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**Expert Group Meeting on the
Implications of the Single European
Market for Industrialization in
Developing Countries**

Vienna, 18-20 March 1992

THE CHEMICALS SECTOR*

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PREFACE

The creation of the European Single Market is the most significant step in economic integration so far taken. The creation of a single economic area in which capital and labour, goods and services all move freely is the target set by the countries of the European Community to be achieved by the end of 1992. Given the size and strengths of the Community, the changes under way may be expected to have significant impacts beyond its borders.

UNIDO, with financial support from the Government of the Netherlands, is holding an Expert Group Meeting to examine the main implications of this process for industrialization in developing countries. The expected growth effects of the Single Market will have implications for the world economy, including changes in trade and investment patterns. Other associated EC policies, especially in the areas of regional policy, competition, technology, environment, energy and technical standards will also affect a wide range of industrial sectors, and thus the prospects for industrialization in developing countries. The Expert Group Meeting will review the implications in terms of key industrial sectors: food, textiles and clothing, footwear, steel, chemicals, and electronics.

The present paper deals with one of these key sectors, the chemicals sector. It reviews trends in the world industry and examines the implications of the Single Market and European Community policy for the chemicals sector in developing countries.

The paper was prepared by the Regional and Country Studies Branch of UNIDO, with Dr. Willem Molle and Dr. Vincent van Polanen Petel, Netherlands Economic Institute, Rotterdam, The Netherlands, as UNIDO consultants.

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1. RECENT TRENDS IN THE CHEMICAL INDUSTRY

1.1 Demand

In general, consumption of chemicals is highest in Western Europe, followed by North America and Japan. This is partly explained by the magnitude of the economies. Another important factor is the high degree of vertical integration in the chemical sector: the chemical sector itself. Since 70 per cent of demand is generated by industry, the degree of industrialization, the degree of integration of industries, is also important in explaining the magnitude of consumption.

Because the sector is highly interwoven in the economy, the chemical sector is generally vulnerable to business cycles. The high degree of integration can make for significant multiplier effects of changes in final demand.

The EC domestic market amounted to US \$ 334 billion in 1990 (including East Germany). On the assumption that this amount accounts for the same percentage of the world total as in 1987, than world demand would have amounted to US \$ 1025 billion.¹

The growth rate of chemical production in the EC and in North America has been slowing down at the beginning of the 90s. This was generally in line with economic development, but even in countries like Germany with a (then) better performing economy the chemical industry lagged behind due to a slump in exports to other industrial countries. This has severe consequences for an industry with an export ratio of more than 50 per cent.

The economic development in Eastern Europe will hardly gain momentum before the middle of the nineties, but in the longer term a huge potential can be expected. For Germany the market situation was characterized by a booming business in chemical consumer goods (cosmetics, detergents, pharmaceuticals) but for the coming years a slower growth is expected. Demand expectations are rather optimistic for Spain and France, but not for Italy, the United Kingdom, Belgium and the Netherlands.

Pharmaceuticals

The demand for pharmaceuticals is influenced by demographic developments (age distribution etc.), income growth, priorities given to health expenditures and short term effects caused by epidemics. Also the organization of the public health sector plays a role. The demand for Over The Counter (OTC) products is highly influenced by income growth.

During the 80s demand growth was generally high in the EC, with the exceptions of Germany and Spain. Demand in the EC was around US \$ 70 billion in 1990, but the national markets are rather segregated, which is partly due to different legal structures in the countries. Estimates of demand growth in volume terms in the EC revolves around 5 per cent per year in the next five years, with above average increases for Spain, France and Italy.

Compared with world demand EC consumption accounts for about 30 per cent for 1987. This is based on the assumption that the EC, the USA and Japan accounts for 70 per cent of the world market for pharmaceuticals.² Apparent EC consumption was then US \$ 44 billion.

¹ UNIDO, *Industry and development. Global report 1990/91*, p. 173.

² Demand figures are derived from the accounting identity Production plus Imports minus Exports. Production figures from *Panorama of EC industry 1991-1992* and trade figures from OECD.

Fertilizers

Fertilizer demand is highly dependent on developments in agricultural production, and along with this, on agricultural policy and developments in biotechnology and crop genetics. In the last decade growth in demand has come from the developing countries. World demand is around \$ 50 billion. In volume terms the latest figure for 1989/1990 was 143.3 million tonnes, of which the EC has some 13 per cent. 56 per cent of the world consumption is accounted for by the CIS (the former USSR), China, the USA and India. Major agricultural events like droughts and political changes in these countries will have a large impact on trade in fertilizers. In the EC consumption has increased by 2.5 per cent on average during the last decade, of which a growing part is supplied through imports. Environmental concerns as well as the need to reform the Common Agricultural Policy (CAP) will probably put more downward pressure on growth, as the declining use of mineral fertilizers will continue.

Plastics

Primary plastics demand is stimulated through overall economic growth and through the substitution process of replacing traditional materials by plastics. Overall estimates of demand are hard to make because statistical data are scattered. Estimates of world demand are at around US\$ 120 billion or 90 million tonnes in 1989. 75 per cent of this is accounted for by thermoplastics, which are all commodity plastics. Engineering plastics account for about 10 per cent of demand, the remainder being a variety of other materials. EC consumption accounts for around 30 per cent, and had a value in 1990 of US \$ 50 billion (29 million tonnes).³

Polyethylene, the major plastic variety, accounts for some 30 million tonnes of consumption in 1990 worldwide. It gives a firm basis for plastics demand, because the use of PE's is widely spread throughout the economy. Western Europe consumes 39 per cent of the total figure; in contrast, Latin America, Africa and the Middle East together account for only 10 per cent.

EC demand is expected to grow in the next 5 years by on average 5 ½ per cent per annum in volume, which is considerably lower than in the late 1980s. Only Germany, Belgium and the Netherlands are expected to have growth rates above this average.

As far as products are concerned: the use of PVC in consumer products is already under pressure because of environmental concerns and will only grow because of building activities, especially in Germany. Because of the relatively low price and its substitution possibilities (also for other plastics) poly-propylene, on the other hand, will continue to be a product with high growth rates.

Petrochemicals

Demand for petrochemical products (olefins and aromatics) stems mainly from the plastics and fibres industries, and to a lesser extent from the fertilizer industry (nitrogen fertilizer production needs ammonia), the paint industry, the soap and detergents industry, and several other chemical industries. EC consumption of ethylene, the major product of the petrochemical industry, amounted to 13.1 million tonnes in 1989, one fifth to one quarter of world consumption. Demand outlook is generally in line with overall economic growth, and for ethylene in particular in line

³ Data are from *Panorama of EC industry 1991-1992*; UNIDO, *Industry and development global report 1990/91*; ERECO, *Europe in 1996: Economic outlook by sector*; Economist Intelligence Unit, *Petrochemicals, an industry and its future*.

with poly-ethylene demand, which in turn generates half of the ethylene demand. This leads up to a growth in volume in the EC of 3 per cent per year during the coming years.

