The Italian gas retail market: a cluster analysis based on performance indexes

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Abstract

The liberalization of the European natural gas sector radically changed the structure of the competitive environment which in turn forced companies to make changes in order to stay in the market. In Italy the liberalization process also had a strong impact on the strategies adopted by the companies involved. This situation instigated various studies of the changing nature of performance through the analysis of company profits and financial positions throughout the first three years following the market liberalization.

This paper focuses on the changes in performance in the natural gas retail market by analyzing the profit and financial position of the companies concerned over the first three years following the market liberalization. The balance sheets of 105 Italian companies in this sector are analysed, after which a cluster analysis is performed employing the most significant performance indexes. The companies are then analysed within each cluster with respect to age, size, geographical location. The analysis is further developed by studying the strategies in terms of business diversification adopted by the operators in response to the radically altered competitive environment.

The results of our analysis show that the majority of companies attained a high level of performance, although this positive outcome was mitigated by the gradual decrease of the average values of performance indicators during the period concerned. There appear to be several reasons for this decline: the performance observed during the three-year period was strongly influenced by regulatory factors; increased competition resulted in reduced profit margins; and exceptionally mild climatic conditions over this period significantly decreased the volume of gas sales.

Finally, it should be noted that the best performance was achieved by companies based in northern Italy which were members of longstanding groups and were single rather than multi-business companies. This result contrasts with the failure of the business diversification strategy, which was widely adopted by enterprises from the utility sectors following the liberalization process.

Keywords: Italian gas market liberalization, performance indexes, cluster analysis.
1 Introduction

The fact that natural gas is relatively environmentally compatible and that its use in the thermoelectric sector guarantees a high level of consumption resulted in the European Community deciding to regulate the natural gas market. It was in this regard that on June 22 1998 the European Parliament and the European Council, by means of Directive 98/30/CE [1], began the liberalization of the European natural gas market, which had previously been characterised by vertical integration and public monopoly [2]. This process ended in 2003 with the Gas Directive 2003/55/EC [3], which is the European gas legislation in force at present.

The European Gas Directive was transposed into Italian law by Legislative Decree n.164/2000, known as the Letta Decree [4], which laid down important guidelines concerning the definition of the eligible customers, competition, and conditions of reciprocity. The most significant change brought about by this legislation was that the Letta Decree imposed the unbundling of the distribution companies from those in retail, and thus allowed the latter to operate in a more competitive market.

Extensive research has previously been conducted in order to analyse one specific aspect of performance in the natural gas market, such as the efficiency or the productivity. Examples of such studies are: Aivazian et al. [5], Jamasb et al. [6], Herbert and Kreil [7], and Sickles and Streitwieser [8] who explore the natural gas industry in the USA; Price and Weyman-Jones [9] who study the United Kingdom's natural gas distribution sector; and Lee et al. [10] who estimate the total factor productivity based on an international comparison. To date, very little research regarding the natural gas market has been carried out in relation to the simultaneous effects of the various aspects of performance, such as financial, liquidity, and profitability indicators. An evaluation of the gas sector with regard to economic performance is carried out by Kim et al. [11], although their work concentrates on the transportation segment. In connection with the Italian natural gas market, a performance analysis is carried out by Erbetta and Fraquelli [12] who focus on the distribution segment.

In contrast, the present paper concentrates on the retail segment which, having undergone major transformations in recent years, is the only sector to be opened to free market competition and is therefore deemed more suitable for a comparative analysis of competitiveness. In our study the performance of the gas retail companies are evaluated in relation to the companies’ age, size, geographical location and degree of business diversification.

The methodology employed here is divided into two consecutive stages:

1. The evaluation of the main financial, liquidity and profitability indicators;
2. The performance of a cluster analysis utilising the indicators from stage 1.

The latter allows the sample to be subdivided into homogeneous groups which are then analysed in relation to the main characteristics of the company.

