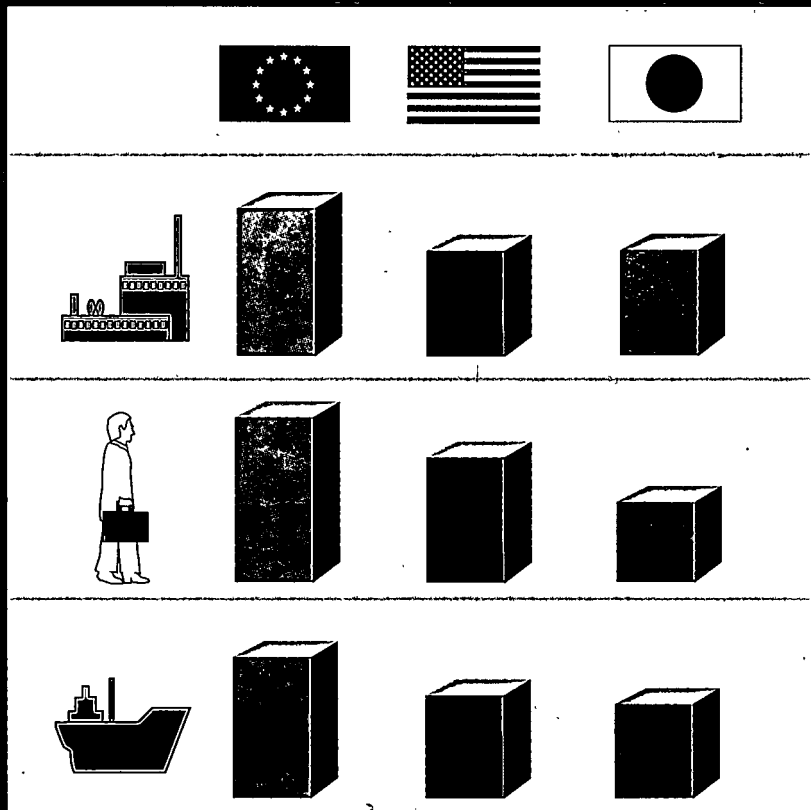




Commission of the
European Communities

European industrial policy for the 1990s



Supplements 1991

1/91 The Commission's programme for 1991

2/91 Intergovernmental conferences — Contributions by the Commission

3/91 *European industrial policy for the 1990s*

European industrial policy for the 1990s

Industrial policy in an open and competitive environment: guidelines for a Community approach

Communication of the Commission to the Council and to the
European Parliament

The European electronics and information technology industry: state of play, issues at stake and proposals for action

Communication from the Commission

Promoting the competitive environment for the industrial activities based on biotechnology within the Community

Communication of the Commission to the Council and to the
European Parliament

Document drawn up on basis of COM(90) 556, SEC(91) 565 and
SEC(91) 629

Cataloguing data can be found at the end of this publication

Luxembourg: Office for Official Publications of the European Communities, 1991

ISBN 92-826-2720-9

Catalogue number: CM-NF-91-003-EN-C

© ECSC-EEC-EAEC, Brussels. Luxembourg, 1991

Reproduction is authorized, except for commercial purposes, provided the source is acknowledged.

Printed in the FR of Germany

Contents

Introduction	5
Industrial policy in an open and competitive environment	7
Introduction	7
Identifying the Community interest	7
The experience of industrial adjustment	8
Global challenges ahead	8
The concept of Community industrial policy	10
The Community approach	10
Ensuring the necessary prerequisites for adjustment	11
Providing the catalysts for adjustment	15
Accelerating adjustment	19
Ensuring a coherent and effective approach	20
Maintaining the impetus towards international investment	21
Strengthening competition internally and externally	21
Promoting the Community's advantages	22
Conclusions	22
The European electronics and information technology industry	25
Introduction	25
The situation of the European industry	26
The international context	28
Developments in Europe and the world	28
The causes of the present situation in this context	30
Community approach	34
A reference framework	34
Proposals for action	35
Promoting the competitive environment for the industrial activities based on biotechnology within the Community	41
Situation and perspectives in biotechnology	41
The importance of biotechnology	41
Macroeconomic indicators	42
Competitiveness of the Community's bio-industries	44
A Community framework for biotechnology	46
Completing the internal market for biotechnology	46

Protection of intellectual property	48
Research, development and innovation	48
Ethics and other issues	49
Actions	50
The legal and regulatory framework	50
Standards	51
Research, development, innovation and investment	51
Intellectual property	52
Ethics	53
The statistical base	53
Conclusions and recommendations	53

Introduction

European industry at the beginning of the 1990s is at a turning point. The programme to complete the internal market has reached a stage where industry in all its forms will be profoundly affected by its consequences over the coming years. At the same time, further liberalization of the world trading system can be expected. These developments provide important opportunities for European industry but at the same time bring with them increased competition which must be successfully met if industry is to flourish. What role should public authorities play in promoting industry's successful adaptation to these new operating conditions?

This was the question that the Commission set out to answer when developing its concept of industrial policy for the coming decade published in the form of a communication to the Council and European Parliament under the title 'industrial policy in an open and competitive environment'. The communication sets out guidelines for the future development of industrial policy in the Community. Enterprises themselves must bear the major responsibility for adapting to change, but public authorities can assist the process by putting in place the suitable environment for business to flourish. In order to do this, public authorities dispose of a number of instruments which ensure that the prerequisites for change are met, which act as catalysts for change or as accelerators of the process once under way.

The guidelines received their first major application in the form of a communication on 'The European electronics and information technology industry: state of play, issues at stake and proposals for action'. At a time when the Community's information technology and electronics industries are facing severe structural adjustment problems, the communication follows a double approach to enable the European industry to be more competitive on its own and on the world market:

- to contribute to the examination of the relative industrial and technological conditions or the Community's electronics and IT industries in the world context;
- to set a consistent package of measures which the Community and Member States would be prepared to implement, provided they could be based on clearly defined medium and long-term objectives.

The communication on 'Promoting the competitive environment for the industrial activities based on biotechnology within the Community' provided a second occasion to apply the industrial policy guidelines. At present the industries involved in biotechnology do not suffer from any structural weakness in terms of R&D, production facilities, investment, financial capability, market penetration in both Community and world markets. However, in order to have the competitive environment for biotechnology in the Community reinforced for future competitiveness certain problems require resolution, notably: insufficient patent protection, fragmentation of the Community market, the unclear image that biotechnology sometimes has for both policy-makers and the general public.

Industrial policy in an open and competitive environment — Guidelines for a Community approach

Introduction

The concept of industrial policy has been the subject of repeated controversies for many years in the Community. More recently the issue has also been debated in the European Parliament. The debate on the theme of industrial policy is often blurred by the lack of a proper definition and an appropriate conceptual framework. Similarly the idea of global competitiveness, often put forward as the objective for industrial policy, is vague and ambiguous.

The present time is appropriate for an attempt to build upon experience and to clarify the concept of a modern industrial policy for the Community in the present global competitive environment. Several reasons militate in favour of such a clarification:

European Community economies have undergone major structural transformations over the last years and are reaching a turning-point;

while the pace of structural adjustment has been high, much more remains to be done;

future industrial competitiveness in the Community will increasingly be determined by the ability to confront major global challenges, in particular competition from major world partners;

with completion of the internal market and the much more transnational way in which industry is operating, the replies to problems of industrial competitiveness must be sought increasingly at the Community level.

Within the Community, a growing consensus — at least implicitly — has developed on the type of policy needed to lay down the conditions for a strong and competitive industry. This emerging consensus has been largely forged by the experience of policies conducted in the Community during the last four to five years. The main question is not whether an industrial policy is opportune, as governments are increasingly recognized to have, in advanced economies, an important influence on industrial development and performance. On the contrary, the main issue is which conditions need to be present in order

to strengthen the optimal allocation of resources by market forces, towards accelerating structural adjustment and towards improving industrial competitiveness and the industrial and particularly technological long-term framework. The role of public authorities is above all as a catalyst and pathbreaker for innovation. The main responsibility for industrial competitiveness must lie with firms themselves, but they should be able to expect from public authorities clear and predictable conditions for their activities.

Identifying the Community interest

To develop an industrial policy concept, one must refer to the Community interest. This implies a reflection:

- on the relative situation of Community industry;
- on the basic factors of competitiveness on global markets;
- on the way in which the different parties concerned can contribute to improving this competitiveness through taking their responsibility in a coherent and articulate fashion.

The Commission considers that only a competitive industry will allow the Community to maintain its position in the world economy, which constitutes the essence of the Community interest.

This reflection should be based on:

- the definition of common interests and areas of potential conflict with its main competitors;
- the development of analysis of and prospects for the relative industrial and technological situation of the Community;
- the development of discussion on industrial problems built around the medium term;
- active partnership between all the interested parties (firms, social partners, scientific bodies, local, regional, national and Community authorities),

the development of joint operations based on new types of industrial cooperation in areas of common interest with our partners.

The experience of industrial adjustment

European Community economies have undergone major transformations in the last four to five years. These transformations took the form of large-scale macroeconomic stabilization leading to a return to non-inflationary growth, of far-reaching structural adjustment and of the strongest industrial recovery since the early 1970s. Such global changes, which were long and painful to achieve, were based upon three main factors for which the Community has offered a most valuable framework and which in return revealed a high degree of Community consensus: macroeconomic stabilization, completion of the internal market, and substantial measures aimed at strengthening the economic and technological base.

These policies provoked a remarkable reversal from an economic situation which was almost unanimously considered, at the beginning of the last decade, as condemned to stagflation, high unemployment and industrial decay. The strength of the successful combination of macroeconomic and structural policies can in part be attributed to the following characteristics which continue to be of high relevance for the future:

(i) first, policy was based on the recognition that European Community economies, in particular in the industrial sector, are confronted with a permanent need for structural adjustment. The correct reaction to these challenges does not lie in quick-fix solutions but in measures designed to strengthen the industrial and technological base. Such a policy must be applied over a sufficient period of time to strengthen industry's confidence;

(ii) second, policies conducted both at macro- and micro-levels must be mutually reinforcing and they must be based on a broad consensus among Member States. Remarkable progress has been made over recent years in achieving coherence between national economic policies, which must be extended. The EMS (European Monetary System) as a precursor to economic and monetary union is making an important contribution;

(iii) third, policies followed also require a high degree of consistency and transparency; hence, the

strong positive effect on manufacturing investment, which typically requires longer-term horizons.

Industrial policies must learn from past experience. During the 1970s, the two oil-price shocks were largely carried by the corporate sector, which had damaging consequences on the financial position of firms and on their capacity to invest and so to remain competitive. During the 1980s, on the contrary, business profitability increased substantially. Firms were progressively able to restore more balanced financial situations and thereby to commit themselves to large investment programmes both for capacity extension and to improve productivity. One should not overlook the fact that adjustment in the Community still has a long way to go before the problem of high unemployment in several Member States can be solved, and world market positions improved.

Global challenges ahead

While the recent performance of European Community industry is favourable overall, economic perspectives, both short- and medium-term, already reveal today new global industrial challenges as well as several macroeconomic uncertainties. As a result, if the slogans of Eurosclerosis and Europessimism of the early 1980s appear now to have been grossly overdone, there should still be no room for self-complacency. With a high living-standard to preserve and to improve, European Community industry is condemned to technological, commercial and financial excellence in order to enable the necessary social and environmental expenses to be incurred. But the economic environment is bound to become more difficult:

Competition is becoming ever more global and more intense both on the world and on the Community markets. Industrial success encountered by the Community's main competitors in several areas where they now fix the reference to competitiveness at the world level justifies that the Community reflects on its long-term industrial interests. If Community firms continue to hold leading positions for many advanced technologies in aerospace, chemicals and pharmaceuticals, the difficulties met on certain markets for electronics (data processing, semi-conductors, components) for which the international competitive situation is especially preoccupying must be acknowledged, in particular as a result of the

level of concentration of world production and the existence of entry barriers.

Technological know-how continues to require ever higher investment and permanently shortens product cycles. True, a certain number of key emerging technologies (advanced materials, advanced electronics and information systems, integrated manufacturing systems, life-science applications) are also in the hands of the Community, but their industrial application becomes more and more difficult. Only those able to occupy a position in the forefront of technological progress can maintain and improve competitiveness. This applies to both the nature of products offered and the production techniques used.

The role of global corporate strategies is now determinant. As a consequence, policies for production localization are now decided on the basis of a systematic comparison of production conditions. The European Community has the advantage of hosting a number of large global corporations. But it is essential that it remains competitive as a production site for these corporations. The presence of industrial clusters is of critical importance for this. It is also crucial that firms from the Community are present on the markets of its major competitors.

Macroeconomic conditions are bound to be more difficult for manufacturing investment with the emergence of strong competing claims on available savings. Three main developments are crucial in this respect: the increasing role of environmental preoccupations, the need to reconstruct sound and competitive economies in Central and Eastern Europe, and the challenge of coping with the consequences of the ageing of the population in our societies. The first two imply large investment requirements while the latter will demand additional financial resources for social needs for the elderly. The higher rate of capital formation required will make the profitability of private investments more important to attract new savings.

Finally current developments recall that the fragility of Western manufacturing economies should never be forgotten. The macroeconomic context has improved greatly in the European Community over the recent period. Nevertheless the sensitivity to external shocks, in the field of exchange rates and oil prices, remains high. In addition, the Community should be particularly attentive to the situation of developing countries, which are still more sensitive to external shocks by virtue of the fragility of their economies as a

result of their level of debt, the fall in the price of certain raw materials, and difficulties encountered when exporting traditional products. Helping developing countries to escape from the crisis is also in the Community's own interest. This makes it even more important to strengthen international cooperation in order to avoid worldwide turbulence.

This combination of factors presents four main challenges for European Community industry:

(i) the standard of living and level of employment in the European Community will continue to depend on the capacity to stay abreast of international industrial competition. In turn this requires staying ahead of technological competition, producing large productivity gains, sufficiently investing in human capital and especially accepting a high pace of structural change. There is no alternative to such an industrial strategy for the European Community to preserve and improve on a high standard of living;

(ii) firms' capacity to invest more and more efficiently in both equipment and technological know-how and in training and qualifications will continue to be a prerequisite. Firms are required to be able to generate adequate volumes of financial resources, which in turn means that preserving the levels of profitability must be a top priority. The consequences in the area of wage and taxation developments should be fully perceived;

(iii) the capacity to master efficiently the diffusion of technological innovation will offer a crucial competitive advantage. In this respect the capacity of European Community industry to make best use of the potential and the results from technological research and development undertaken in Europe will be, more than ever, of great importance for its industrial competitiveness. But of even greater importance will be the capacity of industry to realize innovation — including incremental innovation — in all areas of business, and to achieve a better balance between supply and demand for goods and services;

(iv) the capacity to develop human resources to master technological change and new working organization. This requires, in particular, a greater ability to forecast the skill needs for the future for European Community industry.

The Commission is well prepared to face those challenges. The completion of the internal market is a key factor for increasing competitiveness. Moreover, additional opportunities are provided by perspectives for the European economy and developments in Central and Eastern Europe.

The concept of Community industrial policy

The present communication aims at developing an industrial policy concept for the Community as a whole. It lays the emphasis on the need to concentrate on the creation of the right business environment and on the priority to give to a positive, open and subsidiarity-oriented approach. The case for such a concept for the Community is dictated both by the experience of the recent past and by the main features of the European economy. Sectoral approaches to industry policy can work during a period but they entail inevitably the risk of delaying structural adjustments and thereby creating job losses in the future. Openness to international trade and respect of the rules governing such trade deliver the right signals to the economy and preclude the recourse by the Community to the various types of defensive measures commonly used to protect domestic producers in the furtherance of such policies. By experience, a competitive environment applied to all on the same basis is the best guarantee for a strong and competitive industry.

The industrial policy concept for the Community should therefore be built around an adequate balance between the following key elements:

- (i) first, laying down stable and long-term conditions for an efficiently functioning market economy: maintenance of a competitive economic environment, as well as a high level of educational attainment and of social cohesion;
- (ii) second, providing the main catalysts for structural adjustment. In this respect, the completion of the internal market has a strategic role to play. The principles on which the internal market programme are based built around the harmonization of essential items and the mutual recognition of Member States' own systems also provide optimal opportunities for industrial development;
- (iii) third, developing the instruments to accelerate structural adjustment and to enhance competitiveness.

The Community approach

The internal market itself represents an essential step for business to look, think and act strategically

beyond national borders. A number of other measures are necessary to facilitate the process of internationalization by strengthening the ability of European industry to compete both on its own market and globally. The internal market is also open to firms from third countries. Therefore it is all the more important to prepare European industry for stronger competition.

The process by which industry adapts, on a permanent basis, to the signals provided by the market can best be described under the heading of structural adjustment. It comprises the steady shifting of resources in reply to these signals towards the most productive outlets, and thereby enables an ever higher standard of living to be attained. Structural adjustment and international competitiveness are closely linked since the ability to produce effectively for markets comes precisely from that speedy adjustment of resources to demand which is at the basis of structural adjustment. European industry must find its own path, but it must also be willing to learn from others. Therefore, European industrial policy must provide a reasonable framework for industry to compete successfully world-wide. Effective competition, financial and societal incentives for new business formation are the most important conditions for creating the necessary breeding ground for a market economy.

Behind the Community's approach, therefore, to industrial policy lies the will to promote the most efficient functioning of markets. A dynamic industrial policy concerns the effective and coherent implementation of all those policies which impinge on the structural adjustment of industry. Three axes can be used to build an effective industrial approach;

- (i) maintaining a favourable business environment

An efficient market economy requires that the main initiative and responsibility for structural adjustment must lie with economic operators. This means that public authorities may take accompanying measures to assist and speed up the process, particularly in the area of infrastructural provision (for example education, energy and telecommunications networks, research and development capacity), but can never substitute for the decisions to be made by business. The link between risk and rewards cannot be separated and must be borne by firms. The necessary environment for industrial development is, however, not always easy to achieve. Special interests are always attempting to obtain favourable treatment at the expense of the free play of market forces. European industrial policy must convince firms that such com-

petition hindering activities prove ultimately counter-productive.

Creation of a favourable business environment also involves ensuring that superfluous and niggling bureaucratic regulation is eliminated. Community policies must also fulfil this requirement. The internal market must be made as unbureaucratic as possible. This includes especially a horizontal approach to harmonization; sector-specific rules should only be made in exceptional cases. Both the Community and the Member States have therefore undertaken actions during the last decade specifically aimed at ensuring that in the development of regulation and procedures account is taken of the need not to impose undue burdens on industry, particularly on smaller businesses. The freer enterprise climate thus created has led to the creation and development of many small businesses which in turn has contributed significantly to the growth in employment.

Such measures must continue to be applied if a healthy business environment is to be maintained. Arrangements for ensuring that representatives of industry, including those of SMEs, are consulted at the earliest possible stage in the preparation of proposals which will affect them in the conduct of their business, are of particular importance. This does not mean that legitimate policy objectives, such as those in the social, environmental and consumer protection areas must be sacrificed to the interests of industry. Their impact on industry must, however, be considered so that a reasonable and balanced approach can be adopted.

(ii) implementing a positive approach to adjustment

A positive approach to industrial adjustment implies the recourse to policy which enables public authorities to avoid 'defensive' industrial policies of a protectionist nature; policies which have resulted in the past from the failure to anticipate in time necessary adjustments or as a manner of easing the adaptation required. This has only partially been successful, for example in steel policy. Most 'sectoral' policies in practice have been directed more towards social objectives than the achievement of adjustment. On the contrary, the Community's industrial approach should be based on the active promotion of positive adjustment. Sectoral policies must promote structural adjustment and not retard it. Sector-specific policies have to be carefully examined and possibly adapted.

(iii) maintaining an open approach to markets

The optimal allocation of resources requires that markets should be open, both outside as well as inside the Community. Without open markets the benefits of competition and specialization cannot be reaped. Therefore, market opening should be generalized and all partners must participate equally in the process on the basis of mutual comprehension and effective implementation of rules which guarantee the proper functioning of trade.

