

Lago, Umberto; Visconti, Federico

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## **Regulatory problems in industries with very small firms**

Umberto Lago and Federico Visconti

Istituto di Economia Aziendale

L.Bocconi University

via Bocconi,8 20126 Milan

Italy

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### **Abstract**

In the present paper the following hypotheses have been tested:

1. pressure groups have a marginal role in fragmented industries. In fact, fragmented industries are characterised by the presence of many small firms and by self-centred entrepreneurs, prone more to conflictual than to co-operative behaviours;
2. regulatory interventions in fragmented industries have a strong impact on industry's structure by selecting the enterprises and modifying their strategic and structural profile;
3. the single firms are particularly vulnerable to regulatory interventions in fragmented industries as they can impose fundamental changes that they may not be able to face.

The above hypotheses have been tested in the context of the tannery industry, a fragmented industry with about 2,500 enterprises and more than 25,000 employees.

Specifically, the analysis has concentrated on evaluating the impact of the “Legge Merli” no. 319 of 10/05/1976 and subsequent alterations on the structure of the tannery industry and the behaviour of the single firms. This is a law which had great momentum in shaping the tannery industry as it fundamentally changed the economics of the firms and severely altered competition both among Italian tanneries and vis-à-vis foreign ones.

The research methodology includes both qualitative and quantitative instruments. On the quantitative side, a longitudinal series of balance sheets of 191 firms have been analysed for the period 1986 - 1991, together with industry's secondary data. On the qualitative side, the research has focused on the analysis of published sources, interviews with entrepreneurs and other industry-experts (about 30 interviews were performed).

- The paper is based on a research project on the tannery industry on which both the authors have extensively worked, together with Claudia Cavazza of Bocconi University.

## **1. Structural profile of competitive contexts and economic spaces for small and medium-sized enterprises.**

In the Italian economic system, six models of firm can be identified (Zattoni, 1994), on the basis of their structural characteristics and of the typical management styles:

1. big State owned companies - often monopolists in the industries in which they operate,
2. private family-owned large companies,
3. branches of multinational companies,
4. independent small and medium-sized enterprises ,
5. aggregates of small enterprises,
6. co-operative enterprises (particularly common in Central Italy and in the food industry.).

Generally speaking, the relative size of Italian firms is quite small, compared with international companies. According to a recent survey (Bongiovanni, 1994), small and medium-sized enterprises (SMEs) account for 70% of the total added value of the Italian industry, a figure which is close to 491,000 billion Lire. Moreover, they employ around 82% of the total Italian labour force. SMEs are widely diffused across industries. In fact, SMEs have been able to gain international competitive leadership in small industries characterised by a high level of internationalisation (Corbetta, 1993; Porter, 1991) (jewellery, industrial equipment, tiles and so on). Therefore, it is not necessarily true that SMEs are “economic dwarfs” or simple entities that can be examined adapting management models originally developed for big sized corporations. As a matter of fact, they tend to pursue focus strategies in industries with many segmentation possibilities (Visconti, 1993): this explains why they are more concentrated in fragmented industries, in niches, or tend to have marginal positions in concentrated industries.

More precisely, the competitive positions occupied by smaller enterprises tend, more often than not, to be aimed at a specific group of clients, a restricted line of products, a particular phase of the production process, or a limited geographical area. What is being dealt with here are strategic choices based on, “a restricted competitive area within an industrial sector” (Porter, 1987), or rather, focusing strategies.

There is no doubt that focusing strategies have their roots in the structural characteristics of small and medium-sized enterprises. These do not have the human, technical, commercial, or financial resources necessary to allow them to operate on a large competitive scale.

Nor is there any doubt that the reason for the existence of such behaviour is to be found in the structural profile of the market industries in which the SMEs are usually involved, in the sense that it is a matter of extremely fertile competitive contexts as regards segmentation opportunity and the identification of spaces without leaders within the market.

Bearing this in mind, and giving due consideration to the aims of this report, it would seem appropriate:

1. to define the basic characteristics of the industries occupied by small and medium-sized enterprises;
2. to identify specifying elements of the strategic and operative profile of small and medium-sized enterprises;
3. to formulate the basic hypotheses as regards the functioning of pressure groups within the competitive contexts previously described: hypotheses which have inspired the subsequent research.

With regards to the first aspect, we must inevitably focus our attention on fragmented industries, although economic space for the development of small enterprises can exist both in concentrated industries (typically within business areas which are not very attractive to firms operating on a wider competitive scale), and in industries characterised by a structurally limited demand.

Each of the aforementioned contexts has structural characteristics which encourage and justify the presence of the small enterprise.

In the case of fragmented industries, it is the existence of economic factors (absence of economies of scale, high transportation costs, great differentiation of needs) which obstacle the formation of a leadership which is able to control a significant quota of the market and therefore to influence results within the industry.

By “fragmented industries” we therefore mean those competitive contexts in which “many enterprises compete but no one firm obtains a significant quota of the market so that no one firm can substantially influence the results within the industry.”(Porter, 1982).

In the case of more concentrated industries, however, the SMEs create competitive space for themselves, developing efficient segmentation of customer needs by evaluating the gaps in the market, left uncovered by larger firms (Penrose, 1959).

In the final case of contexts with a structurally limited demand, it is precisely the extreme focusing of needs which does not justify the presence of many firms, particularly the larger ones.

So far, our observations emphasise specific conditions of industries: in some types of industry, the small enterprise can find its own space, in others it cannot.

However, in addition to this information on industries, we should also consider, given the economic structure of our country, some territorial information: the creation and development of SMEs is favoured not only by characteristics of the competitive system, but also by a series of factors associated with the location of the firms.

If we consider the experience of industrial districts<sup>1</sup> it is not difficult to see that the economic space of many SMEs, while deriving in part from the structural conditions of the industry, also depends on having a position, within a specific localising space, in a system of relations between firms, effective on the strategic level, and efficient on the operative level

It is precisely the territorial context which helps us to interpret phenomenon such as the creation of new enterprises, the innovation of products and processes, the accumulation and transfer of knowledge, the strategic flexibility in facing emerging competitive challenges. The small firm has a privileged position in such territorial contexts (Marelli, 1986).

In conclusion, both conditions of the industry and conditions of the territory tend to be important in defining the economic space for the creation and development of SMEs. This is confirmed by the structural evolution of the Italian economy, to which this vast network of

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<sup>1</sup> With industrial districts we refer to clusters of firms located in the same geographic region and operating in the same industry. Firms are normally of small and medium size. One of the key features of the firms in industrial districts is their ability to develop, at the same time, competitive and co-operative strategies (Lorenzoni, 1990).

small firms brings extraordinary richness and entrepreneurial vitality (Corbetta, 1995; Brunetti, Corbetta, 1996).