The aim of the analysis is to answer the following research questions:
Can the Italian natural gas retailers be grouped into clusters characterized by internal homogeneity and external heterogeneity?

Can the clusters be formed by simultaneously considering financial, profitability and liquidity indicators?

If so, do these clusters indicate some market features with respect to the following company characteristics: geographical position, age, size and business diversification?

This research paper is organized as follows: Section 2 provides a description of the data set; Section 3 describes the cluster analysis; Section 4 presents an analysis of the results with respect to the following characteristics of the companies: size, geographical position, age and business diversification; Section 5 concludes.

2 Data set

The data set, supplied by the Unione Italiana delle Camere di Commercio (Italian Union of the Chambers of Commerce), is comprised of data relating to 105 companies operating in Italy, including the balance sheet for each company.

The present analysis refers to the three year period from January 2004 to December 2006. Most of the retail companies in the sample were formed in 2003 and were consequently still in the start-up phase during the three year period considered here. Thus it was not possible to analyse historical data dating back prior to 2004.

On the 1st January 2006 there was a total of 414 companies authorised by the ‘Ministero delle Attività Produttive’ (Ministry of Productive Activities) to practise in the retail market. However, according to research undertaken by the Italian Regulatory Authority for Electricity and Gas (AEEG), only 194 of these companies appeared to be active. Data regarding the three year period considered here were available for 105 of the active companies. Therefore, these 105 companies became our sample representing a significant proportion of the total number of retail companies operating in Italy (approximately 54%).

As regards the geographical distribution, 63% of the companies are located in northern Italy, 24% in central Italy and the remaining 13% in southern Italy.

In relation to company size, the companies analysed have been divided into three groups according to their revenue: small, medium and large sized companies. Our sample is comprised of 48 small companies (45.7%), 33 medium companies (31.4%) and 24 large companies (22.9%).

Approximately 60.8% of the firms in the sample are members of longstanding business groups, while the remaining 39.2% is made up of newly-formed companies.

Finally, with regard to the choice of strategy, whether to diversify or to specialise, 81 firms (77%) are single-business companies (specialised), while 24 (23%) are multi-business (diversified).
3 Cluster analysis

In order to analyse company performance, cluster analysis is applied [13–16]. This analysis is intended to create groups which have the maximum cohesion internally and the maximum separation externally. Among the various clusterisation methods, the technique employed by Ward [17] was chosen as it generates a classification hierarchy while minimising the variance within each of the groups.

The cluster analysis is carried out using SPSS (Statistical Package for the Social Sciences): this allows subjects (the companies) to be grouped in relation to the probability of certain values being scored by a set of variables (grouping variables).

The grouping variables used in this study are the following profitability indicators: Return on Equity (ROE), Return on Investment (ROI), Return on Sale (ROS), and the following liquidity and financial indicators: Liquid Asset index (LA) and Leverage Ratio (LR). The liquid asset index shows the short-term debt-paying ability and it is determined by subtracting from current assets the current liabilities. The Leverage Ratio provides a view of the company overall debt situation and it is calculated by dividing net debt to equity. The above indicators have been chosen since they have a low level of inter-correlation.

Table 1 shows the value ranges chosen for the various performance indicators utilised in the cluster analysis.

<table>
<thead>
<tr>
<th>Range</th>
<th>Performance</th>
<th>ROI</th>
<th>ROE</th>
<th>ROS</th>
<th>LA</th>
<th>LR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Poor</td>
<td>x&lt;0</td>
<td>x&lt;0</td>
<td>x&lt;0</td>
<td>x&lt;=(-)500 000</td>
<td>x&gt;3</td>
</tr>
<tr>
<td>2</td>
<td>Mediocre</td>
<td>0&lt;=x&lt;8</td>
<td>0&lt;=x&lt;5</td>
<td>0&lt;=x&lt;6</td>
<td>(-) 500 000&lt;=x&lt;500 000</td>
<td>2&lt;x&lt;=3</td>
</tr>
<tr>
<td>3</td>
<td>Good</td>
<td>8&lt;=x&lt;10</td>
<td>5&lt;=x&lt;8</td>
<td>6&lt;=x&lt;8</td>
<td>500 000&lt;=x&lt;10 000 000</td>
<td>1.5&lt;x&lt;=2</td>
</tr>
<tr>
<td>4</td>
<td>Excellent</td>
<td>x&gt;=10</td>
<td>x&gt;=8</td>
<td>x&gt;=8</td>
<td>x&gt;=10 000 000</td>
<td>x&lt;=1.5</td>
</tr>
</tbody>
</table>

