SWOT Analysis and Benchmarking Study

Lombardy Region

Part II
The development of the Chemical Industry in Lombardy Region

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II. The development of the Chemical Industry in Lombardy

II. 1 Employment

The chemical industry of Lombardy is very important under at least three points of view:

- it has a relevant position among European chemical regions,
- it represents a major part of the Italian chemical industry,
- it plays a key role for the competitiveness of the Italian industrial system as a whole.

Few people would probably say that, among European chemical regions, Lombardy is the second in terms of employees and the first in terms of companies. Its share of chemical employees over total population is one of the largest in Europe confirming that the data don't depend on the size of the area, but reflect an actual concentration of chemical industry in the region. The reason why the result may sound surprising is that, when thinking about chemicals, large petrochemical sites usually come to mind. On the contrary, the chemical industry in Lombardy shows quite different features from other European regions with a strong chemical presence:

- production is not concentrated in a limited number of highly integrated chemical sites,
- large companies do not prevail, as there is an extensive net of small and medium enterprises.

Top 10 European regions for number of chemical employees

	Chemical employees	Share on population (%)
1. Nordrhein Westfalen (DE)	138045	0.77
2. LOMBARDIA (ITA)	**91305**	**1.00**
3. Rheinland- Pfalz (DE)	66823	1.66
4. Hessen (DE)	65927	1.09
5. Bayern (DE)	60920	0.50
6. Cataluña (ES)	60458	0.98
7. Baden Württemberg (DE)	58936	0.56
8. Ile de France (FRA)	57855	0.53
9. Vlaams Gewest (BE)	47054	0.79
10. North West (UK)	38340	0.56

Source: Eurostat, 2000

Speaking about Italy, it is well-known that a relevant share of the Italian industry concentrates in Lombardy, which alone accounts for 20.9% of all industrial companies and for 24.9% of the related employees. However, this phenomenon is even more pronounced with reference to chemicals:

- Lombardy represents 32.7% of all chemical companies in Italy,
- this share reaches 41.2% considering the number of employees.

Firms and employees of chemicals and total industry in Lombardy

	CHEMICALS		TOTAL INDUSTRY	
	Firms	Employees	Firms	Employees
Units	2522	84545		
Share over Italy (%)	32.7	41.2	20.9	24.9

Source: ISTAT, Census on Industry and Services 2001

This suggests a particular specialisation of the region in the chemical sector. Such a specialisation becomes apparent looking at the specialisation index of different sectors in Lombardy, that measures the ratio between the share of industrial employees working in a certain sector in the region and the same share referred to Italy. Among industrial sectors, chemicals show the highest specialisation index overcoming sectors like mechanical equipment that have a very strong presence in the region.

Specialisation index of industrial sectors in Lombardy

CHEMICALS	1,7
Rubber and plastics	1,4
Metals and metal products	1,2
Electrical machinery	1,2
Paper and printing products	1,2
Machinery and mechanical equipment	1,2
Textile and clothing	1,1
Other manufacturing	0,8
Wood	0,7
Food and beverages	0,6
Transports	0,6
Coke and oil refinery	0,6
Non metal products	0,5
Leather and shoes	0,3

Source: ISTAT, Census on Industry and Services 2001

As already remarked, in Lombardy there is not a strong concentration of chemicals in few sites. On the contrary, the region is characterised by the widespread presence of chemical companies:

- without considering firms with less than 10 employees (due to the scarce reliability of the statistical data for this kind of companies), 404 municipalities over a total of 1546 have at least one chemical company corresponding to a share of 39%;
- in 159 municipalities this presence is rather relevant as more than 100 employees work in the chemical industry.

As we will see later in much more detail, this territorial diffusion is connected to the presence of a large number of chemical SMEs.

2. Specific features, factors of success

and role of the chemical industry in Lombardy

In Lombardy can be found a well-balanced mix of all the actors forming the Italian chemical industry:

- foreign multinational companies,
- medium-large and large Italian companies,
- small and medium Italian companies.

In Italy, foreign MNEs represent about one third of total chemical production. An overwhelming share of these MNEs (68% in terms of workers) is in Lombardy. MNEs have established in the region their headquarters, that often cover all the Mediterranean area, as well as production plants, especially in the sector of fine chemicals and specialties.

