

Privatization in Italy: an analysis of factors productivity and technical efficiency

[26th E.A.R.I.E. Conference, 4-7 September 1999]

Giovanni Fraquelli

(University of Turin - Ceris-Cnr)

and

Fabrizio Erbetta

(Ceris-Cnr)

March 1999

Abstract

This work aims at investigating the changes in technical efficiency following the privatization of 39 Italian medium-sized firms operating in competitive sectors. Using Data Envelopment Analysis over a period of 10 years we highlight that, apart from acquisitions by foreign groups, there have not been significant changes in the levels of total efficiency.

The only statistically significant change concerns the strong recovery in labour productivity that showed to be continuous even during the period undergoing public control. The results, in contrast with the main theoretical predictions, shift attention to the Italian financial market. A weak incentive system and the low competition in the access to the market for corporate control seem to be the main explanatory variables.

JEL: L33, C61

Keywords: Privatization, DEA, Efficiency

Email: G.Fraquelli@ceris.to.cnr.it

We are grateful for the comments to Luigi Benfratello, Laura Rondi, Davide Vannoni, and we also acknowledge the assistance of Silvana Zelli and Maria Zittino of Ceris-Cnr in helping us to collect data for the paper.

1. Introduction

A great deal of economic literature gives the allocation of ownership a fundamental role in outlining the conditions of efficiency for individual firms and the productive system as a whole. This importance is moreover confirmed by the change in ownership and organisational status that took place in the United Kingdom and other countries in Western Europe at the beginning of the '80s.

The presence of re-allocation mechanisms of ownership and control of firms represents a basic factor for the growth and development of a productive system (Barca, 1994). Relating to this topic, public ownership is certainly a restraining factor. This is particularly true in Italy, where the public sector still plays a significant role in terms of employment (20%) and value added (16%) (Zanetti and Alzona, 1998). The privatization process can therefore be considered as a factor that may contribute to improve efficiency. However, this change involves the nature of the ownership and the capital market incentives issues. Public ownership could be criticised from several aspects, such as: priority towards income distribution, managerial aims that are not clearly defined, difficulty in defining the incentive mechanisms, easy access to credit and, in the recent past, soft loans. The re-allocation of public ownership towards a private one should contribute to solve the above-mentioned problems.

Industry aggregations could generate competitive sizes on an international scale. From another viewpoint the increase in the quoted units could bear greater competition on the financial market. However, it should be pointed out that privatization alone is not sufficient to create competition and efficiency improvements. Liberalisation and regulation of markets, especially for public utilities, are needed as well as a correct working of the stock market. In the Italian context, the problem of "contestability" of control is debated with a wide discussion on the future of the large utilities (Zanetti, Alzona, 1998). The opinions in favour of an active control of the financial market, by means of public companies, are compared with the models characterised by a stable share-holding that protects the firm from hostile takeovers.

For the large Italian firms, an empirical analysis about the changing of the efficiency deriving from privatization is at the moment not possible. Telecom Italia has only recently been privatized and subsequently taken-over, the process is being

undergone by Eni and has not even started yet for Enel. However, it should be considered that in the last fifteen years many medium-sized industrial firms have been privatized. Some of them have been incorporated or merged with others and therefore cannot be identified. Others have been bought by groups and have maintained a legal and administrative autonomy. These latter belong to sectors subject to competition both at home and abroad, such as the steel, chemical, mechanics, textiles and food industries. Up until a short time ago these sectors benefited from subsidies linked to location, or more in general, public intervention policies.

This research refers to medium-sized firms that were privatized during the '80s and the beginning of the '90s, where there is sufficient information to chart trends before and after privatization. An analysis of the efficiency changes enables us to judge the managerial capacity of private ownership in a broad sense, but it also enables us to assess the governance of corporate performance.

This work is structured as follows: section 2 contains some theoretical suggestions about the management of public and private ownership. Section 3 shows the main empirical evidence about privatization found on an international scale, while sections 4 and 5 describe respectively the data base and the efficiency estimation methodologies. Section 6 comments on the results. The conclusions can be found in section 7.