The Community will also remain open for direct investment from third countries. Direct investment is an invigorating competitive element by which technical know-how and industrial competence are exchanged and international economic integration put on a broader basis.

Three main areas cover the principal stages of structural adjustment:

(i) prerequisites required for structural adjustment to get under way:

(ii) catalysts, which act on the willingness of business to undertake adjustment in reply to pressures and opportunities;

(iii) accelerators, which further develop structural adjustment.

Ensuring the necessary prerequisites for adjustment

In order for industry to actively participate in the process of structural adjustment a number of prerequisites need to be met.

Securing a competitive environment: an essential task

In order to achieve competitive conditions the following are essential.

First, the greatest vigilance should be exercised on very large concentrations. Such vigilance should ensure the best combination between the requirements imposed by international competition and the maintenance of balanced and competitive conditions

of operation between operators on the domestic market.

Globalization of markets enables not only greater economies of scale to be reaped but also specialization for more defined market segments. At the same time, greater standardization of products places a premium on product innovation, manufacturing excellence, design, reliability compared with the more traditional factors like proximity to markets, distribution systems and customer loyalty. The bases for competition are considerably modified, in particular through rising barriers to entry from higher minimum efficient scales of operations, and more and more intensive research and development expenditure. Competition policy must also take this into account. It is essential for the appreciation of the problem of concentrations that this appreciation should not be limited to the Community market when concentrations are subject to international competition.

Faced by such tendencies towards globalization, European firms must be able to meet the terms of competition as appropriate. In turn, this implies that great care be taken over the definition of the relevant market on which competition must be maintained. Countries with internationally successful industrial sectors have usually been found to possess several competitive firms in the same industry — even when their domestic markets are quite small. Indeed, domestic rivalry between firms can be said to constitute an important element in success overseas. Completion of the internal market should provide the necessary basis both to allow the development of enterprises of sufficient scale and to ensure that competition on that market can be effective. Since the conditions of competition vary considerably between sectors and over time, it will be necessary to analyse such conditions on a permanent basis.

The Regulation on the control of concentrations puts in place the necessary legal instrument for Community treatment of large mergers and acquisitions. The Regulation provides a high degree of the necessary legal security and rapidity for firms in their pursuit of suitable business strategies for competing on the internal market, which must necessarily include the possibility of growth through mergers and acquisitions as long as competition remains effective in the markets concerned. The Regulation will ensure rapid approval of mergers which are not anti-competitive.

Secondly, financial support by public authorities must be rigorously examined and controlled. As other forms of protectionism recede, the importance of State aids as an anti-competitive mechanism tends

to grow. Beyond their negative effect on competition, State aids can also have serious implications for economic convergence within the Community. Large and well developed Member States will always be able to outbid less developed Member States on the periphery of the Community. The four largest Member States account for 88% of all aid granted. The objective of industrial policy should be to create the conditions which allow better control of such subsidies.

It is important to ensure that State expenditure, far from representing a positive contribution to the competitiveness of a region, does not become a covert anti-competitive mechanism which inhibits structural adjustment. Moreover, the effectiveness of the Community's policies to promote greater cohesion could be improved by some progressive reduction in aid intensities in the central and more prosperous regions.

The link between the control of State aids and economic convergence covers several aspects. Existing aid ceilings for the purposes of regional development need to be rigorously enforced. It is not so much the quantity of aid granted as the importance of the differential between existing aid schemes which acts as the spur for foot-loose industrial location. Less developed Member States can therefore make significant budgetary savings provided that the appropriate differentials on a low level are maintained. In addition to national State aids, the granting of aid in cash or kind by sub-national (regional or local) authorities needs to be monitored, since it adds to the total volume of aid and probably aggravates counter-cohesive distortions since authorities in more prosperous parts of the Community are able to offer more generous incentives.

The value of regional development grants can also be undermined by continuing State aids of a sectoral character, which by falsifying competition within an industry also alter optimal location decisions. Sector-specific aids must be limited in both duration and value, and made degressive. Their main task lies in easing structural adjustments. Finally, a return to sectoral subsidization must not be allowed to occur through the use made of existing regional development schemes in more developed parts of the Community, in particular for capital-intensive investments.

Putting a stop to the international subsidy race is an important prerequisite for a further reduction in State aids in the Community. Stricter disciplines on State aids should be applied by the Community's international partners.

Maintaining a stable economic environment

The return to a stable economic environment ensuring improved functioning of the price mechanism allowed industrial recovery in the Community to occur. The maintenance of such conditions, in particular with regard to savings and investment, will continue to be required.

Fiscal policies also have a strong effect on the capacity of firms to invest, and thereby to adjust to market conditions. On the one hand, public authorities must be able to raise the necessary finance for their activities, which includes the direct taxation of enterprises. On the other hand, fiscal treatment, in particular of profits and depreciation, has an impact on the cost and availability to firms of funds for investment. Of particular importance in this context are the fiscal treatment of depreciation and retained earnings. In a time of greatly increased international competition, the impact on European competitiveness of such measures can no longer be neglected. The capital stock is ever more quickly depreciated by technological innovation. There follows a higher requirement for own capital formation, which should be promoted by fiscal policy, which is already the case in certain Member States.

Ensuring a high level of educational attainment

A high level of educational attainment represents the foundation for the necessary level of human capital which advanced economies require. Increasingly the ability to generate and assimilate new technologies, organizational methods and cultural diversity, rather than the level of knowledge itself, is becoming a prerequisite for effective structural adjustment. Lifelong learning should therefore become an attitude and practice to continuously upgrade skills. Some serious imbalances have also arisen with regard to the supply and demand of trained people. All-round education is an important advantage for European industry which can be further strengthened by greater development of specialized knowledge after school. Permanent market-oriented research and training is necessary to maintain or achieve competitive advantage on specialized markets.

Promoting economic and social cohesion

The diversity of Europe's regions presents challenges as well as advantages. The effectiveness of the large market can be enhanced by greater levels of economic cohesion among its regions. The adjustment of less favoured regions to the 1992 single market is being assisted by the Community's structural Funds, which were enhanced for this purpose. They are operating on the factors which are crucial to the competitiveness of businesses, such as the provision of advanced infrastructures and the quality of human resources. Economic convergence between Member States and greater cohesion between regions occurs more spontaneously among countries and regions which have reached a more mature level of economic development. It is important to ensure that industries in those regions which are significantly less highly developed than the central regions of the Community have access to the sort of infrastructures which will enable them to compete on more equal terms not just with other regions within Europe but also on the global market. Dialogue and partnership between industry and the public authorities have a vital role to play in this process.

Flexible, innovative, knowledge-intensive industry requires strong social cohesion. Employee information, consultation and participation in decision-making facilitates structural adjustment by securing confidence in business decisions and assisting the rapid introduction of new working methods and the re-deployment of human resources within the enterprise. Appropriate information and consultation practices covering employees at all levels of responsibility within the enterprise will reinforce their motivation and their receptivity to changes. A good balance between the needs of the various parties concerned will play an important constructive role in such processes.

Adjustments can also be carried out easier in those circumstances, where an adequate level of social protection provides a safety net which diminishes the risks of change and so promotes mobility. At the same time the economy and individual enterprises require a good degree of flexibility, which should not be hampered unnecessarily by too restrictive regulatory practices.

Flexible working hours, which can take various forms also of an innovative nature, will be a matter for negotiations and/or agreements, according to the level concerned. This should not only encourage the creation of new jobs, but also facilitate a better utili-

zation of production equipment in accordance with changing market conditions and at the same time contribute to an improvement of working conditions, in particular with a view to the health of the worker and to his possibilities of better organizing his time both within and outside work. Although such cohesion cannot be without costs for enterprises, these costs must be viewed in the light of the benefits that they are able to draw from it and as a necessary condition for the normal conduct of their activities. It is crucial for higher social costs to be obtained through higher productivity.

Achieving a high level of environmental protection

Continued economic growth can only be sustained by a high level of protection for the environment. As it is no longer possible to treat environmental resources without due regard to their intrinsic value, it is necessary to ensure that the utilization of natural resources is both prudent and rational. It is also necessary for the utilization cost of these resources to be internalized in the market price of products.

To begin with, the heightened concern for environmental matters led to an increased flow of information, and a complex of legislation in order to protect health and the natural environment. Increasingly, environmental awareness is underlined by growing consumer demand for products and services perceived to be environmentally friendly. Environment has a value in itself. Therefore it must be used sparingly.

In the case of acute dangers to health of the environment, outright prohibition is unavoidable. In the interests of conservation, the environment is being seen as a valuable resource on whose use public authorities must impose a framework to guard against overuse. This market-oriented approach concords with the principle that the polluter pays.

Since it is now certain that the necessity to pay due regard to the environment is imperative throughout the world for all segments of business, a leading position occupied by Community firms in the field of environmental protection can represent a major competitive advantage. Such an advantage, achieved by a high level of environmental standards, must not be allowed to erode. As international competitors to European industry also meet increasingly higher

environmental standards, it is imperative that European standards can surpass or at least equal them so that European firms are not hindered in trading freely. Within the single market, it will also be necessary to meet such high levels not only to meet legislative requirements but also to facilitate consumer acceptance and to avoid fragmentation as a result of varying national measures. Having been set at a high level, environmental standards need to be predictable and stable so that industry can produce with sufficient scale to amortize the investments required.

Building on their advantage, many enterprises are anticipating actively developments in the field of environmental standards by adopting appropriate environmental strategies. Through the development of internal environmental audits, many firms can integrate conception, design, production and marketing of products with appropriate clean production processes and technologies. This allows substantial savings of energy previously wasted in the production process, for heating and in the transport of goods, and in materials and labour usage. This approach has led to investments which do not merely add 'filters' to existing plant to capture the waste products but concentrate on the prevention of waste generation.

The high percentage of total investment devoted to environmental protection in certain sectors provides industries supplying the necessary products and know-how with a major market. The current market is estimated by OECD at between ECU 65 and 90 billion, of which ECU 40 billion in the European Community. The fact that several European countries still have some way to go before they attain similar levels of equipment for certain types of protection to that of the USA and Japan today means that the rate of growth of the European environmental protection industry should be particularly rapid. In addition, new market opportunities for business will arise in ensuring environmental standards and legislation have been complied with. Such opportunities can also help to diffuse knowledge about possible cost savings from adopting clean technologies.

A high level of environmental protection is increasingly being met by economic and fiscal instruments and voluntary agencies rather than through legislation. In order to prevent distortions of competition, there must, in addition, be policies towards developing harmonized standards and regulations, particularly in the fields of energy, waste management and disposal, recycling, incinerators, vehicle emissions, CFCs and agro-chemicals (fertilizers). Instead of considering that the requirements of environmental pro-

tection represent a constraint on growth, they should be considered increasingly as an opportunity in favour of competitiveness. Well-conceived environmental policies should therefore result in increased efficiency and lasting improvements in the competitive position of industry.

Providing the catalysts for adjustment

Certain policies play a particularly important role in industrial policy by acting as catalysts for change. Those policies which favour firms' initiative and guide them in the direction of a long-term perspective founded on the Community's interests are to be preferred. Establishing a stimulating economic environment thus requires a clear political consensus on the economic policy to be followed and the necessary resulting decisions. Such an industrial policy is anything but a policy of *laissez-faire*.

The internal market as a factor for change

Through providing a home market of the requisite size and quality, the programme to complete the internal market can be considered as industrial policy *par excellence*. It is not at all the case that at a time when competition increasingly takes the form of global competition on the major markets of the world, the importance of the home market diminishes. All competitors require a home base, from which they may subsequently add foreign operations.

The advantages for achieving economies of scale for investments on the domestic market are not only relevant for mass production, but also for the development of specialized products. As important as the size of the home market is its quality. This is based around the composition of domestic demand, for example for specialized products, and the specific elements of the cultural environment which provide special advantages for competing in particular industries. Italian success in design is an example. The way in which the internal market programme is implemented largely through the principle of mutual recognition allows many of these regional features to be exploited effectively by opening up new market

opportunities without sacrificing essentially local specific advantages. In this sense the interlocking and competitive nature of the European home market is the very opposite of a homogeneous and undifferentiated mass market for standardized products. Such markets no longer offer great advantages in the face of increasingly sophisticated, quality conscious and individualistic consumers. Different tastes and cultural characteristics also in future guarantee a diversified market. The elimination of internal frontiers can lead to new competitive situations, which bring forth even better and more sophisticated goods.

Although the internal market programme represents a whole which must be implemented fully for the benefits for business to flow, some areas of the programme have special benefits to those that the single market will bring in terms of the economies of scale and opportunities for greater specialization.

Standards and product quality

Over the past five years, European standardization has been transformed from a marginal activity to one which is attracting priority attention. The importance that voluntary standards have assumed in the Community's technical legislation has been the driving force behind this change. The development of a European standards system is, however, an on-going process which will take several years to complete.

Under the new approach to technical harmonization and standardization, legislation is confined to laying down the essential requirements to which products must comply in order to ensure the protection of public health or safety, or the protection of the environment or the consumer. European standards provide manufacturers with a set of technical specifications recognized in each directive as giving a presumption of conformity to the essential requirements. The European standards concerned remain voluntary.

Since the adoption of the new approach, the number of new European standards has increased rapidly from 19 in 1985 to 150 in 1989. This is still low compared to that of unharmonized national standards, and compared to the requirements for the implementation of the internal market programme.

European standards are not only required for the purpose of removing technical barriers to trade, but increasingly they are also becoming a key item for the promotion of industrial competitiveness.

Standards promote competitiveness by:

lowering costs for producers;

shaping customer preferences for products by their familiarity;

enabling the emergence of new markets, particularly for developing technologies, where they are becoming a pre-condition for industrial production or marketing.

In those areas for which markets are becoming global, it is crucial that European standards be set at the requisite level and be compatible with international standards. There will still need to be European standards, however, because international standards are not binding but have the status of recommendations. In the absence of internationally agreed standards, it will also be necessary to set standards at the European level initially thereby paving the way to the creation of international standards. Standards for new technologies must be delivered more quickly than ever before if they are to meet the needs of the market.

If standards are to play an important role in improving industrial competitiveness they must command credibility in the market and become the norm by which competitors are judged. It is important, therefore, that they be set at a high level. In this way, the value of standards gains acceptance from end users and the necessity for producers to upgrade quality to meet those standards acts as a spur. The voluntary approach adopted for implementation — apart from legal requirements for type approval — means that it should be possible to agree standards of a high technical level. It also means that private initiative by business must play an essential role in the standards setting process and in the financing of the attendant costs.

Successful standardization implies successful implementation. Credible procedures for certification, inspection and testing play a key role in creating the conditions which allow confidence to grow and mutual recognition of each Member State's procedures to become effective.

Efficient procedures for applying standards entail an added gain for competitiveness when they go beyond certification to cover also conformity assessment — including testing, quality systems and accreditation in addition to certification. It is when control takes place before production (in the course of the development of a prototype or model), or during production (either as surveillance of products or of production processes), that industry gains most

advantage. Increasingly, industry is using quality systems as a source of competitive advantage and to diminish costs associated with lack of quality. Third-party certification adds credibility to these efforts both internally within the firm and externally for clients.

Public procurement

The great importance of public procurement for industrial competitiveness is threefold:

(i) Firstly, the vast size of public procurement — ECU 600 billion or 16% of GDP in 1987 — means that market access is very important for all firms. Of this vast market, available information for the larger Member States shows that less than 4% is taken by imports — and in some cases less than 1%. Compared with markets in general, for which import penetration is around 20% for these countries, public procurement is still very closed.

(ii) Secondly, public procurement may enhance technological capability when it is directed towards the upgrading of marketable demand for products of the latest technology. In order to increase this effect, invitations to tender should preferably be formulated in an open manner and not fix the 'state of technology'.

(iii) Thirdly, public procurement is heavily concentrated on a relatively small group of sectors, and these industries depend on a competitive market for public procurement to develop the necessary products and skills to be successful internationally. Fewer than 20 subsectors of the 60 surveyed for procurement practices account for more than 85% of public procurement. As a result, public procurement represents a substantial proportion of total sales for power generation equipment, and computers and office machinery (30%), aerospace equipment (50%), and railway rolling stock and telecommunications equipment (90%).

The existence of considerable economies of scale in the manufacture of these products has led to high entry barriers and the creation of oligopolistic structures. The lack of innovative competition has led to a redirection of effort toward meeting existing technical requirements at the expense of product innovation, marketing and achieving value for money.

Governments have often rationalized the need to accept such situations through arguments in favour of 'national champions' in order to guarantee security of supply, to maintain a presence in certain vulnerable areas of high technology or to protect jobs. The

failure of such strategies is well illustrated by the data-processing sector where Europe has consistently failed to produce internationally competitive suppliers in spite of massive public support. Without the requirement to adjust in response to the existence of a number of competitors, the necessary spur to innovation is normally lacking. So-called high technology industries quickly lose any competitive advantages provided by protection. It is precisely for these industries, therefore, that the opening-up of public procurement is of greatest importance. It will only be possible to effectively open such markets, however, if the necessary standards at European level are in place.

The strengthening of competition will boost intra-Community trade as well as inducing significant price reductions. Price reductions will occur as public authorities increasingly buy from suppliers who offer the best terms combined with suppliers themselves reducing their prices to meet the greater competitive challenge. In the longer term, lower prices will have to be reflected in production costs. This will lead to major restructuring operations (mergers and plant closures). These structural changes will result in large efficiency gains and the emergence of production units of optimum size with respect to the more integrated Community market. However, the benefits from opening up public procurement will only be reaped if the necessary rules are fully and effectively enforced. In the context of the international opening up of public procurement, it is desirable that the Community's competitors respect disciplines as strict as the Community applies on its own market.

The abolition of national quotas

Even today, more than 30 years after the Treaty of Rome, Member States continue to apply over 2 000 national quotas on imports from third countries, in particular in execution of Article 115 of the Treaty, and a variety of bilateral 'voluntary export restrictions' to protect their industry from third country imports in a number of sectors, including for example automobiles, textiles, toys, porcelain and chemicals. Such arrangements are not consistent with the objectives of the internal market with its freedom for all goods and services to move throughout the Community. The internal market must also be open to goods and services from third countries once they have been legitimately imported into the Community. After completion of the internal market, it will no longer be possible to use border controls at internal frontiers in order to apply such restrictions.

The removal of third country quotas and similar measures represents an important item of industrial

policy because it exposes national markets to a greater degree of international competition and by so doing prepares them for global challenges. The necessary structural adjustment which results from the removal of quantitative restrictions should be taken into account by the Community's structural policies, if necessary by horizontal measures. Defensive protective strategies and subsidies to maintain unprofitable capacity are not an appropriate response to strengthen permanently the industrial competitiveness of European industry.

A coherent legal framework for business

The internal market programme also affects the legal framework for doing business in the Community. The appropriate legal instruments need to be available for firms to choose the most appropriate legal form and size for their needs.

As far as mergers are a necessary pre-requisite for optimal company size, the internal market should provide the necessary legal conditions, subject always to the essential requirement of maintaining competition. At present, company mergers across frontiers are made more difficult than necessary from a legal point of view. In fiscal policy, the two directives on mergers, divisions, transfers of assets and exchanges of shares concerning companies of different Member States and on the Community system of taxation applicable in the case of parent companies and subsidiaries of different Member States, which were adopted by the Council on 23 July 1990 and which are due to enter into force on 1 January 1992 will remove the main tax obstacles to cooperation and restructuring of enterprises within the Community. Additional proposals will be put forward before the end of 1990 according to the orientations set out in the Commission communication to the Parliament and to the Council concerning guidelines on reforming taxation of 20 April 1990. From an industrial policy point of view, the possibility for transnational parent companies and subsidiaries to carry forward and backward losses is of outstanding interest. As far as company law is concerned, it is expected that the adoption of the tenth Directive on transnational mergers will remove the remaining obstacles inherent in the existing national legislations. The setting-up of a joint subsidiary involves at least one partner in an unfamiliar legal system while, again, the tax implications may act as a disincentive. When businesses wish to pursue jointly a single activity, they had no appropriate corporate European form.