1.2 Production and investment

World turnover of chemicals, as a proxy for production, is estimated at \$ 1,235 billion, with Western Europe, North America and Japan together accounting for 71.7 per cent of this figure.⁴ Turnover in the EC amounted to \$ 376 billion. Chemical output grew by 3.7 per cent per year worldwide from 1980 to 1988, compared with a growth rate of now 3 per cent for manufacturing in general.⁵ Although the growth rate of EC chemical industry was below the global growth rate, it was nevertheless higher than EC growth of manufacturing output. Growth in developing market economies was much higher with on average 7 per cent between 1980 and 1988.

Productivity has grown considerably during the 80s, reflecting the restructuring that took place in the chemical sector. Since worldwide employment grew only with 0.4 per cent from 1980 to 1987, implicit productivity has risen at around 3 per cent annually.

EC production growth was smaller in the second half of the 80s than growth of demand, which resulted in higher growth of imports compared with exports. The United Kingdom was the only exception to this; production rose slightly in the UK while the domestic market stagnated. Production forecasts for the next five years are around 3 per cent annually.

The chemical industry is highly capital-intensive, which shows up in the figures for investment. For the EC capital investments amounted in 1990 to \$ 24.5 billion, which corresponds to 6.5 per cent of turnover. This ratio means a rise, reflecting the results of the restructuring during the 80s and the growing demand in the late 80s. Figures for the USA and Japan are 4 and 10 per cent respectively (CEFIC data).

Investments in the chemicals sector tend to be more oriented towards new products and processes, taking into consideration environmental protection and applications of new information technology (like Electronic Data Interchange). Expansion is not a top priority in Western Europe, although the high demand growth rates of 1986-1988 have spurred expansion investments as well.

Pharmaceuticals

Production growth for pharmaceuticals in the EC follows demand closely. This is especially true for prescription (or ethical) drugs. Since half of the OTC drugs, for which prescription is not compulsory, are prescribed by doctors, production of OTC drugs also follows demand closely. Nevertheless, the expected demand for the EC will outpace EC production growth, leading to an estimated import growth of 8 per cent annually to 1996.

Considering R&D as part of investment, investments in the pharmaceutical industry are in general very high because of the large R&D content and can amount to 25 per cent of the turnover.

⁴ This percentage can be calculated from UNIDO, *Industry and development Global report 1990/91*, p. 173.

⁵ UNIDO, *Industrial statistics yearbook 1988, volume 1*, p. 665-677.

Fertilizers

World production of fertilizers in 1989/1990 is estimated at 153 million tonnes, of which 11 per cent was produced in the EC and 34 per cent in Africa, Latin America and Asia together.⁶ The share in production capacity of the developing countries and Eastern Europe has been increasing in recent years. Of the three types of fertilizer, nitrogenous, phosphate and potash, nitrogenous fertilizers account for over 50 per cent of production; this ratio is more or less the same for the EC. The outlook for production is one of growth, except for the EC.

Attached to this is the question of equilibrium between demand and supply. Developments in large markets like India and China can influence world trade patterns, causing cyclical fluctuations; in the short to medium term the same can be said about Eastern Europe, an important producing region. While there are estimates that world production tends to lag behind consumption, leading to price increases worldwide, the past years have witnessed a declining EC demand and growing EC imports, leading to EC overproduction and a price collapse.⁷ This has led to very poor profitability in the EC industry and has induced rationalization, which probably will continue for the remaining decade of this century.

Plastics

The estimate for world production of the major thermoplastics was around 66 million tonnes in 1989, taking account of a share of 66 per cent for Western Europe, the USA and Japan together. Growth in capacity will for a large part come from outside the industrialized countries (45 per cent or more). Investments in the industrialized countries will be directed towards environmentally related products, towards engineering plastics and generally towards improvement of processes and products. Since bulk thermoplastics have a relatively low value added, production sites are near consumption. Since most of consumption takes place within the industrialized countries, most of the capacity is located in the developed world. Table 1 gives capacity estimates by region for some thermoplastics.

Petrochemicals

Total output of petrochemicals is valued at around \$ 100 billion a year⁸, of which ethylene is the major product. At the beginning of the 80s there has been a considerable overcapacity for petrochemicals worldwide. The EC industry restructured as a reaction, which shows up in the figures for capacity (see figure 1). For the petrochemicals industry in particular economies of scale exist. Part of the restructuring consisted of closing down of low capacity, high cost plants. However, this makes business more difficult for companies with only a relatively small interest in the production of olefins and aromatics, because a high utilization ratio is needed to be profitable. This reinforced the drive towards concentration and "back to basics".

⁶ CEC, *The fertilizer industry of the European Community: the issues of today, the outlook for tomorrow*, p. 12.

⁷ UNIDO, *Industry and development Global report 1991/92*, p. 255; CEC, *The fertilizer industry of the European Community*, pp. 14, 19-21.

⁸ UNIDO, *Industry and development. Global report 1990/91*, p. 175.

Table 1 Production capacity of plastics (million tonnes per year, 1989)

	PVC	LDPE	LLDPE	PP
Western Europe	5.3	5.3	0.8	4.2
North America	4.8	4.0	2.6	4.0
Japan		1.4	0.4	1.6
Middle East, Asia excl. China	4.3			
SE Asia and Australia				1.5
Eastern Europe and China	3.0	2.4	0.3	
Eastern Europe				0.9
Africa	0.3			
Africa and Western Asia				0.3
Rest of the world		2.8	1.1	
Latin America	1.1			0.6
Total	18.0	15.9	5.2	13.1

Source: Kunststoffe (October 1990).

Another point to notice is the importance of feedstock cost in cost competitiveness. This argument is valid for both the petrochemical plants and for the plastics plants. Because of this the Western European industry is competitive on the home market, but not really so on export markets. It is one reason for European industry to try to produce more products with a high value-added. These products are less sensitive to economies of scale in production, but R&D investments are likewise much higher.

For the beginning of the 90s a growth in capacity of petrochemicals is to be expected. As far as the EC industry is concerned, a slowing down in investment growth is anticipated. Since there are no major technological changes expected, investments will be directed towards environmental protection and improving productivity.

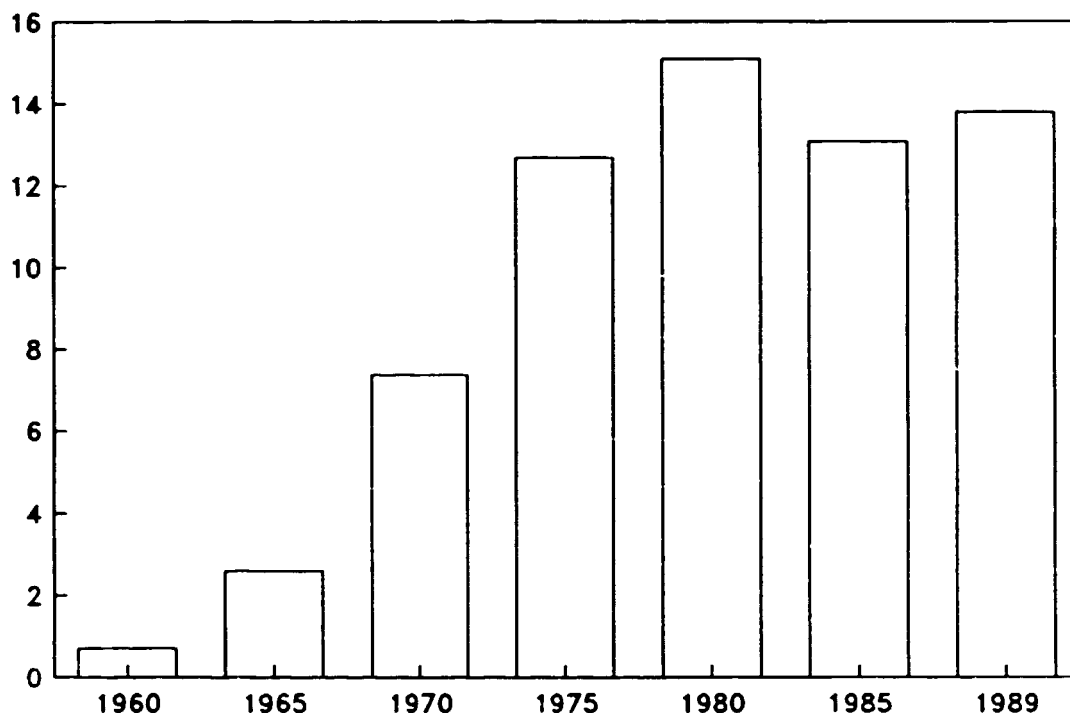
1.3 Competitive position: industry structure, trade and R&D

