

The Chemical and Pharmaceutical Industry

1. The chemical industry

Notwithstanding a certain amount of progress and the ability to realize a fair number of products, on the eve of the Second World War the Italian chemical industry was not in a position to compete, either in quality or in price, with some of the products of international corporations that enjoyed a glorious technical and commercial tradition and massive capital. Inadequate investment, lack of qualified managers and technicians capable of carrying on a technologically advanced industrial process, high labour costs, high taxation, backward equipment and so on, had impeded the industry's development.¹

After the war, recovery was halting. In 1948 the industry had yet to regain the level of output of 1938 and the first few years of war.² At the end of 1949 the output of two key products – phosphates and nitrate fertilizers – was still far below the prewar level, although encouraging signs of recovery were perceptible in parts of the industry. Basic chemicals, for example, and the production of fungicides, were above their prewar peaks by the middle of 1949.³ Yet the chemical industry was stimulated by the increasingly widespread belief, expressed also by the OECE, that chemicals had a great future. A significant portion of Marshall Plan aid to Italy was allocated to increase imports of the feedstocks needed for the chemical industry, while credits were also granted to fund modernization.⁴

The results duly arrived.⁵ In 1950, with Marshall Plan aid still flowing in, output topped the 1938 level. The index of aggregate production for the chemical industry rose to 113 (1938=100) that year, and then to 153 in 1951, 177 in 1953 and 215 in 1954.⁶ More specifically, production of sulphuric acid, which had slipped from 143,000 tons in 1938 to 130,000 tons in 1948, leapt to nearly 201,000 tons in 1952 and to 268,000 in 1956. Output of synthetic ammonia rose from 9,000 tons in 1938 to over 10,000 tons in 1948, about 20,000 in 1942 and over 37,000 in 1956, four times the prewar level.⁷ The growth of output had positive effects on the industry's balance of trade. In 1954 Italy still had to import a good number of chemical products indispensable to the country's economy, but

¹ F. Bracco, "Situation and prospects of the chemical industry", *Review*, XXVI, 1 (January 1972), p. 28.

² G. Pistolesse, "Prospects of the chemical industry in Italy", *Review*, III, 5 (September 1949), p. 403 *et seq.*

³ *Ibid.*, p. 406.

⁴ *Ibid.*, pp. 408-09.

⁵ L. Gozzini, "Evolution of Italy's chemical industry since the war", *Review*, IX, 3 (May 1955), p. 246 *et seq.*

⁶ *Ibid.*, pp. 254-56.

⁷ E. Mattei, "L'industria italiana nel dopoguerra," in *L'economia italiana nel decennio 1947-1956*, *Review*, special tenth anniversary issue, 1957, p. 76.

exports, especially of such products as pharmaceuticals, fertilizers, plastics and synthetic resins, were growing steadily, so the industry's external deficit was held to relatively modest amounts.⁸

Progress continued in the years following,⁹ thanks to the "spirit of enterprise and unshaken confidence in the ability to find solutions, even under the most difficult circumstances".¹⁰ In order to use the natural gas reserves that had been discovered, for instance, the Italian chemical industry had to invent new techniques, build pilot plants, modify them and retest. This was no easy task. As it grew, the industry always had to overcome numerous difficulties, above all the problem of manpower. As was noted by Fulvio Bracco, the president of the national chemical industry association, the industry had to recruit its managers and technicians from among young high-school and university graduates without practical experience and its workers from the masses leaving the countryside, who had first to be given rudimentary schooling (literacy) *en masse* and then brought into the industry. The cost of both these procedures turned out to be high, with serious repercussions for overhead costs. These costs continued throughout the growth of the industry and were still appreciable on the eve of the oil crisis in 1973.¹¹

The most striking results were in the production of phosphate and nitrate fertilizers. Phosphate output was improved by replacing the old, batch-production "cellar" plants with new continuous processing facilities. In the nitrates sector, the production of synthetic ammonia from hydrogen, coking gas, the gasification of low-grade fuels and natural gas, was a great success. Not only were existing plants expanded but others were built from scratch, in Ferrara, Novara and Porto Marghera. Ammonia output increased from 294,000 metric tons in 1953 to 484,000 in 1957; and demand was so buoyant that in 1958 it was decided to build another plant, with a capacity of 108,000 tons. Significant success was also achieved in the production of complex granular fertilizers, consisting of several different primary fertilizers. These had been introduced in 1929, but production was interrupted and did not recommence until 1947. In 1956 Italy had five plants making this type of fertilizer, plus one under construction; consumption of these products rose from 1,000 tons in 1947 to 100,000 tons in 1955.¹² Still another successful process was the conversion of methanol, produced by gasification of coke, into methane, another needed feedstock. Output rose from 13,000 metric tons in 1952 to 38,600 in 1957.