The statistical analysis is performed for each year of the three year period (2004-2006). The agglomerative hierarchical algorithm starts with n clusters, where n is the number of observations. The Euclidean distance between observations is calculated and the two closest points are merged into a single cluster. The process is repeated until all observations are included in one cluster.

Four clusters emerge from the statistical analysis (as seen in the 2006 resulting dendogram in figure 1) in which cluster I contains the companies with the worst performance and cluster IV those with the best results. The results of the Ward method are compared to those of a cluster solution produced by K-means method [19] which is shown to be similar confirming their validity.

A summary of the distribution of the clusters is shown in table 2 below. Most of the companies attain a high level of performance and are found in clusters III and IV throughout the three year period. However, this positive performance is attenuated by the progressive reduction in the average values of the indicators.
The decline may be attributed to various factors. Firstly, the economic trends recorded over the three year period are strongly influenced by the regulatory and tariff related aspects of the gas market, and secondly, the increase in competition results in reduced profit margins. Furthermore, the uncharacteristically mild climatic trends at the time significantly reduces the volume of sales.

On analysing table 2 it is interesting to note that the number of companies in cluster I diminishes over the three year period, indicating that a proportion of the
companies which initially perform poorly following liberalization, later improve thanks to economies of learning.

### 4 Analysis of the results

In this section we analyse the clusters obtained in relation to the following critical factors: age, size, geographical location and business diversification.

With regard to the age of the company, there are two company typologies: those which entered the market after the liberalization of the sector and those which stem from the unbundling of larger companies required by the Letta Decree which came into effect on 1 January 2002. Despite being a newly registered company, any firm of the latter typology should be considered a well established enterprise in terms of know-how inherited from the company group to which it belonged. In table 6, ‘new’ denotes the newly formed companies which entered the market after liberalization, whereas ‘established’ refers to those which originated from previously established groups.

On further examination of the sample in section 2, the mean of each cluster is compared to the overall mean for each of the critical factors. Company characteristics which have a greater than average concentration within each cluster are shown in table 3.

In 2004 the geographical position is seen to be related to the performance of the companies. There is a prevalence of firms from the north in the best cluster, whilst the worst cluster mainly consists of companies from the south.

With regard to company size, the smaller companies are found in both the first and third clusters, although the firms are mainly from the south in the first cluster whilst those in third cluster are prevalently from the north. Most of the medium sized companies are to be found in both cluster II and cluster IV, but again these clusters differ geographically. The medium sized companies found in cluster II are predominantly from central Italy, whereas those in cluster IV are chiefly from the north.

As regards the age of the companies, the newly formed firms are mainly distributed in the first three clusters while the best cluster is primarily composed of well established companies.

It may be noted that regarding business diversification, the clusters reflect the average distribution of the sample, with the exception of cluster II, which has a prevalence of single business companies.
In 2005 the composition of the clusters does not undergo any significant changes from the previous year, with the exception of the third cluster in which there is now a prevalence of smaller, established companies which are mainly from central Italy. A further difference with respect to 2004 is found in cluster IV, which is mostly formed of single business companies.

Regarding the distribution of the companies with respect to their age, it may be observed that there are newly formed companies in the worst clusters, whereas in the best clusters most of the firms belong to established groups. The group background and the ability to maintain stable relationships with clients and suppliers is therefore indicative of success.