Concentration

The chemical industry is a concentrated industry, with five companies holding 40 per cent of the worldwide turnover; the companies are Hoechst, Bayer, BASF, ICI and Du Pont. A more or less equivalent picture arises for Western Europe, with the proviso that the European market is almost completely dominated by European companies. West European companies also have a dominant share in world production. Of the five first companies only Du Pont is not based in Europe. Notwithstanding the high degree of concentration, competition on the West European chemicals market is rather strong.

Figure 1

Ethylene production capacity in the EC million tonnes per year



Source: CEC, *Panorama of EC industry 1991-1992* (Luxembourg, 1991), p. 8-73; W. Molle and E. Wever, *Oil refineries and petrochemical industries in Western Europe* (Aldershot, 1984), p. 84.

Pharmaceuticals

The picture of concentration varies between different chemical sub-sectors. The pharmaceutical industry is for instance dominated by US based firms: of the top 15 pharmaceutical firms 8 (or 9, including SmithKline Beecham) are US firms, 5 (6) are European and 1 is Japanese. Together the top 15 companies accounted for 80 per cent of world exports in 1985.

Fertilizers

On the other hand, fertilizer industry is much less concentrated on a world scale, although it can still be characterized as an oligopolistic industry. On a much larger scale than elsewhere in the chemical sector the fertilizer industry has many state-owned companies and is permeated by government intervention. The EC fertilizer industry has been concentrating, inter alia as a result of massive restructuring. The outcome was that in 1990 seven companies accounted for 80 per cent of EC fertilizer production; of these seven two companies (numbers 1 and 3 in rank according to turnover) are effectively state-owned: Norsk Hydro (Norway) and Kemira Oy (Finland).

Plastics and petrochemicals

The European plastics and petrochemicals industries are also highly concentrated. The former has a concentration ratio of 37 per cent regarding the four leading companies (C4 ratio), and of 60 per cent for the first eight firms (1990). For the petrochemicals industry the C4 ratio is 36 per cent (1988), calculated with regard to ethylene capacity.⁹

Entry barriers

High concentration ratios mean oligopolistic markets, indicating the existence of entry barriers. Much of the chemical industry is characterized by high entry barriers. For petrochemicals, primary plastics and (nitrogenous) fertilizers investments costs are high for new plants, due to the large scale of the plants, or in the case of fertilizers, due to the acquiring of the technical knowledge.

Entry barriers also exist because of the importance of R&D and protection by patents, as is the case for pharmaceuticals. R&D expenditures in the pharmaceutical industry average around 10 to 12 per cent of turnover. On average, R&D accounts for 5 3/4 per cent of turnover in 1990. In the past decade there has been an almost continuous rise of this percentage from 4 per cent in 1980.

In addition high marketing expenditures are also necessary in the pharmaceutical industry (as well as in the soap and detergents and in the cosmetics industries).

Furthermore, the pharmaceutical industry in Europe still exists of 12 separate markets, due to national health regulations and trade and licensing conditions, causing remarkable price differences for the same product sold in different countries.

As far as the pharmaceutical industry is concerned, it should be noted that only a rather small percentage of producers is doing research work; in Western Germany the share is about 5 per cent of the members of the producers federation. These companies are responsible for more than 95 per cent of research expenditure.

Attached to R&D is the question if patent life is long enough to make the R&D efforts worthwhile. Patent life refers to the time during which protected profits on a drug can be made, and generally runs for around 20 years. However it may take 10 to 15 years before a so-called New Chemical Entity can be commercially marketed, thus reducing the patent life effectively. So the high R&D and marketing costs are to be recovered in relatively few years.

The research output can be measured by world-wide patent applications (inventions with patent applications in at least two countries). Considering the period 1983-1989, 36 per cent of the innovations in chemistry came from the EC, compared with the US share of 34 per cent and the Japanese share of 22 per cent. For the pharmaceutical industry these figures are 35.8 per cent (EC), 38.7 per cent (USA) and 16.2 per cent (Japan) respectively.¹⁰ These figures illustrate the relatively strong competitive position of the European industry and the entry barriers for companies from the developing world.

⁹ Sources: plastics: *Chimie Actualités*; petrochemicals: Economist Intelligence Unit, *Petrochemicals*.

¹⁰ ERECO (1992), *Europe in 1996*.

The rather strong position of the EC chemical industry on the world market also shows up in trade figures: around 60 per cent of OECD chemical exports stem from EC countries. On the other hand some 75 per cent of extra EC imports are from OECD (non EC) countries. The non-oil developing countries had in 1984 a share of 4.6 per cent in total EC chemical imports (including intra EC imports) and of 16.1 per cent of extra EC imports.¹¹ In 1989 these figures were 4.6 and 16.4 per cent respectively, which means that there was a small amount of substitution between non oil developing countries and the rest of the world. Since the share of imports from OPEC has grown, it means that the share of industrialized countries has declined, albeit with a small percentage.

Trade

The specific characteristics of some chemical industries imply that international trade is not always the most efficient to meet world demand. High transportation costs, low added value are among the features which hinder trade. As a result trade in plastics, for instance, is low compared with production: 8 per cent of the West European production is exported outside West Europe; for the USA and Japan these percentages are 11 and 11.5 per cent respectively. The average for the chemical industry in the EC is some 20 per cent; for pharmaceuticals it is around 17 per cent. This means that West European suppliers have another advantage in competing on the West European market for products with high transportation costs. Only countries with ample raw materials are well equipped to challenge the West European suppliers on their home market.

Company strategies

The economic downturn at the beginning of the 80s led companies to alter their strategies. The characteristics of the industry and the developments in feedstock prices and competition from abroad (Middle East, East Asia) are the influential factors behind the choices made. Company strategies involved:

- Moving towards refined chemicals, which means more R&D effort, more marketing costs and lesser sensitivity to economic fluctuations.
- Turning back to the core business; this can mean *inter alia* joint-ventures between oil companies and major chemical firms to produce together the basic petrochemicals (e.g. BP and ICI, BASF and Shell, Bayer and BP).
- Rationalizing production.
- Benefitting from economies of scale. This can take form in increasing installation size, but also in forms of mergers and joint-ventures for R&D and marketing, as is the case in the pharmaceutical industry.