As regards the elements which characterise the strategic and operative profile of the SMEs, we must bear in mind the fact that the variety and variability of the behaviour of these firms does not at all facilitate the individualisation of common traits.

One possible way of confronting the problem is to take into account criteria of a quantitative nature, based on parameters such as total sales, the number of people employed, added value, and the amount of capital invested (Corticelli, 1979). Such an approach allows us to distinguish large firms from small ones. However, it does not help us either to understand the entrepreneurial formulae of SMEs or to focus on their working methods, their strong points or the factors which limit their development.

Consequently, it would be preferable to look at things from a qualitative point of view and, on the basis of empirical observations, identify any common factor which unifies the SMEs, despite the fact that they are very varied (Corbetta, 1993; Varacca Capello, Zattoni, 1995).

The first factor which characterises small firms is that they tend to be lead by teams, which are restricted at the top level and where very few people have responsibility for the development ideas of the firm. Both operative choices and strategic decisions depend largely on the ideas, beliefs and competence of these key decision-makers. This results in an extraordinarily rapid decision-making process, as regards both formulation and implementation.

To understand the second factor, we must consider the choices of competitive position. SMEs tend to operate within an environment of restricted competition, in the sense that their development does not follow the multiple dimensions which define the competitive environment in which the firms may be operating.<sup>2</sup>

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<sup>2</sup> Porter, 1987, identifies four possible dimensions to define the competitive environment: the segment environment, which refers to the variety of products produced and buyers served; the geographical environment, which refers to the total of the areas or countries in which a firm competes; the industry environment, which refers to the total of the correlated industries in which the firm operates; and the degree of integration, which refers to the degree to which activities are carried out within the firm or by independent firms.

For example: firms which serve an extended range of customers or geographical areas tend not to be involved in correlated industries; those which develop the vertical level of integration limit their growth along other dimensions of the competitive environment; those which are open to correlated industries concentrate on specific categories of clients.

To summarise, the entrepreneurial formulae of SMEs are set up in such a way that “development along the multiple dimensions which define the potential competitive environment is not possible.” (Corbetta, 1993).

It must be pointed out that limiting competitive involvement does not simplify the strategic approach. In fact, many SMEs have set up entrepreneurial formulae which require a sophisticated level of strategic and operative managerial ability.

The third and final factor arises from the fact that, in SMEs, there is often an overlap between firm and family, with particular reference to families of owners of company capital. This overlap can be of varying degrees: it may be total (in the sense that the human and capital resources of the firm are supplied entirely by the owner family) or partial, where the firm has already exceeded the minimum dimensions, and the owner family is limited to providing capital, entrepreneurial and managerial resources.

What is important is that precisely this overlap is one of the elements which most influences, both negatively and positively, the structure and working mechanisms of the firm as well as its path of development (Corbetta, 1995).

There is no doubt that the SMEs, which operate within the previously described competitive contexts and are characterised by the structural factors which have been outlined, are put under pressure by important and impelling challenges of change. These are challenges which derive from the evolution of competitive contexts. Just consider the processes of concentration in operation within numerous historically fragmented industries and the related shake-out phenomenon (Sinatra, 1989). Consider also the dynamics of the internationalisation of many industries/markets, which provoke radical changes in the competitive profile and in the rules of the competitive game. Consider, moreover, the evolution of international regulations, the changes in systems of distribution, the innovations on the technological front, the problems of information management, and so on.

These are all challenges which severely test the prospective capacity of the working mechanisms of the SMEs, highlighting the structural limits (the “dependence” of the entrepreneur, which ends up compromising the continuity of the firm; the lack of financial resources caused by the “closed” nature of the family business model, which prevents appropriate courses of growth; and so on).

Within this setting, bearing in mind the importance and urgency of the strategic challenges that many SMEs have to face, this paper aims to verify the impact of regulatory interventions in industries which are typically occupied by small and medium-sized enterprises.

In particular, this study has investigated the validity and consistency of the following hypotheses:

1. in fragmented industries, characterised by the presence of numerous small firms, which are often very “individualistic” and tend not to be geared towards co-operative behaviour, pressure groups tend to have a marginal role;
2. in such industries, regulatory interventions have an important impact on the structure of the industry, influencing the number of firms and modifying their strategic and structural profile;
3. the single firm operating within a fragmented industry therefore seems to be extremely vulnerable to regulatory interventions which impose profound and radical changes in the productive and organisational structure, both in terms of investments and in terms of the acquisition of specific knowledge and abilities.

In order to verify the above hypotheses, we made reference to a particular industry, the tannery industry, and to the Merli no.129 law of 10/05/1976. The depth of analysis required has lead us to concentrate our research on a specific industry which can be investigated with an acceptable degree of detail.

Moreover, we have chosen an industry which is representative of SMEs and have chosen to analyse the impact on this industry of a legislative intervention which was important for its development, as well as the role of pressure groups in the process.



## **2. The Italian Tannery Industry**

### **2.1. Structural evolution of the tannery industry.**

The Italian tannery industry is an example of a fragmented industry dominated by aggregates of small firms. The choice of the tannery industry as the object of our analysis has been driven by two considerations:

- having chosen to focus the analysis on a single industry, the tannery industry is a fragmented industry which has experienced relevant changes in recent years due to the impact of legislation.
- enterprises in the tannery industry share many of the structural features characterising Italian small and medium-sized enterprises: limited number of share-holders, often belonging to the same family which is heavily involved in the company's management; simple and lean organisational structures with unsophisticated operating systems; rapid and centralised decision-making processes; limited articulation of activities performed; limited product range and high service orientation. A lot of them have been founded by individual entrepreneurs - with little formal education and technical background - who left the company in which they were employed to set up an independent venture. In many cases, the new companies were spin-offs of the existing ones.

In 1995, the tannery industry generated 10,200 billion Lire of total turnover, 48.5% of which was exported. The Italian tannery industry accounts for 65% of the total tannery production of the E.U. It consists of about 2,400 companies, employing approximately 25,000 people. Almost all companies are located in specific geographic areas (clusters): Arzignano in the north-east of Italy, S.Croce sull'Arno in central Italy, Solofra in Southern Italy and Turbigo in the Milan area.

