,4	−1,3	1,1	1,2	−0,8	−2,1	−5,0
14. Gross debt of general government (% of GDP)	:	58,4	60,4	59,1	58,2	56,0	50,7	44,2	39,4	39,9	43,7
15. Interest payments by general government (% of GDP)	:	4,5	4,9	4,9	4,5	4,3	3,9	3,7	3,4	3,0	2,9
16. Money supply (end of year)[2]	:	14,1	13,6	13,0	15,9	16,4	17,6	19,1	11,5	5,8	:
17. Long-term interest rate (%)	7,6	13,4	10,7	10,6	9,8	9,5	9,3	9,6	11,1	9,9	9,0
18. Profitability (1961-73 = 100)	100,0	73,8	87,5	91,6	91,3	96,9	99,2	94,0	83,9	83,0	92,3

[1] 1961-90: Eurostat and Commission services; 1991-92: Economic forecasts April-May 1992.
[2] M4.

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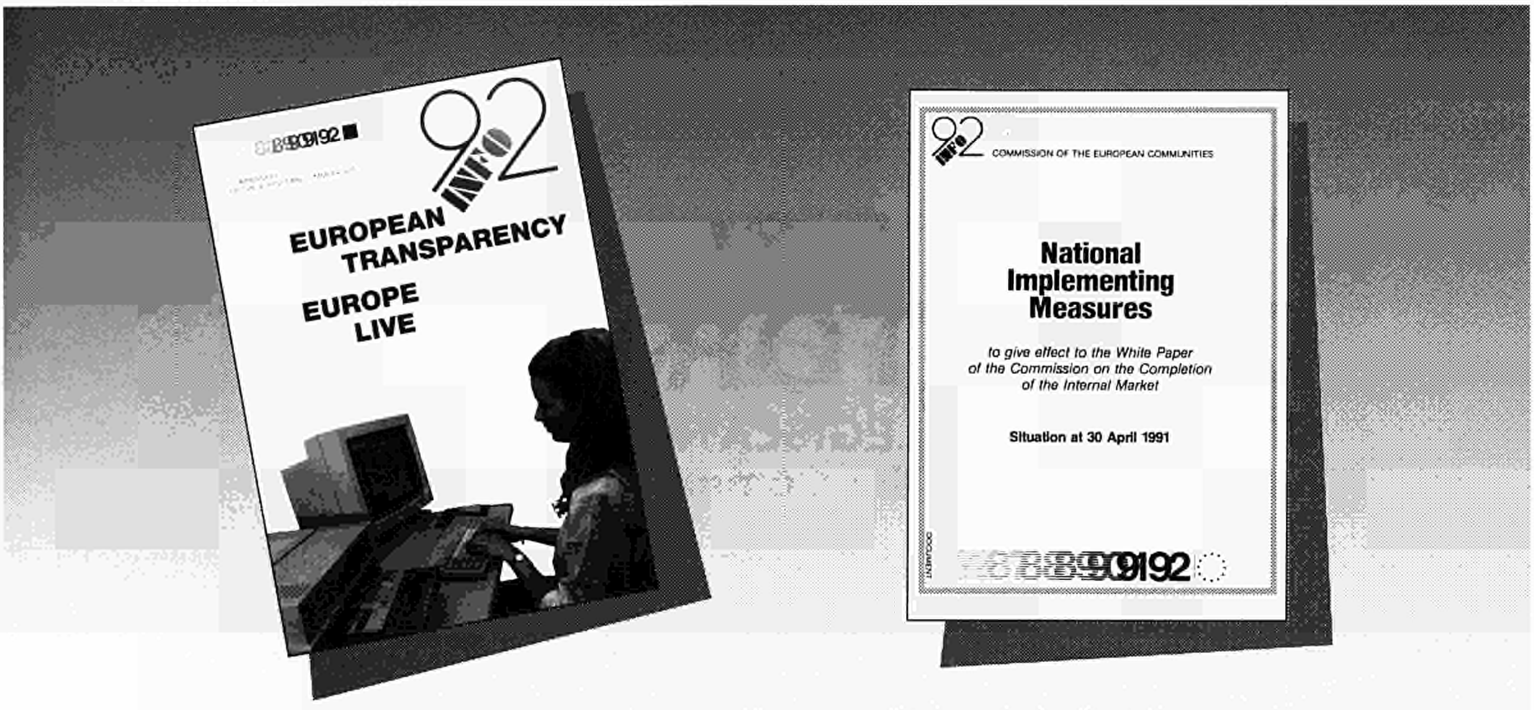

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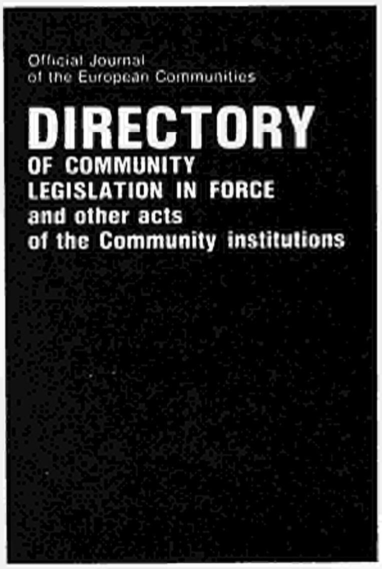

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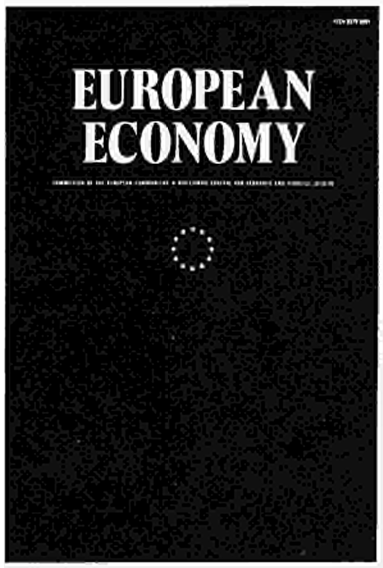

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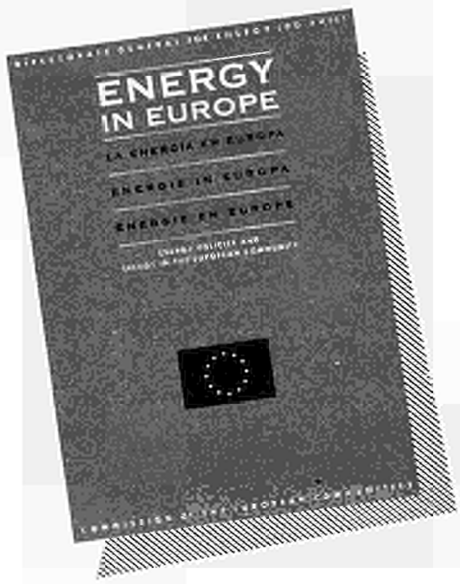

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