The massive restructuring during the 80s has made the West European companies now more resistant to economic downturns than at the beginning of the 80s. *Inter alia*, their competitive strength stems from the move towards the high end of the market, a movement that is still going on. This means that it is harder for firms from developing countries to compete in the market for products with a high value added, but they should be able to enter the market with low value added products.

High value added products offer by their nature a relatively low content of labour input. Low labour costs play thus a minor role in the price of the product, making it difficult for countries where relative low wages are important for their competitiveness.

¹¹ See Annex 2.

Implications for the developing countries

Summing up, the chemical industry is highly concentrated, the market is generally very competitive and worldwide. Because of the existing economies of scale, either in the form of plant size or in the form of high R&D and marketing efforts, it is not easy for new companies to enter the market. Since West European companies have also strengthened their competitive power with regard to high value added products, it is generally only worthwhile for developing countries to enter production of low technology chemical products. However, if they can profit from feedstocks nearby such as oil and gas, the picture could become a bit different.

2. IMPLICATIONS OF THE SINGLE EUROPEAN MARKET

2.1 The White Paper and after

Technically, the concept of a Single European Market refers to the proposals of the White Paper from June 1985 and the goals and modifications of the European treaties in the Single European Act from July 1, 1987. However, it is clear that the intentions of the EC go beyond the completion of the internal market given the political statements about the economic and monetary union, the political union, the European economic area and Eastern Europe. So it is necessary to adopt a broader concept of the internal market. This section consists of a discussion of the internal effects for the chemical industry in general, which is followed by a section with more specific remarks, followed by a survey of Eastern European changes. This chapter concludes with implications for the developing countries.

With regard to the actual situation concerning the White Paper and areas of possible interest for the chemical industry, by mid 1991 roughly two thirds of the proposals were adopted. Among those were all proposals on abolishing technical barriers for the chemicals market, and many for the pharmaceuticals market. Other areas of interest, not directly relevant for the chemical industry, are: fiscal harmonization, European standards, abolition of border controls, transport de-regulation and trade statistics. With regard to the Single European Act the following areas could be added: environment and energy policies and R&D policies. Also trade policy is of special interest. The White Paper proposals on fiscal harmonization are facing serious delay.

2.2 Internal effects

In general the effects of the internal market can be subdivided into welfare effects, trade effects, production effects and investment effects. For the purpose of this paper the effects will be split into internal and external ones.

Internal effects can again be divided into static ones, general growth effects and dynamic long-run effects.

Not many estimates appear to be available on the effects of the completion of the internal market regarding the chemical industry. The major study in this respect is still the EC's own study, on the basis of which the Cecchini report was written.¹² Estimates are only available for the static effects.

¹² For the estimates: CEC, *The economics of 1992*, European Economy 35 (Luxembourg, 1988). To the knowledge of the people we have interviewed there are indeed very few estimates for the chemical industry.

In this respect, the micro-economic approach of the CEC report is relevant. The analysis distinguishes four stages. In stage 1 the effects of static trade creation and diversion were calculated. These are in general very small, except for pharmaceuticals in the case of public procurement. We label these effects as "static welfare effects". Extra EC imports of chemicals will decline by approximately 2 per cent (in terms of 1985 figures). In stage 2 the direct and indirect gains from cost reductions due to the elimination of cost-increasing production restrictions were calculated. In the case of chemicals these are larger than in stage 1. These effects are labelled as "internal efficiency effects". Extra EC imports will decline by on average 10 per cent. Major effects are being expected from stage 3 effects: those of economies of scale. There are no effects reported on trade, however.¹³ When bearing in mind that the chemical industry is highly integrated in the EC economy, significant effects can be expected from extra production and income growth. Because of the way the results were calculated in the CEC report (combination of different sources, no explicit modelling of the rest of the world) the outcome for the income growth is not more than an order of magnitude. On this basis it is not possible to say more than that the income growth induced imports will offset the trade diversion effects of stages 1 and 2.¹⁴ In table 2 the results for the static effects are summarized.

Table 2 Results of the CEC (1988) report for the chemical industry

	EC welfare gains billion ECU of 1985	% change of extra EC imports	% change of production
stage 1	1 - 1.1	-1.7 - -2.3	
stage 2	1.7 - 1.9	-9.5 - -10.4	
stage 3	7.7		3.3
stage 4, no restructuring	4.6		2.0
Total with no restructuring	15.0 - 15.2		6.4 - 6.5
stage 3&4, with restructuring	6.4		2.7
Total with restructuring	9.2 - 9.4		3.9 - 4.0

Source: CEC, "The economics of 1992", *European Economy* 35 (march 1988), pp.171-188.

What would be of relevance for the chemical industry? The industry in general is characterized by economies of scale and highly integrated production. So in principle, the dynamic effects could be great, as well as the static effects. The enhanced competitiveness is important, as well as the R&D and environmental policies.

The elimination of national barriers seems however less important. The technical measures in the White Paper regarding chemicals are not that impressive. Secondly, the European market is

¹³ See also: L.A. Winters, "International trade and '1992'", *European Economic Review* 35 (1991), p. 374.

¹⁴ See also M.W.S. Davenport, "EC external policy and developing countries' export", *Journal of Common Market studies* XXIX no.2 (December 1990), p.184.

already very integrated. Thirdly, the use of European standards is a matter for the chemical industry, but not of great importance to the effects of the internal market for chemicals.¹⁵

Policy reactions such as raising external barriers are not to be expected. As far as the chemical industry is concerned there exist no voluntary export restraints, tariffs are relatively low and there are no quotas.

So, when speaking of the chemical industry in general, a large impact could be expected because of economies of scale effects. But because in the 80s a massive restructuring has already taken place, with the purpose of reducing inefficiencies and increasing competitiveness, it is questionable if these efforts will continue in the 90s as a result of the completion of the internal market.

2.3 Some specific aspects

However, there are still a number of measures which are of importance to the chemical industry, namely liberalization of transport, indirect taxation and liberalization of the energy market. Furthermore the industry itself stresses also electronic data interchange and a free movement of chemical goods (with regard to dangerous goods or chemical weapon precursors e.g.). As to the question of how important these matters are with regard to the magnitude of growth, the European chemical industry seems to have the opinion that the effects are relatively small. When compared with the potential growth effects from benefiting from economies of scale this seems very plausible indeed.

With regard to fertilizers it can be said that considering the fact that there is only a limited number of large multinational fertilizer producers in EC countries, little impact can be expected from the realization of the SEM.

Basically, the same can be said for petrochemicals and plastics. There could be some economies of scale effects, but bearing in mind the changes that took place in the 80s, much of these effects are likely already to have happened. Of more concern will be the environmental policy of the EC. This will be addressed later.

The message of all this is, that because the chemical industry is already international, the impact of the internal market will not be as great as in other industries.

However, for the pharmaceutical industry, the story of the SEM could have quite substantial effects. The completion of the internal market can bring about major changes in the pharmaceutical industry as a result of fewer licensing restrictions and free trade. The main impact - in theory - will be on price differences because the re-imports into high-price countries will then be customary and because the EC directives - e.g. the "transparency" directive 89/105 - will make the market more transparent. This will be reflected in reducing the profits of the pharmaceutical industry, which may lead to reducing the number of firms.