The Italian tannery industry has been traditionally very important for the Italian economy as a whole and for the specific geographic areas in which companies are located. In recent years, some trends occurring at the international level have stressed some of the structural

weaknesses of Italian players, forcing them to heavily modify their strategies. In fact, in the last fifteen years, the following issues have become relevant in the Italian tannery industry:

- the new environmental laws;
- the rivalry of new low-cost producers mainly located in the south-east Pacific area;
- the crisis of the shoe industry, which is by far the largest buyer accounting for 50% of total tannery production;
- the increasing substitution of bovine leather for sheep and goat skins.

These forces have induced severe changes in the structure of the Italian tannery industry, pushing enterprises out of the industry or forcing them to restructure and invest into new equipment. The whole process led to the displacement of a large number of firms and to a severe reduction of the work-force: the total number of firms decreased from 33,657 in 1981 to 25,000 in 1995. The effects of these forces were not only at industry level, but also at the level of the single firms, which were forced to implement radical changes in their strategy and structure.

With reference to the research hypotheses, it is the aim of the present paper to observe the net impact of the environmental laws on the competitiveness of the Italian firms operating in the tannery industry. Consistently with the hypotheses, the analysis will focus on understanding:

- the role of pressure groups;
- the impact of regulatory intervention in the structure of the industry;
- the impact of these interventions in the strategy and the structure of the single firms.

These topics will be analysed in the context of the issuing of a specific law, the “Legge Merli” no.319 of 10/05/1976 and subsequent alterations.

This law forced enterprises operating in the tannery industry to control the amount of wastewater produced from the tanning process and, in many cases, to commit to substantial investments (in times when the threat of low-cost producers was arising and the interest rates on bank loans were as high as 28%) in order to comply with this severe regulation.

In order to understand which particular interventions were required by law, we will briefly describe the characteristics of the waste produced by the tanning process and the purification process.

## **2.2 Environmental problems in the tannery industry**

### **2.2.1 Characteristics of the waste produced by the tanning process**

First of all, we must take into account, the fact that the waste produced by the tanning process is highly pollutant due both to the presence of organic residue from the process of leather processing and very different chemicals, used in the production process. Moreover, the content of waste varies enormously at different times of the day, depending on the different operations carried out.

The most important factors which determine the pollution content of the waste are:

1. *The system of conservation of raw hides.* The tannery industry works with raw hides which have undergone processes to ensure their conservation, generally drying and salting.
2. *The type of hide processed.* For some types of oily skins, such as sheepskin, the process of liming is not sufficient to completely eliminate fats. Therefore, it is necessary to make use of various solvents which can then be found in the discharge of water.
3. *The type of tanning.* In comparison to other elements, chrome tanning is the most polluting and creates the most difficulties for purification.
4. *The type of chemical substances used for finishing off the hides.* These depend on both the physical characteristics which we wish the final product to have, and the use which will be made of the leather (shoe manufacturing, leather goods, articles of clothing, etc.).

The important primary parameters for controlling the tannery waste are: pH, raw materials, sedimentary materials, materials in suspension, B.O.D. (Biological Oxygen Demand), C.O.D. (Chemical Oxygen Demand), toxic metals (chrome), sulphides and chlorides.

### **2.2.2 Purification process of tannery waste**

From a technical point of view, the purification process (described below in a simplistic and schematic manner) of industrial waters (and therefore of tannery waste), has three phases:

1. Preliminary treatment phase: the aim of this phase is to eliminate the “suspended solids” (insoluble raw parts) in the water, which derive principally from the leather purification process. It is carried out by passing the waste through one or more filters which separate materials with diameters of more than a few millimetres. In some cases a chrome recuperation process is carried out along with the preliminary treatment. This consists essentially of three phases: collection, precipitation, and filtration of chrome residue.
2. Chemico-physical phase: the object of this phase is to eliminate part of the chemical substances used during the production process, which are not completely absorbed by the processed hides. After being mixed to achieve a uniform composition, the waste is treated with particular chemical reagents (called flocculating agents) which absorb the chemical substances and provoke flaky precipitates which are deposited on the bottom of the tanks creating chemical sediments of the purification process.
3. Biological phase: in this process, organic substances in the waters are treated with micro-organisms which biodegrade them, transforming them into less complex substances which are emitted partly in the form of sediment and partly in the form of gas.

The water treatment process results in the production of sediments which have different characteristics depending on the phase of purification from which they result.

The sediment must be treated in such a way that they are eliminated without harming the environment. The main objectives of these treatments are the reduction of the volume and the stabilisation of the organic waste substance. Tannery firms may carry out one or more phases of the purification process within the firm itself.

There are, substantially, three types of intervention:

Firms located within a tannery district carry out internally only the preliminary treatment sending the obtained waste to a consortium purification plant (whose industrial load is 95% tannery waste).

Firms located outside this district have two alternatives: a) to carry out the preliminary treatment and chemical-physical phases internally, sending the obtained waste to a civil purification plant whose industrial load has an extremely reduced content of tannery waste, b) to obtain an independent purifier which carries out all three of the phases described above and dump the waste either in the sewerage system or directly into lakes and rivers.

As regards the treatment of sediments, depending on the level of purification carried out internally, the tannery firms can send them either directly to a consortium purification plant (in the case of simple preliminary treatment of the waste) which will see to successive treatments, or treat them (even if only partially) and send them directly to a type 2B<sup>3</sup> dump (as indicated by the “comitato interministeriale”, article 5 of the D.P.R. 915/82).

### **3. The fundamental stages of the legislative procedure**

The fundamental stages of the formation of Italian legislation on water protection and waste control can be summarised as follows:

before the Merli law (no 319 of 10/05/1976) the protection of water itself was not considered to be important. The legislation was, in fact, concerned with dangers or damage which the uncontrolled flow of water might cause, its quality and healthiness when destined for human

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<sup>3</sup> “These are storage plants where special, toxic, and harmful waste can be disposed of or treated, provided they do not contain substances belonging to groups...”, For a complete definition of such waste see article 4.2.3.2. of the “Delibera del Comitato interministeriale” of 27<sup>th</sup> July, 1984, which provides for “.Provision of the first application of article 4 of the D.P.R. , 10<sup>th</sup> September 1982, concerning the elimination of refuse”.

consumption, i.e. that there was a fair division between civil and industrial use, according to good administration.

The Merli law represented a cultural and institutional improvement given that, for the first time, there was a direct and general protection of all water including all types of waste: public, private, direct, indirect from civilian settlements and public sewers, above and below ground.

Such protection was to be carried out both by the use of prevalently penal sanctions and by the use of significative managerial techniques and control of water resources: the regional plans for water improvement. These plans form the basis of the national plan which are responsible for the organisation of the aqueduct, sewerage and purification public services.