The entry into force of the European economic interest grouping has gone some way to remedying

the problem. The adoption of the European Company Statute, which has been before the Council for several months, will go a step further by allowing companies incorporated in different Member States to merge or to form a holding company or joint subsidiary of a European format, while avoiding the legal and practical constraints arising from the existence of 12 different legal systems. Since the decision to adopt such a statute will be a matter of choice for the firms themselves, and the possibility of using existing nationally constituted corporate forms will remain, this new legal form will have to find its place in competition with national and Community legal instruments. But one can expect its broad acceptance as a result of increasing European industrial cooperation.

Beyond the possibilities for industrial cooperation opened up by the internal market, the protection of intellectual property also plays an important role in allowing business to internationalize. Providing speedy and effective protection throughout the market represents a powerful incentive to innovation. This is also true for the Community's dispositions covering data protection, which represent a prerequisite for the free flow of information through the internal market.

Trans-European networks

Trans-European networks form a direct part of the completion of the internal market which contribute to the integration of Community industry and markets by filling in missing links between existing national systems. Beyond the Community, trans-European networks assist in the realization of the European economic area and economic development in Central and Eastern Europe through providing the necessary technical and physical basis for doing business with the Community. Within the Community, networks assist the development of peripheral regions by facilitating their access to central regions.

Mobility of persons and fluid movement of goods calls for dense, rapid and cost-effective transport infrastructure for travellers and goods, and the elimination of remaining bottlenecks and improved integration of different types of carriers (rail-road) are of particular importance. The single market also requires a Europe-wide integrated telecommunications network and properly conceived and executed interlinking national energy distribution systems in the Community. (Work is already in progress in certain areas such as customs, statistics and social security. The third framework programme provides for prenorma-

tive research work on system integration to put in place a common methodological and standards base.) Lastly, the establishment of training networks between universities, firms and research centres of the Community has become more and more necessary to provide an international dimension to training.

The Community as a world trade partner

As a necessary complement to internal market opening, an open and vigilant trade policy is required based on the rigorous enforcement of agreed international rules. The Community's approach has always been open, both as a result of its historically strong ties with the rest of the world and as a cause of its leading role in international trade. An open approach in turn requires that the rules of the game be respected by all trading partners since the Community's economy will become more sensitive to such practices in line with its even greater openness. A failure to ensure that respect for these rules is maintained would lead to renewed protectionist pressures. The aim of the Community, which is strongly attached to the principle of the balance between rights and obligations, should be to ensure that the markets of the Community's competitors are as open as that of the Community itself.

In this context, the importance of a successful conclusion of the Uruguay Round of negotiations under GATT cannot be overstressed. Such an outcome would present further opportunities for Community industry in foreign markets still protected, such as the Asian NICs, and to sectors not previously covered by the agreement, in particular services.

The Uruguay Round also provides a splendid opportunity to agree comprehensively on those international rules of the game, which are more appropriate than those in the past to deter unfair practices. The greater openness on international markets must be accompanied by the necessary disciplines for trade to be conducted on the basis of fair and loyal competition. In particular the rules with regard to dumping must be both transparent and tough. There should be no doubt about the Community's intention to apply them consistently. Nevertheless, it must be ensured that the stronger partner does not impose unilaterally its own interpretation on the weaker. Improvements to the disputes procedures should ensure that such

rules, once set, are respected. This expressly includes circumvention by third countries.

It is only by progressing on the road to a really open and fair world economy that new advantages can be obtained in addition to those reaped by completion of the internal market. The multilateral approach remains the best approach which allows all partners, in particular developing countries, to be associated. The consequences of the globalization of markets require in addition greater exchange of information between partners at all levels.

Accelerating adjustment

A positive approach to industrial adjustment also implies the recourse to policies which can help accelerate the process. These include:

- The development of the technological capacity of the Community. The impact of technology is not limited to a few high technology sectors but affects the whole economy, both in terms of products and production methods. Thus, the mastery of generic technologies such as flexible manufacturing systems and information technologies, new materials and biotechnology possess great importance for the competitiveness of European firms.

For example, information technologies allow considerable quantities of information to be entered, treated, stocked and diffused ever quicker. They concern almost all industrial activities whose management methods are modified. They influence in particular the performance of firms through allowing the development of more efficient conception, production, simulation and optimization tools and through facilitating their management.

The significance of the mastery of new generic and diffusing technologies for the competitiveness of almost all economic activities must therefore be clearly understood. In order to remain in the technological race, and *a fortiori* to make up in certain cases a lag, requires that firms analyse and fully understand the risks and considerable financial and human resources (material and immaterial investments, need to assemble very high qualified teams, often multi-disciplinary) required. They must combine long-term strategies and short-term flexibility in the context of a coherent, stable and predictable environment maintained by public authorities.

The role of public authorities should therefore be based, to begin with, on the realization of the general importance of technology. In this context, the Community must be particularly attentive to the preoccupations expressed concerning the deterioration of its position in certain areas of advanced technology.

The end result of the combined actions of firms, public authorities and scientists in the field of technology should allow the Community to realize a very high level of global competitiveness.

It is on the conditions governing the conception, development, diffusion and exploitation of technology that efforts should be concentrated to improve the Community's efficacy in this field.

The ability to manage in the best way these four elements largely determines firms' industrial performance and implies that public authorities put in place the framework allowing their full exploitation.

The fact that industrial structures are becoming more and more internationally interdependent also implies that Community industry finds its place in the context of growing cooperation between groups at world level.

The strategic role of the diffusion and exploitation of technology means that isolated measures are inadequate for its promotion. It requires that a number of mutually coherent measures be implemented:

by strengthening the size and cooperative nature of the pre-competitive research effort. It is clear that for the effort of public authorities to bear fruit, firms must remedy the low level of their own investments for technological research, development and innovation. The creation of an appropriate fiscal environment would be of assistance on this matter;

by the promotion of an active policy for innovation based on the rapid transfer of know-how from basic research through to industrial application, by ensuring in particular the SMEs access to this know-how and their possibility to make best use of it. This policy should, as a result, have a significant portion devoted to the circulation of information, including that from abroad;

by the positive effect that a high level of standards, the implementation of technologically advanced trans-European networks and public procurement open to the most sophisticated technologies can have on demand;

by strengthening training, in particular through specialized centres of higher education.

- A dynamic policy towards small and medium-sized enterprises (SMEs). Through their contribution to flexibility in production and their capacity to adapt quickly to new market trends, SMEs play an important role in structural adjustment. Policies aimed at maintaining an enterprise culture and at the creation and development of SMEs must be maintained. Efforts to ensure that burdens for the economy are limited are particularly important for smaller firms, as are information and business services and mechanisms to improve business cooperation. Policies to improve access of smaller enterprises to Community and external markets are also important.

Through sharing risk large firms and SMEs can be complementary; and increasingly the presence of strong suppliers oriented towards the world market represents an important factor for competitive success. It will be necessary in future to ensure that small and large firms can develop in parallel, in particular through cooperation.

- Better use of human resources, facilitating the introduction of new technologies and working methods through vocational training and more efficient redeployment through retraining. In the face of impending skill shortages and a much faster rate of innovation, the adaptability and quality of human capital has become a key determinant of industrial competitiveness and the one on which developed economies must place greatest reliance in future. It is important to recognize that upgrading of skills must take place throughout industry and should not be restricted merely to so-called high technology industries. The distinction between 'high-tech' and 'low-tech' industries is losing its importance. Also in traditional areas there is a permanent requirement for greater sophistication and further qualifications. European industry in the long run can hardly rely on price alone to remain competitive; it must further improve its product technology and exploit fully its reserves of productivity.

- Ensuring the requisite conditions for the development of business services. The growing complexity of production and management methods requires a dynamic and competitive business services sector. A major objective should be to extend the coverage of the internal market programme to eliminate remaining obstacles to the creation of a common market for these services. The efforts being made to achieve the internal market in the area of financial services will also result in cost-savings to industry.

Ensuring a coherent and effective approach

All policies with consequences for industrial policy must be looked at from a common perspective and be mutually compatible. However, individual policies must be developed and implemented at the appropriate level. Ensuring coherence comprises the following items.

First, as with all Community policies, the principle of subsidiarity by which the Community only tackles those tasks which can be done better at the European level must be applied to industrial affairs. With completion of the internal market, the economically relevant markets in which firms operate often no longer coincide with national boundaries. In this case external economies can be provided rather at European rather than national level. For instance, large-scale investment in R&D or infrastructure projects may be more efficiently carried out if national resources are more concentrated.

It will be necessary, therefore, for industrial policy to identify the correct mix of Community, national and local responsibilities. For instance, in research and development a division of responsibility between the pre-competitive aspect of Community-financed research and the Eureka projects which are closer to the market has been developed. Programmes for promoting technology transfer and the access of SMEs to research programmes are also important at EC level. Nevertheless, national R&D programmes will continue to be dominant, and the coordination of these programmes with the Community's efforts must be ensured.

Secondly, the experience of the 1970s and 1980s has shown that sectoral policies of an interventionist type do not form an effective instrument to promote structural adaptation. They have failed to make industry competitive by delaying the requirement to implement necessary adjustments, led to grave misallocation of resources and exacerbated problems of budgetary imbalances. Of course, the situation of different industrial sectors in the European economy is not static and from time to time issues affecting specific sectors have to be tackled at Community level.

Especially grave problems of adjustment have been tackled at Community level in the past, for instance for steel, textiles and shipbuilding. Equally, the Community has had to pay special attention, and will continue to do so in future, to areas that can play a key role for the development of the European indus-

try and of the European economy as a whole, such as telecommunications, information technology, aeronautics, the maritime industry. It is nevertheless essential that policies aimed at specific sectors are fully consistent with the general principles of industrial policy as described above.

Special importance has to be attached in this context to coordinated efforts for research. There may also be a case for encouraging industry to set up joint research laboratories. (but not necessarily Community financed), in particular to further develop sectoral applications for core technologies. Specialized institutes of higher education have also proved important for providing industry with the necessary skills and to facilitate the transfer of research (which often also takes place in such centres) to industry. Particularly high levels of training in specialized skills are also required in order to facilitate the introduction of modern manufacturing technologies.

Thirdly, greater consultation with the representatives of industry is required in order to strengthen consensus in the Community and to guide European policies towards the real problems. In developing policies and guidelines, it is particularly important that the representatives of industry be fully consulted at the earliest possible stage. This should include consultation with the representatives of SMEs as well as with those of larger enterprises. Also employee representatives must be given sufficient opportunities to make comments.

Maintaining the impetus towards international investment

Growing internationalization of the economy requires that, in addition to their activities on the internal market, Community operators are able to increasingly invest abroad to implement coherent global strategies. Such investment should not be seen as in contradiction with efforts to improve competitiveness within the Community but as complementary to them. European firms are already undertaking substantial industrial investments in third countries, particularly the United States, but the changing situation within Europe requires an added impetus to this process. If the emerging market economies in Eastern Europe are not to falter in their progress, they will require a substantial transfer of technology, know-how and capital. In view of the geographic, historical and political ties of the Community with these coun-

tries, efforts will need to be made to develop the flow of investments by European firms towards Eastern Europe. But also in the Far East, European industry has to expand its presence. The obvious difficulties with market access must not lead European industry to neglect these important markets. In this context, the analysis of conditions likely to assist the development of firms' investments outside the Community should be more especially examined. The Community must support these efforts by parallel market opening.

Strengthening competition internally and externally

Completion of the internal market should increase competition on the Community market. However, it will be necessary to ensure that the movements towards concentration which are taking place in anticipation of the single market do not obstruct the free play of market forces. The tendency for certain groups to acquire a dominant position under the guise of achieving a sufficient critical size should be checked. In many ways, a series of cross-border mergers which leave no firm in charge of significant markets can lead to stronger competition between the resulting groups than the national champions option. The way in which concentration takes place is therefore as important as the degree. In order to maintain competition on the Community market, the necessary legal basis has now been put place. It remains to elaborate the appropriate means of evaluating the industrial impact of such concentrations. The implementation of the regulation will entail a full analysis of the markets concerned.

Respecting competition on international markets will become much more important. Globalization of markets and the ever greater dimension of major groups requires that mechanisms be created that can avoid the creation at international level of monopolistic or oligopolistic situations which would be unacceptable at national or regional level. The even greater impetus towards liberalization, and attendant possibilities for international firms, opened up by the Uruguay Round could lead to an increase in those anti-competitive tendencies and dominant positions which are already visible for such markets as data processing and telecommunications equipment or consumer electronics. Reflection on the means to confront this issue is required, both within the Community and at international level.

Promoting the Community's advantages

Industrial integration is to be regarded as an instrument of economic and social cohesion. Regional diversity within the Community is one of its advantages, allowing the creation of new sources of competitive advantage through appropriate specializations. The adaptation of regional industries to completion of the internal market therefore can constitute an important vector for the development of EC industry. In order to achieve this, efforts already undertaken through the structural Funds to ensure that the weakest regions develop the type of infrastructure and quality of human resources essential for the success of their firms in a competitive environment should be pursued. Technical assistance should be supplied to certain parts of industry, for example through programmes of Community initiative which attempt to improve the capacity of SMEs in less developed regions to compete. In a dynamic market, restructuring can take place without the negative consequences on employment and output that occurs in a period of recession. Underutilized resources can be put to work productively and already the advantages of several regions, particularly in the south of the Community, are also attracting investors from elsewhere in the Community.

Conclusions

I — The Commission proposes that the Council approves:

the Commission's analysis of the degree of industrial adjustment achieved so far and of its ongoing character which is required for the global competitiveness of European industry;

the concept that Community industrial policy should promote permanent adaptation to industrial change in an open and competitive market. It is based on the principle of free trade and on the competitive functioning of markets around long-term industrial and technological perspectives;

the principle that this policy be implemented through the creation of a favourable environment for firms' initiative through the coherent recourse to all those Community activities having an impact on industry;

that industrial problems at a regional or sectoral level should increasingly be resolved by horizontal measures.

II — In order to implement these principles in the current competitive context, the Commission proposes that the Community and Member States:

1. Improve the functioning of the internal market:

through ensuring its completion on the basis of the White Paper's approach, properly transposed and enforced at the national level;

through ensuring better control of public financial assistance to industry, in particular when this assistance affects highly capital-intensive investments;

through ensuring more coherence between different Community and national activities as far as they concern industrial policy. In order to achieve this and assure subsidiarity, it is important to develop dialogue and the exchange of information;

through accepting the necessity for this policy to take into consideration developments resulting from the globalization of markets, production and operators, as well as the industrial policies of the Community's main competitors.

2. Improve the functioning of the world market:

through a continuous effort to further open up and strictly implement the multilateral trading system;

through facilitating the flow of international investment;

through vigilance against unfair commercial practices, and the will to deal with them;

through facilitating cooperation with international partners of the Community, amongst others in Central and Eastern Europe;

through ensuring that the markets of the Community's competitors are as open as that of the Community itself on the basis of the principle of balance between rights and obligations.

3. Pursue those positive adjustment policies aimed at building a favourable economic environment for private initiative and investment in the Community:

by maintaining a macroeconomic framework directed towards stability and the facilitation of medium and long-term funding for industrial enterprises. In the current context of growing international economic uncertainty, a dependable macroeconomic framework is more and more necessary for business;

by ensuring that the efforts of firms, the Community and Member States for technological research and development are strengthened, through greater cooperation between the parties concerned and in particular between producers and users of new technologies, and through exploiting the industrial potential of innovation and technological research and development policies at national and Community level;

by strengthening policies which take into account the special requirements of SMEs and the promotion of new business formation. In particular, national and Community actions to support intra-Community and international cooperation between SMEs and large firms should be developed;

by directing national and Community structural instruments more towards backing structural adjustment strengthening firms' competitiveness in less developed regions;

by recognizing that a high level of environmental protection offers both challenges and opportunities for industry, and that competitiveness and protection of the environment are not in opposition to one another;

by implementing effective policies to develop human resources, in particular through a life-long approach

to the acquisition of skills based on detailed knowledge of industry's requirements;

by supporting the implementation of trans-European networks required for the proper functioning of the Community and wider European markets;

by ensuring that a sufficiently attentive examination of industrial development is made in order to ensure that the necessary requirements for adjustment are met.

Structural adjustment

I. Prerequisites	II. Catalysts	III. Accelerators
<ul style="list-style-type: none"> ● Competition ● Economic context ● Educational level ● Economic and social cohesion ● Environmental protection 	<ul style="list-style-type: none"> ● Internal market ● Commercial policy 	<ul style="list-style-type: none"> ● Research, development, technology, innovation ● Training ● Small and medium-sized enterprises ● Business services

The European electronics and information technology industry — State of play, issues at stake and proposals for action

Introduction

1. In November 1990 the Commission adopted a communication on industrial policy.¹ While placing the main responsibility for improving industrial competitiveness on firms, the Commission indicated that it was up to the public authorities to provide them with a clear and predictable framework and outlook for their activities.

The industrial policy approach adopted by the Commission and approved by the Council is based on the concept of Community interest, on past experience of industrial adjustment and on the overall industrial challenges which the Community must be prepared to tackle.

It focuses on the importance of the single market to industry and on the application of the competition rules at international level to ensure, on the basis of a balance of rights and obligations, that competitors' markets are as open as the Community market. In its industrial policy paper the Commission also comes out in favour of pursuing positive adjustment policies, including a technological development policy; such policies are regarded by the Commission as complementing the open and competitive environment needed in the context of the single European market.

2. This open, horizontal and offensive approach has a natural application in the Community's electronics and information technology (IT) industries, which are facing severe structural adjustment problems at present. In view of the 'enabling' nature of these industries and their external effects on the economy as a whole, they are often regarded as strategic. In the run-up to the completion of the internal market and the increasingly global dimension of the economy, a better supported approach could be based on the following questions: do the actual conditions of competition allow European industry to be effective? What policies are appropriate in order to stimulate our competitiveness?

3. These industries provide three main categories of products and services: components,² which are the

basis of any electronic equipment or system; computers, consisting of hardware, peripherals, software and office and industrial automation applications;³ and finally consumer electronics.⁴ These are the industries which are the subject of this communication.

Other allied high-growth industries, e.g. the industries which provide audiovisual services, telecommunications equipment and services, and on-line database services, are not discussed in this communication, but may be covered by separate communications.

4. Taken as a whole, these industries have certain specific features, contributing as they do towards the compilation, creation, communication and application of something which may be regarded as a new resource, namely information.

They are already important in their own right, with a worldwide turnover of ECU 700 billion in 1990 and a Community-wide turnover of ECU 175 billion. Their rapidly expanding market now represents 5% of GDP and will be nearing 10% by the year 2000.

However, they also constitute an infrastructure through the 'enabling' nature of the technologies

¹ Commission communication on industrial policy in an open and competitive environment (COM(90) 556), see p. 7 of this publication.

² *Components*: passive components, active components including memories, microprocessors, microcontrollers, application-specific integrated circuits (ASICs), etc.

³ *Computers*:

hardware: portables, microcomputers, minicomputers, workstations, mainframes, network equipment, etc.

peripherals: printers, disks, screens, etc.

software: packages and applications, information systems, systems engineering and services, etc.

office automation: photocopiers, facsimile machines, dedicated terminals, etc.

industrial automation: numerically controlled machine tools, robots, sensors, computer-aided design, manufacturing and management, computer-integrated manufacturing systems, etc.

⁴ *Consumer electronics*: television, videotape recorders, video-cameras, video-disc players, compact disc players, etc.

developed by them. The closely interdependent group formed by these rapidly developing new technologies provides the hardware, software and application systems now used in virtually all economic and social activities. As a result, these industries have a major part to play in the competitiveness of industry and the quality of services, in particular public services of general interest.

The impact on employment is considerable. It is estimated that between 60 and 65% of the working population is directly or indirectly affected by these technologies and their applications.