The Italian chemical industry not only produced fertilizers but also worked on the conversion of natural gas, thanks in part to the substantial investment

⁸ *Ibid.*

⁹ Between 1948 and 1957 the value of Italian chemical output tripled. See B. Orsoni, "Present situation and prospects of the Italian chemical industry", *Review*, XII, 3 (May 1958), pp. 235 *et seq.*

¹⁰ *Ibid.*, p. 236.

¹¹ Bracco, "Situation and prospects", p. 29.

¹² Mattei, "L'industria italiana", p. 85.

that had been made in this sector. Italy now had a petrochemical industry, with the cracking of crude oil and natural gas, offering materials used among other things for the fabrication of plastics. To exploit this demand, new plants were built and existing plants greatly extended. The production of hydrocyanic acid, acetylene, chlorinates, etc., was begun, and a factory with an annual capacity of 35,000 tons of synthetic styrene-butadiene rubber derived from natural gas was built. Further, a process was begun for the conversion of the residual gas from partial combustion into acetylene, to be converted into ammonia. In 1958, 12 per cent of Italian natural gas output was used for chemicals, which according to competent observers was the highest such share in the world.¹³ Italy was the first European country to create a petrochemical industry, in 1949 when petroleum-based products were still largely unknown. The Italian chemical industry thus added petrochemical derivatives and polymers, moving into the sphere of heavy chemicals. But, lacking raw materials, the industry had to derive feedstocks from all available derivatives. Ethanol was thus used to produce ethylene, and the plants necessary for its utilization were built in Ferrara, with a target of 10,000 tons a year in 1952. This output expanded to 40,000 tons in 1958, and with other plants under construction output was predicted to rise by a further 50,000 tons.¹⁴ These advances helped both to lower prices and to improve quality, and in 1958 one third of Italian chemical output was exported.¹⁵

Over the next decade, as the chemical industry took root throughout the country, growth proceeded at an even faster pace. Progress was especially great in the petrochemical industry between 1956 and 1960, spurred by growing domestic and international demand and by the discovery, as we have seen, of oil and gas in some parts of southern Italy.¹⁶ Italy's synthetic resin and plastic-materials industry, until just a few years, previously so modest as to require substantial imports, achieved a place of prestige internationally. By the turn of the sixties it was in full expansion, producing large-scale exports.¹⁷ Under the spur of demand, output would have grown still further but for the considerable rise in oil prices in the later sixties, which increased the cost of indispensable inputs.¹⁸

¹³ Orsoni, "Present situation and prospects", p. 238.

¹⁴ *Ibid.*, pp. 238-40.

¹⁵ *Ibid.*, pp. 240, 244.

¹⁶ See Chapter VIII, Section 5.

¹⁷ F. Mattei, "Italian industry in the five-year period 1955-1960", *Review*, XV, 6 (November 1961), pp. 489-90.

¹⁸ The rise in oil prices in the second half of 1967 followed the Arab-Israeli war and the consequent closure of the Suez Canal. Mediterranean tankers now had to round the Cape of Good Hope, greatly increasing charter costs, owing in part to the inadequacy of the oil fleet to handle the increase in demand for charters. In addition, there were new U.S. restrictions on oil exports. These coincided with sharply rising production costs in Italy due to wage rises stemming from bitter labour disputes; the entry of some emerging countries into the world petrochemical market, which heightened competition and made it difficult to raise prices; the influence on public opinion of environmentalist campaigns against certain petrochemical products; difficulty in exporting to Latin America; and rising prices of other raw materials, machinery, etc.