The threshold of 100 million euro of sales allows to identify a group of medium-large Italian companies that, even if internationalised, maintain their activity focused in Lombardy. These companies are maybe unknown to the public, but they often hold the European or world leadership in their sector of activity and therefore represent cases of success of the Italian chemical industry.
The main feature all these cases of success share is that they adopt niche strategies:

- focusing their activity on very specific “families” of goods,
- but offering a wide variety of products in order to satisfy every demand of a particular market.

Their products have a very high value added because of their technology content and of the embedded immaterial component in terms of service for the customer. This is possible through:

- the development of a close relationship between the enterprise and its customers culminating in partnerships for the design and production of on-demand specific chemical products,

- the emphasis put on the sales network and on the training of human capital with specific technical and scientific skills, able to perceive and immediately transmit the evolution of demand,

- the key role given to R&D activity, developed inside the company but also nourished with profitable partnerships with the University,

- the incessant innovation, which regards first of all the product but often also the process, involving the design and building of equipment.

Other factors of success are flexibility and speed in reacting to changes, capabilities that these companies have developed from the experience in the Italian market, which is characterised by a myriad of end-users with specific needs.
Being very specialised, these companies have to make a continuos effort to enlarge their own niche. In a globalised world, this means progressively moving from exporting to opening selling agencies and then production facilities abroad.

Main Italian chemical companies in Lombardy

	Main activity	Worldwide sales (2002, million euro)
Radici Group	Fibers	1155,0
Gruppo Snia	Fibers, biomedicals	1134,0
Gruppo Bracco (*)	Diagnostics	905,0
Mapei	Adhesives and chemicals for building industry	900,0
Montefibre	Fibers	534,9
Gruppo C.O.I.M.	Polyurethanes	385,0
ACS Dobfar	Active pharmaceuticals ingredients	303,0
Lamberti	Specialties	297,0
Sipcam-Oxon Group	Agrochemicals	285,0
Sapio	Industrial gases	275,0
IVM Group	Paint for wood	275,0
Gruppo Sol	Industrial gases	267,4
Siad	Industrial gases	218,0
Indena	Active pharmaceuticals ingredients	169,0
3V Partecipazioni Industriali	Auxiliary for fine chemicals	160,0
Novaceta–Bemberg-Nuova Rayon	Fibers	160,0
Isagro	Agrochemicals	153,0
Solchem Italiana	Active pharmaceuticals ingredients	152,0
Italsilva	Detergents	150,0
Intercos Italia	Cosmetics	135,1
Filattice	Fibers	135,0
Zambon Group	Active pharmaceuticals ingredients	111,2

Note: companies with a majority of Italian capital share
(*) value excluding pharmaceuticals

Source: Federchimica

Even if the role of foreign MNEs and medium-large Italian companies is very important for the whole sector, it is undeniable that the chemical industry in Lombardy is above all made of SMEs:

- excluding companies with less than 10 employees, 91% of all chemical companies have less than 250 workers,
- SMEs account for the majority of chemical employment (64%).

These shares are in line with the ones referred to the rest of Italy. On the contrary, the comparison with Europe shows that in Lombardy SMEs play a much greater role in terms of employment (representing 64% of total employment versus 32%). These data confirm that Lombardy is the second European chemical region not because of the presence of many large and integrated sites but rather thanks to a wide net of small and medium chemical companies.

What determines the presence of such a large number of chemical companies and especially of SMEs in Lombardy? First of all, it is well known that historically Italian industry has always been dominated by small and medium family-owned companies. This pecularity apply to the chemical sector as well. Another reason lies in the particularly strong presence of Lombardy in chemical sectors where the average size of firms is lower. Considering the distribution of chemical employees by sector of activity, it results that Lombardy has a share of employment larger than Europe in:

- detergents and cosmetics (15.8% versus 13.3%),
- "other chemical products"(14.9% versus 11.3), a varied aggregate where chemicals for industry prevail,
- and above all in pharmaceuticals (36.5% versus 28.6%) that include also active ingredients for pharmaceuticals.