5. This communication has been written at a time when many of these industries are in difficulty, especially in Europe. This state of affairs calls for an analysis without complacency, and in a world context, of the situation in this sector, the causes of the difficulties encountered and the respective roles to be played by and the challenges to be faced by the firms and the public authorities.

The communication follows a double approach in order to enable the European industry to be more competitive on its own and on the world market:

- (i) to contribute to the examination of the relative industrial and technological conditions of the Community's electronics and IT industries. This examination analyses the situation by looking at all the players concerned in Europe and the world as a whole, taking into account the progress towards a single European market which is still influenced by structures and behaviour bound up with the fragmentation of the Community market and subjected to international competition with very contrasting rules;
- (ii) to set out, in keeping with the industrial policy paper mentioned at the beginning, a consistent package of measures which the Community and the Member States would be prepared to implement. It must be made clear, however, that this initiative will be pointless and impracticable unless it is based on clearly defined medium and long-term objectives set by the industry and on specific commitments from their side.

The situation of the European industry

6. The following prominent features emerge from a detailed quantitative analysis of the situation of the industry in Europe and world wide.

The electronics and IT industry in Europe and the world as a whole is expanding considerably, particularly on the demand side. Market studies suggest that this expansion will continue at least until the end of the decade, making this industry even more important than it is today.

The background to the development of these industries in the world as a whole makes it easier to understand the current difficulties of the European industry. The causes are examined in greater detail in Section 'The causes of the present situation in this context'. As a result of them, despite the strengths and the genuine efforts made to face up to technological changes and new market conditions (establishment of the single market and globalization) the European industry has weaknesses and shortcomings which give grounds for concern.

A major and rapidly expanding industry

7. The European electronics and IT industry has achieved great importance in a particularly short space of time. With a growth rate of around 15% per annum in the 1980s, well in excess of the GDP growth rate, it has caught up with other major Community industries such as the chemical industry and the motor industry. Between 1984 and 1989 the turnover for this industry as a whole more than doubled, rising from ECU 55 billion to ECU 130 billion. Allied to the telecommunications industry, which both drives it and is driven by it, the electronics and IT industry now represents nearly 5% of GDP in Europe compared with 5.5% in Japan and 6.2% in the United States of America.

The trend since 1980 in world production for all the electronics and IT industries, together with telecommunications, by main geographical areas, is as follows:¹

American production is pre-eminent in absolute terms but falling over time (37% in 1990 compared with 46% in 1980),

Japanese production has increased considerably in both absolute and relative terms (24% in 1990 compared with 15% in 1980).

¹ Source: EIC.

The European industry's comparatively modest production level has remained fairly stable (24% in 1990 compared with 26% in 1980), although there are major differences between sectors.

Demand in Europe represented a quarter of world demand in 1984 and a third in 1989. With the single European market, the driving roles of the European market will increase. The forecast for the year 2000 is for sustained demand growth in the 'triad': 11% for active components, 11% for computers and 4% for consumer electronics.

Strengths and restructuring efforts

8. The European electronics and IT industry has considerable potential and in recent years has made significant progress in certain areas, in particular in software and computer services and in industrial automation.

There are in the Community some 13 000 computer services and engineering companies whose strengths lie in particular in the integration of customized software and systems. In 1989 Siemens, Bull, and Olivetti ranked for the first time among the top 10 computer companies, though admittedly a long way behind IBM, whose turnover is nearly three times their combined turnover. The European advanced manufacturing equipment industry (numerically controlled machine, tools, industrial robots, etc.) has regained its position of world leader, pursued by Japan and well ahead of the United States of America. Alongside the electronics and IT industry, the European telecommunications industry has considerably strengthened its competitive position, with Alcatel and Siemens in first and third places, respectively, in the world.

Europe's university and research structure possesses a wealth of differentiated cultural and intellectual resources. The situation as regards research and technological development has changed substantially since 1980. The Community programmes (Esprit, RACE, Brite and Eureka) have helped to mobilize human, financial and technological resources. Their catalytic effects have helped to encourage joint analyses, develop inter-firm cooperation and consolidate the technological base.

The European companies operating in these areas employ over 800 000 highly-skilled workers in the

Community and approximately 1 100 000 in the world as a whole.

To face up to the current difficulties, the European firms are engaged in restructuring operations: they are stepping up their efforts to reduce costs and increase their productivity, and are striving to speed up their response to rapid changes in demand. These restructuring efforts are costly and entail significant job-shedding. Many of them are refocusing their activities on markets with a promising future (Olivetti in microcomputers and workstations, Philips in consumer electronics, etc.), and adjusting their operating and distribution structures.

Weaknesses

9. Despite this growth, these strengths and this technological potential, there are worrying weaknesses and shortcomings. An analysis of the situation of the Community industry indicates a limited presence in certain key sectors: semiconductors, peripherals, consumer electronics, and a precarious situation in computers. Apart from the consequences for the balance of trade, this situation obliges European companies to obtain supplies of certain vital components from their competitors, which impedes their decision-making ability.

In semiconductors, Japan has a 49.5% share of production compared with 36.5% for the United States America and 10% for Europe.

Computer peripherals (disks, printers, screens, etc.) are manufactured to a large extent in Japan (40% of world production) and to a lesser extent in the United States (25%). Production in Europe accounts for only about 15%.

In consumer electronics, Japan accounts for 55% of world production and has control over 99% of its domestic production, 27% of production in Europe and 20% of production in the United States. The Community industry accounts for nearly 20% of world production.

In computers, production in Europe only covers two-thirds of internal demand, and 60% is accounted for by firms of American origin (IBM, DEC, Hewlett-Packard).¹ After staging a significant recovery

¹ It should be noted that American and Japanese companies create less value added per employee in Europe than in their domestic markets.

between 1984 and 1987, the Community industry has again lost ground in Europe.

Overall, therefore, the increased demand for electronics and IT products and services in Europe is being met only to a limited extent from European sources. Production in Europe covers about 75% of consumption in the electronics and IT sector, as compared with 140% in Japan. This imbalance has generated a trade deficit in Europe which has worsened since the start of the 1980s. For electronics as a whole, it was ECU 31 billion in Europe compared with a surplus of ECU 57 billion in Japan and a deficit of ECU 7 billion in the United States. Europe's deficit is mainly attributable to trade in components (deficit of ECU - 5.6 billion), computers (deficit of ECU - 15.3 billion) and consumer electronics (deficit of ECU - 9.6 billion) in 1989. This balance-of-trade position indicates that the Community industry is not competitive enough in these sectors. The growing internationalization of the economy means that European firms must be able to invest increasingly abroad. These investments and cooperation arrangements should allow a further improvement in firms' competitiveness.

10. An analysis of the situation of European firms on the European and world markets indicates different positions depending on the areas of activity and, as a whole, major differences of scale in comparison with American and Japanese firms.

The world semiconductor market is dominated by Japanese firms (NEC, Toshiba, Hitachi, Fujitsu, Mitsubishi) which account for nearly 90% of world production of high-capacity memories, and by the American microprocessor manufacturers (Intel, Motorola) which control over 80% of world production of 16- and 32-bit microprocessors (the most popular at present).

Investing 15% of their turnover in R&TD and 13% on average in manufacturing equipment, the European firms (Philips, SGS-Thomson, Siemens — 10, 12 and 14 in the world rankings, respectively) have still not achieved the critical threshold 5% of the world market. The turnover of the second manufacturer of semiconductors in the world (Toshiba) is higher than the combined turnover of these three manufacturers.

In computers, American firms are in the lead with five of the top 10 companies, the biggest of which, IBM, dominates the world market as a whole. The Japanese firm Fujitsu has moved into second place following its acquisition of ICL. The share of the European market held by IBM is greater than that of

Siemens/Nixdorf, Bull, Olivetti and Philips together. The latter have increased in size as a result of outward expansion and by acquiring other firms: Bull has acquired 85% of Honeywell Electronics and 51% of the IT division of Zenith (United States). Siemens recently bought Nixdorf. The significance of the investments made is considerable: on average 10% of turnover is spent on R&TD, 10% on investments in capacity and 10% of the wage bill is made up of training costs. However, the Community industry consists of virtually the same (medium-sized) firms as 10 years ago. Many of them recently had poor financial results (high losses for Bull, Nixdorf, Philips), as did the main American manufacturers in fact (DEC, Unisys, Hewlett-Packard, Wang). Unlike the computer manufacturers, the software and IT services companies (CAP-Gemini Sogeti, SEMA Group, Logica, etc.) are in a strong, though vulnerable, position.

In industrial automation, Europe has major trump cards with Siemens, Comau-Fiat, Renault, GEC, etc. and a wealth of efficient SMEs, especially in Germany and Italy.

In consumer electronics, apart from Philips and Thomson, which respectively occupy the third and sixth places world-wide, Japanese companies, with Matsushita and Sony in the lead, dominate the industry. The only other non-Japanese firms in the top dozen are Korean, Samsung and Goldstar at ninth and tenth. Philips and Thomson hold very strong positions in the USA through their subsidiaries Philips North American and RCA and are at the forefront of HDTV research there. US industry is barely represented in this sector; Zenith, the best placed American firm, ranks only sixteenth.

Despite the high rankings held by European companies, their strengths reside generally in the more mature technologies, and their shares in the newer products are declining (e.g. camcorders).

The international context

Developments in Europe and the world

11. Historically, the development of the IT and electronics industries has been influenced by the structure of demand, features of the market and the attitude of the public authorities.

Three main categories of users have shaped these features.

(i) The public authorities. Public procurement, although it currently represents only 15% of the market for these industries, has long made its mark on them. It involved heavy and expensive equipment (miniaturized equipment, distributed computer systems and the liberalization of telecommunications being relatively recent phenomena). Orders placed by national public bodies, such as for mainframe computers or telephone exchanges, have created captive, protected markets throughout the world. Public procurement has thus helped national champions to emerge and proprietary standards, often incompatible, to develop. These features are blurring; public procurement is becoming more commonplace with the emergence of distributed products and systems. In Europe, with the completion of the internal market, public procurement is gradually being opened up to competition. However, European IT and electronics firms have inherited a dependence on national buyers, proprietary standards and telecommunications infrastructures which are not properly interconnected at European level. The European market is still fragmented, which limits economies of scale and reduces size and networking effects.

(ii) Firms. The products and services of the IT and electronics industry have become an essential element of productivity, flexibility and competitiveness for almost all of the productive fabric. They provide innovative elements such as electronic components for the motor industry and have now become indispensable production and design tools: computer-aided manufacturing and engineering, computerized telecommunications networks, workstations, applications software, etc.

Firms face a twofold challenge: gaining access to the most innovative IT and electronics products, with optimum price, delivery and after-sales service terms, and also organizing themselves to exploit their potential to the maximum. Trade relations between manufacturing and user firms, the existence of a large market for standardized hardware and applications, and the presence of leading-edge users, are now essential preconditions for growth in the IT and electronics industries. These conditions differ from those prevailing in the United States of America and especially in Japan.

(iii) Individual consumers. Their market is mainly consumer electronics and associated services, but also, increasingly, products originally designed for business use (minicomputers, etc.). It is a mass con-

sumer market which makes severe demands on manufacturers in terms of cost and quality. This market is highly competitive, is subject to a high rate of innovation and involves taking major risks in the introduction of *de facto* standards. To remain competitive, firms must sustain a constant R&TD and innovation effort, and have substantial financial, production and commercial resources.

12. History also influences the conditions for the growth of these industries throughout the world.

In the United States, the power of the IT and electronics industry was built up in the 1960s. Stimulated at first by the major military and space programmes, large groups consolidated their positions. The vitality and receptiveness of the American market, businesses' entrepreneurial spirit and the workings of competition allowed many medium-sized firms (start-ups) to gain a foothold on the market and a rich and lively fabric of small and large firms to develop. Focusing originally on mainframe computer systems, in the 1970s the American industry concentrated on minicomputers, in the 1980s on personal computers and today on open and distributed systems. At the same time the software industry grew up, nourished by successive generations of hardware (the 'proximity effect').

The American computer and components industry is still powerful, even though it has been experiencing difficulties since 1980 in the face of Japanese competition. On the other hand, the American consumer electronics industry has almost disappeared: the American market, which is open and competitive, is now dominated by Japanese and European firms.

In Japan, the industry has grown and gained strength along a number of different paths. Japanese growth is not solely the result of market forces, but rather of long-term strategic planning in which the public authorities play a central part. The objective was to rebuild the Japanese economy and commercial and technological interdependence with a view to achieving a very strong presence on the world market. The method used has been to consolidate and exploit an economic and political system which ensures close cooperation between the public authorities and industry, accompanied by selective public financing. It has given rise to structural protection of the domestic market and strong horizontal and vertical integration of the industrial groups, banks and distribution.

This complex 'controlled market' system has created favourable conditions for the growth of new industries including IT and electronics. The industry's

development strategy has relied primarily on consumer electronics. Success in this area has led to a chain reaction: technological skills and breakthroughs, success with complex production processes, quality control, rapid innovation. These advantages then ensured Japanese success in the production of memories and later, peripherals. Japanese industry seems to be implementing a strategy to gain control of the world electronics market by gradual stages: after consumer electronics, components, now computers and maybe, by the end of the century, telecommunications.

Japan has inherited from the past a technologically, industrially and financially strong industrial structure, a structurally protected national base and a strong capacity to innovate. To make up for its relative weakness in research, it launches well targeted international cooperation initiatives.

For a long time in Europe, in the absence of a true Community market, the development of the IT and electronics industries and the industrial and technology policies adopted by the Member States were conceived on a national basis. The confines of the national markets, the difficulty in penetrating other Community markets and a certain reluctance to tackle other markets have weakened the Community IT and electronics industry as a whole. Not only were national champions able to achieve only limited economies of scale and networking effects, but also synergies between Community manufacturers and users from different Member States failed to materialize. At the present time, no Community IT and electronics manufacturer, not even among the largest, has a European image, especially in the eyes of the major user industries. For certain countries, the defence sector has been able to create captive markets and limit the stimulating role of competition on industry's ability to innovate. In consumer electronics, the segmentation of the Community market has paradoxically been able to protect European manufacturers from the Japanese, who have concentrated on the American market which is homogeneous and open.

The European market and its industry are now undergoing radical changes. Much work has been done at both national and European level: industrial R&TD work and many restructuring initiatives have been stepped up, major national technological programmes have been launched, Community intervention has increased through the various Community programmes, Eureka has been a mobilizing force, and markets have been opened up through the internal market. Despite these efforts, Europe is still suffering from the consequences of long-term fragmen-

tation of its markets and its firms' difficulties in setting medium and long-term objectives. European industry must adapt its structure to the Community and world dimension, but this can only be a long and costly process.

13. In addition to these difficulties rooted in the past, European industry faces the phenomenon of globalization. Increasingly exploited by the more powerful firms, principally American and Japanese, it allows them to make up for certain gaps in their basic expertise, meet constantly rising R&TD costs and the shortening of product life, and to benefit from the high rate of technological innovation. Globalization also allows them to take advantage of differing competition conditions on the world market. For European firms facing fiercer competition on their own domestic markets, it is becoming essential for them to weave complex webs of cooperation arrangements, in particular by creating technological and commercial cooperation networks at both Community and national level. For the Community public authorities, it is becoming important to ensure, in this context of globalization and on the basis of balanced rights and obligations, that its competitors' markets are as open as its own.

The causes of the present situation in this context

14. Certain causes are of a cyclical nature. To begin with, the adverse effects of the economic cycle characterized by a slowing down of growth are being aggravated by the fall of the US dollar and the yen in relation to the ecu. With the depreciation of the yen and the US dollar, competitive pressure from Japanese and American goods on the European market has grown sharply.

15. Most are structural, however, and have been highlighted by the poor general economic climate of the 1990s. They are manifold and interrelated. In order to analyse them, we will use the latest theoretical models¹ developed for the study of the competitive advantages of nations and apply them to the European IT and electronics industries. The analysis is based on four elements: demand conditions, factor

¹ See in particular M. E. Porter: 'The competitive advantage of nations', *Harvard Business Review*, March-April 1990, and *The Free Press*, New York, 1990.

conditions, related and supporting industries, and firm strategy, structure and rivalry.

In addition to these factors, unequal competition conditions are accentuated by the public authorities.

Demand

16. The Community market has inherited a high degree of fragmentation in relation to the other large markets in America and Japan. This has particularly serious consequences for the European IT and electronics industry.

The limited scope of its markets, often still confined to the national level has restricted the exploitation of economies of scale. European firms are therefore faced with higher unit production costs than their competitors. This is even more of a handicap since its effects are dynamic and cumulative.

For the same reasons, European firms have not been able to exploit 'network externality' effects. These effects appear when a user's choice is influenced by the size of the firms concerned or the total number of users of the products he wishes to buy. These networks attract users and they become captive for reasons unrelated to price, but linked to the difficulty of converting existing hardware, a wide range of compatible products or services, and the life of the networks. The segmentation of the Community market has restricted the size of networks and the number of users for European firms.

The former development of proprietary standards and systems, long used to create captive national demand, becomes a handicap at a time when European firms, which have never commanded sufficiently large markets to impose their standards, are obliged to change to open standards and systems. This essential change is called for by users but it does have the effect of eroding European computer hardware manufacturers' profit margins since the markets for open systems are more competitive. It also increases their costs, since the old and new generations of equipment have to be maintained simultaneously during the transitional phase from one to the other, while maintaining compatibility with dominant proprietary systems.

17. The lack of leading-edge users¹ in Europe, in contrast to the United States and Japan, prevents the European IT and electronics industry from exploiting

all the advantages of being first to market in new fields. However, for the development of the IT and electronics industries, the existence of a dynamic and demanding market plays a decisive role. The quality of demand is as important as quantity. The advantages of leading-edge demand are not only technological, but also commercial and financial. Indeed, it is during the period when a product is introduced that prices are high and profit margins sufficient to release the resources needed to finance R&TD and prepare subsequent generations of products.

Supply

18. Competition conditions are unequal between different areas. On a market which, in the case of IT and electronics, is world-wide, and where certain firms must employ a global strategy to survive, these differences become economically decisive and pose a political problem. While the degree of competition and openness to direct foreign investments is increasing in Europe with the completion of the internal market, certain foreign markets are still practically closed to the penetration of Community investments and products. While European firms must step up their efforts, and invest and develop partnerships in third countries, there are many reasons why they may come up against barriers to such initiatives. At a time when competition rules are becoming stricter in the Community, in other competing areas measures relating to concentrations and aid allowed are becoming more flexible or are sometimes remaining less strict. This state of affairs facilitates or on the contrary makes very difficult, depending on the internal markets of firms, their simultaneous presence or the distribution of their products throughout the world. The same applies to the concentration and vertical integration facilities offered to them.

19. Similarly, in view of the considerable volume of investments in R&TD and production capacity, financing conditions militate against the IT and electronics industries in Europe. In contrast to the United States, the financial system is reluctant to invest in start-ups. In contrast to Japan, the cost of financing R&TD and capacity investment is high in Europe

¹ European demand is estimated to be two to three years behind the American and Japanese markets and is reluctant to buy until new innovative products spread on to external markets.

and access to financial resources is difficult in the case of long-term or high-risk operations.¹ This allows Japanese firms to devise a long-term development strategy and invest at lower cost.

20. Availability of skilled staff. Rapid technological advances have made the European IT and electronics industry heavily dependent on highly skilled staff with state-of-the-art knowledge. However, in the labour market there are not enough engineers and researchers with recent training in the production, adaptation or use of these technologies. For the same basic population, Japan trains 80 000 engineers a year as compared with 41 000 for Germany and France together. Due to a lack of qualified staff (systems engineers, staff trained in computer-aided management), user industries and small businesses in particular are unable to make the most of competitive openings arising in the IT field. This means that demand on the European market is less advanced and less receptive to innovations than in the United States or Japan.