In 1970 the chemical industry's growth slowed around the world, from the U.S. to the U.S.S.R., Japan, West Germany, and elsewhere. In Italy, the average annual rate of growth from 1960 to 1970 was 9.2 percent (above that of the U.S., the U.S.S.R. and the U.K. but behind West Germany, France, Japan, the Netherlands and Switzerland).¹⁹ However, this overall figure resulted from very rapid growth in the first half of the decade and a gradual slowdown thereafter. Certainly, the Italian chemical industry lost considerable ground in world trade. Meanwhile, domestic consumption increased far more than production, and the sectorial balance of trade felt the repercussions. A deficit of 26 billion lire in 1967 widened to 38 billion in 1968, 159 billion in 1969 and 240 billion in 1970, and worsened still further in 1971.²⁰ In short, in a five-year span the deficit increased ten-fold. Chemical output for agriculture diminished by 7 per cent, and that of synthetic resins and dyes shrank by 7.5 per cent and that of sundry products by 9 per cent. The only positive note was the increase in exports of fine chemicals, such as pesticides, perfumes, cosmetics and extracts.²¹

This difficult period of growth gave rise to a chemical industry divided into sectors - basic, intermediate, fine and paracheimical - with a structure similar to the other Western countries at the start of their present stage of industrial development. In Italy, basic chemicals were the province of large-scale state-owned industrial complexes, controlled by government. Intermediate chemicals belonged to large and medium-sized enterprises. Fine chemicals and paracheimicals were the domain of small businesses, highly fragmented. As a whole, the industry employed over 200,000 persons, with an increase in personnel that continued despite the slump. Total staff, comprising workers and technicians, rose from 236,626 in 1967 to 252,747 in 1970.

Small and medium-sized enterprises certainly played a decisive role in the growth of the industry in the twenty years following the war, thanks to the rapidity with which they made major decisions on advances in industrial processes and the introduction of new technology, ploughing profits back into the business in order to expand output and employment. Nevertheless, as Bracco wrote in 1972, despite its up-to-date technology and real possibilities of development, the Italian chemical industry remained economically weak and still exposed to ruthless competition.²²

The main obstacle to growth continued to be high production costs. The situation was aggravated with the labour conflict of the autumn of 1969, the strikes of 1970-71 and, in Bracco's words, a considerable amount of "demagogic legislation". Nearly 6 million man-hours were lost in 1969 and another 3 million in 1970. The cost of labour increased by more than 56 per cent in these two

¹⁹ Bracco, "Situation and prospects", p. 24.

²⁰ *Ibid.*, p. 26.

²¹ *Ibid.*, pp. 26-27.

²² *Ibid.*, p. 28.

years, and was aggravated by a fall in productivity owing to shorter hours under the new collective bargaining agreement and higher absenteeism.²³ Worse still, as Bracco noted, labour conflict continued even after it had become clear that higher costs of raw materials and ship charters, which were a serious problem for an import-dependent industry like Italy's, and increasingly strong competition in the domestic market with the U.S. surtax had further undermined Italian competitiveness.²⁴

A few years later, Bracco's judgment was essentially unchanged. He noted that in, 1973, low profitability and low productivity still characterized the Italian chemical industry. Against profits of 2.8 per cent in West Germany, 7.7 per cent in the UK, 3.1 per cent in the Netherlands, 3.5 per cent in Belgium and 4 per cent in France, the Italian chemical industry returned scarcely 1 per cent. In sales per employee, the Italian industry outperformed only that of the UK. All the other European countries had markedly better figures. Compared with per employee sales of \$26,800 in Italy, the West German chemical industry recorded \$43,900.²⁵

This situation was blamed on a multitude of factors, but above all on "the predominantly hostile climate in which Italian enterprises [had] been forced to operate in the last few years." Businesses were also damaged by the lack of any sort of government planning or policy for industry or technological development, not to mention the inadequate infrastructures and high and rigid labour costs. All these factors weighed heavily on the chemical industry, which is inherently exposed to international competition. Hence it needed "large amounts of capital and a continuous flow of research and innovation, as well as having to constantly adjust to the rapid evolution of markets and technologies."²⁶

In 1975, despite the jump in oil prices in 1973, the situation was somewhat better, and even more progress was made in 1976. Luciano Caglioti, writing in 1977, noted that the previous year total turnover for the Italian chemical industry had risen 13 per cent, while employment remained around 250,000. Alone in the European Community, however, the Italian chemical industry was still running a trade deficit, which amounted to 817 billion lire in 1976.²⁷

2. Rubber manufacturing

Rubber was one of Italy's most traditional chemical products. The industry began in 1872 and developed substantially over the next few decades, with a

²³ *Ibid.*, p. 29.

²⁴ *Ibid.*, pp. 29-30.

²⁵ F. Bracco, "The Italian chemical industry. Prospects and problems", *Review*, XXX, 2 (March 1976), p. 112.