<table>
<thead>
<tr>
<th>Year</th>
<th>Geographical Location</th>
<th>Company Size</th>
<th>Age of Company</th>
<th>Business Diversification</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>I Cluster South</td>
<td>small (from South)</td>
<td>new</td>
<td>average</td>
</tr>
<tr>
<td></td>
<td>II Cluster Central</td>
<td>medium</td>
<td>new</td>
<td>single</td>
</tr>
<tr>
<td></td>
<td>III Cluster average</td>
<td>small (from North)</td>
<td>new</td>
<td>average</td>
</tr>
<tr>
<td></td>
<td>IV Cluster North</td>
<td>medium</td>
<td>established</td>
<td>average</td>
</tr>
<tr>
<td>2005</td>
<td>I Cluster South</td>
<td>small (from South)</td>
<td>new</td>
<td>average</td>
</tr>
<tr>
<td></td>
<td>II Cluster Central</td>
<td>medium-large</td>
<td>new</td>
<td>average</td>
</tr>
<tr>
<td></td>
<td>III Cluster Central</td>
<td>small (from Central-North)</td>
<td>established</td>
<td>average</td>
</tr>
<tr>
<td></td>
<td>IV Cluster North</td>
<td>medium</td>
<td>established</td>
<td>single</td>
</tr>
<tr>
<td>2006</td>
<td>I Cluster Central</td>
<td>average</td>
<td>new</td>
<td>average</td>
</tr>
<tr>
<td></td>
<td>II Cluster average</td>
<td>small</td>
<td>new</td>
<td>average</td>
</tr>
<tr>
<td></td>
<td>III Cluster average</td>
<td>large</td>
<td>new</td>
<td>average</td>
</tr>
<tr>
<td></td>
<td>IV Cluster North</td>
<td>average</td>
<td>established</td>
<td>single</td>
</tr>
</tbody>
</table>

It is interesting to note that both in 2004 and 2005 the companies which attain the best performance are prevalently from the north, medium-sized and belong to established groups, whereas the worst companies are from the south, small and newly formed.

The high level of performance attained by the medium-sized companies is due to the fact that they take advantage of economies of scale (in contrast to the smaller firms) and they simultaneously contain operating costs (in contrast to the larger companies). This finding is also supported by previous research [18], which brought to light the way in which medium-sized companies are able to attain better results since they manage to maintain a low level of incidence of set-up and labour costs.
The companies from the north tend to perform better due to the fact that they have to compete against a larger number of competitors and consequently they must contain their operating costs in order to attain the higher levels of efficiency required in a more competitive market. Firms operating in the northern regions account for the greatest percentage of Italian retail gas companies. These areas are the most attractive from an industrial viewpoint and are also those in which the climate is colder and hence there is a greater demand in terms of volume of gas. Furthermore, firms are able to access capital more easily in the north than in the south. This, in conjunction with the other factors stated above, provides the new companies with strong incentives to operate in the north and to leave the south to the older incumbent retail companies.

Firms belonging to the well established groups on the other hand achieve good results thanks to economies of learning that are the basis of their greater competitiveness nationwide.

In 2006 the changes in the composition of the clusters are more significant. In relation to the geographical position the northern companies again perform the best, whilst the performance of the firms from central Italy worsens. The latter is largely due to the anomalous temperatures in the autumn 2006 that were between 3-5°C higher than the seasonal average [20].

With reference to company size, there is a prevalence of small companies in the second cluster. Throughout the period 2004-2005 the small companies which are found in cluster I improve their performance and move to cluster II by 2006, whilst many small companies which over the same two year period are found in the third cluster perform worse and also move to the second cluster. It should be noted that the companies which perform worse are mostly from central Italy, and that their poor performance is due to the exceptionally mild climatic conditions described above. The small companies which improve their performance, moving from cluster I to cluster II are uniformly distributed with respect to their geographical position. Such an improvement may be explained by the fact that they have increased the number of their end users both by consolidating their market position and by starting to retail further afield across the nation. It may also be observed that there is a prevalence of large companies in cluster III, due to the movement of a significant percentage of such companies which were found in cluster II in 2005.