2. Privatizations: some literary contributions

The privatization processes in Europe and, in particular, in the United Kingdom during the '80s and '90s have basically had the aims of reducing the state deficit, developing stock markets and improving technical efficiency and profitability.

When dealing with the link between the nature of ownership and productive efficiency, it seems possible to refer to two main explanations. The first viewpoint takes into account the incentive mechanisms within the firm and shows that management choices can be explained in different ways according to the institutional context they are

placed in. The second one correlates efficiency to the greater dynamic and selective capacities of open capital and product markets.¹

2.1 *Incomplete contracts and internal incentive mechanisms*

The study of economic relationships between agents shows how difficult it is to define complete contracts. The parties (for example, buyer and supplier) cannot foresee all future situation: this means asymmetric information and distortions in the distribution of benefits. Such situations need appropriate incentive patterns (Tirole, 1988).

The long-run relationships are often characterised by specific investments that can be seen as *sunk costs* and they can be recuperated solely by producing. Contracts that call for such capital expenditures can take place only if the parties who bring the relative resources have sufficient guarantees about the distribution of future economic benefits. Moreover, the productive processes are usually carried out by technically interdependent *teams* of human and physical capitals (Williamson, 1975). This fact, together with the impossibility of regulating by contracts any future situation, makes more probable opportunist behaviours by the participants in the relationship. To face this situation, power of control and claim of benefits should be attributed to those subjects that can maximise internal efficiency thanks to their greater experience, capacity and their minimum degree of substitution in specific operational processes. The purchase of *residual rights of control*² by them³ would represent a second best solution⁴ (Grossman and Hart, 1986; Hart and Moore, 1990; Hart, 1990). Furthermore,

¹ Whereas the opening of the capital market is a result of privatization (since public ownership prevents the circulation of property rights), competition on the market of products is, in theory, independent of the type of ownership. In fact, there is the case in which a public firm competes against private ones (Anderson, De Palma and Thisse, 1997), although the disciplinary role of the competition of the product market is less binding for a public firm.

² It would, therefore, be noted that, in this model, the residual rights only refer to non-human assets and do not extend to the human assets that cannot be bought or sold (Hart, 1990).

³ For now, the issue of separation of ownership and control, that is to say, the conflict of interests between ownership and managers, is not dealt with. The latter is normally closer to the production processes.

⁴ The first best solution appears in the case in which the contracts are complete and there are no doubts nor threats of opportunist behaviours, since the contribution of non-owners would be maximised. In

such a model of *property rights*, defined as GHM (Grossman-Hart-Moore), tends to give re-allocative market mechanisms a decisive role for an efficient ownership set-up (Barca, 1994). The presence of public shares limits the allocative capacity of the property rights with negative results on the productive performance and innovation.

If attention is shifted to the separation between ownership and control, the divergence of the objective-functions of the owners and managers takes on considerable importance. Beginning with the studies carried out by Laffont and Tirole (1986), many authors have concentrated on the comparison between the efficiency of public authority and that of private owners in defining managerial incentive schemes. The *principal-agent theory* asserts that the principal finds it difficult to observe directly the actions taken by the agent and know the real conditions of productivity. The managers, in this way, can announce a managerial situation to be more difficult than in fact it is, so as to guarantee a *slack management*. A more careful monitoring, however, would be able to limit this moral hazard issue. In the private sector, the principal-agent relationship is developed to a smaller number of layers compared to the public sector⁵. Therefore privatization can be viewed as reducing the agency noise and facilitating the introduction of more effective incentive schemes (Bös, 1991; Martin and Parker, 1998).

The control in the public sector is moreover influenced by the bureaucratic behaviour of public officials (*public choice theory*). This process is not modified by the vote of citizens because of very high political transaction costs. The public sector is therefore conditioned by the search for a *rent-seeking activity* on the part of managers and workers together with political groups (Niskanen, 1971).

Vickers and Yarrow (1988), however, do point out the presence within the objective-function of the government of a specific aim linked to social welfare (with particular reference to quantities and prices). This means that only significant increases in internal efficiency by the private operator (with a reduction of prices and tariffs) can produce, in differential terms, an increase in wealth. Furthermore, the relative ease with which the public government, by means of monetary incentives, is able to motivate the

this case, the ownership typology would have no influence on the definition of more effective incentive schemes.