²⁶ *Ibid.*

²⁷ L. Caglioti, "The role of chemistry and chemicals in modern society", *Review*, XXXI, 6 (November 1977), p. 386.

varied range of products, and expansion abroad as well. The key impulse was the rise of the automobile, with its demand for tyres and other products. The first Italian factory to manufacture rubber was Pirelli, but at the turn of the century others joined in, and already by the eve of the First World War the rubber industry was solidly established and a major factor in Italian industrial development.²⁸ Its expansion is attested by its consumption of raw rubber, which rose from 700 tons in 1900 to 3,000 in 1913, while exports rose from 7 to 50 million lire in value. Even greater gains were made between 1913 and 1938, as the number of firms producing rubber products rose to about 70, meeting domestic demand and providing significant exports as well. Raw-material imports rose to 28,000 tons in 1938, and total output to nearly 55,000 tons. The Italian rubber industry was now the world's eighth largest.²⁹

Despite war damage, the rubber industry, unlike chemicals, regained and passed its 1938 level of output and exports by 1948. And much greater progress was to come. While the rubber production of all the EEC countries increased by 136 per cent between the end of the war and 1960, that of Italy nearly doubled between 1950 and 1959, from 77,000 to over 150,000 tons. The sharpest spurt of growth came between 1953 and 1955 and was concentrated mainly on tyres, technical and health-care products. Later there was also growth, though slower, in the manufacture of rubber shoes and shoe components.³⁰

Meanwhile, the number of firms grew to about 200. From Milan and Turin, where the first factories were located and which remained the hub of the industry, especially for tyres and technical articles, rubber manufacturing spread to other parts of northern and central Italy. Vigevano became a major centre for the production of rubber shoes. Other firms arose in the Veneto and the Marche.³¹ Nationwide, in 1973, the industry employed some 40,000 persons. In the South there was no factory producing rubber articles until 1960, but later a fair number came into being. In 1961 the South accounted for 2 per cent of the national total of rubber manufacturing plants, 5 per cent in 1962 and 10 per cent in 1963, with projections of 12 per cent for 1965.³² The plants were set up in more than one southern region, including Sicily.³³

Although the industry's output was varied, with such products as cables, tubes for electrical wiring and hoses and tubes of all lengths and sizes, elastic bands, mats of all shapes and sizes plus sanitary articles, band-aids, waterproof fabrics, shoes of various sizes and styles, belts, toys, etc., the main product, though subject to fluctuations, continued to be tyres, considerably ahead of technical articles (excluding sanitary items). In 1959, motor-vehicle tyres

²⁸ E. Soleia, "The Italian rubber manufacturing industry", *Review*, XVII, 4 (July 1963), p. 243.

²⁹ *Ibid.*

³⁰ *Ibid.*, p. 245.

³¹ *Ibid.*, p. 244.

³² *Ibid.*, p. 256.

³³ *Ibid.*, p. 246.

accounted for 87 per cent of total rubber output.³⁴ The share still remained above 81 per cent in the years that followed.³⁵ From the start Italian rubber manufacturing was an export industry, with a steady trade surplus, even though exports, like output, varied from year to year, the variability becoming more pronounced after 1953. Output ranged from 17,000 tons in 1954 to over 36,000 in 1962. In some years the trade surplus was more than 20,000 tons.³⁶ The industry's performance was appreciable, even by European Community standards, where Italy ranked third behind France and West Germany.³⁷

3. Plastic materials

The sector of the chemical industry that achieved the most impressive progress was plastic materials. Brought to Italy from Germany in the forties at the time of close cooperation between the two countries, the plastics industry made giant strides after the war with the discovery of oil deposits, the development of oil refining and the birth of the petrochemical industry. By 1973 Italy was the world's fourth leading manufacturer of plastic materials, behind only the United States, Japan and West Germany.³⁸

Much of this success was due to the fact that plastic materials were produced both by large industrial complexes and by small companies specializing in particular items. The industry consisted of 5,000 firms with 100,000 employees, producing 1.8 million tons of plastics materials and converting raw materials worth 350 billion lire into products worth 750 billion. The variety of firms in plastics' manufacturing was broad indeed, ranging from companies with 2,000 workers down to those with just 20. One hundred companies, or 2 per cent of the total, had output worth more than 1 billion lire each, accounting for 45 per cent of total production; another 400 firms accounted for 33 per cent more. Thus, 10 per cent of plastics manufacturers accounted for 78 per cent of total output. The rest was the work of small factories, some family-style craft workshops, which sprang into being like mushrooms and disappeared just as swiftly.