One of the most critical matters for the industry was to fit the waste systems of each productive installation with a purification system which allowed waste to be dumped either directly into rivers and lakes, or into public sewers (thus leaving part of the treatment to municipal purification plants).

While the Merli law was being formed, some highly industrialised regions expressed concern about particularly cautious or high standards or limits of acceptability in the case of some effluents. In fact, as soon as the law was put into practice, the parameters of the tables were revealed to be inadequate as they placed too much importance on inorganic parameters, particularly heavy metals, placing little emphasis on organic micro-pollutants. The legislators therefore, given the evident difficulties in adapting to the parameters of the tables, allowed the regions to make exceptions to the parameters and to defer the dates for compliance.

From the point of view of the industrial associations directly involved in the new law, considering the complexity of its effects, - its more or less hard impact on all industries - it was considered necessary that Confindustria (the Italian manufacturers' association) should intervene to sensitise the government forces to the problems of the law itself. Thanks to this intervention, many tech-scientific evaluations were made showing, in many cases, the objective impossibility of respecting the limits of the Merli law.

In order to accommodate both the protests of the industrial world and the regions' requirements to protect water resources, the legislators intervened with new measures which partially revised some of the tabular limits. This was achieved through a complex and rigorous system of evaluations carried out in the institution headquarters, culminating in the deliberation

of the “Comitato interministeriale” (inter-ministerial board) for the protection of water against pollution of 30<sup>th</sup> December 1980. This set out instructions for the control of waste from public sewers and municipal installations which do not make use of public sewers. The deliberation revised some of the tabular limits for distinct regions; for example, the parameters which are most relevant for the tannery industry (chlorides and sulphates) were redefined differently for the Veneto area and the Tuscany area:

	Merli Law 1976	Inter-min. Com. 1980:Veneto	Inter-min. Com 1980:Tuscany
Chlorides	1200 ppm	1800 ppm	6000 ppm
Sulphates	1000 ppm	1700 ppm	1800 ppm

On the subject of water protection, the regulatory process did not stop at the Merli law and the board’s revisions of 1980. Numerous legislative measures have been introduced in the last fifteen years. Two of these have particular relevance.

Firstly, the law no. 36/94, or “Galli law”, effectuated the reform of water systems, sewers, and purification plants with the aims of guaranteeing an adequate service as regards quality and quantity; the effectuation of the “piano di bacino” (rational and environmentally tolerable use of the water resources); and encouraging the industry’s development and entrepreneurial management of the water services.

The critical point in these regulations lies in the “piano di bacino”, or rather in the territorial and demographic dimensioning of optimal limits by the Regions. The Regions have the task of eliminating the numerous cases where the water resources are managed on a time and materials basis by town councils, and to create consumption areas with a minimum of 500-600 inhabitants where the local bodies must find an organised form of unitary management of the water service. The “Ministero dei Lavori pubblici” and the local bodies must also establish an adequate price to ensure equal levels of management.

Secondly, the reform of control of waste water set out by the “Merli law” culminated in the no. 172 conversion law of 17<sup>th</sup> May 1995. This law was introduced after a long series of urgent

decrees which were due to the necessity to intervene on some critical points: to bring the rigid Italian regulations into line with the new EEC no. 271/91 directive on the treatment of urban waste water (a directive which, on the contrary to the Italian law, provides for intervention on procedures but does not fix emission limits); to definitively regulate the power of the regions to fix limits of acceptability for waste water different to the national ones; to modify the penal rules in force.

In reality, the no. 172/95 law did not assimilate the Competitiveness directive, but only had it formally recalled, thus limiting one of its main effects: the much longed for simplification of the tables of the “Merli law” by the elimination of the most restrictive parameters.

It must be noted that the aims of management and control of the water resources were not reached, despite and possibly because of the very many modifying interventions made since 1976, creating a body of superimposed rules with a lack of co-ordination and unclear as regards the actual jurisdiction of regions, provinces and town councils.

#### **4. Research Methodology**

The design of each study begins with the choice of a paradigm (Creswell, 1994). A paradigm is defined as a set of assumptions about the social world, how science should be conducted and what constitutes legitimate problems, solutions and criteria of proof (Kuhn, 1970)

Two paradigms are widely discussed in literature on research methods in social sciences: the quantitative and the qualitative paradigms.

##### **4.1 The quantitative paradigm.**

The quantitative paradigms is termed the traditional, the positivist, the experimental, or the empiricist paradigm (Creswell, 1994). It includes experiments, quasi-experiments and surveys ( cross-sectional and longitudinal). The ontological assumption of this research method is that reality exists apart from the researcher, it is objective and can be measured using a



questionnaire or an instrument. The researcher, therefore tries to eliminate bias, to select a representative sample from the population and to place great emphasis on the validity and reliability of results.

In quantitative studies “concepts, variables and hypotheses are chosen before the study and remain fixed throughout the study” (Cresswell, 1994). Quantitative studies are, therefore, based on existing theories and literature which are used deductively to derive research questions and hypotheses to be tested through surveys and experiments.

#### **4.2 The qualitative paradigm.**

The qualitative paradigm is termed the constructivist approach (Lincoln and Guba,1985), the interpretative approach (Smith, 1983), or the post-positivist or post-modern perspective (Quantz, 1992). It includes ethnographies, grounded theory, case studies and phenomenological studies. The ontological assumption is that reality is constructed by the individuals involved in the research situation. Morse (1991) states: “characteristics of a qualitative research problem are: (a) the concept is immature due to a conspicuous lack of theory and previous research; (b) a notion that the available theory may be inaccurate, inappropriate, incorrect, or biased; (c) a need exists to explore and describe the phenomena and to develop theory; or (d) the nature of the phenomenon may not be suited to quantitative measures.”

There is no clear procedure for data collection, analysis and reporting in qualitative research. There is also no clear idea about where to place and how to use the literature: the qualitative approach should use the literature inductively towards the end of the study, but it can also be found in the introduction of the study to “frame” the problem (Cresswell, 1994).

The characteristics of the present research seem unsuitable for a very large survey. As a matter of fact, the chosen paradigm is a mixed quantitative-qualitative one. The research has been based both on secondary and primary data.

#### **4.3 Data collection procedure.**

Secondary data have been provided by industry associations' reports and by published data and documents such as financial accounts, newspapers, market research.