For years the industry has been warning against the lowering of prices and thereby of profits, because this would restrict research efforts. In principle this argument may be valid, but in practice the effect is likely to be small, because the pharmaceutical industry has been the most

¹⁵ Actually, in the area of standardization the standards for quality assurance are of importance (EN 29001, 29002, 29003 and 29004). Information: CEFIC, *EN 29001 ISO 9001, Guidelines for use by the chemical industry* (Brussels, July 1991).

profitable one for many years. Furthermore, the R&D is carried out by multinationals, so that a reduction of the profit level in Europe is likely to be relatively small.

When taking into account the structure of the pharmaceutical markets in the EC and the actual situation of the measures to be taken for completion of the SEM, it is not likely that there will be a single market for pharmaceuticals on January 1, 1993, nor in 1994 or 1995. Although many measures regarding the pharmaceutical industry are in force, this does not mean that the single market is already on its way. There are still amendments to the single market for pharmaceuticals:

- National health systems harmonization is not part of the programme. In fact, it is more likely that there will be a political union than that the systems will be harmonized.
- Economic integration does not mean abolishing cultural differences, which are of importance in the use of pharmaceuticals.

To these can be added some considerations, which also are valid if there is a SEM:

- Other developments are perhaps more important: new technologies, demographic changes.
- Although the reduction of price differentials will reduce profits, the restoration of the effective patent life to 16 years will offset this effect, so that the R&D investments are not likely to decline, despite of the single market.

This last point will be detrimental to developing countries pharmaceutical industries.

2.4 Impact of East European changes

The changes in Eastern Europe have stimulated a number of publications stating that Western industry in general is not seizing the opportunities, although there are many risks involved. The same statements can be found regarding the chemical industry.

The industry is however interested, especially of course in former East Germany. Although the plants there are out of date, there is a customer base. So western companies investments can be regarded as aggressive to get a foothold in East European markets or defensive to keep other companies out. After the takeover of Synthesewerk Schwarzheide by BASF, other West European companies followed, like Solvay and Bayer.

Most of the investments are being directed to East Germany. The projects in the rest of Eastern Europe have been smaller and more market oriented. There are of course a number of risks, some of them not being applicable to East Germany.

The following improvements are however necessary all over the previous CMEA:¹⁶

- Increasing productivity by adjusting the number of employed to the volume of production on an economic basis;
- Increasing productivity, safety standards, and quality standards by investment in new or modernized plants;
- Changing and modernizing the product mix in order to withstand free competition on the world market;
- Reducing the pollution of air, water and soil by either improving the production process, or changing the product, or terminating the production altogether.

¹⁶ ERECO, *Europe in 1996, Economic outlook by sector* (Paris, 1992).

For the chemical industry the problem of environmental pollution adds to other obstacles like the uncertainty on rights of possession or conditions of employment when a firm is to be privatized. All in all, given the high degree of risks and uncertainties a huge boost in investment growth is not very likely in the short term.

What is more likely are the opportunities for market expansion. Plastics consumption can serve as an example. The per capita consumption of low density poly-ethylene in Western Europe is for instance 14.1 kg, whereas this is at its highest in former East Germany with 12.2 kg and at its lowest in Poland with 3.4 kg.

2.5 Implications for developing countries

What does the foregoing discussion mean for the developing countries? We will follow the points made in general about the external effects and see to what extent they matter for the developing world. Koekkoek, Kuyvenhoven and Molle (1990) have given an overview of possible external effects on trade, to which some new ones could be added. One is that the stimulation of R&D by the EC could lead to a more attractive investment climate. Secondly, the environmental policy of the EC leads to higher costs of production, offsetting a number of the effects of the internal market.

First of all, the calculations of the CEC (1988) report show that in the case of the chemicals market, the completion of the SEM will lead to a roughly neutral effect regarding trade creation and diversion. Given the fact that to a large extent the chemical industry already is international, this outcome is just more likely. Although there could be substantial internal effects of the SEM for the pharmaceutical industry, it is highly questionable if this will happen in this century. Furthermore, trade in pharmaceuticals with developing countries is on average not very large (see annex), so even if the SEM becomes a reality it is still questionable if there will be substantial effects for the developing countries.

The increased competitiveness from price and cost reductions could be of more concern. Since there are economies of scale in the production of chemicals, trade displacement could be very serious. However, reaping the benefit of economies of scale seems already to have happened, and is not likely to be a major result of the internal market in the case of chemicals. But restructuring in the chemical industry is an ongoing process, although it is expected to continue on a relatively smaller scale than in the 80s.

The removal of national barriers will have an impact on trade in chemicals, but not a large one. Internal barriers were and are not that high. The trade diverting effect is thus likely to be small.

Fears of a fortress Europe seem not to be warranted in the case of chemicals in general. However, in the case of internal export controls there are still some regulations which hinder internal trade (on chemical weapon precursors, drug precursor chemicals, arms and strategic goods and dangerous chemicals). When these are being replaced by a general framework, then non EC countries in general could face higher external barriers. In the case of pharmaceuticals there are 12 separate markets, and it is not likely that they will be replaced by one EC market in the near future. External barriers are thus not likely to be raised, with the exception of the extending of the effective patent life. Finally, in the case of fertilizers the EC has a track record of some anti-dumping measures, which however were particularly directed against East European countries. But there is some pressure here on the EC to be more stringent on unfair competition (especially from Eastern European countries).

How relevant is investment diversion as a result of the dynamic effects? This seems to be of much importance. The dynamic effects though are a result of increased efficiency and competition in an already rather high integrated market. The SEM will not add much to this. The question for the developing countries is thus how to cope with this now, and not later.

R&D and environmental policies will be dealt with in the next chapter.

Finally, Eastern changes may have a long term impact on trade and investment. Trade with Eastern Europe will give opportunities to high quality chemicals producers. Those are not to be found in large numbers in the developing world, however. But given the shortages and the scope for growth in Eastern Europe there are for many producers opportunities for trade, when one is willing to take risks. In the long run there may be some investment diversion, but in a shorter term the investments in Eastern Europe by the chemical industry are not that large, with the exception of East Germany. A major drawback are the possible environmental liabilities in take-overs of or joint-ventures with East European firms.

To conclude, in relations with developing countries the chemical market will not be affected to a large extent by the internal market in general with regard to trade. Investments however could be more seriously affected, in a way which is detrimental for the developing countries. But against this some caveats could be made, such as those raised by the developments in the 80s.

3. INDUSTRIAL POLICIES OF THE EC

3.1 Competition and trade policy

Industrial policy includes a number of areas: competition policy, trade policy, environmental policy, technology policy, standards and certification. We will restrict ourselves to competition, technology, standards and environment.

The question may be raised as to why the EC has no formal industrial policy. This touches the heart of the idea of a Common Market: regulation of markets is in principle not required, because the free play of the market should take care of regulation. So, at the beginning of the EEC a mere competition policy was thought necessary.