With the exclusion of pharmaceutical products, these are activities where economies of scale and size are less important and where downstream markets justify the development of niches in which specialised companies operate.
On the contrary, it is clear that Lombardy is not specialised in basic chemicals where instead the size of companies and plants is absolutely relevant; the share of employment is lower than in the rest of Italy (18.3% versus 27.0%), where most of the Italian petrochemical sites take place, and even more with respect to Europe (32.6%).

<u>Chemical companies and employment by class of employment</u>

	LOMBARDY		ITALY (ex. Lombardy)	EUROPE
Companies	units	%	%	%
SMEs	1017	94.3	94.9	87.6
250-499	44	4.1	3.3	6.5
500 and more	17	1.6	1.6	5.8
Total	1087	100.0	100.0	100.0
Workers	units	%	%	%
SMEs	54159	64.0	61.2	31.9
250-499	15700	18.6	16.0	14.3
500 and more	14686	17.4	22.9	53.7
Total	84545	100.0	100.0	100.0

Source: ISTAT, EUROSTAT 2001
Note: companies with less than 10 employees have not been considered

Even if Lombardy is relatively specialised in some chemical sectors, the panorama appears very diversified as there is not a single activity predominating. Considering the strong presence of chemical activities in the region, we can therefore speak about a chemical cluster although it cannot be defined as an Italian industrial district because of the specific features of the sector. An industrial district is an agglomeration of small and medium firms, specialised in a single-product business, concentrated in a specific area. Chemicals do not generate the organisational form of industrial districts because productive processes are vertically integrated and the possibility to use subcontracting is very limited.

Distribution of chemical workers by sector (%)

	LOMBARDY	ITALY (ex. Lombardy)	EUROPE
Basic chemicals	18.3	27.0	32.6
Agro-chemical products	1.5	0.8	1.5
Paints, varnishes, printing ink and adhesives	9.2	10.9	9.6
Pharmaceuticals	36.5	31.5	28.6
Detergents and cosmetics	15.8	11.7	13.3
Other chemical products	14.9	14.7	11.3
Man-made fibers	3.8	3.6	3.0
Total	100.0	100.0	100.0

Source: elaboration on ISTAT, EUROSTAT 2001

However, the concentration of chemical companies identifies in the area a sort of technological district, a network involving different actors that all together are able to create the best conditions for the development of sophisticated companies like the chemical ones. The well functioning of this network depends on:

- the cooperation and partnership among chemical and other industrial companies, representing downstream users, favoured by the fact they share the same culture and the same organisational form,
- the profitable relationship between chemical companies and a system made of many excellent universities able to develop research projects oriented to industry and to offer qualified human resources,
- a widespread entrepreneurial attitude, present in some cases also in the Public Administration,
- the availability of a wide range of services (financial, for environmental management, etc.) that makes possible outsourcing,
- a plant engineering sector at a worldwide top level.

All these characteristics make Lombardy one of the most advanced industrial areas in Europe. In this respect, the chemical sector plays a specific and fundamental role. The nature of such a role can be better understood looking at the spending allocation of innovative activity (data are available only for Italy, but they reasonably apply to Lombardy as well):

- mainly, other industrial sectors get innovative inputs from outside in the form of innovative machinery and equipment (50.2% of total expenses for innovation),
- on the contrary, chemical companies are deeply involved in internal R&D (42.8% of total expenses for innovation).

As a matter of fact, what distinguishes chemicals from other manufacturing sectors is that it is a science-based industry. Having to change the matter, chemical companies cannot innovate only in the process, but have to innovate also in the product: that is to say they have to do research. Being producers of intermediates, chemical companies transfer technology and represent a major source of innovation for downstream users. As a consequence, chemical companies have a key role in maintaining and enhancing the competitiveness of their clients, which are virtually all Italian industrial sectors.
Speaking about Lombardy, this is particularly true with reference to the privileged relationship between companies producing chemical specialties for industrial purposes and some traditional Italian districts. Only to mention one case, there is a strong relationship between the development in Lombardy of the sector of varnishes for wood and the district of furniture in Brianza (an area around Milan). Chemical companies offer their clients products of fine chemicals and the so-called performance chemicals, that is to say products not bought for their chemical formula but for the performance they make possible for their users.