The structure of the European productive fabric

21. The relations between the IT and electronics industry and the surrounding industrial and scientific fabric are crucial. They can take many forms: access to basic knowledge depends on relations with scientific circles; knowledge of market needs, and users' ability to develop leading-edge markets, depends on relations between manufacturers and users. Relations within and between industries allow the exploitation of complementary features and technological and commercial interdependences within the IT and electronics product family, and between small and large businesses. All these relations result from the compactness, solidity and dynamism of the productive fabric around industrial and scientific poles of competitiveness.

In Europe, vertical integration of IT and electronics firms is relatively limited in comparison with American and especially Japanese firms. It failed in the past because European computer manufacturers tried to generate upstream business by making components, but only for their own needs. Since the markets within firms were insufficient, they were not able to reach critical production volume thresholds. On the other hand, this strategy has led to beneficial results for certain American groups, notably IBM, which

were large enough to guarantee sufficient outlets within the enterprise. In Japan, vertical integration has succeeded since component production by consumer electronics or IT firms was oriented towards the export market, regardless of the cost. Groups such as Toshiba, Hitachi, NEC and Fujitsu belong to the top 10 companies in the world in two and sometimes three segments of the components-IT-consumer electronics chain simultaneously. Inadequate integration in European firms, in relation to their American and Japanese competitors, is a handicap, particularly as far as components are concerned.

Although there is plenty of cooperation on precompetitive research in Europe, cooperation arrangements on the development of new products are all too few and far between. For certain products such as memories, liquid-crystal displays (or HDTV), they are or will become indispensable, in view of the human, technological and financial resources which can only be mobilized on a European scale.

Finally, the structure of the European productive fabric also has gaps in it as far as relations between manufacturers and users are concerned, which is a hindrance notably for start-ups and in complementary arrangements between large and small companies. Such relations exist in software and applications — where European competitiveness is high — but are generally insufficiently developed.

European business strategy

22. With the exception of precompetitive R&D, the industrial strategy of Community firms has failed to take sufficient account of the Community dimension and long-term prospects. Opportunities for coopera-

¹ The financial costs for R&D in Japan are substantially less than in Europe. A recent study published by the Federal Reserve Bank of New York shows that, in the medium term, costs may vary by up to 10 percentage points. Long-term investments made by Japan simultaneously on all fronts are colossal and their origin cannot in any way be explained by profit margins on the domestic or external markets. Furthermore, in Japan the major groups are concentrated around a bank which participates directly in strategic development decisions and their financing. Access to financial resources is therefore secure and not dependent on the firms' short-term profits.

tion with Community and international partners have not been fully exploited. As regards innovation and production, European firms have failed to take full advantage of the opportunities for cooperation created by the major Community technology programmes and have not put long-term global strategies in place early enough. In this context, we should consider whether R&TD policy has not been too limited to the precompetitive area. It has however been Commission policy up to now to leave near-market research to the companies themselves so as to maintain the incentive for them to compete through innovation.

European firms must simultaneously sustain their R&TD efforts and capacity investments, manage their change towards both the Community and world markets and assimilate the many internal and external restructuring operations which they must carry out, while losing no time in finding a place on the most promising and innovative market segments which many have yet to enter (peripherals, micro-computers and portables). This requires considerable financial resources which they can raise neither internally, as competition is fierce, nor externally, as the financial system in most Member States is not properly geared to financing long-term or high-risk operations.

The European IT and electronics industry's R&TD investment capacity needs are considerable. In the recent past European firms have made great efforts: on average they spend as much as their American or Japanese competitors in relation to their turnover (some 9.5% and 8.0% of sales are spent on R&TD and capacity investment, respectively). The financial resources to be mobilized for the seven largest European firms amounted to around ECU 14 billion in 1989. Despite these efforts and taking account of their relatively small size, these resources are still lower than the investment expenditure of the six largest Japanese firms (ECU 22 billion) and seven largest American firms (ECU 20 billion).

23. European firms have a high-quality technological base, but fail to bring enough innovative products on to the market quickly enough. There is a shortage of new firms in Europe, especially small ones, to exploit the new market openings which are constantly arising through rapid technological development. There are three reasons behind this: the first is the hesitant market. The second concerns finance: firms have insufficient financial resources and banks are reluctant to take risks. The third results in particular from the shortage of skilled staff in systems management.

The inequality of competition conditions is accentuated by public authority involvement

24. The structural characteristics of the IT and electronics market described above (substantial economies of scale and learning, high entry and exit costs) lead the most powerful firms to acquire dominant positions, build barriers to entry, form cartels or closely control the use of certain technologies, subcontracting networks and distribution systems. In addition to these imperfections of the market, various failures of the competition mechanisms appear: external effects between activities or geographical areas, public facilities, especially R&TD where private production is insufficient and information incomplete or unbalanced. These failures call for information, coordination and stimulation functions which the pricing system alone, however 'perfect' it may be, cannot provide.

These imperfections and failures of the market mechanisms, and also the economic and social importance of the IT and electronics industries have encouraged the public authorities of the major economic zones to pledge support to the industry and provide it with a competitive advantage on a local basis.

25. In the United States the public authorities have taken part in an intense debate on maintaining American technological supremacy using national security as the main pretext, and have widened their range of economic policy instruments. The involvement of the public authorities has taken on various forms.

Massive orders for hi-tech equipment are being placed by various departments and agencies (in particular the Department of Defense), and expensive R&D programmes, backed up by the creation of university networks, are under way. The implementation of competition laws has been watered down. Special procedures apply in certain sectors with regard to foreign firms carrying out their activities in the USA. The implementation of the Buy American Act enables preferential treatment to be given to American firms.

Discrimination against American firms of foreign origin as regards R&TD is being practised by the Department of Defense, and Sematech is one example here. As negotiations stand at present, the GATT rules are applied in a selective fashion.

Bilateral pressures (Super 301) to obtain reciprocity, based on the 1988 Omnibus Trade and Competitiveness Act, aim to allow American firms to penetrate third countries' markets, under threat of unilateral retaliatory measures (the Community has been designated a 'priority country' for telecommunications); at the same time, the USA is calling for 'national treatment' from its trading partners which would like to see reciprocal opening-up of the markets.

26. In Japan, the policy of the public authorities is based on various instruments with mutually reinforcing effects: backing for business cooperation in terms of strategic planning and of scientific and technical cooperation; virtual closure of public procurement to foreign companies while ensuring a high degree of internal competition; support for the setting-up of major diversified vertically and horizontally integrated groups, capable of sustaining for several years the losses incurred by the market launch of new products usually manufactured on the basis of technologies originally acquired externally. Japanese industry is geared to long-term strategies. The 'Keiretsu' also provides a high level of cooperation and solidarity between Japanese firms.

The Japanese market is protected structurally by the way the productive system is organized, with support from the public authorities. The big Japanese conglomerates generally have a dual banking and commercial focus. The banking side takes care of the financing, according to the group's strategy, of long-term or high-risk operations such as research and the production of innovatory products. The sales and distribution side (notably in consumer electronics) deals with the promotion of products, market research and control via the captive markets created between the companies in the group.

Comparative studies show that the prices charged for certain equipment in Japan are far higher than in other parts of the world.

27. The other South-East Asian countries have also greatly consolidated their foothold in the IT and electronics industries, in particular via long-term technological development programmes (such as the 10-year 'Submicron process technology development' programme in Taiwan) and an intensive investment strategy.

28. The Member States have all developed their own R&TD policies accompanied by different instruments and have launched numerous national and international initiatives (such as the European Space Agency, the Eureka initiative and aeronautical and military cooperation projects).

The Community, so far with very limited powers in the field of defence, has concentrated on the completion of the internal market, an essential step to make firms look, think and act beyond national frontiers. It is also committed to the strict application of the law concerning the competition conditions set out in the Treaty, the liberalization of telecommunications in the same spirit, and in particular the implementation of a major technological cooperation policy, more for the stimulus it provides than for the scale of financing involved.

Committed to a policy of opening up to competition, it has actively promoted a standardization policy in favour of open systems geared towards hardware compatibility. It has decided to promote the development of trans-European networks which, through their structural effects, will ensure that full economic and social advantage is taken of the completion of the internal market. These trans-European networks relate in particular to computerized communications service vocational training networks.

As far as trade is concerned it has endeavoured, so far with limited success, to obtain from its main trading partners an open, multilateral international trade system, ensuring, on the basis of the principle of balanced rights and obligations, that its competitors' markets are as open as its own.

It has also been concerned to continue the integration of the European markets by new agreements with the EFTA and East European countries.

These are all positive measures. They have not yet managed, however, to offset the failures of the market and imperfections in competition which characterize the IT and electronics market.

A Community approach

A reference framework

29. Measures to be taken to restore the competitiveness of the electronics and IT industry depend on firms themselves taking the initiative and facing up to their responsibilities, and on their capacity to make the most of the new opportunities presented by the single European market.

Despite their present difficulties, firms must follow a long-term strategy which allows them to maintain

and step up action to increase productivity, modify their operating and distribution structures, anticipate technological developments and client needs, pool their efforts and become more complementary in certain fields, and form alliances on a European and world scale, while observing Community competition rules.

If firms can make a clear and unequivocal commitment to activities of this kind, supported by the new market conditions and in accordance with the rules of competition, it is up to the Community or the Member States, applying the principle of subsidiarity, to help create a favourable environment for them, taking into account in particular the importance of IT and electronics for the whole of society.

30. In order to back up firms' initiatives, the Community must identify the European interest before making proposals for measures to be taken in this field. One objective is to allow firms to have access to the markets for products, investment and technologies. The completion of the internal market is an essential contribution to this but firms will need time to take advantage of all the opportunities it offers. This may not be enough, however. In a context of the move towards global markets and substantial economies of scale, production geared to the world market has become essential. IT and electronics firms are increasingly inclined to manufacture their products on the spot, so as to take advantage of the proximity of the market and the special relations with clients which result. Access to the markets must include the possibility for direct investment and exports in all parts of the world.

31. As a precondition for the expansion of European industry, it must also have access to technology. Indeed competitiveness cannot be achieved without it and without the latest products incorporating technology, given the expansion in trade, the growing interdependence of economies and the increasingly hot pace of the marketing of new products. This applies primarily to components; firms need satisfactory access to components so as to be able to continue to place innovatory products on the market.

A second important condition, indissociable from access to markets and technologies, involves mastery of technologies in Europe. This may be unrelated to a firm's origins but is closely linked with the type of R&TD work it carries out in Europe and the way in which it disseminates its technologies outside. This means that the risk of a break in external sources of supply, especially in microelectronics, is reduced by the Community's capacity to develop products to

deal with that eventuality, should it prove necessary. It also means the capacity to develop these technologies in harmony with European societal development.

A third factor relates to European firms whose basic markets are largely in Europe, with the positive effects on strategic decision-making, mastery of the technology and innovation in Europe which this entails. Firms with the bulk of their activities taking place in Europe do not enjoy the same advantages as their competitors on their national markets, and face imperfections in the system of competition or failures of market mechanisms at international level.

It is against this background that the Commission is proposing Community action to help firms through the adjustment process which they are facing, and help them meet customer needs, without taking artificial measures to support them.

Proposals for action

There are five proposals altogether, relating to demand, technology, training external relations and the business environment.

Demand

32. The creation of trans-European networks, as advocated by the Commission incorporating harmonized telecommunications services, will considerably stimulate the demand for IT and electronic equipment.¹

33. Computerized telecommunications links between administrations must be set up as quickly as possible and a high level of interoperability of information systems achieved, while respecting human rights, in order to speed up integration of the European market. Preparatory R&TD activities are planned under the third framework programme (1990-94).²

¹ 'Towards trans-European networks — for a Community action programme' (COM(90) 585 final).

² Proposal for a specific programme on the development of telematics systems in areas of general interest.

34. This action must be accompanied by the launch of projects designed to modernize or create, with the help of computerized telecommunications, infrastructures in the fields of distance learning, transport, public health and the environment. Another project might relate to the gradual introduction of broadband services networks into the Community, in particular by the implementation of an international pilot project for a broadband network between research centres. Projects relating to a pan-European high-definition television service could also be studied and business applications found.

These infrastructures for meeting user requirements will necessitate substantial investments in the Member States over the next 10 years. These investments will be all the more profitable and effective if they can draw on full-scale Community-wide trials.

The Community's role will be limited to providing the necessary impetus and coherence, helping to define overall projects, coordination — especially for the exchange of results — and taking the general measures for which it is responsible, for instance harmonization of architecture and protocols. The investment necessary to implement projects drawn up and prepared in this way will have to be largely financed by the parties concerned, although this does not necessarily rule out Community support, notably through the use of the appropriate financial engineering mechanisms.

35. Intensified joint efforts will be needed to disseminate and exploit the results of R&TD work on IT and electronics conducted at Community or national level or in a multinational framework such as Eureka.

The national bodies responsible for conducting these tasks will have to work together with the Commission's departments on computerized telecommunications networks and cooperation projects targeted primarily at SMEs.

36. Increased user involvement in the Community's technological development programmes will be sought, both in their initial phases and if they are extended, in particular in the context of Eureka.

Technology

37. In order to keep pace with the extremely rapid rate of technological development in electronics and

IT, satisfy the growth in demand and maintain an active role on a market which is becoming global in scale, the Community could consider launching a second generation of R&TD, ranging from projects at the precompetitive stage to projects geared more closely to the market.

This second generation, which is already emerging through the pilot projects being conducted under the third Community R&TD framework programme (1990-94) adopted by the Council on 23 April 1990, will be characterized in particular by the concentration of work on a smaller number of better targeted projects, closer cooperation with users, provision of training linked to advanced research and opening-up to international cooperation.

38. The guiding principles of the technology projects would rest on the following considerations:

(i) It would make eminent sense to build further on points of strength in as far as they continue to offer, like software and CIM, potential for growth.

(ii) The frontier between computer software and hardware, predicated by the need to optimize the cost/benefit ratio, keeps moving towards ever more powerful systems, thanks to progress in microelectronics technologies, which allow more and more functions to be integrated on to one chip.

In a sense, it can be said that today's systems will be tomorrow's chips. It is therefore essential to master the technologies on which these components are based in order to secure the continued growth of the software and systems industries.

(iii) Most technologies are on the brink of radical change or a new generation, which offer opportunities for bridging existing gaps and taking the lead again. This is the case in priority areas, like microelectronics, peripherals and high-performance computing.

Projects implemented towards this end would need to be of a different nature depending on the objective pursued. Mobilizing projects aimed at accelerating technology take-up on a broad scale would thus need to be carried out alongside integrating projects aimed at mastering and consolidating a selected range of interdependent technologies.

These major projects, that would involve participation from all over the Community, would represent the core of R&TD effort and would have to be funded from the Community budget and as appropriate by national, regional or local sources, in particular within the context of Eureka.

Among the main objectives to be pursued, one could mention:

- For software, to increase productivity by concentrating on production methods and tools and their early transfer to users in the framework of mobilizing project(s), involving notably SMEs.

Emphasis will be on software re-usability as well as on precompetitive work on both systems and applications interfaces.

The creation of a trans-European software institute at the initiative of Community industry could receive Community support. Provision is made in the third framework programme for a pilot experiment (European systems and software initiative).

- For computer-integrated manufacturing (CIM) and engineering, to strengthen European manufacturing capabilities by the timely provision of the most powerful technologies of the IT and electronics industries. These will help to shorten design-to-product time, implement just-in-time strategies, and make for more flexible production, especially small, diversified runs under severe time constraints. These technologies are also essential for achieving decisive quality improvements.

- For microelectronics, to develop integrated-circuit design and manufacturing technologies for both standard components (memories and logic circuits) and custom integrated circuits (ASICs), R&TD work building on and carrying further the collaboration established under Jessi. To supplement the above, efforts would need to be undertaken to provide microprocessor capabilities with particular emphasis on the definition of a family of new-generation architectures, securing compatibility and the transition from current-generation machines.

- For peripherals, to establish capabilities for developing input/output devices and subsystems. Special attention should be given to high-resolution flat-panel display technology currently based on liquid crystals (LCD). A specific industrial commitment should be obtained on this. It is also essential for the development of consumer electronics.

- For high-performance computing (HPC), to take advantage of the possibilities offered by progress in the field of parallel processing, through which computing power is expected to be increased by a factor of 1 000 by the end of the century. This will revolutionize the field and open horizons to applications for new users. This represents a major challenge in software. Once the complex software problems have been overcome, there should be rapid exploitation in many fields, such as simulation, forecasting and

optimization in manufacturing industry, environment and meteorology. A project lasting 10 years will probably be needed to master this new approach and all its implications. A preparatory phase is planned under the new programme on IT within the third framework programme.

- For telecommunications, to respond to the growing demand for improved user friendliness, better economic return, faster response times and increasing freedom of choice and flexibility in integration of services. This should be achieved by the development 'intelligent' networks, integration of flexible services, and the extension of multitasking capabilities to create or improve telecommunications networks while safeguarding data integrity and security. The objective would be to achieve response times and performance comparable to what is obtained today in companies' local area networks. Integrated broadband network technology provides both the capacity and the generic intelligence to respond to the user needs. Satisfying user demands requires a sustained effort of mobilizing and integrating technology and advancing international standardization at a rapid pace. Second-generation efforts should concentrate on the systematic development and validation of modular standardization of common parts of services enabling open service implementations to evolve with demand.

Training

39. The Community urgently needs to train research scientists and engineers capable of developing and making maximum use of the new information technologies, where new generations are constantly emerging.

Multidisciplinary training measures could be launched or stepped up. They would be targeted at training staff and at staff engaged in production and management in firms using and supplying computerized telecommunications products and services. Training activities should also be developed to promote new forms of business management, integrating computer applications and advanced telecommunications in new management and production systems.

The Commission, in its communication to the Council on trans-European networks, has already pro-

posed specific measures on vocational training.¹ The R&TD framework programme for 1990-94 also includes an entire specific programme devoted to developing human capital and promoting the mobility of research scientists. The Commission has also been involved for a number of years, notably since 1986, in the development of highly specialized programmes and initiatives on initial and continuing training in new technologies such as Delta, Comett, Force and Euroform.

Networks of excellence composed of both academic and industrial research teams, geographically distributed throughout the Community, will continue to be set up in order to provide a critical mass of complementary knowledge and expertise, and help to share limited and expensive resources.

External relations

40. The Community can help to sustain a competitive Community electronics and IT industry by adopting a trade policy based on the following six objectives:

- (i) maintenance of an open, multilateral international trade system;
- (ii) the improvement of access to the markets of the main trading partners in electronics and IT (notably the United States, Japan and South Korea);
- (iii) establishment of fair competition in international markets;
- (iv) support for scientific, technological, industrial and commercial cooperation in the international arena;
- (v) continuing integration of European markets by means of new agreements with EFTA and East European countries;
- (vi) economic restructuring aid for the East European countries.

41. The electronics and IT industries are directly concerned by the Uruguay Round of multilateral negotiations, and a satisfactory conclusion could make an important contribution to the achievement of the first two objectives.

The Uruguay Round 'market access' negotiations are especially important for semiconductors and consumer electronics. Inconsistencies in the present tariff

structure for semiconductors are liable to place the Community's processing industries at a competitive disadvantage. Within the constraints of the current global negotiations, the Commission will attempt to iron out these inconsistencies, while taking into account the respective interests of Community producers and users.

On consumer electronics, the Community has offered less substantial tariff reductions to its trading partners on certain products. In addition, the Commission will insist on the need to remove the numerous non-tariff barriers which hinder imports of consumer electronic goods to some of our partners (in particular Japan).

The Community is paying close attention to the possibility of the renewal of the bilateral agreement on semiconductors between the United States and Japan which has important direct implications for all the Community's electronics and IT industry. The Commission will not hesitate to take action — as it did when the original agreement was concluded, by calling for a GATT panel — if the new agreement contains provisions which may be against the interests of the Community electronics and IT industries.

Moreover, in view of the damaging instability of supply prices on the world components market, the Commission believes that the OECD should be asked to set up a new consultative forum on semiconductors.