⁵ Whereas in a private firm there is a relationship only between shareholders (or partners) and directors, in the public sector the agency relationship involves taxpayers, elected representatives, government ministers and officials who will be running the firm.

state firms, makes it preferable to maintain operative structures run by public power (De Fraja, 1993).

2.2 *The role of the market as a source of efficiency*

Both the public and private structures present frictions between owners and managers, but the private system has the advantage of specific incentive mechanisms linked to the opening to competition of capital markets and products (Martin and Parker, 1998). The theory of the *market for corporate control* emphasises how in a market of transparent property rights, unaffected by asymmetric information and organisational imperfections, an inefficient management of a private firm can turn into a loss in value for the firm. This situation would make a takeover more likely by those operators interested in obtaining profits by capital gains, following the recovery in the productivity level (Vickers and Yarrow, 1988; Barca, 1994). So the threat of takeover positively influences the efficiency⁶.

Nevertheless, the risk of bankruptcy can weigh upon private economic units. This threat occurs since these latter are not supported by public funding and financing on favourable terms and are, on the contrary, marked by a *harder budget constraint*. This fact may make the administration more aware of the needs for money-saving and therefore of control of inefficiencies. In an empirical analysis of Italian publicly-owned firms Bertero and Rondi (1998) clearly shows how the passage from a *soft* to a *hard budget constraint* is reflected in a greater caution in the use of resources by the state managers themselves. However, Schmidt (1996) notes that a government intervention geared towards making the financing system of a public firm more restraining is absolutely unfeasible. A similar behaviour would be perfectly reasonable with regards to a private firm with the possible outcome, however, of a reduction in quantities produced.

⁶ The takeover operation might not succeed, especially with regards to firms with widespread ownership, because of *free-raider* behaviour by the owners. In this case, each shareholder can decide, independently of each other, to retain their own share because keeping it would give them the possibility to gain the price increase following the raid (Tirole, 1988; Vickers and Yarrow, 1988; Trento, 1992).

An open and competitive capital and product markets in any case represents a fundamental assumption for any privatization program. They can generate advantages both in terms of technical and allocative efficiency (Kay and Thompson, 1986; Yarrow, 1986). The dynamics characterising the market of property rights would have a more influence on less efficient economic subjects. The simple substitution of a public monopoly with a private one, instead, would contribute to the creation of a bureaucratic structure as inefficient as the correspondent state-owned one. Recent works (Nickell, Wadhvani and Well, 1992; Nickell, 1996) emphasise how market concentration is reflected in reduced productivity levels. This is due to a scant *managerial tension* that can be attributable to the presence of monopolistic positions.

When privatization accompanies a development of competition, it may be easier for the monitors to operate cross-sectional comparisons between homogenous firms. In this way they can deduce information regarding the normal level of the productivity performances (*yardstick competition*). In any case, since the market share proves to be inversely correlated to cost dimension (Hay and Liu, 1997), a firm aimed at development policies should limit any kind of inefficiency.

3. The empirical studies

The empirical surveys about ownership changes (public versus private) mainly refer to the British context, which experimented privatization on a wide scale in the last twenty years. The measures of performance are generally made up of profitability, efficiency, capital investment and leverage indicators, cost functions, level of labour employed. Many studies tend to focus on the short run efficiency and neglect the long run impact of privatization. This is especially due to the subsequent corporate transformations and the fact that the phenomenon is fairly recent. Analysing the impact on allocative efficiency is more difficult given the need to evaluate whether prices and new products have influenced the general wealth. Table 1 gives a general view of a set of contributions taken from literature.

Interpreting the various results is not always simple because of frequent interactions among different economic policies such as creation of competitive product and capital markets (Kay and Thompson, 1986; Yarrow, 1986), new industry

regulations and restructuring of the privatized firms. This makes unclear the evaluation of the effects of the privatization itself. Moreover, the question concerning the effective enhancement in performance after public divestiture does not find a complete agreement in theoretical and empirical literature.