<u>Spending allocation of innovative activity in Italy</u>
<u>(Percentage share on total)</u>

	CHEMICALS	TOTAL INDUSTRY
Internal R&D	42.8	29.2
Purchase of innovative machinery and equipment	16.7	50.2
Training	8.5	3.1
Other	32.0	17.5

Source: ISTAT (2000)

3. Chemical employment in Lombardy

Compared to 1971, the chemical industry has experienced a considerable reduction of its employees both in Lombardy and in the rest of Italy. However, in Lombardy this drop has been relatively smaller (-28.8% versus –32.0%) demonstrating a better performance of the chemical companies in the region.
It should be emphasised that the loss of chemical employment is somewhat over-estimated as it has been partially compensated by the outsourcing of some activities.

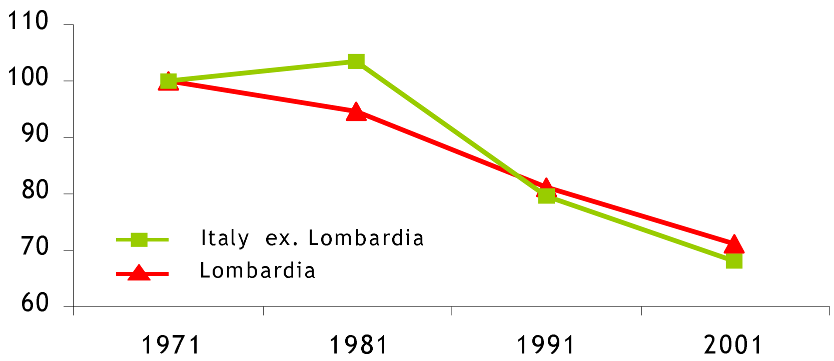
<u>Employment in chemicals, 1971-2001</u>

	1971	1981	1991	2001	% change
Lombardy	118822	112580	96235	84545	-28.8
Italia (ex. Lombardy)	177272	183469	141174	120608	-32.0
Share of Lombardy on Italy (%)	40.0	38.0	40.5	41.2	+1.2

Source: ISTAT, Census on Industry and Services 2001

Looking at the development of chemical employment by class of employment, it results that the drop in particular has regarded large companies (-71.9%) while SMEs have even experienced a rise relative to 1971 (+7.5%). The dramatic fall concerning large companies is partly due to the dismissals of the most important Italian chemical groups (Montedison, ENI).
The employment loss has involved almost all sector of activities but has been particularly dramatic in basic chemicals (-56.0%) and man-made fibers (-76.3%). Employment has kept rather stable in detergents and cosmetics (+0.8%) and has increased in “other chemical products” (+7.5%).

Dynamics of employment in Italy and in Lombardia (Index, 1971=100)



Employment in chemicals by class of employment in Lombardy

	1971	1981	1991	2001	% change
SMEs	50358	57386	54139	54159	7.5
250-499	16112	17728	20234	15700	-2.6
500 and more	52352	37466	21862	14686	-71.9
Total	118822	112580	96235	84545	-28.8

Source: ISTAT, Census on Industry and Services 2001

Employment in chemicals by sector of activity in Lombardy

	1971	1981	1991	2001	% change
Basic chemicals	35061	36464	20490	15432	-56.0
Agro-chemical products	1485	1469	1400	1285	-13.5
Paints, varnishes, printing ink and adhesives	8418	9843	8845	7790	-7.5
Pharmaceuticals	35233	35277	36739	30882	-12.3
Detergents and cosmetics	13215	13742	13352	13319	0.8
Other chemical products	11715	7905	10789	12592	7.5
Man-made fibers	13695	7880	4620	3245	-76.3
Total	118822	112580	96235	84545	-28.8

Source: ISTAT, Census on Industry and Services 2001

The quality of chemical employment becomes apparent when compared to total industry. In Lombardy:

- the share of managers in chemicals is more than twice that of the total industry (4.0% versus 1.7%),
- almost one third of new recruiting involve graduated people while in total industry this share falls to 9.1%.

Compared to Italy, chemicals in Lombardy show a higher share of managers and office-workers, but a lower share of graduated people in new recruiting.