42. The Commission will seek to ensure equitable conditions of competition and market access for both products and technologies at world level. As international competition intensifies and as markets become global, the fact that all companies competing in the world market are not operating under the same conditions of competition may cause particular problems for specific markets and products such as those in electronics. For example, very large companies may use their extensive range of activities in the electronics sector to cross-subsidize certain products and activities and seek to gain market shares by undercutting their competitors. Similarly, in this sector, a high degree of vertical integration and the acquisition or existence of dominant positions could give rise to abuses in particular market segments, such as discri-

¹ 'Towards trans-European networks: objectives and possible applications' (COM(89) 643 of 18 December 1989) and 'Towards trans-European networks — for a Community action programme' (COM(90) 585 of 5 December 1990).

minatory practices, predatory pricing or refusal to supply. In the Community, if such practices were proved, they would be subject to the prohibition of Articles 85 and 86. The Community must insist that its competitors and the public refrain from such practices and that the public authorities put in place an efficient system to prevent such abuses. The response to external competitive pressures must be to secure a situation in which Europe's competitors refrain from unfair practices in their own or third country markets, not to modify the application of the rules in the Community. Competition policy strengthens European companies and is not a luxury to be discarded when there is competition from outside. New Community measures to control concentrations have an important part to play.

The Commission will investigate the existence of such practices among the Community's main competitors. If abuses and unfair practices can be shown to exist, pressure will be brought to bear on the relevant authorities. Identification of specific obstacles to fair competition followed by pressure on the public authorities has brought positive results in other sectors. For example, as a result of Community pressure, access has been granted to the Tokyo Stock Exchange. Partly as a reaction to international criticism, Japanese competition policy is being reformed and strengthened. The Japanese and US authorities must be pressurized to go further in this direction so as to bring about a situation where the main international trading partners can operate under roughly equivalent competition rules.

43. While meeting its international obligations, the Community will have to fall back, where necessary, on its customs regulations (temporary suspension of the autonomous duties of the common customs tariff) and its trade policy instruments (such as anti-dumping measures and customs duties). In any event, the anti-dumping procedure can only be considered as a last resort. For this reason it is necessary to maintain detailed statistics and use all available bilateral and multilateral consultative forums in order to anticipate and avoid those situations which could result in the Community having no other choice than to take anti-dumping measures.

The Community applied the anti-dumping regulations to several electronics and IT products in the period 1985-90: semiconductors, photocopiers, printers, video-recorders and television receivers. It seems that the effects of anti-dumping measures can vary, owing to the peculiarities of the markets for these products and the controversial impact of these measures on consumers and the industries which use components.

In any event, application of Article 115 will not be possible at the intra-Community borders once the internal market has been completed.

44. In the search for a balance between international cooperation and technological independence, firms should take responsibility for their strategic choices in this area, while the public authorities have the important role of providing appropriate frameworks for trade and cooperation.

45. The Community, in close collaboration with the industrialists concerned, has already taken part in international cooperation, for example in the field of standardization. Other opportunities are now emerging, such as the project for a programme on intelligent manufacturing systems (IMS). A number of areas of technological cooperation are currently being explored with American organizations. The Community itself should also seize the initiative in launching scientific cooperation programmes.

46. The Community will continue current negotiations with the EFTA countries with a view to creating a European economic area. The huge market which will be created in this way will offer fresh growth opportunities for the electronics and IT industries.

47. The Community must face up to its responsibilities *vis-à-vis* the Central and Eastern European countries and help them to bridge the technology gap and make good their inadequate infrastructure, especially in telecommunications. In time these countries will offer new opportunities and prospects for industrial cooperation. Their needs are very considerable: their production system must be adapted or changed and IT has a central part to play in their efforts to catch up.

The business environment

48. The implementation of the concept of industrial policy also calls for further measures in the field of electronics and IT designed to create a healthy business environment.

49. Improving financing systems. Given the importance of financing systems for firms which are capital-intensive and require high R&TD expenditure, the public authorities should hold discussions with banks and financial institutions on ways in which risk capital could be employed in conjunction with taxation measures.

Training schemes for staff in the banking sector encompassing both the financial side and computerized systems applications should also be looked into.

50. Faster standardization and integration of standards into products (hardware and software). Since products now become obsolete so rapidly, European firms are finding it increasingly difficult and costly to manage the evolution of standards. Ways of speeding up the procedures for drawing up standards, especially those relating to software, should be studied with European and national standards institutes.

European industry must also build new standards into its products and systems more quickly, like its foreign competitors, so as to derive maximum benefit from such standards, and must play an active role in the European, foreign and international standards bodies.

51. Closer involvement of the development of electronics and IT in the introduction of structural policies. The structural Funds make a significant contribution to the development of the less prosperous regions, by promoting the infrastructure for technology transfer, the dissemination and exploitation of research results, and the launching of training schemes in science, technology and management. These measures are among the priorities for development established, for each of the Community's less-favoured areas, within the Community support framework. In addition to these measures, the Commission has adopted a series of Community initiatives such as Stride, STAR, Telematique and Prisma. These initiatives help to create an environment that favours the development and dissemination of new technologies in firms, especially small businesses, in these regions. These structural measures should continue, and be better targeted where necessary, especially in the most disadvantaged areas.

52. Developing infrastructure for cooperation. The dialogue between the various groups involved needs to be stepped up, a move which could lead to the formation of partnerships.

Special measures could be considered or stepped up to help SMEs to expand their networks and step up their activities beyond their national frontiers.

Pilot operations for cooperation between SMEs, large firms and research centres at Community and international level should be launched, multi-sectoral basic technologies promoted in the framework of overall technology policy and the need for major industrial investments in basic components required for future generations of data-processing and electronics products taken into consideration.

The progressive integration into components of the functions contained in information and communication systems requires an improvement in cooperation between semiconductor manufacturers and users.

The Commission will continue its efforts to facilitate the formation of such cooperative partnerships.

53. This communication is intended to serve as background for a debate with the Member States, the European Parliament, the Economic and Social Committee as well as the industries, manufacturers and users concerned, in order to analyse the situation as perceived by the Commission and discuss the action to be taken.

This should enable the Commission to enter into fruitful dialogue with industry, users and investors, in order to assess the situation in greater depth from a dynamic perspective and to identify conditions for a long-term recovery, while respecting the roles of the parties concerned.

Promoting the competitive environment for the industrial activities based on biotechnology within the Community

Situation and perspectives in biotechnology

The importance of biotechnology

Biotechnology is a key technology for the future competitive development of the Community and it will determine the extent to which a large number of industrial activities located within the Community will be leaders in the development of innovative products and processes. The recent Commission communication on industrial policy stressed that only those industries in the forefront of technological process can maintain and improve competitiveness in the European economic system as a whole. The capacity of the industries which use biotechnology as a tool of production to play a leading role in research and to master industrial applications will be crucially affected by the economic environment within which these industries work. The main responsibility for industrial competitiveness rests with firms themselves. It is, therefore, crucial that public authorities, both at the Community and Member State level, provide clear and predictable conditions for the activities of industry. This strategic dimension is important if the Community is to be in a position where it can offer a combination of factors and/or preconditions essential to the full industrial diffusion of biotechnology.

An indication of the potential size of this sector can be ascertained from an estimate, according to industry sources, that world sales of biotechnology-derived products (excluding fermented foods and drinks) were approximately ECU 7.5 billion in 1985, representing three times the volume of investment in the field made between 1980 and 1985. Industry estimates for the year 2000 vary widely between ECU 26 billion and ECU 41 billion. Even the conservative estimate yields a threefold increase in sales.

The recent increase in biotechnology products is only a beginning. It is clear that biotechnology will have a strategic significance in dealing with some of the major challenges facing the developed and developing world, i.e. food, health, environment and popula-

tion growth. Biotechnology will play a significant role in protecting and improving our environment. New vaccines, developed through biotechnological techniques, have already saved many lives and improved the quality of life for both humans and animals. Efforts are being directed towards the development of drought resistant plants, of great interest to many developing countries, and making certain plants unattractive to their traditional predators thus reducing the need for excessive use of pesticides. The application of biotechnology to increasing food production will be of great importance to developing countries while, at the same time, having a profound impact on agriculture in the Community with major implications for the Community's agricultural policy.

At the same time, biotechnology suffers from a bad image amongst policy-makers and the general public. Concerns have been expressed about the potential impact on human and animal health and the environment resulting from the incorrect use of new biotechnology. Each strategy to improve the economic framework for biotechnological techniques must be aware of these dimensions, not only as a constraint but as a challenge to balance the different aspects. Although some of the expressed fears seem exaggerated they are, nonetheless, of great political influence. It is imperative therefore that problems of public acceptability, and ethical questions raised, be recognized and dealt with. It is suggested that there should be advice available to the Commission in the area of ethics in biotechnology.

The biotechnology revolution will ultimately have an impact on our everyday lives as profound as that of information technology but the time dependence of industrial applications must be recognized. While scientific progress is as rapid in many areas of biology as informatics, for many of the applications, especially those where added value is greater, as in the pharmaceutical industry, the time required for innovations to reach the market is much greater, largely due to the time required for registration. This cost (in terms of time as well as money) makes pre-normative research in such sectors particularly important.

It is of paramount importance that the industries using biotechnology develop competitively. This

need to create favourable conditions for the biotechnology industries, which are crucial to the development of the Community as a whole and which will affect competitiveness across a broad spectrum of the Community's industries, including the agricultural sector, must be combined with the protection of human, animal and plant health, safety and the environment. In fact, the need to achieve higher standards of health, safety and environmental protection do not act as limiting factors but as major opportunities for industry to develop through biotechnology more precise, effective and non-polluting products and services which will contribute to these aims. It is, therefore, the role of government to ensure that the framework which is provided for such activities is comprehensive enough to satisfy public concerns while, at the same time, encouraging the industrial development of biotechnology. The Commission considers that the Community should be attractive to both Community and non-Community investors so that it may reap the benefits which will accrue from the industrial application of biotechnology. The purpose of this communication, therefore, is to examine the future perspectives for competitive biotechnology in the Community.

The Commission has been active, through communications to the Council in 1983 and 1986, in defining a comprehensive framework for biotechnology and in identifying policies across a broad spectrum of Community activities which aim at encouraging the conditions necessary for competitiveness while ensuring the protection of health, safety and the environment. These Community activities have encouraged biotechnology firms in the Community.

The general approach to the Community's industrial policy was laid down in the aforementioned industrial policy communication. The Commission considers that a separate paper on biotechnology is needed due to the growing importance of biotechnology in the Community. Biotechnology is confronted with differing expectations and strategies and this report shows the necessity to have a coherent industrial approach for competitive biotechnology in the Community.

Macroeconomic indicators

Description of the industries involved

Within the Community, it is the pharmaceutical, agrochemical, food and drink sectors which have

been the most active in developing the industrial applications of biotechnology. Biotechnology has potential uses across a broad spectrum of industries including energy, metal extraction, waste treatment, chemical products and bioelectronics. At the moment, however, the use of biotechnology in these industries is relatively undeveloped.

It is estimated approximately 800 firms in the Community, 1 000 in the United States and 300 in Japan, are active in biotechnological research. The vast majority of these firms are small- and medium-sized enterprises in the pharmaceutical or chemical fields which are notable for having a high proportion of research staff specializing in contract research and contract manufacture. In addition, a significant proportion of the firms active in biotechnology in the Community are chemical and pharmaceutical multinationals, providing a broad industrial base, with significant financial and technological capacity, for the development of Community biotechnology.

The importance of biotechnology in these main areas of application can be illustrated as follows:

The agrochemical industry

The majority of firms active in this sector are multinational chemical companies whose agrochemical divisions only represent a small part of the total sales of the group. Product differentiation is a key factor to the competitiveness of this sector. Biotechnology has recently become a key area of research in this industry with seed and plant development, e.g. drought-resistant plants, dominating biotechnological developments. Attention has been focused on new products which will be environmentally safer and demonstrate stronger pest control. However these new products are not expected to be commercialized before the year 2000.

The pharmaceutical industry

This sector includes products destined for both human and veterinary health care. The world pharmaceutical industry as a whole is confronted with the high cost of developing new technologies and marketing new pharmaceutical products. Differences in testing requirements and standards world-wide contribute significantly to the high cost of R&D. In the Community alone, the current fragmented market, in terms of market authorizations and approval, results in significantly higher costs for European firms.

The food and drink industries

The European food and drink industries are made up of a mixture of firms and sectors with very different structural and operational characteristics. (These include, for example, the agricultural sector, which produces food and non-food raw materials, and the food industry which processes these raw materials.) This variety can be attributed to the diversity of market demand, market size and the technologies and traditions particular to each country and each sector. Within these industries biotechnology has applications for new animal and plant varieties on the one hand and for new organisms, e.g. for making cheeses, on the other hand.

Employment

The current Community average for employment in the abovementioned sectors is 19.8% representing approximately 15 million jobs. All sectors expect a growth in employment levels due to biotechnology and it is estimated that approximately two million biotechnology-related jobs will be created in the Community in these sectors by 2000.

The identification of the exact numbers of those employed in research in biotechnology is difficult in all Member States mainly because no differentiation can be made between biologists and those biologists specializing in biotechnology.

It has to be recognized that multinational firms have great flexibility in determining the location of their research facilities so there is considerable competition to attract such investment and the resulting employment.

Industrial structure

In terms of structure, the high costs of research, testing, marketing, and patenting favour large companies. Large firms, with diversified resources, are also in a better position to afford the cash and time necessary before they can see a return on their investment in biotechnology. On the other hand, smaller start-up firms have greater flexibility and faster response times. Nevertheless there are big differences according to sector and product and it is evident that

cooperation is mutually beneficial to large and small firms. This is supported by the fact that many of the SMEs which succeed in developing an innovative product either seek collaboration with established pharmaceutical or chemical firms or are taken over. The interaction between the large established firms and SMEs, e.g. takeovers, encourages the development and commercialization of innovative products.

The industries involved in biotechnology are increasingly characterized by participation in joint ventures between European, Japanese and United States firms at an international level. Not only do the strategic alliances which have thus been formed extend across the whole spectrum of industry from SMEs to multinationals but also to the university and pure research sectors. From a European standpoint it is thus important that the Community remains an attractive industrial site in order to build such alliances on the basis of mutual interest rather than as a result of unilateral predominance.

Financial aspects

The financial strength of the Community industries involved in biotechnology is an asset; and the strength of these industries is illustrated by their activity in seeking strategic alliances or takeovers with US companies such as Zymogenetics and Genentech. A consequence of this activity is that some Community firms have located certain biotechnology research and production facilities in the United States.

The nature of State aids payable in respect of biotechnology R&D varies widely throughout the Member States and biotechnology R&D within the Community is fragmented when compared with the US. The Member State which devotes the most finance to R&D in biotechnology is the UK with a total outlay of ECU 500 million (public funds: ECU 185 million; private funds: ECU 315 million) in 1987. The total for the Community as a whole for the same year was ECU 1 630 million (public only). This figure should be compared with the United States for the same year where a total of MECU 2 538 (federal: MECU 2 484) was available for biotechnology R&D. Furthermore, the greater availability of venture capital is often stressed as a comparative advantage of American firms. On the other hand, long-term capital seems easier to obtain in the Community and, especially, in Japan.

Competitiveness of the Community's bio-industries

The recently adopted communication on industrial policy stresses that the principal responsibility for competitiveness lies with industry itself. A number of factors determine this competitiveness, many of which are particular to individual markets, e.g. the size of the market, public perceptions, and, not least, company investment policy. Two factors in particular will affect the competitiveness of the bio-industries:

- (i) international policy strategies,
- (ii) intellectual property rights.

The strategies applied by firms in the market are particularly important given the fact that Community firms compete on the national, Community and international levels. In international competition Community firms are faced with comprehensive industrial strategies to which they must be able to react. The competitiveness of Community firms will be better improved if the Community's competitive environment enables the completion of the internal market, the improvement of R&D and encourages cooperation both at the Community and international levels.

As biotechnology becomes a major priority for industry and governments throughout the developed and developing worlds, the Community is participating in the related international scientific and technical cooperation. By maintaining scientific excellence, technological leadership and appropriate social policies (e.g. for training and human resource development), the Community can manage and can benefit from the structural adjustments which the new knowledge and technology will require and facilitate.

The following factors, many of which fall within the responsibilities of the public authorities, are also considered as potentially important in determining the competitiveness of countries involved in biotechnology:

- financing and tax incentives for firms;
- government funding of basic and applied research;
- personnel availability and training;
- the legislative framework;
- intellectual property law;
- university/industry relationships;
- anti-trust law;

international technology transfer, investment and trade;

government targeting policies in biotechnology;

public perception and consumer choice.

The interplay of the factors which stimulate world-wide economic growth, much of which relies on the interaction between research, industry and trade, is complex. Although it is difficult to measure competitiveness by a single figure one indication could be the flows of direct investment representing investment by EC firms in the United States.

International comparisons of policy strategies

Biotechnological research and development is currently concentrated, although not limited, to three main geographic zones: the United States, Japan and Europe (including the EFTA countries). Smaller, developed countries (e.g. Australia, Canada, Israel) also have significant capabilities and many newly industrializing countries, particularly South Korea, Taiwan, Singapore, Brazil, India, and China, are giving high priority to biotechnology developments. Moreover, the markets for the products of biotechnology are geographically world-wide, e.g. recombinant vaccines in Indonesia or the Sahel, and are of particular interest to developing countries.

Biotechnology is perceived as a strategic sector for international competitiveness, especially in the United States and Japan, and support by the public authorities has manifested itself in various different approaches:

United States

In order to provide guidelines for the future regulation of biotechnology the Office of Science and Technology Policy published principles, in 1990, relating to the scope of oversight for the planned introduction into the environment of organisms with deliberately modified hereditary traits. This initiative develops and refines the principles laid down in the 1986 coordinated framework for the regulation of biotechnology.

In the United States it is estimated that approximately 1 000 firms are active in biotechnology

research and the industrial application of the results of this research. Since 1975 more than 200 established firms have diversified into biotechnology.

The United States, because it possesses the world's major biotechnology information infrastructure involving both databases and specialist software, currently has the potential of controlling the sources and flow of information in biotechnology. Furthermore, federal support levels for biotechnology research are steadily increasing and in 1991 are estimated to represent approximately MECU 2 850. The positive climate for biotechnology is supported through close links between industry and universities. This means of supporting the diffusion of technological innovation is a characteristic advantage of R&D in the United States.

Japan

In 1981 MITI identified biotechnology as a key technology of the future. Under the auspices of MITI Japanese companies set up the Bio-industry Development Centre in 1983 with the intention of assuring cooperation in promoting R&D and commercialization of biotechnology. Furthermore, MITI has published guidelines which relate to the industrial application, manufacturing of medicines and the agricultural use of recombinant DNA technology.

It is estimated that approximately 300 firms are engaged in biotechnology research and more than 150 of the larger industrial Japanese companies are currently engaged in the industrial application of this research to biotechnology.

A solid competitive base is provided by the Japanese market which, according to the Japanese Industry Development Centre, could grow from USD 1.5 billion in 1985 to USD 35 billion in 2000.

Japanese industrial strategy for biotechnology is coordinated by MITI with particular emphasis being placed on the integration of new process technologies into Japan's fermentation and chemical industries. The real value of such a strategy is that company research into new and important technical areas is stimulated.

The European Community

Many of the world's leading pharmaceutical and chemical companies which are involved in biotechnology are Community based.

Key issues of our policy approach in favour of biotechnology are evidenced by the wide range of Community research programmes supporting R&D and the importance attached to ensuring that the raw materials used in biotechnological processes (sugar and starch) are available to Community producers at world competitive prices.

Environmental and public health considerations as well as the completion of the internal market for biotechnology products has had the highest priority as shown by the type of legislation adopted by the Community in this area.