A large part of the studies analysed do not give unambiguous evidence on the suitability and economic advantages from the privatization process. This result is strengthened by the positive productivity performances obtained by UK publicly-owned firms (Molyneux and Thompson, 1987; Vickers and Yarrow, 1988; Hutchinson, 1991; Bishop and Thompson, 1992). On the contrary, Dewenter and Malatesta (1998) comparing publicly and privately-owned large firms around the world, show that the former are less profitable, more leveraged and more labour intensive than the latter. They, however, provide little evidence for the effectiveness of privatization itself and then hypothesise that a switch to private ownership is in fact subordinated to previous restructuring processes. An increase in productivity performance in advance compared to the actual time of privatization is also highlighted by Martin and Parker (1995). This is due to the activity directed to make the placement of the assets onto the market easier.

The results from a set of UK firms that were privatized or changed their organisational status within the public sector do not seem to guarantee notable improvements in total productivity (Dunsire, Hartley and Parker, 1991; Hartley, Martin and Parker, 1991; Hartley and Parker 1991a; Hartley and Parker 1991b; Boussofiene, Martin and Parker, 1997). Furthermore, these analyses show that the greatest contribution to the increase in technical efficiency is linked to the labour factor that is more involved in the transaction costs of the public sector. In fact, state-owned firms pursue political rather than economic strategies, aimed to widen the public consensus towards the politicians in power. This situation can lead to oversize the employment level with negative returns on the conditions of operative efficiency (Pint, 1991; Boycko, Shleifer and Vishny, 1996). This behaviour seem to be confirmed by empirical studies based on the analysis of Total Factor Productivity and Labour Productivity (Martin and Parker, 1995). After privatization it is possible to see a sharper growth in labour productivity than in the total factor indicator. This fact suggests the idea that substitution between capital and labour and removal of the excess of work-force created by the public management have occurred. However, In contrast with these conclusions,

Meggison, Nash and Van Randenborgh (1994), analysing a large sample of privatized firms around the world, show that the divestiture not only provides statistically significant increases in real sales, profitability, operating efficiency, capital spending and dividend payments ratios but also in the level of employment.

A more correct evaluation of the impacts of sells-off needs to take into account two exogenous variables: technological progress and industry business cycle. During a study concerning the privatization of British Gas, Waddam Price and Weyman-Jones (1996) credit the improvement in performance mainly to technological progress (*frontier shift*) rather than to an advancement towards efficiency frontiers (*catching-up*). The importance of the demand variable is confirmed by Haskel and Szymanski (1993). They also underline how the divestiture has also had significantly less influence compared to the degree of the opening to market competition.

As far as the effects of privatization in Italy are concerned, Sarno (1993) and Fraquelli and Fabbri (1998) agree on the improvement showed by the short run profitability and labour productivity. However the privatized units maintain high levels of financial leverage.

4. The data base

The analysis is based on a sample of 39 Italian medium-size industrial firms controlled mainly by private large groups.

Privatized firms were identified by “Banca Dati Nomisma” and “Mediobanca” sources. Each firm was observed over the period from 1975 to 1996, with time series not less than 6 years, distributed before and after privatization.

The balance-sheet data were taken from the Ceris Panel (Margon, Sembenelli, Vannoni, 1995) until 1993 and directly from the “Mediobanca” sources for the subsequent three years. In particular, the selected variables are: sales (SAL) and value added (VA) as measure of output, the number of employees (NEMPL), the gross fixed assets (GFA) as measure of real capital, the net capital stock (NCS), total equity plus

financial liabilities, as measure of financial capital and the costs of materials and services (CMAT)⁷, as input variables.