This sort of industrial structure was not uncommon in other countries either, but fragmentation on the Italian scale was hard to find. Giovanni Moretti, chairman of the plastic materials group of Aschimici, the chemical industrialists' association, considered this fragmentation pathological, as these tiny companies were unfit to produce or quickly adopt technological innovations, new industrial processes and new equipment that the industry required. All this weighed on quality and costs, hence the competitiveness of the product.³⁹ Among the large companies that

³⁴ *Ibid.*, p. 247.

³⁵ *Ibid.*, p. 249.

³⁶ *Ibid.*, p. 250.

³⁷ *Ibid.*, p. 253.

³⁸ G. Moretti, "The Italian plastic materials industry", *Review*, XXVII, 3 (May 1973), p. 162.

³⁹ *Ibid.*, pp. 168-69.

collectively accounted for 78 per cent of total output, 50 per cent was produced by Montedison; SIR-Rumianca contributed another 20 per cent, ANIC 15 per cent, and Solvay 5. Between 1972 and 1973 these four firms were joined by Liquichimica, which controlled Ceramica Pozzi, a producer of polyvinyl chloride.⁴⁰

The industry could have expanded still more impressively but for the psychological diffidence of a part of the consuming public. Italy was only thirteenth in the consumption of plastic materials, with 35 kg per capita per year - half the West German level - while the potential uses of plastics were still largely unexploited. Many products, such as home appliances, containers, automobiles, electronics, toys, etc., could easily have been made of plastic. Certainly a look at the figures for production and consumption is enough to show that only part of Italian output was consumed domestically and the rest exported. A reverse trend began in 1968,⁴¹ owing largely to declining competitiveness. Although less highly developed than it might have been, plastics manufacture maintained a trade surplus, unlike the chemical industry overall, whose external deficit was large and growing rapidly: 37 billion lire in 1968 and 300 billion in 1972.⁴²

Italy succeeded in creating a viable engineering industry specialized in making machinery and equipment for plastic materials. About a hundred companies existed, with 10,000 workers. Adding in factories supplying such complementary equipment as granulators, folding machines, silos, and the like, the number of firms in plastics-related production came to about 200, with total production valued at 100 billion lire.⁴³

4. Pharmaceuticals

The pharmaceutical industry⁴⁴ was launched in Italy around the turn of the century but did not become important until the First World War, when it had to satisfy the war-related explosion in demand at a time when supplies from abroad, especially from the more advanced industries of France, Switzerland and Germany, were hard to obtain. The most striking gains, however, came in the interwar years. Italian drugs in 1920 were still of natural origin: extract of quinine for malaria, coca-based anesthetics, herbal infusions. The production of synthetic drugs began during the twenties, and in 1933 sulpha drugs too were produced, the first step towards the effective treatment of infectious disease.⁴⁵

It was above all during the years of autarky, according to Bracco, that "Italian pharmaceutical firms, also those born in chemists' back shops, began to take on

⁴⁰ *Ibid.*, p. 163.

⁴¹ *Ibid.*, p. 174.

⁴² *Ibid.*

⁴³ *Ibid.*, pp. 170-71

⁴⁴ F. Bracco, "The Italian pharmaceutical industry. Its structure, problems and prospects," *Review*, XVIII, 5 (September 1964), p. 343.

⁴⁵ Caglioti, "The role of chemistry", p. 390.

a pattern and organization of production that deserved to be termed 'industrial'.⁴⁶ Further progress was made during the war, but there was also extensive damage. With peace, over and above the reconstruction of damaged or totally destroyed plants, the pharmaceutical industry widened its range of products and progressively reorganized, thanks in part to the resumption of contacts with the more advanced countries. Between 1956 and 1960 output increased in quantity and improved in quality. Activity was also extended to South America and Asia.⁴⁷ By the early sixties the industry consisted of more than a thousand firms and 40,000 employees, 40 per cent of them office workers and technicians. Of the latter, at least 20 per cent were university-trained. Most of the companies (90 per cent) were located in the North, the rest in the Centre and the South. Bracco's figures show a great range in firm size: four companies with more than 1,000 employees, 8 with between 500 and 1,000, 25 with 200 to 500, 35 with 100 to 200, 60 with 50 to 100. All told, these 132 firms employed 30,000 workers, while the other 850 pharmaceutical producers had staffs ranging from 50 down to fewer than 10.