Furthermore, it is evident from an examination of the leading universities and institutes engaged in biotechnology R&D, that the intellectual basis for a competitive industrial structure in the Community is strong. But databases in the Community are often fragmented and not comprehensive. Researchers within the Community therefore rely on access to the comprehensive databases which exist in the United States. Therefore, the Community must support an open scientific information infrastructure for biotechnology within the Community and world-wide, coherent with international developments in bio-informatics (including databanks, software, and electronic networks and services);

Intellectual property

The economic importance attached to the protection of intellectual property in the field of biotechnology should not be underestimated since firms will only invest in long-term high-risk projects if they can be guaranteed adequate protection for the results of their research. In this regard it is absolutely necessary that industry within the Community benefit from similar levels of protection as their international competitors and that trade barriers resulting from differing levels of protection be avoided. These principles are being actively negotiated by the Community in GATT.

Differences in the length of the period of exclusivity granted under existing patent protection legislation, notably in the pharmaceuticals sector, adversely affects Community industry in comparison with its international competitors. This lack of a sufficiently tight patenting system could have a negative effect on investment. Companies take into account the patent systems in operation when assessing potential investment decisions. If biotechnology patent protection is weaker in the Community than outside of the

Community then the profitability expectations for European firms will be less than for their competitors.

Industrial research activity is reflected in the number of patent applications made to the European Patents Office (EPO). Biotechnology is not, of course, a specific sector of scientific activity but is more the application of a range of processes across a range of sectors. This breadth of activity is reflected in the different classes of patents which are granted by the EPO. Between 1986 and 1988 the average breakdown of applications for patents at the EPO, in relation to biotechnology, was the following: 38.5% of American origin, 31% of European origin and 19.5% of Japanese origin. These levels are more easily appreciated when looked at in the overall context (patent applications across *all* technological sectors) where we see that between 1984 and 1989 the average level of applications lodged of US origin was 26% and of Japanese origin was 17.5%. Therefore the level of penetration in Europe of US and Japanese patent applications in biotechnology is considerably greater than the average for all industrial sectors.

A Community framework for biotechnology

The Community's public authorities are responsible for ensuring that the regulatory and industrial frameworks relating to biotechnology which exist within the Community are conducive to the competitive development of the industries involved. It is therefore the role of the national authorities and, where necessary, Community authorities to address themselves to the factors necessary to achieve a single market for biotechnology, to achieve a competitive position in so far as the protection of intellectual property is concerned, to provide the necessary framework for encouraging research and development, and to ensure protection of human, animal and plant health and the environment. The need to achieve these goals is recognition of the fact that the completion of the internal market in the immediate future is the best industrial policy for the competitive development of industry.

In common with other industrial sectors, it is necessary to avoid market fragmentation caused by unilateral actions by Member States in so far as they erect new trade barriers within the Community. The

importance to industry of having a harmonized and transparent approach to regulation is underlined by the high investment cost of research in biotechnology.

Community firms need a strong and competitive home market so that they are strong enough to face international competition and in order that the Community itself is interesting for investors. Therefore, in order to provide clear and more common rules, both for industry and for national legislators, and to fulfil the commitments proposed in earlier communications, the Commission has launched a wide range of complementary vertical and horizontal initiatives which take into account the objectives of Community policies. These initiatives play an important interactive role towards the provision of a stable regulatory environment for the industrial development of biotechnology.

Completing the internal market for biotechnology

The completion of the internal market for biotechnology will mainly depend upon the application of two tools at the Community level: the legal framework and the industrial use of standards.

The regulatory framework

Not all products derived through biotechnological methods will require a specific assessment and/or authorization procedures. Currently the vast majority of biotechnology products are produced through traditional methods (e.g. cheeses, malt extracts, beers and yeasts). As far as new biotechnology products are concerned, which involve gene manipulation, each product will have to be considered on a case-by-case basis and assessed as necessary.

Those products which do require governmental activity may be assessed and authorized under the regulatory framework for biotechnology which has been developed by the Community. This regulatory framework, which is based upon scientific analysis and evaluation, covers horizontal (environmental and

worker protection) and product legislation. This latter is based on the three criteria of safety, quality and efficacy,¹ which are also applied when assessing whether a product can be authorized for distribution on the open market. The horizontal framework ensures that all stages of pre-industrial development and environmental aspects are covered.

The approach now applied by the Community, based upon the correct and thorough application of the criteria of safety, quality and efficacy, in conjunction with relevant horizontal legislation, ensures consumers safety and economic interests and permits the protection of human, animal and plant health and of the environment. Furthermore, in order to ensure that the consumer protection aspect is covered, the impact on consumers' information and choice needs to be taken into account.

Recent debate has focused on the introduction of broader socio-economic needs in addition to the three traditional criteria when assessing biotechnologically derived products. The debate is ongoing and the preoccupations involved differ. To some the concept includes a broader analysis of health and environmental aspects, to others it should focus on social and/or economic impacts (for example, consequences on agricultural production). The Community must, above all, avoid a situation creating uncertainty. As a rule, decisions have to be based upon objective assessments using clearly identified criteria. Uncertainties about product acceptance and authorization could result in a diversion of investment and could act as a disincentive for innovation and technological development by industry. The Community must, however, guarantee the public that the properly controlled. The dynamism of the industry and the confidence of public opinion depend on the ability of the Community to reassure both parties.

Where a biotechnological product is assessed, the three traditional criteria, based on scientific evaluation apply. By their nature, socio-economic aspects need to be considered in a different way. It is not the intention to have another systematic assessment in addition to the three criteria. The Commission will normally follow scientific advice. The Commission reserves the right, however, to take a different view in the light of its general obligation to take into account other Community policies and objectives. This might, in exceptional cases, lead to requirements for further information. It might equally, in exceptional cases, lead the Commission to propose that other policies be modified in the light of biotechnological developments.

Standards

Following the principles of subsidiarity and Community policy on the use of standardization the Commission considers that it is appropriate to mobilize the considerable technical expertise available in industry to support the targets of the legislation already adopted at Community level.

The use of standards complements and fulfils the regulatory framework and accords with both the policies expressed in the White Paper on the internal market and with the principle of subsidiarity. This was recognized in the conclusions of the Council meeting on 16 July 1984, which pointed out that European standardization not only helps to create a standard technical environment but also improves competitiveness, on both Community and external markets, especially in new technologies. The Council has established as a general principle that standards should be used in support of the legislative programme. Such support can make a significant contribution to the development of biotechnology.

The Commission has noted that, as in the United States and Japan, standardization projects have been launched in the Member States in a variety of fields, but without following a consistent approach. This lack of a consistent approach results in increased costs to industry and it would, therefore, be more beneficial for industry if standardization were to be coordinated at a European level.

Since biotechnology is beginning to find its way into industrial applications, priority should be given to standardization of those industrial aspects which support Community legislation but which are not covered by it in order to make the most of the results of research undertaken and the experience gained to date. Furthermore, in order that high levels of safety may be guaranteed, the maximum use should be made of quality assurance and certification procedures within the global approach to certification and testing.

In industrial areas other than biotechnology, the regulatory approach complements the self-regulatory activities of industry. In the different issues raised by biotechnology, however, industry has an interest in the legislator indicating from the beginning the scope

¹ It should be noted that these three criteria are nowadays considered to include impact on nature and safety for the environment.

and orientations for standardization in order that confusion is avoided.

Protection of intellectual property

In recognition of the need to ensure that the Community's industries and agricultural producers are in a position to be competitive at the international level, the Commission has proposed two measures concerning the legal protection of biotechnological inventions and Community plant variety rights, both of which should go far towards improving the current situation:

- the legal protection of biotechnological inventions

The fact that differences in the legal protection of biotechnological inventions exist even within the Member States, and that such differences could create barriers to trade and to the creation and proper functioning of the internal market, has called for a harmonized legislation concerning the legal protection of biotechnological inventions. The harmonization of patent protection in the Commission's proposal for a directive represents an essential element in the Community's multi-faceted strategies for biotechnology.

- plant variety rights

The objective of the Commission proposal for a regulation on Community plant variety rights is to assure plant breeders that, through a single decision, they may acquire direct and uniform protection throughout the entire Community rather than with the existing fragmented approach.

It is difficult to discuss the form of the final interface between these two proposals since they are still being discussed in the various Community forums. Nevertheless, the Commission should ensure that its approach will be comprehensive and will be coherent with international developments in this field.

The development of harmonized Community legislation in the protection of biotechnological inventions is taking place at a time of rapid technological change and of ongoing international negotiations and discussions (UPOV, GATT, the European Patent Convention). This conjuncture represents an opportunity to strengthen and improve the basis for innovation within the Community while simultaneously addressing the need for greater international harmonization on issues such as burden of proof, 'grace

periods', 'first to invent versus first to file', and access to deposited strains.

Research, development and innovation

The Commission recognizes that strengthening the scientific and technological base of industry is essential for the Community's industries to become more competitive at international level. The Community's principal role is to furnish the necessary dynamism and coherence, to contribute to the definition of joint projects, to the coordination of the various interests involved, to the exchange and diffusion of results and to the harmonization of actions lying within its competence. The Single European Act, which brought research and technological development for the first time explicitly into the EEC Treaty, has provided new impetus towards an overall strategy for research and competitiveness in the bio-industries.

The recently adopted third framework programme will further develop significant new areas for Community research activity in biotechnology and other aspects of life sciences and technologies, in particular through specific programmes on

biotechnology,

agricultural and agro-industrial research,

biomedical and health research,

life sciences and technologies for developing countries.

The Commission's contribution to biotechnology should be reinforced and this should be reflected in the next review of the R&D framework programme.

The long-term strategic objective is to contribute in a coherent way to the development of Europe's potential for understanding and using the properties and structure of living matter. Such basic biological knowledge is the essential foundation needed for applications in agriculture, industry, health (human, plant and animal), nutrition, and the environment. Sectors which ignore this new knowledge and its potential cannot long remain competitive.

In emphasizing the several programmes relevant to biotechnology, the Community recognizes that biotechnology is much more than the application of recombinant DNA technology. Areas such as tissue

and single cell culture, receptor biology, and immunology are no less important to industry and, where appropriate, are being stimulated and strengthened through Community R&D programmes.

Reference has been made to the particular importance of registration activities in sectors such as pharmaceuticals and food, the objects of careful regulatory oversight for well known reasons.

The methods of prenormative research, building upon elements of earlier and current programmes will be expanded; as a contribution to the joint development of scientific basic elements for regulations and in contact with corresponding international activities. Through modern biotechnology, it will be possible to increase the speed and precision of product development and testing, and hence simultaneously improve services, reduce costs and sharpen competitiveness.

It is essential that the Community activities in biotechnology and related research stretch beyond the laboratory, through development and demonstration, to stimulus and support for innovation in industry. In this respect the current activities of the Value programme are important, in promoting the dissemination and utilization of the results of scientific and technical research, with special consideration to the needs of SMEs — vital elements for a dynamic development of industrial biotechnology.

Ethical issues arise in biotechnology (as discussed below) and in the biotechnology research programmes all necessary importance is attributed to the ethical implications of such work and to their relevance to industry. In biomedical research too, ethical issues arise, and a research in biomedical ethics is expected to form part of the next programme in this area. Within the current programme on human genome analysis, the ethical, social and legal aspects of this work form a significant element; a specific expert working group has been constituted, its first meeting was held in April 1991.

Ethics and other issues

Biotechnology, through its wide ranging implications for food, health and the environment, and through the new knowledge and technologies it offers, will have considerable positive impacts on our way of life. It also offers specific new possibilities for information and interventions affecting human life, and

raising or reinforcing basic ethical issues. For both these general and ethical reasons, it attracts considerable public interest and debate, some of it confused. This is important for industry as such confusion can adversely influence the whole climate for industrial development of biotechnology.

The questions arising in public debate belong to distinct categories and debate will continue to be ill-defined (and for public policy purposes, ineffectual) so long as a clear differentiation is not made between these issues:

(i) Ethical considerations relating to human life and identity, which may arise (for example) in medical practice and counselling, or in research on human embryos and the human genome.

(ii) Other value-laden issues which may be raised by biotechnology, including:

- animal welfare issues concerning, *inter alia*, novel methods to enhance the productivity of agricultural animals and the development of new animals by biotechnological methods for medical research, agricultural or other purposes;
- issues relating to the limits of intellectual property rights (patents, plant breeders' rights) and concerning a mixture of economic and ethical aspects — e.g. patenting human beings might be universally rejected, patenting of modified micro-organisms widely accepted.

(iii) Environmental issues about the potential impacts of release of living genetically-modified organisms into the environment. There is a Community framework for the protection of the environment and it is important that this is implemented. Issues relating to protection of health, safety and the environment are to be satisfied.

(iv) Health and safety-related issues, either concerning worker safety *vis-à-vis* biological agents, or consumer and public safety issues such as are addressed by applying the usual criteria of quality, safety and efficacy to products of biotechnology.

(v) Issues related to transparency and information to allow for well informed consumer choice.

(vi) Issues relating to the socio-economic impact (e.g. on production and employment) of new biotechnology-aided methods of production in agriculture.

It is essential that a clear distinction be made between ethical questions, related mainly to the first and partly to the second of the above categories and other issues raised by the applications of biotechnology. All of these concerns are important and both

national and Community policy-makers must ensure that legislative and other measures (agricultural, environmental, consumer protection, research, product safety, protection of human rights) respond to the concerns expressed. The Commission is aware that its responsibilities in this area extend beyond the borders of the Community.

On bio-ethical issues, the Community has been seriously involved in the succession of international conferences; from the first at Hakone, Japan, in 1985 to that held in Rome in 1988 (on ethical issues in human genome sequencing) and that hosted by the Commission in 1989 on environmental ethics. Reference has been made to ethical elements of research programmes in biotechnology and human genome analysis (and to the latter's working group on ethical, social and legal aspects); similarly the future programme of environmental research will include ethical aspects of environmental policy and management.

The Commission organized in 1988, in conjunction with the German Ministry of Research and Technology, the first European Bioethics Conference on human embryos in modern medical and biological research. During the conference, the scientific and technical aspects relating to this issue were presented and discussed by biologists, physicians, sociologists, philosophers and theologians, as well as legal experts and legislative authorities. A common position was reached on basic considerations: rejection of commercial exploitation; protection of genetic information; and establishment of multidisciplinary ethical committees.

Following a meeting of Ministers of Research at Kronberg in March 1990, the Commission has now established a working group on human embryos and research, which held its first meeting in Brussels in March 1991. In this field it is seen as particularly important to maintain close contact with the substantial and continuing work of the Council of Europe (as it has already done, for example, in the field of animal welfare conventions).

Regarding the other, less directly ethical, issues listed above, the Commission has been and remains actively involved. Some are treated elsewhere at appropriate points in this communication.

The Commission will continue to carry out social, economic and technological assessment studies to accompany its policy initiatives and research programmes in biotechnology, as it has done for many years through programmes such as FAST (forecasting

and assessment in science and technology), and through the work of the European Foundation for the Improvement of Living and Working Conditions (who have accorded to biotechnology the highest priority in their work on social assessment of technology).

Actions

At present the sectors involved do not suffer from any structural weakness in terms of R&D, production facilities, investment, financial capability, market penetration in both Community and world markets. However, in order to have the competitive environment for biotechnology in the Community reinforced some problems should be solved:

insufficient patent protection,

fragmentation of the Community market,

the bad image that biotechnology sometimes has for both policy-makers and the general public.

A number of initiatives are required on a broad range of fronts if the competitiveness of the industries using biotechnological techniques is to be encouraged. Further action must be taken in the development of the legal framework, the use of standards, the protection of intellectual property and financial support for research and development. Furthermore, at the national and Community level, the ethical questions raised by biotechnology must be addressed.

The legal and regulatory framework

The Commission intends to ensure that the wide range of initiatives relating to biotechnology which emanate from the numerous services involved are cohesive and complementary. The recent establishment by the Commission of the Biotechnology Coordination Committee, a high level inter-service committee, underlines the recognition of the need for a cohesive approach.

The problems of ensuring policy coherence between different ministries and agencies is no less of a problem at Member State level than at Community level. It is in the interests of the Member States, just as it is

necessary at Community level, that channels of communication operate well both within their national administrations and to the European institutions.

The Community has 'horizontal' directives which relate specifically to the environment and to the protection of workers in the workplace. These directives have provisions relating to adaptation to technical progress; and the Commission will make full use of these provisions in order to guarantee that unknown risks are assessed at an early stage. There are also 'vertical' directives which relate specifically to sectors and products affected by biotechnology e.g. pharmaceuticals.

The Community endeavours not to create unnecessary regulatory burdens to industry. The Commission will examine whether existing product legislation is appropriate and can be applied as it is, or slightly amended, to take into account any particular aspect related to biotechnology.

Existing horizontal legislation will continue to safeguard situations not covered by sectoral product legislation.

Biotechnology represents dynamic innovatory techniques for a wide range of industries. Therefore, it poses a challenge for legislators who need to be able to respond to its rapid development. This means a constant assessment of the appropriateness of existing and proposed legislation. The Community should, at the same time, ensure that excessive demands are not made on industry, and with consequent cost to the consumer, by unnecessary duplication of testing procedures relating to product authorization. In this regard the Community will ensure that testing and authorization procedures are streamlined and that one assessment and notification procedure covers all that is required for product authorization.

The Commission considers that the legal and regulatory framework which now exists, or is proposed, is adequate to ensure protection of health and the environment. It has also identified that further consideration will have to be given to the risk assessment of biological agents and to implementing existing Community legislation on worker protection, health, safety and the environment while taking into account the state of scientific knowledge and technical progress. Furthermore, in order to contribute to public acceptability and to ensure consumer protection, the impact on consumers' information and choice needs to be taken into account. The Commission will ensure that the Community does not over-regulate and that the Community's legislation for biotechnology is coherent.

Standards

Europe's standardization bodies, CEN (the European Committee for Standardization) and Cenelec, by virtue of their structure, their composition, their common rules of procedure and their relations with their international counterparts ISO and IEC, are in a position to draw up harmonized European technical specifications for certain aspects relating to the industrial application of biotechnology, e.g. equipment, and codes of good practice on subjects supporting Community legislation but which are not covered by it.

The Commission intends to pursue a dialogue with CEN with the intention of drawing up a clear and precise mandate for CEN's activities in biotechnology by identifying those aspects which can be most effectively and usefully developed by CEN.

The initiative and responsibility of industry is crucial to the success of the use of standards in biotechnology. If the problems relating to the identification of harmonized technical standards cannot be resolved by CEN then the determination of technical standards will fall back to the legislators for inclusion in the legal framework.

Research, development, innovation and investment

The Community must remain attractive to investment in biotechnology, not only between Member States but also from third countries, since direct investment is an invigorating competitive element by which technical know-how and industrial expertise are exchanged and international economic integration put on a broader basis. An integrated approach is imperative so that the Community is attractive from the point of view of R&D production and manufacture, and marketing.

Certain Member States of the Community, as well as some third countries, have recognized the future importance of biotechnology to economic competitiveness and have identified varying strategies to realize this goal. Current Community support for R&D is very limited when compared with the level of support provided by the Member States on an individual basis or, indeed, with the level of federal support in the United States. Within the Community only Germany, France, the Netherlands and the UK, out of 15

countries surveyed by the OECD, had endeavoured to achieve vertical/lateral coordination of R&D policies and programmes in biotechnology.

The Commission will continue the progressive development and implementation of a policy for R&D in biotechnology which is relevant to the future needs of industry, strengthening the scientific base and infrastructure in consultation with Member States, and with effective coordination between the programmes required at Community level, and national programmes.

There is a need for biotechnology in the context of large integrated projects, addressing targets of strategic importance to the Community, and requiring contributions from two or more specific research programmes. Examples could be found in decentralized networks of laboratories, collaborating in applying the methods of molecular biology and genetic engineering to agriculture; on the advanced use of biotechnology for biomass energy, through integrated projects including high value co-products, or on research to provide the scientific and technical background for modifying the protocols of various classes of drugs, such as cardiovascular.

The wider international dimension demands new responses and the Commission is exploring appropriate mechanisms for scientific collaboration with other countries, focusing on topics such as biotechnology information infrastructure, and prenormative research in biotechnology. Of importance in this respect are existing forums such as the EC-US Task Force for Biotechnology Research, the broader EC-US Joint Consultative Group on Science and Technology, the EC-US High Technology Group and Permanent Technical Working Group on Biotechnology and the Environment.