Although the single business companies remain those with the best overall performance, the companies which improve their performance are all multi-business, illustrating that companies with this typology manage to take advantage of economies of variety over time.

Regarding the distribution in relation to company age, the same trend which is observed over the 2004-2005 period continues into 2006. In the worst clusters there are many firms which have recently entered the market, whereas in the best clusters most of the companies belong to well established groups.

With regard to business diversification, the single business companies also perform better in 2006. Poor performance in multi-business companies would
appear to be counterintuitive since diversified companies ought to obtain better economic and financial results theoretically due to economies of scope. However in practice, given that the process of diversification began relatively recently, it is possible that more rewarding effects of this strategy have yet to mature.

5 Conclusions

This paper analyses the market performance of companies involved in gas retail over the three years following the liberalisation of the sector, i.e., 2004 to 2006.

A sample of 105 firms were analysed, representing approximately 54% of the companies operating in the sector. Firstly an analysis of the balance sheets was carried out calculating the main profitability, financial and liquidity indicators (ROI, ROE, ROS, LR and LA) which were then utilized as variables for the cluster analysis.

Four clusters were obtained from the statistical analysis, which was carried out using the Ward method. Cluster I contained the companies with the worst performance and cluster IV those which achieved the best results.

It may be observed from the cluster analysis that throughout the three years in question most of the companies performed well and thus were to be found in clusters III and IV. However, this positive performance was attenuated by the progressive reduction in the average values of the indicators. This decline was mainly due to two factors: firstly the economic trend recorded over the three year period was strongly influenced by the regulatory and tariff related aspects of the gas market; and secondly the uncharacteristically mild climatic trends at the time significantly reduced the volume of sales.

It is interesting to note that the number of companies in cluster I diminished over the three year period, indicating that a proportion of the companies which initially performed poorly following liberalization, later improved thanks to economies of learning.

A second analysis was carried out by considering the distribution of the companies throughout the clusters in relation to a number of critical factors: the geographical location, size, age and business diversification. The main findings are summarised below.

Throughout the three year period it was observed that with respect to the age of the companies, in the best clusters there was a prevalence of companies which belong to longstanding business groups, whereas in the worst clusters there were more businesses which were new to the market. Thus the know-how of personnel, strong ties with suppliers, and trust building with clients would appear to be factors which are critical to a competitive advantage.

In relation to company size there was a prevalence of medium sized companies in the best cluster in both 2004 and 2005. Firms of this size were therefore able to take advantage of economies of scale (as opposed to smaller firms) while at the same time they managed to contain operating costs (in contrast to the larger companies). It should be noted, however, that the
companies were more evenly distributed with respect to their size in 2006 thanks to an improvement in the performance of both larger and smaller sized companies.

With regard to geographical location, the companies in the north of the country achieved the best performance throughout the three year period. This is due to the greater degree of competition which induces companies to reduce their operating costs and thus attain a higher level of efficiency. Most Italian operators in gas retail are based in northern Italy because it is the most attractive area from an industrial standpoint, and also since there is a greater demand for gas as the climate is colder there than in the rest of the country. It is also interesting to note that the companies in central Italy underwent a downturn in 2006 which was largely due to the unusually mild temperatures that autumn which caused a considerable reduction in the revenues of gas retailers.

As regards business diversification, the specialised companies outperformed the diversified companies throughout 2005 and 2006. This result may be due to the fact that the multi-business companies were still in the start-up phase. Newly diversified companies must sustain greater reorganization costs and therefore they are initially unable to take advantage of the economies of scope.

References