In due time, it was found to be not sufficient. There was a need for a structural policy, one that is supply side oriented, for industry, based on several considerations:

- increasing international competitive power;
- increasing financial capacity;
- increasing scale;
- restructuring of old sectors;
- technological innovation.¹⁷

Still, in general the attitude of the EC regarding industrial policy is fairly non-interventionist. Stimulation is present however in the field of R&D.

Trade policy and state aids are relevant. State aids in the chemical sector was and is not very important. Only the sector of man-made fibres has received state aids. In fact, state-owned chemical companies had to restructure so they would become more competitive. In the case of trade policy, external trade restricting measures and regulations are not substantial (see table 3). There are no voluntary export restraints, the common external tariff is relatively

¹⁷ W. Molle, *The economics of European integration*, (Aldershot, 1990), pp. 275 - 279.

low and no quotas exist. In the case of fertilizers there were some anti-dumping measures directed against East European countries.

This means that market forces are especially strong in the case of chemicals. The chemicals sector is therefore market driven and has to face competition from abroad to a much larger extent than many other sectors.

Table 3 Non tariff barrier equivalents (in percentages) for various countries and products)

	EC	USA	Japan
Food, beverages	33	44	72
Raw materials	49	0	46
Mineral fuels	28	6	38
Chemicals & other manufacture goods	8	8	8
Machines & transport equipment	2	0	2

Source: J. Whalley, *Trade liberalisation among major world trading areas*, MIT Press (Cambridge, Mass., 1985).

3.2 Technology

The EC's technology policy is given shape in its framework programs, currently that of 1990-1994 (the first ones were for the periods 1984-1987 and 1987-1991). For this program a funding of ECU 5.7 billion is available. This amount is divided over certain key areas: Information and communications technologies, Industrial and materials technologies, Environment, Life sciences and technologies, Energy, and Human capital and mobility. Of these, information and communication technologies gets the most attention.

Under the umbrella of this framework program a number of specific programs, like ESPRIT in the case of information technology, are being implemented. Which programs are of interest for the chemical industry?

The industry itself has set out priorities for research and technology development. These are: Advanced fundamental knowledge of chemical reactivity and principles of catalysis, Biotechnology and life sciences, Environmental protection, Reliable synthesis, processing and reprocessing of functional and structural materials, New environmentally benign and resource minimising chemical process technologies. They stress also the need for pre-legislative research, so that legal measures can be based on scientific results.¹⁸

CEFIC concluded that their five key areas for R&D are more or less covered by the Community's third framework program. But the industry is not taking part to a great extent in the framework program. This kind of direct stimulation is indeed not likely to be fruitful in an industry which is highly competitive. Projects for the framework program need often co-operation between companies. This is very unlikely, since the industry itself stresses the importance of intellectual property rights, and no company wants a competitor to look into their R&D departments. In the view of CEFIC, governments should foster an improved climate for

¹⁸ CEFIC, *European policy for science and technology. The position of the European chemical industry* (Brussels, 1992), pp.20-28.

R&D. This means inter alia extending patent life, company taxation which is no less favourable than that of non EC competitors and complementing industry's own R&D. Regarding this last point the industry stresses the need for more support of universities for fundamental research.

The outcome of this is that the specific R&D programs of the EC are of little importance for the industry. The more general policies of taxation and competition play a much more important role. Developing countries could be worried about falling behind in knowledge, but that is an outcome of the R&D efforts and location of the industry, not of the EC.

This means for the developing countries that the competitive edge of West European suppliers in the case of technology is not much increased because of EC policy. The high R&D efforts of the industry itself are much more important.

3.3 Energy and the environment

The chemical industry is one of the most energy consuming and environment polluting industries. In 1988 the chemical industry accounted for 20 per cent of the industrial process CO₂ emissions in Europe: the chemical industry contributes also large amounts of nitrogen oxides and sulphur dioxides when compared to other industrial sectors. The European industry is however making efforts to improve the situation. In many cases production processes or products were replaced by others, in some cases they have been finished totally.

As a case, the Dutch chemical industry invested florins 258 million (US \$ 122 million) in what can be called environmental projects. This is 6.2 per cent of all investments made by the chemical industry, whereas the industrial average was 3.9 per cent.

The important environmental topic for the plastics industry is the waste problem. Recycling on a large scale is only in effect for industrial scrap. Municipal plastic waste is much more difficult to recycle, although there are some improvements. Burning of plastics can cause air pollution, chlorofluorocarbons (CFC's) and hydrocarbons (HC's) being the major air pollutants (the major source for CFC's are the aerosols, though).

The efforts of the chemical industry to reduce pollution are to be found in the areas of exhaust reduction by cleaner processes or end-of-pipe measures, waste recycling and product substitutions (for CFC's, PVC e.g.). The EC however judges the outcome of these efforts as not sufficient in attaining the goals for the environment. Therefore the CEC is considering measures that act on price behaviour and that do not have only a partial effect. The policy of separate guidelines for a process which is air polluting in parallel with other guidelines for processes that are water polluting is abandoned, because of the possible interactions between all kinds of piecemeal measures. This policy has resulted in some 150 measures. One of the proposed measures in the new approach is the by now well known CO₂ tax.

The proposed CO₂ tax has the goal of reducing emissions of carbon dioxide (or better: stabilizing). This is to be achieved by making the energy inputs more expensive, according to the inputs carbon and energy content. A gradual introduction should smooth out the effects. DRI has assessed the economic impact for the CEC of the CO₂ tax and calculated a slight downward pressure on economic growth. The increase in prices of energy for the chemical sector will vary between 63 per cent for coal and 15 per cent for electricity. Undoubtedly this will have a major impact on production and investment.

The chemical industry has a very high energy consumption, but more than half of its total consumption is raw material input, not process energy. Of the 139.4 million tonnes of oil

equivalent (MTOE) energy consumption, 80.4 MTOE was feedstock. The use of process energy is declining relative to production. This is mainly due to improving efficiency. It is therefore not surprising that the industry has asked for these facts to be considered when contemplating an environmental and energy tax.

According to some opinions, the chemical industry will abandon their own programs for energy efficiency and environmental investments when harsh measures like environmental taxes are being introduced. But this is not certain, because, in the CEC proposal, industries may be exempt from the tax when competing industries in non EC countries are not taxed by their governments¹⁹. This is of relevance for the chemical industry.

An important result however, will be a redirection of investments from the EC to countries with less energy and environmental costs. Although it is not calculated in the few studies on the tax, this effect could be of great importance.

4. SPECIAL RELATIONS OF THE EC WITH DEVELOPING COUNTRIES

The external impact of the SEM on special groups of developing countries must be identified with regard to changes in the product markets of special concern to them. When relating the products to groups of developing countries the following points can be made.

Petrochemicals and plastics

Latin America, the Middle East and East Asia are relatively important in the case of petrochemicals, the former two also regarding primary plastics, due to the higher transportation costs of plastics for the latter. Theoretically these groups would be affected seriously in the case of investments, because particularly in petrochemicals production there exists economies of scale. So some investment diversion could occur.

On the other hand, countries in the Gulf region have access to ample feedstocks, an important source for the industry. For West European companies to be competitive they need their petrochemical complexes to be baseloaded on naphta (which is indeed the case in the majority of complexes). They can be competitive vis-à-vis other West-European producers but not in the export market. Here are opportunities for other producers. Countries in the Middle East seem to be best equipped to grasp them.