The monetary values have been deflated⁸ using specific industry prices indices (3 digit) and choosing 1993 as the base year. The deflation of fixed assets turned out to be more complex. The eighth report issued by the “Centrale dei Bilanci” (1995), provides a time series of aggregated balance-sheet between 1984 and 1993 that have been corrected according to the Current Purchasing Power (CPP) accountancy system. By using them it has been possible to build up a set of implicit deflators (DEFL_t) regarding gross fixed assets (AGGRGFA_t), for t included between 1984 and 1993, as follows⁹:

$$AGGRGFA_{t,93} / AGGRGFA_{t,t} = DEFL_{t,93}$$

By applying these coefficients to the balance-sheet values of each firm i, from 1984 to 1993, the series of rectified items, according to the prices of the base year, have been obtained as follows:

$$GFA_{i,t} * DEFL_{t,93} = GFA_{i,t,93}$$

For the years prior to 1984 and following 1993, that were not available from the “Centrale dei bilanci” report, the series have been completed by a direct estimate carried out according to the technique of perpetual inventory method.

5. The measures of efficiency

The analysis of technical efficiency has been carried out by applying *Data Envelopment Analysis* (DEA). This is a method introduced by Charnes, Cooper and Rhodes (1978) as a generalisation of the Farrell index (1957) based on the concept of the efficiency frontier. This frontier is made up of those units (*Decision Making Units*, DMUs)¹⁰ that, compared to the others, minimise the use of productive resources given

⁷ This value, that was not available in the “Mediobanca” sources, was obtained from the difference between sales and value added for each firm in each year.

⁸ The deflation procedures of the monetary balance-sheet values are those found in Fraquelli (1997).

⁹ In this formula, *t* indicates the general year to which the aggregate refers, whereas *93* is the base year of prices index.

¹⁰ As the DEA method can be adapted to a varied system of units that have decision making capacities, even not organised as a firm (schools, hospitals, etc), it would seem appropriate to use the general term DMU.

the output (input-oriented measure), or maximise the output given the input size (output-oriented measure).

The basic idea behind the DEA methodology is represented by figure 1, where the isoquant drawn refers to an elementary case with two productive factors (x_1 and x_2) and one output (y). Points A, B, P are all associated to a unit level of production, but only A and B lie on the efficiency frontier, since there are no units able to carry out productive combinations that are more efficient. Farrell's coefficient (*technical efficiency*, TE), measures the distance that separates the points from the frontier line. It turns out to be equal to the maximum value 1 for the units (DMUs) indicated as A and B (*peer group* of point P), whereas firm P's efficiency is defined by the ratio $TE=OQ/OP$, where Q is the radial projection of P on the frontier.

Given n DMUs, the efficiency input-oriented frontier can be obtained by solving Linear Programming problems (LPs) in a dual form with $m+k$ constraints (Coelli, Prasada Rao and Battese, 1998), of the type:

$$\begin{aligned}
 & \text{Min}_{\mathbf{q}} \mathbf{q} \\
 \text{s.t. } & -y_{i,r} + Y\mathbf{I} \geq 0 && r=1,\dots,m && \text{output} \\
 & \mathbf{q}x_{i,t} - X\mathbf{I} \geq 0 && t=1,\dots,k && \text{input} \\
 & \mathbf{I} \geq 0
 \end{aligned}$$

with $i=1,\dots, n$, where \mathbf{q} ($0 \leq \mathbf{q} \leq 1$) is a scalar that measures the efficiency score of the i -th DMU, $y_{i,r}$ and $x_{i,t}$ represent vectors $M \times 1$ and $K \times 1$ of all outputs and inputs for the same firm i , \mathbf{I} is a vector $N \times 1$ of weights assigned endogenously to the units considered and Y and X are matrices of m outputs and k inputs respectively of size $M \times N$ and $K \times N$ ¹¹. As an alternative, the coefficient \mathbf{q} subjected to a minimising process, can be read by considering the difference between the maximum score equal to 1 and the actual index

¹¹ If the projection of a DMU takes place on the horizontal or vertical facet of the frontier (figure 1), there is a input slack (IS), expressed in the form: $IS = \theta x_{i,t} - X\lambda$. It implies the possibility of further reducing some inputs without changing the quantity of output, by means of a non radial movement along the frontier. These slacks are an inevitable consequence of the frontier construction method chosen (DEA) and of the fact that finite samples are used. Moreover, in order to evidence all potential IS, Coelli, Prasada Rao and Battese (1998) suggest the use of the more sophisticated multi-stage

value. This represents the potential efficiency gain in the use of the factors, given the output and maintaining the same operative mix¹².