Structure of employment by worker status in Lombardy (%)

	Managers	Office-workers	Workers
Chemicals*	4.0	55.1	40.9
Total industry	1.7	30.7	67.6
Chemicals in Italy	3.5	52.9	43.6

(*) include also oil refinery
Source: Unioncamere – Ministry of Labour (2002)

Recruiting by level of education in Lombardy (%)

	Primary school	Secondary School	University
Chemicals*	14.0	55.1	30.9
Total industry	41.6	49.3	9.1
Chemicals in Italy	15.1	52.4	32.6

(*) include also oil refinery
Source: Unioncamere – Ministry of Labour (2002)

In Lombardy, R&D personnel consists of more than 3 thousand employees and accounts for 3.7% of overall chemical employment. This share is far below the 7.6% referring to the European Big 4 (Germany, France, Italy, UK). In this respect, the limited size of companies appears to become binding as the passage from informal innovation to a more structured R&D activity requires relevant organisational, managerial and financial resources.

R&D personnel, 2001

	Units	Share on chemical employment (%)
Lombardy	3.103	3.7
Big 4 *		7.6

(*) Germany, France, Italy, UK
Source: EUROSTAT, ISTAT

A well-rooted stereotype about chemicals is that of being a risky sector for the safety of its employees. On the contrary, the chemical industry proves to be strongly engaged in protecting the health of its workers:

- in Lombardy the frequency and seriousness of accidents at work in chemicals is about one half of the average of total industry,
- both indicators are lower in Lombardy than in the rest of Italy.

Frequency and seriousness of accidents at work in Lombardy

	Frequency (every 1000 employees)	Seriousness (lost working days per employee)
Coke and oil Refinery	12,6	0.7
Leather and shoes	22.4	1.5
CHEMICALS	20.9	1.8
Electrical machinery	20.1	1.8
Paper and printing products	28.4	2.3
Textile and clothing	31.4	2.4
Machinery and mechanical equipment	43.2	2.9
Transports	54.1	3.0
Food and beverages	43.8	3.1
Other manufactures	41.0	4.2
Rubber and plastics	55.0	4.2
Metals and metal products	65.2	5.4
Non metal products	67.0	6.9
Wood	65.2	7.2
TOTAL INDUSTRY	42.1	3.4
Chemicals in Italy	22.8	2.1
Total industry in Italy	48.8	4.1

Source: INAIL, 1999-2001

4. Imports and exports

In Italy, chemicals show a considerable trade deficit (more than 9 billions euro in 2003). In 2003, Lombardy accounted for 77.2% of the overall trade deficit in chemicals, which confirms the concentration of the Italian chemical industry in the area and its role of "purchasing headquarter" for the whole country.
Looking at the composition of the chemical trade balance by sector of activity, it results that most of the deficit refer to basic chemicals (more than 4 billions euro in 2003). On the contrary, an important trade surplus has been consolidating in detergents and cosmetics and in varnishes and adhesives.

The fact that chemicals have a persistent trade deficit often overshadows the relevance of the sector in terms of exports:

- in Lombardy, chemicals represent the second sector in terms of value of exports preceding many traditional sectors of specialisation like leather and shoes or textile and clothing,

- in 2003, the chemical industry made exports for 12 million euro accounting for 15.5% of the overall exports of the region,
- during the period 1991-2001, chemicals performed even better than mechanical equipment.

External trade of Lombardy in chemicals by sector of activity, 2003 (million euro)

	Imports	Exports	Trade balance
Basic chemicals	7946	3442	-4504
Agro-chemical products	254	155	-99
Paints, varnishes, printing ink and adhesives	380	492	112
Pharmaceuticals	5551	4063	-1488
Detergents and cosmetics	1165	1643	478
Other chemical products	2390	908	-1483
Man-made fibers	823	530	-293
Total	18510	11233	-7277
ITALY	35144	25721	-9424
Share Lombardy over Italy (%)	52.7	43.7	77.2