Pharmaceuticals

In the pharmaceuticals market Latin America and the Far East have some interest. Given the general outlook for the single market in pharmaceuticals, they will face for a long time the numerous trade barriers in the EC.

Fertilizers

The EC market for fertilizers is of relatively great importance for the developing countries. North Africa and the Middle East especially have interests in this. This is easily explained by the relative abundance of raw material like natural gas and phosphate rock. The question is how in

¹⁹ As for actual developments: In mid-1992 the Commission will submit a Communication to the Council of Ministers on industrial competitiveness and protection of the environment.

this case the pyramid of preferences will alter in the next decade, because many of the Mediterranean countries have special relationships with the EC.

In the last decade the relative importance of imports from Africa and the Middle East grew significantly. Given the rather bleak outlook for the EC market, it is not expected that this will continue. Moreover, their increase in the share of EC imports has been accompanied by a decrease, in particular of the share of the EFTA countries, which partly reflects the restructuring of the 80s. Since this will not continue on the same scale, this factor adds also to the conclusion that the exports of fertilizers will not grow as fast as in the past decade.

To conclude this section it can be said that although the pyramid of preferences may be affected by the internal market, this will not have large effects in the case of chemicals

5. SUMMARY AND CONCLUSIONS

In this paper the question has been addressed of the extent and the way in which the completion of the Single European Market will affect the chemical industry in Europe and in the developing countries. This has been done by elaborating three building blocks: an assessment of the economic situation in the European chemical industry, an overview of possible effects of the SEM using some estimates from others and looking into some areas of industrial policy of the EC. Special attention was given to four subsectors of the chemical industry: petrochemicals, plastics, fertilizers and pharmaceuticals.

The present economic situation of the chemical industry is one of waiting for better times, after a period of "golden years". Thanks to massive restructuring in the 80s the chemical industry could profit from one of the longest periods of continuous economic growth, securing profitable capacity utilization rates and eventually stimulating some expansionary investments. From the previous slump at the beginning of the 80s the industry has learned not to continue production during an economic slowdown, so the general attitude is one of slowing down production. This showed up in figures for 1990, and combined with the fact that in general the chemical industry is a mature one, the outlook is one of moderate growth, in line with GDP growth.

Restructuring has been especially harsh in the European fertilizer industry, induced by a declining market. Restructuring meant also a redirection of company strategies towards more high value-added products to make production less sensitive to the business cycle, together with strategic alliances and strategic acquisitions, for instance in the field of biotechnology. In the pharmaceutical industry European firms are looking at the American market, with SmithKline Beecham as example. Summing up, the European chemical industry has been exploiting economies of scale and equipping itself to tackle competition from abroad.

The effects of the completion of the Single European Market have been addressed in many articles before, with some conflicting views on workings and magnitude. At first much attention was paid to the "once and for all" effects, the 4.5 to 7 per cent boost from the Cecchini report. In the case of the chemicals sector large effects were expected on growth because of economies of scale, adding up to 4 per cent production growth in the industry. As far as the external effects of this growth are concerned it was concluded that part of this growth was based on rather large trade diversion effects, but that given the degree of integration of the chemical industry trade creation and trade diversion would likely cancel each other out.

Worries about East European trade diversion seems unwarranted. The state of the chemical industry in Eastern Europe is not good at all, it is "strong" in old processes and in "old"

products - inorganic chemicals - and demand in Eastern Europe is far outpacing production. Growth of trade is more likely to be in the direction from the EC to Eastern Europe than vice versa.

Politicians and also economists have stressed however, that the more important effects are to be expected from the dynamic effects. Since these rely inter alia upon increasing returns to scale and R&D investments, it is of importance to consider these for the chemical industry. However, these effects are very difficult to calculate. The outcome is in general a higher growth rate, making the path of GDP growth not only shift upward, but also become steeper. This of course can induce a higher extra EC imports growth.

There is however a caveat, which worries the developing countries: investment diversion. The induced higher growth rate is only feasible with more investments in R&D and in taking advantage of economies of scale; the potential higher rate of return can divert investments from other parts of the world. In the case of chemicals especially South-East and East Asia could be affected.

But as far as Eastern Europe is concerned, it is not likely in the coming years that investments of Western European (or US, or Japanese) chemicals firms in Eastern Europe will be overwhelming. Some business reports appear not to favour it, and it may be negatively influenced also by the uncertain legal status of many ventures and the fact that when a western firm takes over a East European plant, it has to pay for upgrading the production process in at least two ways: quality and environment-safety.

So, whereas in principle trade effects are in the case of chemicals not likely to be great, investment effects could be. The question of course is if this is the case in practice.

Some of the "1992" changes are theoretically of importance for the trade in chemicals. For the developing countries measure which could be detrimental to their trade are the removal of internal barriers (legal barriers, border controls, mutual recognition of standards) because of the trade diverting effects. These however have been estimated to be offset by trade creating effects.

Concern has been expressed of a "Fortress Europe". Restricting this to a definition which encompasses only the raising of the average EC barriers to compensate the loss of national barriers, this concern seems in general not warranted for the chemical sector. An exception is the pharmaceutical industry, where the extension of effective patent life is likely to become a reality. Although not intended as a non tariff barrier, it acts like one.

Much of "Europe 1992", measured by the proposals of the White Paper, is already reality for the chemical industry. All the proposals on technical matters regarding the chemical industry have been adopted and almost all regarding the pharmaceutical industry. Of more importance are other measures like VAT harmonization (although only the administrative burden is of relevance), technology policy and environmental policy. Of these only the environmental (and energy) policies are likely to have significant effects.

Putting some of the pieces together, the image arises of an industry which has already been profiting from economies of scale, has been restructuring, and is already very much competitive. The calculated "once and for all" effects based on economies of scale from the Internal Market measures are likely already to have taken place, but only partly as a consequence of the 1992 program - the case of restructuring state owned chemical companies. Further effects are not very likely to be great for an industry which is already very European, if not global. Dynamic effects could be of great importance, but these also are likely to have been started in the 80s.

Technology policies seem in this respect important, but firstly the EC has the greatest interest in areas that are of less importance to the chemical sector, with the exception of biotechnology. Secondly the chemical industry is not taking part in large amounts in the EC framework programmes for R&D stimulation. Indeed, the industry asks for more attention to fundamental research at universities instead of universities going commercial and doing more applied research.

Environmental policy, with the actual example of the CO₂ tax, can have very large effects on an industry which is the second largest carbondioxide "producer" in Europe. This could inter alia lead to lower growth. But, since in the CEC proposal some sectors, of which some subsectors of the chemical industry, would get a zero tax rate as long as EC competitors do not have such a tax as well, and since the supposed introduction will be gradual, some of the effects remain to be seen. But if there is an area with large effects, this is the one.

An important and likely result will be a diversion of investments towards non-EC countries, especially when energy and environmental costs are high in the EC. The SEM might result in a stronger industry, but the actual EC environmental policy will probably result in offsetting the effects of the SEM, at least in economic terms.