Care will be taken to ensure that State expenditure contributes to the competitiveness of the industries affected and does not become a mechanism inhibiting competitiveness. Therefore, financial support by public authorities must continue to be rigorously examined and controlled.

With the exception of pre-competitive R&D, the industrial strategy of Community firms has failed to take sufficient account of the Community dimension and long-term prospects. Opportunities for cooperation with Community and international partners have not been sufficiently exploited. As regards innovation and production, European firms have failed to take full advantage of the opportunities for cooperation created by the major Community technology pro-

grammes and have not put long-term global strategies in place early enough. In this context we should consider whether R&D policy has not been too limited to the precompetitive area. It has, however, been Commission policy up to now to leave near-market research to the companies themselves so as to maintain the incentive for them to compete through innovation.

The Commission through its general policies — above all for completion of the internal market — seeks to promote innovation and investment in biotechnology and will, in addition, expand in future such initiatives as the Value programme, and stimuli to innovation such as the Sprint activity. The Venture Consort action is also particularly relevant in this context.

Through these and other initiatives, in conjunction with the concertation action of the Bridge programme, the Commission is developing an approach to stimulate the formation and growth of small companies in biotechnology.

Intellectual property

Questions of ensuring adequate protection for biotechnological inventions within the Community are being addressed. The recently proposed directives on the legal protection of biotechnological inventions and Community plant variety rights represent essential measures in this direction. Nevertheless, a number of the provisions contained within the legal framework laid down by the European Patent Convention (for example, the exclusion from patent protection of plant and animal varieties) might need to be reconsidered for improved adaptation to advances in biotechnology. Given the rapidity of progress in biotechnology it is clear that certain principles retained in the Convention should be adapted if the Convention is to accurately reflect the requirements of a modern economy as well as developments in science and technology.

The Community's industry currently suffers from differences in the length of protection granted under existing patent protection legislation in comparison with that of its international competitors. It is therefore essential that the Community have a strong system of patent protection in place if investment in biotechnology is to be encouraged.

Ethics

The Commission realizes that it is not possible to find general solutions for ethical issues which can be applied as a universal rule and that ethical issues need to be identified on a case-by-case basis. Recent debate has focused on ethical and other aspects of human genome analysis, of human embryo research, of environmental research, of animal welfare, and of intellectual property law.

It is desirable that the Community have an advisory structure on ethics and biotechnology which is capable of dealing with ethical issues where they arise in the course of Community activities. Such a structure should permit dialogue to take place where ethical issues, which Member States or other interested parties consider require resolution, could be openly discussed. It would also enable recognized experts from relevant groups to participate in guiding the legislative process. The Commission considers that this would be a positive step towards increasing acceptance of biotechnology and towards ensuring the achievement of the single market for its products.

The Commission is profiting from, and collaborating with, the important work of the Council of Europe in this area.

The Commission considers that through addressing explicitly the ethical challenges, it is helping to improve the climate of public understanding and opinion concerning the responsible development of biotechnology; hence facilitating the acceptance of its benefits, and ensuring a single market for its products.

The statistical base

One of the major problems relating to an accurate analysis of the real impact of biotechnology to the industrial structure of the bio-industries is the lack of information. Reliable biotechnology-specific statistics on these new aspects of industrial activity are extremely difficult to find for several reasons: the manufacture and sales of biotechnologically-derived products tend to be integrated with the overall industrial production figures for the sectors concerned; many cases involve the development of completely new products for new markets for which there is currently no competition and, therefore, no issue of competitiveness. This lack of biotechnology-specific

information also makes it difficult to assess the impact of Community actions which are directed towards biotechnology. It is therefore necessary that the Community compile a statistical base on the industries and products relating to biotechnology in order that accurate and useful analyses may be conducted.

Conclusions and recommendations

The Community will continue to promote the beneficial application of biotechnology while ensuring safety for man and the environment. In doing so it will avoid creating undue burdens for industry.

The legislative framework

Within the overall goals of ensuring adequate protection of health and the environment, environmental and health legislation has been adopted at Community level. This should be implemented as a matter of urgency.

The Commission will continue to ensure a coherent regulatory approach and an efficient and simplified interaction between sectoral and horizontal legislation.

New biotechnology products involving gene manipulation may need to be considered and assessed. The Commission foresees, therefore, that in the future a number of biotechnology products, will have to be regulated under Community existing sectoral legislation. The Commission will only do so where a thorough case-by-case examination in the light of characteristics inherent to specific biotechnological products or processes indicates that this is necessary.

Sectoral legislation may require adaptation to technical progress and the progress of scientific knowledge in order to deal with advances in biotechnology. Review of existing legislation will be ensured to reflect rapid developments and technical progress. In the exceptional cases where legislation does not provide for adaptation to technical progress the Commission will keep this legislation under review.

Where a biotechnological product is assessed, the three traditional criteria, based on scientific evaluation apply. By their nature, socio-economic aspects need to be considered in a different way. It is not the intention to have another systematic assessment in addition to the three criteria. The Commission will normally follow scientific advice. The Commission reserves the right, however, to take a different view in the light of its general obligation to take account other Community policies and objectives.

Duplication of testing and authorization procedures will be avoided. In this regard the Commission will ensure that testing and authorization procedures are streamlined and that one integrated assessment and notification procedure covers all that is required for product authorization.

Adopted Community legislation in the field of public health and the environment will continue to provide adequate protection in cases not covered by sectoral legislation.

Measures to enhance competitiveness and public acceptability

The Commission proposed that priority be given to the following:

- (i) the Community's contribution to research and development in the area of biotechnology should be reinforced. This will be undertaken in the review of the R&D framework programme;
- (ii) the Community will, through its research programmes, information market policy, and interna-

tional collaboration, contribute to the development of a biotechnology information infrastructure within the Community and world-wide (including databanks, software, and electronic networks and services);

(iii) in order that work in the field of standards may fully complement the Community's legislative work, a clear and precise mandate shall be prepared by the Commission's services, in consultation with CEN;

(iv) Community legislation currently under discussion in the area of intellectual property should be adopted, and Community legislation already adopted should be transposed into the legislation of the Member States, as a matter of urgency in order that the Community will have a coordinated approach which will strengthen its position in international negotiations;

(v) statistics specific to biotechnology should be compiled in order that statistical monitoring of developments in the industrial application of biotechnology may take place;

(vi) bilateral and multilateral international contacts must be further strengthened. In addition to this the Community should pursue, within the context of international bilateral working groups, GATT, the OECD, EFTA and, where appropriate, other international bodies, the establishment of environmental and health objectives and should ensure that these are integrated into economic and other policy decisions;

(vii) to enable ethical issues to be clearly identified and discussed, the appropriate advisory structure at Community level should be established;

(viii) the Commission will regularly evaluate the progress and competitiveness of the biotechnology industries in Europe in order to make sure that the agreed framework remains appropriate. Success in this regard will, essentially, depend on the strategies adopted by the industries concerned.

Commission of the European Communities

OFFICES IN THE COMMUNITY

BELGIUM

Rue Joseph II 99 – 1040 Bruxelles
Joseph II straat 99 – 1040 Brussel
Tel (32-2) 235 38 44
Fax (32-2) 235 01 66
Telex 26657 COMINF B

DENMARK

Højbrohus
Østergade 61
Postbox 144
1004 København K
Tel (45-33) 14 41 40
Fax (45-33) 11 12 03/14 13 92
Telex (055) 16402 COMEUR DK

SPAIN

Madrid

Calle de Serrano, 41, 5.ª planta
28001 Madrid
Tel. (34-1) 435 17 00
Fax (34-1) 576 03 87/577 29 23
Telex (052) 46818 OIPE E

Barcelona

Avenida Diagonal, 407 bis
08008 Barcelona
Tel. (34-3) 415 81 77
Fax (34-3) 415 63 11
Telex (34-3) 415 70 44

GERMANY

Bonn

Zitelmannstraße 22
5300 Bonn
Tel. (49-228) 53 00 90
Fax (49-228) 53 00 950/12
Telex (041) 88 66 48 EUROP D

Berlin

Kurfurstendamm 102
1000 Berlin 31
Tel (49-30) 896 09 30
Fax (49-30) 892 20 59
Telex (041) 18 40 15 EUROP D

München

Erhardtstraße 27
8000 München 2
Tel. (49-89) 202 10 11
Fax (49-89) 202 10 15
Telex (041) 52 18 135

FRANCE

Paris

288, bld Saint-Germain
75007 Paris
Tel. (33-1) 40 63 40 99
Fax (33-1) 45 56 94 17/45 56 94 19
Telex (042) CCEBRF202271F

Marseille

2, rue Henri-Barbusse
13241 Marseille CEDEX 01
Tel (33) 91 91 46 00
Fax (33) 91 90 98 07
Telex (042) 402 538 EURMA

GREECE

2, Vassilissis Sofias
Case postale 30284
10674 Athina
Tel. (30-1) 724 39 82/3/4
Fax (30-1) 724 46 20
Telex (0601) 21 93 24 ECAT GR

IRELAND

Jean Monnet Centre
39 Molesworth Street
Dublin 2
Tel. (353-1) 71 22 44
Fax (353-1) 71 26 57
Telex (0500) 93827 EUCO EI

ITALY

Roma

Via Poli, 29
00187 Roma
Tel. (39-6) 678 97 22
Fax (39-6) 679 16 58/679 36 52
Telex (043) 610 184 EUROMA I

Milano

Corso Magenta, 59
20123 Milano
Tel (39-2) 80 15 05/6/7/8
Fax (39-2) 481 85 43
Telex (043) 31 62 00 EURMIL I

LUXEMBOURG

Bâtiment Jean Monnet
Rue Alcide de Gasperi
2920 Luxembourg
Tel (352) 430 11
Fax (352) 43 01 44 33
Telex 3423/3446/3476 COMEUR LU

THE NETHERLANDS

Korte Vijverberg 5
2513 AB Den Haag
Tel. (31-70) 346 93 26
Fax (31-70) 364 66 19
Telex (044) 31094 EURCO NL

PORTUGAL

Centro Europeu Jean Monnet
Largo Jean Monnet, 1-10.º
1200 Lisboa
Tel. (351-1) 54 11 44
Fax (351-1) 55 43 97
Telex (0404) 18810 COMEUR P

UNITED KINGDOM

London

Jean Monnet House
8 Storey's Gate
London SW1 P3AT
Tel. (44-71) 222 81 22
Fax (44-71) 222 09 00/222 81 20
Telex (051) 23208 EURUK G

Belfast

Windsor House
9/15 Bedford Street
Belfast BT2 7EG
Tel. (44-232) 24 07 08
Fax (44-232) 24 82 41
Telex (051) 74 117 CECBEL G

Cardiff

4 Cathedral Road
Cardiff CF1 9SG
Tel (44-222) 37 16 31
Fax (44-222) 39 54 89
Telex (051) 49 77 27 EUROPA G

Edinburgh

9 Alva Street
Edinburgh EH2 4PH
Tel. (44-31) 225 20 58
Fax (44-31) 226 41 05
Telex (051) 72 74 20 EUEDING

European Communities — Commission

European industrial policy for the 1990s

Supplement 3/91 — Bull. EC

Luxembourg: Office for Official Publications of the European Communities

1991 — 54 pp. — 17.6 × 25.0 cm

ISBN 92-826-2720-9

Catalogue number: CM-NF-91-003-EN-C

Price (excluding VAT) in Luxembourg: ECU 4.25

The communication on industrial policy in an open and competitive environment sets out a series of guidelines to be applied to industrial issues in the future.

The communication on the European electronics and information technology industry sets out the measures that public authorities can undertake to promote the adaptation of an industry facing severe structural adjustment problems.

The communication on biotechnology integrates the different regulatory and other instruments required to ensure an appropriate environment for the continued development of industrial activities based on biotechnology.

Venta y suscripciones • Salg og abonnement • Verkauf und Abonnement • Πωλησεις και συνδρομες
Sales and subscriptions • Vente et abonnements • Vendita e abbonamenti
Verkoop en abonnementen • Venda e assinaturas

BELGIQUE / BELGIË

Monteur belge / Belgisch Staatsblad
 Rue de Louvain 42 / Leuvenseweg 42
 1000 Bruxelles / 1000 Brussel
 Tél (02) 512 00 26
 Fax 511 01 84
 CCP / Postrekening 000-2005502-27

Autres distributeurs /
 Overige verkooppunten

Librairie européenne / Europese Boekhandel

Avenue Albert Jonnart 50 /
 Albert Jonnartlaan 50
 1200 Bruxelles / 1200 Brussel
 Tél (02) 734 02 81
 Fax 735 08 60

Jean De Lannoy

Avenue du Roi 202 /Koningslaan 202
 1060 Bruxelles / 1060 Brussel
 Tél (02) 538 51 69
 Téléc 63220 UNBOOK B
 Fax (02) 538 08 41

CREDOC

Rue de la Montagne 34 / Bergstraat 34
 Bte 11 / Bus 11
 1000 Bruxelles / 1000 Brussel

DANMARK

J H Schultz Information A/S

EF-Publikationer

Otttilavej 18
 2500 Valby
 Tlf 36 44 22 66
 Fax 36 44 01 41
 Girokonto 6 00 08 86

BR DEUTSCHLAND

Bundesanzeiger Verlag

Breite Straße
 Postfach 10 80 06
 5000 Köln 1
 Tel (02 21) 20 29-0
 Fernschreiber
 ANZEIGER BONN 8 882 595
 Fax 20 29 278

GREECE

G.C Eleftheroudakis SA

International Bookstore
 Nikis Street 4
 10563 Athens
 Tel (01) 322 53 23
 Telex 219410 ELEF
 Fax 323 98 21

ESPAÑA

Boletín Oficial del Estado

Trafalgar, 27
 28010 Madrid
 Tel (91) 44 82 135

Mundi-Prensa Libros, S.A.

Castelló, 37
 28001 Madrid
 Tel (91) 431 33 99 (Libros)
 431 32 22 (Suscripciones)
 435 36 37 (Direccion)
 Téléc 49370-MPLI-E
 Fax (91) 575 39 98

Sucursal

Libreria Internacional AEDOS

Consejo de Ciento, 391
 08009 Barcelona
 Tel (93) 301 86 15
 Fax (93) 317 01 41

Libreria de la Generalitat de Catalunya

Rambla dels Estudis, 118 (Palau Moja)
 08002 Barcelona
 Tel (93) 302 68 35
 302 64 62
 Fax 302 12 99

FRANCE

Journal officiel Service des publications des Communautés européennes

26, rue Desaix
 75727 Paris Cedex 15
 Tél (1) 40 58 75 00
 Fax (1) 40 58 75 74

IRELAND

Government Publications Sales Office

Sun Alliance House
 Molesworth Street
 Dublin 2
 Tel 71 03 09

or by post

Government Stationery Office

EEC Section

6th floor
 Bishop Street
 Dublin 8
 Tel 78 16 66
 Fax 78 06 45

ITALIA

Licosa Spa

Via Benedetto Fortini, 120/10
 Casella postale 552
 50125 Firenze
 Tel (055) 64 54 15
 Fax 64 12 57
 Telex 570466 LICOSA I
 CCP 343 509

Subagent

Libreria scientifica

Lucio de Blasio - AEIOU

Via Meravigli, 16
 20123 Milano
 Tel (02) 80 76 79

Herder Editrice e Libreria

Piazza Montecitorio, 117-120
 00186 Roma
 Tel (06) 679 46 28/679 53 04

Libreria giuridica

Via XII Ottobre, 152/R
 16121 Genova
 Tel (010) 59 56 93

GRAND-DUCHÉ DE LUXEMBOURG

Abonnements seulement
 Subscriptions only
 Nur für Abonnements

Messageries Paul Kraus

11, rue Christophe Plantin
 2339 Luxembourg
 Tél 499 88 88
 Téléc 2515
 Fax 499 88 84 44
 CCP 49242-63

NEDERLAND

SDU Overheidsinformatie

Externe Fondsen
 Postbus 20014
 2500 EA 's-Gravenhage
 Tel (070) 37 89 911
 Fax (070) 34 75 778

PORTUGAL

Imprensa Nacional

Casa da Moeda, EP
 Rua D Francisco Manuel de Melo, 5
 P-1092 Lisboa Codex
 Tel (01) 89 34 14

Distribuidora de Livros Bertrand, Ld.º

Grupo Bertrand, SA

Rua das Terras dos Vales, 4-A
 Apartado 37
 P-2700 Amadora Codex
 Tel (01) 49 59 050
 Telex 15798 BERDIS
 Fax 49 60 255

UNITED KINGDOM

HMSO Books (PC 16)

HMSO Publications Centre
 51 Nine Elms Lane
 London SW8 5DR
 Tel (071) 873 9090
 Fax GP3 873 8463
 Telex 29 71 138

Sub-agent

Alan Armstrong Ltd

2 Arkwright Road
 Reading, Berks RG2 0SQ
 Tel (0734) 75 18 55
 Telex 849937 AAALTD G
 Fax (0734) 75 51 64

ÖSTERREICH

Manz'sche Verlags- und Universitätsbuchhandlung

Kohlmarkt 16
 1014 Wien
 Tel (0222) 531 61-0
 Telex 11 25 00 BOX A
 Fax (0222) 531 61-81

SVERIGE

BTJ

Box 200
 22100 Lund
 Tel (046) 18 00 00
 Fax (046) 18 01 25

SCHWEIZ / SUISSE / SVIZZERA

OSEC

Stampfenbachstraße 85
 8035 Zurich
 Tel (01) 365 51 51
 Fax (01) 365 54 11

MAGYARORSZÁG

Agrinform

Kozpont
 Budapest I., Attila ut 93 H-1012

Levélcim

Budapest, Pf 15 H-1253
 Tel 36 (1) 56 82 11
 Telex (22) 4717 AGINF H-61

POLAND

Business Foundation

ul Wspolna 1/3
 PL-00-529 Warszawa
 Tel 48 (22) 21 99 93/21 84 20
 Fax 48 (22) 28 05 49

YUGOSLAVIA

Privredni Vjesnik

Bulevar Lenjina 171/XIV
 11070 - Beograd
 Tel 123 23 40

TURKIYE

Pres Dagitim Ticaret ve sanayi A.Ş.

Naribaşçe Sokak No 15
 Cağaloğlu
 Istanbul
 Tel 512 01 90
 Telex 23822 DSV0-TR

AUTRES PAYS OTHER COUNTRIES ANDERE LANDER

Office des publications officielles des Communautés européennes

2, rue Mercier
 L-2985 Luxembourg
 Tél 49 92 81
 Téléc PUBOF LU 1324 b
 Fax 48 85 73
 CC bancaire BIL 8-109/6003/700

CANADA

Renouf Publishing Co. Ltd

Mail orders — Head Office
 1294 Algoma Road
 Ottawa, Ontario K1B 3W8
 Tel (613) 741 43 33
 Fax (613) 741 54 39
 Telex 0534783

Ottawa Store
 61 Sparks Street
 Tel (613) 238 89 85

Toronto Store
 211 Yonge Street
 Tel (416) 363 31 71

UNITED STATES OF AMERICA

UNIPUB

4611-F Assembly Drive
 Lanham, MD 20706-4391
 Tel Toll Free (800) 274 4888
 Fax (301) 459 0056

AUSTRALIA

Hunter Publications

58A Gipps Street
 Collingwood
 Victoria 3066

JAPAN

Kinokuniya Company Ltd

17-7 Shinjuku 3-Chome
 Shinjuku-ku
 Tokyo 160-91
 Tel (03) 3439-0121

Journal Department

PO Box 55 Chitose
 Tokyo 156
 Tel (03) 3439-0124

Price (excluding VAT) in Luxembourg: ECU 4.25

ISBN 92-826-2720-9



OFFICE FOR OFFICIAL PUBLICATIONS
OF THE EUROPEAN COMMUNITIES
L-2985 Luxembourg



9 789282 627204