A mixed qualitative-quantitative paradigm was selected to collect primary data: data was collected both through personal interviews with entrepreneurs and managers of industry associations (Unione Nazionale Industria Conciaria - Unic) and through the analysis of balance sheets of a sample of firms. The idea of qualitative research is to purposefully select informants (or documents or visual material) that will best answer the research question. No attempt is made to randomly select informants (Cresswell, 1994). In accordance with this principle, data for the present research has been collected through 28 in-person interviews with entrepreneurs or top managers of Italian tanneries as well as with officers of industry associations.

The results of the interviews have constantly been circulated within the work-group in order to help the hypotheses generation process and to drive the following research.

The major limitations associated with personal interviews are linked to the fact that they provide indirect information which is filtered through the views of the interviewees and that the presence of the interviewer may bias responses. Moreover, the process requires fieldwork, which involves the researcher physically going to interview people, strongly constraining the size of the sample. This obviously has a serious consequence on the possibility to generalise the results, but as mentioned by Merriam (1988), the intent of qualitative research is not to generalise findings, but to interpret events.

As far as quantitative research is concerned, the balance sheets of 191 Italian tanneries have been analysed (out of a total of about 2,600 enterprises) for the period 1986 - 1991 in order to evaluate the structural evolution of the tannery industry. The sample has been selected from the database of the "Centrale dei Bilanci" and it represents:

- total revenues (1991) for 2,524 billion lire accounting for about 38% of total industry revenues;
- average revenues of 13.2 billion lire per tannery compared with an industry average of 2.5 billion lire;

- total employment of 6, 846 people out of a total of 27,000 in the industry;
- average employment of 36 people per tannery compared with an industry average of about 10 employees per tannery;
- a total export of about 561 billion lire out of a total of 2,357 billion lire;

At first the balance sheets of the whole sample were analysed. Subsequently, the analysis was differentiated identifying four classes of companies on the basis of their revenues (1991); finally a comparative analysis of the balance sheets of companies operating in the two most important clusters (Arzignano and S.Croce) was completed.

With specific reference to the environmental issue, our aim was to understand the impact of the cost of purification on the competitiveness of the firms, distinguishing between those firms which make use of consortium purification plants, firms outside the district which make use of other purification plants and firms equipped with their own purification systems. Given the fact that it would be impossible to work out analytical statistics about the cost of purification from the aforementioned balance sheets, the following methodology was used:

1. a questionnaire, designed to single out the direct and indirect components of the total cost of purification for the firms, was distributed to the tanneries;
2. since the cost of consortium purification plants strongly influenced the total cost of purification of the firms (both within the district and isolated), it was considered necessary to analyse the structure and costs of these consortium purification plants (four were analysed in Tuscany and Veneto). The aim of this was to determine any potential differences in prices;
3. finally, by summing the firms costs with costs enforced by the consortium plants, we evaluated the impact on competitive activity of the single firms (both within the districts and isolated) caused by water purification costs in the Tuscany and Veneto districts.

#### **4.4 Setting**

Interviews and balance sheet analysis were designed in order to cover the four Italian tannery clusters, with a special emphasis on the two most important ones (Arzignano and S.Croce).

## **5. The evidence**

In order to understand the complex impact which the water regulations had on the tanning industry, we must focus our attention on two different levels of analysis: the single firm and the industry as a whole.

### **5.1 The single firm**

The most relevant effects on single firms can be defined as follows:

- problems due to the uncertainty of the regulations.
- modifications in the policy and planning of long-term investments.
- increased load on the cost structure.
- difficulties in relations with administrative and juridical authorities.

#### **5.1.1 Problems due to regulations uncertainty**

The high levels of regulatory uncertainty led entrepreneurs to turn to the various administrative bodies (the environmental offices of town councils, provinces and regions). on many occasions in order to find their way out of the maze of procedures required to obtain waste authorisation and, above all, to understand which technical interventions were requested. In theory, a new professional figure would have been required to deal with both legal and technical matters concerning the protection of the environment. Obviously, this would have led to further costs. In most cases, therefore, the entrepreneurs or the technical directors of the establishments took on these problems themselves, dedicating their own time to this task and thus leaving less time for their ordinary activities.

The choices of management and treatment of waste depended largely on whether or not the firms were part of a tannery district.

In the four areas (Campania, Lombardy, Tuscany, Veneto) the tannery firms created purification associations. These associations allowed the division of purification costs among the firms of the district by imposing prices on the quantity and quality of waste sent to the purification plant.

Going back to the process of purification described earlier, our analysis shows that all of the firms carry out the preliminary treatment stage internally. In fact, they are equipped with filters, sedimentation tanks, pumps and a system to collect sediment from the filters. Almost all of the tanneries situated within a district, after the preliminary stage, send the waste water to a consortium purification plant, which carries out the subsequent phases of purification. As regards the filter sediment (i.e. the sediment produced during the first stage of the process), there are some differences between the districts: while in Veneto and Lombardy it is collected by the consortium plants, in Tuscany, the firms deal with the elimination of this sediment themselves (equivalent to solid urban waste), together with other tannery waste. The Tuscany area is, moreover, equipped with a centralised system for the collection of chrome and all firms must collect any chrome residue (chrome is not collected in the other areas).

The firms outside the district, which send their waste to a municipal purification plant also carry out the chemical-physical treatment and some are equipped with chrome collection systems.

The sediment which arises from this stage of purification, classified as special, non-toxic, harmless waste, is sent directly to a type 2B dump.

Firms equipped with an independent purification system nevertheless dump their waste in sewers and the water is therefore also filtered by a municipal purification plant. Even sediment deriving from the completed process is sent to a type 2B dump. In some cases the firms are equipped with a sediment dryer so as to reduce its volume simplifying its storage and elimination.

Due to the fact that single firms were required to equip themselves with the systems described above, they were forced to modify their own investment choices.

### **5.1.2 Modifications in the policy and planning of long-term investments**

The long term planning of investments had also to take into consideration the purification systems, leaving fewer financial resources for interventions aimed at modification and innovation of the production process.

There were many delays in the plan to substitute obsolete systems and thus, interventions aimed at reducing production costs were not only delayed but also made useless by the introduction of a new cost, the cost of purification.