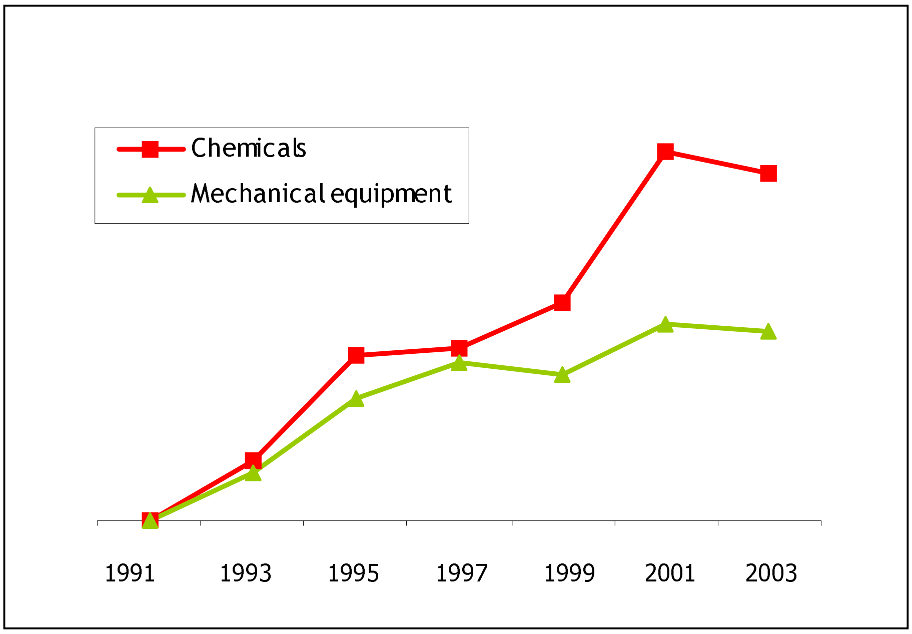
Source: ISTAT

Exports from Lombardy by sector, 2003

	Export (million euro)	Share on total industry (%)
Machinery and mechanical equipment	16547	22.9
CHEMICALS	11233	15.5
Electrical machinery	9182	12.7
Textile and clothing	8067	11.2
Metals and metal products	8469	11.7
Transports	5461	7.6
Rubber and plastics	3405	4.7
Other manufatures	2914	4.0
Food and beverages	2766	3.8
Paper and printing products	1533	2.1
Non metal products	1038	1.4
Leather and shoes	1105	1.5
Wood	323	0.4
Coke and oil refinery	272	0.4
Total	72317	100.0

Source: ISTAT

Exports performance in chemicals and mechanical equipment
(Index, 1991=100)



Source: ISTAT

A major part of chemical exports from Lombardy is directed to the European Union (52.6%). In particular, Germany is the main trading partner (13.0%). Compared to Italy, the share covered by the European Union is slightly lower in favour of a higher share of the United States (7.9%) and of China (1.4%).
With reference to chemical imports, the role of the European Union is overwhelming (73.9%). Germany confirmsto be Lombardy main trading partner (19.1%).

Destination of chemical exports by area (%), 2003

	Lombardy	Italy
UE15	52.6	54.9
France	9.1	9.8
Germany	13.0	13.1
UK	6.3	6.6
Central Eastern Europe	7.0	7.6
Other European countries	9.9	10.2
North America	9.3	8.6
USA	7.9	7.6
Central and South America	3.3	2.9
Asia	12.6	11.3
China	1.4	1.2
WORLD	100.0	100

Source: ISTAT

Origin of chemical imports by area (%). 2003

	Lombardy	Italy
UE15	73.9	75.5
France	13.2	13.2
Germany	19.1	20.8
UK	8.8	9.1
Central Eastern Europe	3.4	3.1
Other European countries	8.0	8.5
North America	5.4	4.9
USA	5.2	4.7
Central and South America	0.7	0.5
Asia	7.4	6.8
China	1.5	1.6
WORLD	100.0	100.0