In this work, the DEA methodology has been applied on data structured in time-series, instead of over cross-sections (Boussofiene, Martin and Parker, 1997). Each year referring to an individual firm represents a DMU. For each firm the frontier is calculated across the years and the comparison is made between the annual efficiency scores. This approach has the ultimate aim of examining the conditions of efficiency of each firm before and after privatization.

The period for which DMUs are observed differs with respect to calendar years and their length. To make a comparison possible, the privatization years of the 39 firms were indicated by central time t . The same was done for the previous and subsequent years, called $t-1$, $t-2$, up until $t-5$ and $t+1$, $t+2$, up until $t+5$. Then, for each year, we calculated the average of the efficiency scores of all the firms.

Since the number of observations between $t-5$ and $t+5$ differs year by year, the full sample of 39 firms appears as unbalanced. To test the robustness of the efficiency ratings obtained from the unbalanced sample, the statistics were also carried out for two balanced sub-samples. They include respectively the 25 firms that cover the whole range $t-3$, $t+3$, and the 16 firms that cover the whole range $t-4$, $t+4$. In this way, the years have all the same number of observations.

As a same firm is compared over a short time series, it was considered correct to operate with the DEA model at constant returns to scale (CRS)¹³. It seems to be rational to hypothesise absence of modifications of the productive scale. The consideration of the variable returns to scale (VRS) would seem to be more appropriate, on the other

method, that is applied in this work. It involves the resolution of a sequence of radial LPs to identify the efficient projected point.

¹² For a given linear programming problem, only the units that make up the peer group of a specific DMU will take on the values λ different from zero (points A and B in figure 1 with reference to the inefficient unit P). In this way the projected point Q repeats the technology used by the original unit P and identified by the linear combination $\lambda_A A + \lambda_B B$.

¹³ The DEA model with the CRS system refer to LPs that have been presented in this work. The variable returns to scale model (VRS) foresees, instead, the addition of the following equality constraint (Coelli, Prasada Rao and Battese, 1998):

$$\sum_{i=1}^n \lambda_i = 1$$

hand, for data that are structured according to a cross-section. In this case the firms can in effect present different scales.

The methodology described above is non-parametric. This means that it needs neither the specification of underlying production functions nor sets of weights for the different inputs and outputs used (Coelli, Prasada Rao and Battese, 1998). With reference to the case being studied, it must however be noted that the scores simply indicate the dispersion of efficiency of each firm during the period. It is therefore not possible to provide a judgement regarding the relative level of efficiency between the firms¹⁴.

For reflecting the dynamics of the industry business cycle a further input variable was included into the DEA system¹⁵. This is represented by the index number of the industry gross product where a value equal to 100 is assigned to the year of privatization¹⁶.

The statistic significance of the differences in the efficiency ratings of the firms observed before and after privatization was examined using the Wilcoxon paired test¹⁷. The homogeneity in the efficiency behaviour was investigated considering the two averages of the ratings, for every firm, prior to and following the t time. The test was based on three levels of significance α (1%, 5%, 10%).

¹⁴ So as to assess the impact of technological progress, the distribution of the different firm-years along the frontier were investigated. It was noted in particular if the units before and after privatization are placed in (two) defined clusters; this would be a clear indicator of a change in technological conditions. Since the test is not significant, it can be felt that the analysis maintains its own explanatory effectiveness even without introducing a technological progress variable.

¹⁵ The trend of demand is, in fact, an exogenous element that is able to affect efficiency levels. In particular, it can be hypothesised that there is a positive correlation between the variations of the demand and the rate of productivity. (Boussoufiane, Martin and Parker, 1997). A period of too high or too low demand may, respectively, cause an over or under estimation of the DEA scores.

¹⁶ These aggregated data have been taken from the ISTAT source.