### **5.1.3 Increased load on the cost structure**

The increased load on the cost structure was clearly highlighted by our research. The results of the analysis of balance sheets, which reflect the higher costs of the tannery firms due to the duty of environmental protection but also to the competition of firms from emerging countries and to the difficulties caused by the shoe industry crisis, show a consistent reduction in income and a worsening of the financial situation. This was also due to the investments necessary under the new regulations.<sup>4</sup> The more specific empirical analysis of the impact of the environmental regulation on firms allowed us to quantify specifically the costs of purification which the firms must pay (the analytical data of eight of the firms interviewed can be seen in appendix 2). The results show that:

- in all of the cases examined purification costs represent an important part of overall cost component. In fact, we are dealing with an industry of low added value when even a few percentage points (on total sales) can lead the company from financial gain to loss;

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<sup>4</sup> In the period 1986-1991 the tannery firms show :

- a consistent reduction in income in terms of percentage of proceeds.
- a progressive increase in the financial burden on net proceeds from 1987 until 1991.
- the consequent decrease in the competence income of the exercise, until its complete cancellation in 1991.

- we are dealing with a managerial area where there is a lack of solid know-how and which suffers from factors (geographical and political) outside the firms' control. This explains the heterogeneity of the choices and policies adopted by the various public administrations and firms and explains the variations in performance of the firms themselves. In particular:

- 1) the Veneto firms outside the district have total purification costs which are 40% higher than the costs of those firms within the district;
- 2) although the Veneto firms outside the district have similar total costs per cubic meter, there are many relevant differences in how these costs are broken down. In particular, for some firms, internal purification and dumping costs are respectively 30% and 80% less than for other firms. However, these lower costs are balanced out by the extremely high costs of purification plants. From the qualitative analysis, we can assume that the low costs of internal purification for some firms goes hand in hand with a low quality of waste. This low quality of waste results in higher costs at the purification plant. Note that the cost system of purification plants depends on a formula which is more or less complicated depending on the situation: as well as a fixed cost there is an added amount which depends on the quality of the water discharged by the firms and which is evaluated by the use of some key indices (the most important of which are: suspended solids, chlorides, sulphates, COD, chrome and tenso-actives).
- 3) Of the cost differences between Veneto district firms, about 20% is essentially attributable to cost differences between the purification plants used. However, we can also suppose that the low cost of internal purification for some firms is due to the effects of scale economics, found, as we will see, also in the case of the Tuscany area.
- 4) Tuscany firms suffer from the elevated costs of consortium purification plants. Moreover, there are notable differences in costs of internal purification probably due to different levels of internal efficiency and to scale effects (as described above), as well as significant differences in costs of sediment dumping (the sediment deriving from the preliminary treatment stage, instead of being sent to the consortium purification plant, as happens in Veneto, is sent directly to the dump along with other tannery waste).

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• the drop in the net income balance.

5) Veneto firms with independent purification systems have higher costs of those firms within the district and lower costs than the Tuscany consortium firms.

At this point, it may be interesting to observe incidence of purification costs on the total sales of the firms analysed.

It can be clearly observed that the incidence of purification costs on the total sales wavers from 1.5% to 3% (take the example of the sample examined in appendix 2). This is in line with a survey carried out by Unic in 1992, which identifies a variation of 1.5% to 5% with an average of 2.5%. The following table also shows how Tuscany firms suffer higher costs than those within the Veneto district while having comparable costs to those Veneto firms outside the district (table 1).

**TABLE 1: INCIDENCE OF PURIFICATION COSTS ON TOTAL SALES**

	VENETO	TUSCANY
<b>3.0%</b>	∄	⊙
<b>2.5%</b>		⊙
<b>2.0%</b>	⊕	
<b>1.5%</b>	⊕	

Key: ∄ = Veneto firm outside the district

⊕ = Veneto district firms

⊙ = Tuscany district firms

**5.1.4 Difficulties in relations with administrative and juridical authorities**



Further problems in the management of environmental problems were caused by the difficult relations with the administrative and juridical authorities.

As a result of the lack of clarity of the internal regulations, the firms within the tannery industry were subject to the pressure of investigations and juridical actions sometimes resulting in heavy sanctions. The judges sometimes go as far as considering the adjustments to the indices of acceptability made by the regions to be unacceptable and insisting that they respect the tabular limits laid down by the “Merli law”. Moreover, decrees and administrative injunctions have resulted in solutions being negotiated between enterprises and institutions. Such relations with the public administration have, in fact caused a complex situation and uncertainty in the management of tannery firms: decisions are often influenced by external bodies which have the power to intervene severely in the management (consider the block of operations in tanneries, and the consequent failure to dispatch orders and the loss of clients).

A striking example took place in the management of the conflict situation of the Sarno valley, following the ordinance of the mayor of Solofra” no.49 of April 4<sup>th</sup> 1995 for “immediate intervention to confront the socio-economic and environmental emergency in the river Sarno basin.” In this situation the intervention of the national union of the tannery industry (Unic) was very important. Unic collaborated actively with its own regional section in order to fix the parameters as equally as possible both for the tannery enterprises and for the requirements expressed by the mayor’s ordinance.

## **5.2 The industry**

The impact of water protection regulations on the whole tannery industry was equally important and, in some cases, a decisive factor in shaping the tannery industry’s structure.

The most relevant effects are:

- the closure of some isolated firms;
- the transfer of productive processes to geographical zones with less environmental control;
- the process of concentration within the districts;

- differences in competitiveness between firms in the Veneto and Tuscany areas;
- differences in competitiveness between Italian firms and European firms.

### 5.2.1 The closure of some isolated firms

As shown previously, with the introduction of the “Merli law”, the environmental problem was taken on by the Italian industry, creating purification consortiums in the four districts involving a total investment of over 900 billion lire.

The possibility of constructing consortium purification plants within the districts played a fundamental role in the industry’s survival. Many cases of closure of isolated firms were registered including, for example, Piedmont tanneries which found themselves compelled to construct complete purification plants without the possibility of turning to consortium purification plants. In fact, the Piedmont firms, which were situated more sparsely than the firms of the other four districts, had difficulty reaching the critical production mass required to justify independent purification systems.

The decline in the Piedmont tannery industry which was, historically, one of the first and most important in Italy, can be attributed precisely to this difficulty in providing independent purification plants: the firms which could not generate a sufficient volume to justify this investment were forced out of the industry (table 2).

**TABLE 2: ITALIAN TANNERY INDUSTRY - NUMBER OF FIRMS BY REGION**

	1951	1881	1991
<b>PIEDMONT</b>	128	113	89
<b>LOMBARDY</b>	196	465	267
<b>VENETO</b>	90	667	729
<b>TUSCANY</b>	345	1109	960
<b>CAMPANIA</b>	212	495	482

In parallel, the number of firms in the Veneto, Tuscany and Campania districts grew considerably, as if to fill the space left by the disappearance of the Piedmont firms (the drastic change in the Lombardy district can, on the other hand, be attributed to crisis in the sheep- and goatskin market). Therefore, the possibility to build a consortium purification plant allows the reduction of single firms' investments in purification plants, thus reducing total purification costs and limiting their burden on total production costs.