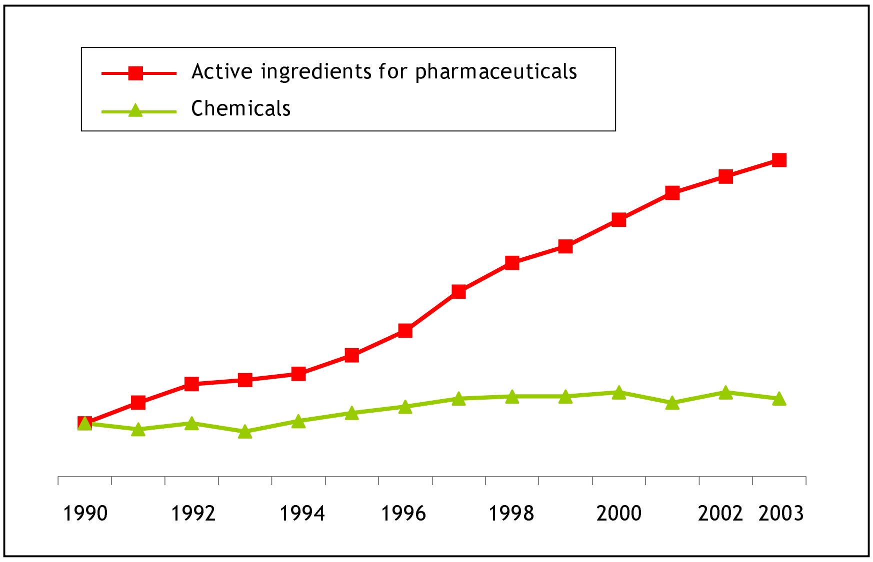
Source: ISTAT

5. Active ingredients for pharmaceuticals: a sector at world top level

Among Italian chemical sectors, active ingredients for pharmaceuticals probably represent the only one enjoying a clear international leadership:

- Italian production accounts for about 15% of the world market and 30% of overall European production,
- 85% of this production is exported,
- Italian exports mainly address to Advanced Countries (Italian products satisfy about 56% of the United States demand) which implies fitting to strict requirements in terms of quality,
- Lombardy has a major role as it employs 58% of the sector total employment.

Performance of Italian production of active ingredients for pharmaceuticals and overall chemicals (index, 1990=100)



Source: Federchimica estimate on ISTAT

In particular, Italian companies are specialised in the production of active ingredients for generics, defined as pharmaceutical products for which the patent has expired. In this context, the main factor of success consists in the capability to find the best process for producing a certain substance in the shortest lag of time. To be effective companies need:

- a considerable technological know-how in order to transform a laboratory invention into an industrial process which requires not only to design equipment but also to determine the best way to synthesize known molecules,
- speed in taking decisions in order to have already identified the best method to obtain a substance when the patent expires,
- flexibility and production efficiency, which imply the use of automated multi-purpose plants able to produce limited quantities of many different substances,
- high skilled personnel able to make accurate controls on the transit of different substances inside the reactors and to decontaminate the apparatus from previously treated substances.

What emerges is then a sector characterised by a high degree of technology and innovation in which:

- 5% of total employment is dedicated to research,
- R&D expenditure represent about 3% of turnover against an average of only 1% for the overall chemical industry,
- together with in-house research, forms of cooperation with external research structures are developed (accounting for 30% of total R&D expenditure).

The international success of Italian companies was partially favoured by historical reasons, namely by the absence of a regulation on intellectual property protection until 1978; after then companies, being forbidden to copy pharmaceutical products, took advantage of their experience and know-how focusing on the production of active ingredients for generics. But most of all, this competitiveness depends on the fact that the sector represents the best synthesis of typical factors of success of the small-medium Italian company: family-owned, fast in taking initiatives, flexible, creative. However, all these elements must be coupled with a high quality standard and sophisticated scientific and technological skills.

The quality and reputation of Italian companies have turned them into major players also in the so-called custom manufacturing, which consists in the production of sophisticated molecules exclusively for single pharmaceutical MNEs. This practice is spreading as pharmaceutical groups prefer to focus on their core activities: research of new products, brand management and marketing.

The specialisation of Italy and, in particular, of Lombardy in active ingredients for pharmaceuticals is important not only because it is an innovative sector, but also because it enjoys perspectives of strong and sustained growth:

- belonging to life sciences, it will benefit of the growing demand for health and quality of life as well as of the ageing of population,
- custom manufacturing is likely to spread as pharmaceutical groups more and more are concentrating on immaterial activities and outsourcing chemical syntheses to specialised companies,
- the market of generics is expected to enlarge as a consequence of policies for the containment of health expenditure.