¹⁷ The Wilcoxon test is of a non parametric nature, suitable to test if two dependent samples show the same behaviour relative to a specific characteristic. It is based on the replacement by ranks of the differences in absolute value of the observations referring to the corresponding elements in the two dependent samples (or to the same element observed before and after a particular treatment).

6. The results

6.1 Analysis of technical efficiency using DEA indices

The unbalanced sample (table 2) that counts all the 39 firms for the years included between $t-5$ and $t+5$ do not show clear and significant changes in the dynamics of global efficiency. DEA indices are built under the hypothesis of constant returns to scale (CRS) on both SAL and VA. Table 2 also shows the ratings relative to the two balanced samples including respectively 25 firms for the three years before and after privatization and 16 firms for the years between $t-4$ and $t+4$. The last two samples examined confirm the results of the unbalanced one. However, there seems to be an upward gap during the years between t and $t+2$ (the phase immediately after privatization), followed by a settling or even a deterioration in the performance as shown in figure 2. The improvement of the efficiency seems therefore to be a purely transitory benefit, incapable of strengthening the productive structure of the firms transferred to the private sector.

The annual variability of the efficiency values is slightly accentuated if the output is measured by the VA, although not statistically significant. Given the relatively reduced number of observations for each firm, the elimination of an input variable (CMAT), occurring when VA is used as output measure, makes the model more selective¹⁸. In any case, the dynamics of the average efficiency seems to confirm the indices based on the SAL.

In table 3, the DEA ratings were calculated including the industry business cycle variable. This last explanatory factor makes a redefinition of the productive frontier as well as of the ranking of the firms in every year and produces an upwards shift of the average values of the DEA indices¹⁹. We can see, even though not to a significant extent, a short run variation on the two years immediately following the sell-off.

¹⁸ When indicating the possible limits of the methodology, Coelli, Prasada Rao and Battese (1998) state that: "The addition of an extra input or output in a DEA model cannot result in a reduction in the TE (Technical Efficiency) scores", p. 181.

¹⁹ A satisfactory discrimination power is achieved when the number of observations (in this case, the number of year for each firm) is three times the number of input times the number of output (Boussofiene, Dyson and Thanassoulis, 1991). If the number of observation lies below this boundary, the DEA ratings will tend to move gradually towards the frontier.

However, the gaps between the periods before and after privatization turn out to be further reduced and this evolution seems to confirm the absence of changes in the technical efficiency.

6.2 Different subgroup tendencies

The sample of 39 firms is quite representative of the privatized units in Italy, but turns out to be small with reference to the single industrial sector. Anyway, we will see later that belonging to certain industrial sectors is a fairly significant element so as to interpret the results. However, it is more useful here to aggregate the firms according to the nationality of the new owners (Italian or foreign groups). The data can be found in table 4.

The comparison between the acquisitions by foreign groups and those of private national ones shows different behaviour. The first sub-sample (eight units) is characterised by a recovery of efficiency process prior to privatization and maintains its continuity also during the subsequent period. The second is stable in the pre-privatization period and evidences a small decline in the post-privatization one. It is, moreover, important to note the statistic significance of the diversity between the years before and after privatization for the indices based on VA relating to firms under foreign control.

6.3 Factors productivity

The search of the main factors explaining the trend of total technical efficiency suggests the calculation of partial productivity indices, taking as output both SAL and VA at constant prices, and aggregating the inputs GFA and NCS. For each firm the highest annual value was made equal to 100, and the whole time series was re-calculated over this benchmark. The results can be found in table 5.

The disaggregation of the productive factors shows that the stability of the efficiency index is the result of a positive performance of the labour and a negative one regarding the materials and (real and financial) capital. The average labour productivity values reveal a statistically significant gap of about 10-15 points in favour of the period

following privatization. However, it should be noted (figure 3) that there is a constant growth trend, at least until $t+2$, that characterises even the pre-privatization phase²⁰.

The dynamics of the NEMPL variable reveals that also in Italy, despite certain rigidities in the labour market, this resource has a greater flexibility compared to the other productive factors. The improvement of the labour productivity between t and $t+2$ is probably the element responsible for the positive gap observed in the same years by DEA ratings. However, this progress occurs within a background already oriented towards an increase in efficiency.