### **5.2.2 The transfer of productive processes to geographical zones with less environmental control**

Another solution adopted to reduce total purification costs (as well as the cost of labour) was the transfer of part of the production process to geographical zones with less environmental control.

The majority of Italian tannery firms were forced to look for methods of restricting costs by eluding the environmental problem:

- the importation of half-worked (wet-blue) or half-finished (crust) skins instead of raw skins in order to reduce the processing of the skins to be carried out in Italy and to avoid the most polluting stages of processing (the so-called "riviera" operations). This initiative is favoured by the exportation policies of developing countries which tend to limit the sale of raw skins preferring to make use of local labour.
- the creation of productive units in countries with low-cost labour. In fact, the importation of wet-blue and crust, while permitting a reduction in production costs, often does not result in an acceptable level of quality after the successive refinement stages. This is due to the technical underdevelopment of the tannery industry in developing countries as well as the poor selection of primary materials. However the creation of productive units run by Italians in these countries has the advantage of guaranteeing low labour costs and low purification costs without the disadvantages of lower quality processing (even though this has negative effects on the level of employment in our country, as shown above).

However, the creation of productive units abroad is possible only for larger firms which have the necessary financial resources and managerial skills. In reality, the Italian tannery industry is dominated by small and very small firms which do not often have the size which is necessary to take such measures as we have described.

### **5.2.3 The process of concentration within the districts**

In recent years, numerous concentration processes to create groups of firms, have been adopted within single districts.

On the one hand the number of firms was reduced by about 20%, falling from 2849 in 1981 to 2400 in 1995. On the other hand, new alliances, agreements and actual groups of firms were created within the districts.

After several attempts to increase the size through consortiums which, however, were found to be unstable and vulnerable to opportunistic behaviour, various groups with head firms were created, particularly in Veneto and Tuscany. These are groups whose aim is, on the one hand, to exploit synergy and to gain size without losing the typical flexibility of small firms, on the other, to absorb firms in difficult positions. The groups created in the tannery industry tend towards horizontal integration (i.e. they aim for a multi-business development “replicating the historical entrepreneurial formula with new market - product combinations and evaluating the tangible and intangible interrelations between different business areas” (Visconti, 1996)) rather than vertical integration which is often disastrous due to the lack of adequate technical, commercial or planning ability or to disagreement and conflicts between those involved (Visconti, 1996). The group logic enables firms to (Visconti, 1996):

- satisfy a wide range of clients’ needs thanks to the variety of products on offer.
- rationalise and optimise the management of the commercial network.
- develop important promotional activity
- create an information flow of wider spectrum, thus allowing the planning of production to be more aimed at the requests of the market.
- create a greater contractual power in suppliers
- realise co-operation at the research and development levels.
- obtain greater productive flexibility thanks to the transfer of infra-groups of personnel as required.

The quantitative analysis for dimensional classes on the sample of balance sheets of 191 firms clearly showed that the larger firms (with a turnover of more than 25 billion lire in 1991) increased their proceeds much more than the average of the firms in the sample (which are larger than the average size of firms in the industry) and also increased their numbers of employees. However, the smaller firms (with a turnover of less than 10 billion lire), decreased both their proceeds and number of employees. Moreover, the smaller firms' profit performances (as a percentage of turnover) worsened more than it was the case for larger firms.

#### **5.2.4 Differences in competitiveness between firms in the Veneto and Tuscany areas**

Another important effect of the environmental regulations was the difference in levels of competitiveness between firms within the Veneto district and firms within the Tuscany district. In fact, if we consider the various consortium purification plants, we discover that there are notable differences between regions. These differences can, in part, be attributed to: differences in regional regulations, differences in exceptions to the rules made by different regions in terms of the quality of water emitted from purification plants, different levels of efficiency in the management of dumps and incinerators, different levels of severity in the magistrate's control of dumps and purification plants and the in sanctioning of any failure to apply the appropriate tabular limits. All of the above is confirmed by some interesting data which can be found in appendix 1.

A striking example of this situation of unbalance is to be found in the present situation of the Tuscany industry.

In the Tuscany area, sediment elimination costs have, until now, represented about 50% of total purification costs, determining a high internal cost per cubic meter of water for industrial consumers. This is largely due to the growing difficulties (caused by strong opposition from the community and environmental movements) which the Public Administration face in locating suitable sites for the control of dumps. Consider the plan for the last dump opened in the area. The original plan, which goes back to 1985, foresees a dump with a total capacity of about 5 million cubic meters costing 30 billion lire. Only after much difficulty and with

considerable delays did the authorisation arrive to construct for 350,000 cubic meters, still at the price of 30 billion lire. This brought a huge increase in costs.

As regards the quality of discharged water, the Tuscany region established limits for the concentration of chlorides and sulphates which were higher than table “A”, law 319/76. Such regional regulations do not, however, appear to guarantee immunity from the magistrates’ power. In fact, the magistrates tend to consider the plants to be centralised, with prevalently industrial dumps which are therefore subject to the limits of table “A”. The regional exceptions are, therefore, not considered to be valid.

As a result, the requirement to respect more rigid qualitative parameters than the other regions resulted in much higher managerial costs for consortium purification plants.

These costs are automatically passed on to customer firms resulting in an increase in total purification costs for Tuscan firms.

#### **5.2.5 Differences in competitiveness between Italian firms and European firms.**

Finally, the difference in competitiveness between Italian and other European firms results from the non introduction of the Community guidelines which places the Italian tannery industry in an inferior position with respect to other European countries. Consider, for example, guideline no. 271/91 concerning the treatment of urban waste water which has not yet been introduced in Italy. Chlorides and sulphates are not considered to be polluting or harmful substances. These omissions are much more permissive than current Italian law. Italy’s failure to adapt to European regulations results in a distortion of the market and of international competition in the leather industry to the disadvantage of the Italian industry, which continues to be subject to higher purification costs than its European competitors

## **6. Some conclusions**

With reference to the research hypotheses, this study allows us to draw the following conclusions.

1. The first hypothesis, concerning the marginal role of pressure groups on fragmented industries, appears to have been confirmed.

When the “Merli law” was brought in, Unic was already operating, though decisions were still being made at a local level by local Chambers of Commerce and Industrial Associations. However, these bodies tend to represent the whole spectrum of industries present in the area and are not likely to intervene forcefully in specific problems. The environmental problem was largely treated as a local issue. Thus, the initiatives taken to protect the firms within the sector were fragmentary, incoherent and brought no concrete results.