All this means that for developing countries, not taking regional differences into account, the effects of the internal market are small in the case of the chemical industry, basically because it is felt that many of the effects already have taken place. When looking into the subsectors, the major exception is the pharmaceutical industry. Although many White Paper proposals have been adopted, the EC pharmaceutical market will by and large be 12 separate markets because of differing national health systems and differing cultural habits in e.g. prescription.

As far as different regions of developing countries are concerned, the question is if some groups will be more affected, positive or negative, than others. Since most of the ACP countries do not have the infrastructure for large chemicals production, it is not likely that they will profit much of their status (with possible exceptions for countries with some natural resources like Trinidad and Tobago and Nigeria). The observable trend of more production in the Middle East is likely to continue, though they have perhaps most to worry about European industries complaints of "unfair practices". South-East and East-Asian countries could be affected by some investment diversion.

Since trade effects are not likely to be great, the question is to what extent the developing countries can cope with the opportunities in the chemical industry. Since East European production will probably slump, the short term opportunities will probably be in low technology chemicals. This is further strengthened by the strategy of European firms to concentrate more on high value added products. If a developing country would like to be in that business, out of other considerations, it could be frustrated in its purposes.

A final note has to be made regarding the environmental EC policy. This will likely result in investment opportunities for the developing countries, especially in basic chemicals. Developing countries have more scope for investments when the energy and environmental costs are lower. With measures like the CO₂ tax this could be actual within a relative short period.

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ANNEX 1 Leading chemical companies

Top ten chemical companies of the world (\$ million)

Company	Country	Turnover chemicals	Turnover total	Research and development expenses
Hoechst	Germany	29754	30274	1813
Bayer	Germany	28101	28101	1848
BASF	Germany	26399	31463	1397
ICI	United Kingdom	25291	25291	1330
Du Pont de Nemours	USA	22268	40047	1428
Dow Chemical	USA	19773	19773	1136
Unilever	United Kingdom / Netherlands	17723	48193	794
Rhone-Poulenc	France	15662	15662	1052
Proctor and Gamble	USA	(15000)	27026	-
Elf Aquitaine	France	14556	34871	727

Top ten European chemical companies (ECU million)

Company	Country	turnover chemicals	turnover global	expenses on research and development
Hoechst	Germany	21561	21938	1314
Bayer	Germany	20363	20363	1339
BASF	Germany	19130	22799	1012
ICI	United Kingdom	18327	18327	964
Unilever	United Kingdom / Netherlands	12843	31299	575
Rhone-Poulenc	France	11349	11349	762
Elf Aquitaine	France	10548	25269	527
Ciba-Ceigy	Switzerland	10512	11329	1179
Enichem	Italy	9789	9789	-
Royal Dutch/Shell	United Kingdom / Netherlands	9346	84371	672

Top ten European plastics producers (ECU million)

Company	Country	turnover
Bayer	Germany	6030
ICI	United Kingdom	4105
BASF	Germany	3991
Enichem	Italy	3136
Hoechst	Germany	2831
Solvay	Belgium	2825
Shell	United Kingdom and Netherlands	2804
DSM	Netherlands	2316
Atochem	France	2160
Montedison	Italy	1778

Top ten European pharmaceuticals producers (ECU million)

Company	Country	turnover
Glaxo	United Kingdom	4812
Bayer	Germany	3915
Hoechst	Germany	3944
Ciba-Geigy	Switzerland	3660
SmithKline Beecham	United Kingdom and USA	3655
Sandoz	Switzerland	3266
Rhone-Poulenc Roter	France and USA	3437
Roche	Switzerland	2763
ICI	United Kingdom	2009
Wellcome	United Kingdom	1881

Top ten European fertilizer producers (ECU million)

Company	Country	Turnover
Norsk Hydro	Norway	2250
ICI	United Kingdom	1216
Kemire	Finland	1187
Ecros	Spain	849
Atochem	France	830
EniChem	Italy	780
BASF	Germany	733
EMC	France	581
DSM	Netherlands	494
Groupe Rollier	France	307

Source ANNEX 1: Chimie Actualités, november 1991.

ANNEX 2 Country groups shares of EC chemical imports

Percentage share of country groups in EC imports

Percentage share of total imports (including intra EC imports)

	Total		Petrochemicals		Pharmaceuticals		Fertilizers		Plastics in primary forms	
	1984	1989	1984	1989	1984	1989	1984	1989	1984	1989
intra EC	71.5	72.2	72.1	71.5	60.8	61.8	64.2	57.5	80.3	79.6
EFTA	9.3	9.9	8.0	8.6	19.5	21.8	9.8	7.4	8.0	7.9
Eastern Europe	2.5	2.3	3.0	2.8	0.8	0.7	9.3	9.9	1.7	2.1
North America	10.0	8.4	9.5	8.4	13.9	10.4	6.9	6.8	7.8	6.5
Latin America	1.0	0.9	1.4	1.1	0.9	0.8	0.1	0.8	0.3	0.7
Africa	1.7	1.2	0.5	0.9	0.3	0.1	5.5	10.9	0.1	0.0
Middle East	0.7	1.0	0.9	1.1	0.1	0.1	3.9	5.0	0.4	1.2
Far East	1.1	1.3	2.1	1.7	1.4	1.4	0.0	0.2	0.1	0.4
Japan	1.6	2.1	2.4	3.3	1.8	2.2	0.0	0.0	0.9	1.1
Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Australia/New Zealand	0.3	0.2	0.1	0.0	0.2	0.2	0.0	0.0	0.0	0.0
OPEC	0.4	0.7	0.6	1.4	0.1	0.1	0.4	1.5	0.0	1.0
NODC	4.6	4.6	4.6	4.0	3.1	3.1	10.0	18.3	1.5	2.4
ACP countries	0.7	0.5	0.9	0.2	0.4	0.1	0.2	1.2	0.0	0.0

Percentage share of extra EC imports

	Total		Petrochemicals		Pharmaceuticals		Fertilizers		Plastics in primary forms	
	1984	1989	1984	1989	1984	1989	1984	1989	1984	1989
EFTA	32.7	35.5	28.6	30.2	49.8	57.1	27.5	17.5	40.8	38.7
Eastern Europe	8.9	8.1	10.9	9.7	2.2	1.8	26.1	23.3	8.7	10.4
North America	35.1	30.0	33.8	29.3	35.5	27.2	19.2	16.1	39.6	31.8
Latin America	3.5	3.2	5.1	4.0	2.3	2.1	0.3	1.8	1.6	3.4
Africa	6.0	4.5	1.9	3.1	0.7	0.1	15.5	25.8	0.6	0.2
Middle East	2.4	3.6	3.3	4.0	0.2	0.3	10.8	11.7	2.1	6.0
Far East	4.0	4.6	7.4	6.0	3.6	3.6	0.1	0.5	0.5	1.7
Japan	5.6	7.6	8.7	11.7	4.5	5.7	0.1	0.1	4.3	5.5
Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Australia/New Zealand	1.0	0.7	0.3	0.1	0.4	0.6	0.0	0.0	0.3	0.0
OPEC	1.4	2.6	2.2	4.9	0.3	0.2	1.1	3.6	0.2	4.7
NODC	16.1	16.4	16.5	14.1	7.9	8.0	27.8	43.1	7.5	11.6
ACP countries	2.6	1.7	3.1	0.7	1.1	0.6	0.7	2.9	0.0	0.1

Source: OECD.