For the most part, none were in a position to utilize their full capacity. For some products, such as penicillin and salicylic acid, capacity utilization was under 50 per cent. For others, such as sulpha drugs, under 15 per cent. The leading laboratories were heavily engaged in research, which employed 16 per cent of overall personnel at an annual cost varying between 6 and 7 billion lire. Thanks to this commitment and its achievements, Italy produced 12,871 different medicines for human use in 1964. Some companies had production facilities or subsidiaries abroad and were well known in Central and South America, North Africa and the Middle East, and even the Far East.⁴⁸

These advances gradually narrowed the external trade deficit. While pharmaceutical imports rose from 12,489 billion lire in 1951 to 35,046 billion in 1963, exports rose from 6,318 to 30,665 billion, cutting the deficit from 6,171 to 4,381 billion lire.⁴⁹ In fact, for some products, notably compounds, exports actually far outstripped imports in 1960-62. The situation was modified after 1963, due on the one hand to government-induced price cuts and on the other to higher labour costs owing to union pressure. Bracco argued that this combination had undermined the industry's international competitiveness, widening the trade deficit once again.⁵⁰

The health reform of the mid-sixties brought massive subsidies for drug purchases, lending enormous impulse to demand, and Italy was soon one of the leading consumers of medicines (third in Europe, behind France and West Germany, and fifth worldwide).⁵¹

⁴⁶ Bracco, "The Italian pharmaceutical industry", p. 343.

⁴⁷ Mattci, "Italian industry in the five-year period 1955-1960", p. 490.

⁴⁸ Bracco, "The Italian pharmaceutical industry", pp. 347-48.

⁴⁹ *Ibid.*, pp. 345-47.

⁵⁰ *Ibid.*, pp. 348-49.

⁵¹ M.E. Vainicher and F.M. Frasca, "The pharmaceutical industry in Italy: problems and prospects", *Review*, XXXIII, 1 (January 1979), p. 155.

Annual per capita consumption of medicines rose to 12,000 lire, compared to 8,000 in Britain and 23,000 in West Germany.⁵² The industry achieved an average annual rate of growth of over 9 per cent during the sixties which accelerated to nearly 12 per cent between 1970 and 1977. From a base of 100 in 1970, the index of production rose to 132.4 for basic products in 1977 and to 218.4 for pharmaceuticals. The sector thus outpaced industry as a whole, whose production index rose to 123.5 over the same period. The index number for manufacturing came to 122.5; and for chemicals generally the index rose to 144.6.⁵³ That is to say, in the eight years from 1970 through 1977, while the pharmaceutical industry more than doubled its output, manufacturing industry gained no more than 22.5 per cent and, chemicals 44.6 per cent.⁵⁴ The trend continued in 1978. Vainicher and Frasca explained the difference in growth rates by reference to the special nature of the pharmaceuticals market and the diversification of production, which, though obtained by a whole series of small firms, was actually fuelled by the great foreign multinationals, with their investment and their advances in R&D.

The rapid growth of pharmaceuticals' output affected the structure of the industry, which was moving towards greater concentration. The 1,300 laboratories of the fifties were reduced to 866 in 1965, 635 in 1969, 558 in 1976 and 538 in 1977. Between 1965 and 1977, 228 companies vanished,⁵⁵ but Italy continued to have more firms in business than France, the UK or the US. In 1976, companies with over 1,000 employees still accounted for just 13 per cent of all Italian employment in pharmaceuticals, which rose from 51,436 in 1970 to 59,519 in 1976, a gain of 15.7 per cent.⁵⁶ Firms with under 100 employees accounted for 25 per cent of the total.⁵⁷

The fragmentation greatly increased the number of products put on the market. Vainicher and Frasca noted that 1,500 active ingredients were used to derive some 8,000 compounds and 14,000 different preparations. The numbers were reduced somewhat by 1970, but they were still excessive, reflecting marketing needs rather than a research drive for new medicinal ingredients and new products. In 1977 R&D spending in the pharmaceutical industry came to 97 billion lire, while marketing costs were 233 billion.⁵⁸ The authors concluded that, given the large number of small firms dependent on others for research, pharmaceuticals in Italy represented not so much an industry as a service activity. Moreover, Italy's large pharmaceutical manufacturers were all owned by multinationals, whose main investment and research facilities were located in their home countries, and which limited their activities in Italy to packaging, labelling, boxing, and in some cases just marketing.

⁵² Caglioti, "The role of chemistry", p. 390.

⁵³ Vainicher and Frasca, p. 140.

⁵⁴ *Ibid.*

⁵⁵ *Ibid.*, p. 152.

⁵⁶ *Ibid.*, p. 141.

⁵⁷ *Ibid.*, p. 152.

⁵⁸ *Ibid.*, p. 156.