After the introduction of the “Merli law”, a “consciousness” began to form within the sector followed by its adoption of an official position on environmental matters. This happened when the experimental station for leather and tannery goods of Naples took part in a commission set up by the Minister for the environment (decree of 6<sup>th</sup> March 1993). It was revealed that a reduction in pollution caused by tanneries in certain territories could only be achieved by public intervention aimed at reserving the use of urban dumps.

The lack of unity between those involved in the sector brought about a situation where there were different regional policies in terms of environmental regulations and management of the exceptions to the national law. These policies, brought about by the extended and repeated deliberations to reach acceptability limits for purification plants, seem to have provoked relevant differences in management costs of purification plants and, consequently, in the purification costs of the firms. These differences can not be justified by the different environmental protection requirements of the different regions, and are, therefore, not acceptable from the point of view of anti-trust law.

2. The second hypothesis, on the relevance of the impact of regulatory interventions on the structure of the fragmented industry, appears to have been confirmed by our research. As shown above, the introduction of the “Merli law” resulted in a complete revolution within the tannery industry provoking the selection of the weakest firms (those isolated in primis), the transfer of production processes to other geographic areas (South-east Asia and Eastern Europe) with the consequent reduction in employment levels.

the concentration of firms, and the lower competitive levels of some regions and of the “Italian system” with respect to Its European partners.

3. At the level of single firms, as shown above, the introduction of this law had relevant effects on both their strategic and structural profiles. The new regulations strongly influenced the methods of management and organisation of the tannery industry involving managerial problems, an increased burden on the cost structure, difficulties in relations with the administrative and juridical authorities. In many cases quasi-artisan firms were forced to transform into managerial, industrial firms. The firms which managed to carry out this transformation survived, and in some cases, increased in size. Those firms which did not manage to transform were forced out of the industry or to occupy an increasingly marginal role.

From the research carried out, the weak position of small and medium-sized enterprises is evident in the face of legislative action which can have disruptive effects on the structure of the industry. In the case examined, such effects were multiplied due to the lack of co-ordination, partly from the public administration institutions (state, regions, town councils) and partly from the firms within the industry, who did nothing to impose their interests on a national scale, but simply turned to local associations.

It is evident that, in order to prevent such a disruptive influence on the competitive system, the competencies and responsibilities of the public administration bodies must be reorganised and there must be a co-ordinated representation of interests by the various associations involved on behalf of the firms.

In industries which are strongly dependant on other sectors (as in the case of tannery), it would also be useful to approach problems considering all of the steps of the production process rather than looking only at the single industry. This would allow, on the one hand, a wider legislative perspective and, on the other, a greater bargaining power of firms in the interested industries.



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### APPENDIX 1: COMPARISON OF THE DIFFERENT COST STRUCTURES OF PURIFICATION PLANTS

	TUSCANY		LOMBARDY		VENETO		VENETO	
	I PURIFICATION PLANT (Final1993)		II PURIFICATION PLANT (Final1993)		III PURIFICATION PLANT (Final1993)		IV PURIFICATION PLANT (Budget 1995)	
	Lit./mc water treated	%	Lit./mc water treated	%	Lit./mc water treated	%	Lit./mc water treated	%
Consumption of chemical products	3.076	16,7	454	14,5	/	/	/	/
Sediment elimination	6.450	35	103	3,3	207	9	472	14,8
Electric energy	1.253	6,8	410	13,1	/	/	/	/
Other industrial costs	682	3,7	550	17,6	485	21,1	141	4,4
Purification plant management costs	/	/	/	/	794	34,5	2.019	63,3
<b>INDUSTRIAL COSTS</b>	<b>11.461</b>	<b>62,2</b>	<b>1.517</b>	<b>48,5</b>	<b>1.486</b>	<b>64,6</b>	<b>2.632</b>	<b>82,5</b>
PERSONNEL COSTS	2.930	15,9	920	29,4	76	3,3	268	8,4
OTHER COSTS	4.039	21,9	691	22,1	738	32,1	290	9,1
<b>TOTAL COSTS</b>	<b>18.430</b>	<b>100</b>	<b>3.128</b>	<b>100</b>	<b>2.300</b>	<b>100</b>	<b>3.190</b>	<b>100</b>
VOLUMES TREATED	969.026 mc		850.000 mc		3.600.000 mc		8.460.000 mc	

**APPENDIX 2: COMPARISON OF PURIFICATION COSTS FOR EIGHT OF THE TANNERY FIRMS INTERVIEWED (Lit./ mc)**

AREA	FINAL PRODUCTS	VOLUMES	FIRM PURIFICATION TREATMENT	CUBIC METRES OF WATER	WASTE COLLECTION BODIES	FIRM PURIFICATION COST	COST OF SEDIMENT DUMPING	COST OF PURIFICATION SYSTEM	TOTAL PURIFICATION COST
① Veneto (outside district)	Wetblue	7.500 tons	Chemical-physical treatment and chrome collection	170.000	Municipal consortium	2.968	294	4.000	<b>7.262</b>
② Veneto (outside district)	Finished hides	1 - 3 mill. of square feet	Chemical-physical treatment and chrome collection	66.423	Municipal consortium	4.310	1.865	1.063	<b>7.238</b>
③ Veneto (district)	Finished hides	15 - 25 mill. of square feet	Preliminary treatment (sediment and filter)	196.520	Consortium III	629	-	3.374	<b>4.003</b>
④ Veneto (district)	Finished hides	1 - 3 mill. of square feet	Preliminary treatment (sediment and filter)	50.000	Consortium IV	670	-	4.120	<b>4.790</b>
⑤ Toscana (district)	Leather	1.816.435 Kg.	Preliminary treatment (sediment and filter)	18.000	Consortium I	2.528	5.890	20.458	<b>28.876</b>
⑥ Toscana (district)	Leather	6.200.000 Kg.	Preliminary treatment (sediment and filter)	119.000	Consortium I	613	933	20.084	<b>21.630</b>
⑦ Toscana (district)	Finished hides	3 - 5 mill. of square feet	Preliminary treatment (sediment and filter)	35.876	Tannery consortium	1.945	-	8.000	<b>9.945</b>
⑧ Lombardia (district)	Finished hides	1 - 3 mill. of square feet	Indipendent purification plants	28.418	Municipal consortium	6.941	1.570	224	<b>8.735</b>