6.4 Evaluation of the results

It is quite difficult to pinpoint the specific effect of the privatization from other elements of an exogenous and endogenous nature. In any case, the results give some interpretative keys.

Labour productivity trend shows that the privatization process is associated with some important effects before the divestiture itself. At a managerial level, this evidence underlines the intention to “prepare” the firms for the transfer into a private financial market context by cutting the level of work-force²¹. The wide recovery of labour productivity confirms the hypothesis of serious over-sizing of this factor when the firm is subjected to public control (Pint, 1991; Boycko, Shleifer and Vishny, 1996). The priority for the employment in the objective function of the public owner together with the lack of profitability incentives and financial constraint tends to create an excess in the number of the employees. In their empirical studies of Italian privatizations, Fraquelli and Fabbri (1998) confirm an excess employment for the publicly-owned firms but to the detriment of (low) salary levels.

For the other productive factors (materials and capital) the trends are lacking of evident progress. This tendency leads to think that the strategies developed by the

²⁰ The data of the firms included in the sample reveal that the growth in labour productivity is associated with a decreasing number of employees during the observed periods.

²¹ Bertero and Rondi (1997), by a panel of private and public Italian firms, have shown a changing in the behaviour during the passage from a *soft* to a *hard budget constraint* (that took place at the end of the 80s). Even the state firms became more sensitive to the financial pressure, improving total productivity and reducing employment.

management of the privatized firms are affected by *short-terminism* biases. The effectiveness of private control, in theory characterised by a *harder budget constraint*, has only partially worked. Only the labour factor is supposed to be the main source of inefficiency and then received particular attention. Thus, the above analysis gives evidence of a partial failure of the private corporate control.

This occurs even though the economic units of the sample operate in sectors, such as mechanics, steel, textiles and food industry that are open to competition incentives. The presence of a dynamic capital market together with a competitive product market should however provide a background suitable for a complete development of the potentialities of private ownership (Kay and Thompson, 1986; Yarrow, 1986)²².

In judging the role of the “new” private ownership it must be emphasised that in Italy the efficiency incentive mechanisms, over the period when the main privatizations took place, turned out to be fairly weak, and still are. One of the reasons is probably the mass of economic and financial government subsidies that many of the public firms enjoyed before (and after) undergoing privatization. As stated above, most firms belong to the mechanics, steel, textiles and food industries. These sectors widely benefited in the past years from an industrial policy built upon contributions and subsidies. Furthermore, in some cases the firms were purchased and then sacrificed because of incentives geared towards the reduction of the productive capacity or policies aimed at the concentration of sales.

Among the interpretative hypotheses of the failure to recover efficiency, it must be stated that the Italian financial market is quite weak. The productivity measure had a poor increase after privatization although the product market environment was open to competition and suitable for an efficiency enhancement. So it can be hypothesised that the private ownership itself or, more probably, the disciplinary role of the Italian capital market failed. This interpretative suggestion is also sustained by the better results relative to the firms acquired by groups of foreign countries with more dynamic financial market conditions²³.

²² In a competitive context, the poor profitability of an economic unit can be interpreted by the market as an indicator of inefficiency. The negative judgement of the management activities can place the firm under the risk of *takeover* with the subsequent replacement of its managers.

²³ It is opportune to note that the reference to financial market conditions of foreign countries, though realistic, is to be taken with some cautions. In fact, the number of observations is limited and the time

The Italian financial market is characterised by a strong concentration of the holding ownership, with a primary role of the families²⁴. In this way, the ownership re-allocation function becomes weaker and it makes, consequently, the managers' efficiency incentives less sharp. Such a rigid share-holding system in Italy has been worsened further by a poor influence of the credit institutions (Barca and Ferri, 1994). Till now the Italian banks have had ineffective capacity of controlling and addressing the entrepreneurial choices of the subjects financed.

The unsatisfactory efficiency performance cannot be therefore directly ascribed to the failure of the private model. The absence of contestable ownership structures, with the threat of "new" controllants, may have prevented managerial incentives. This hypothesis is supported by the work of Barca and Ferri (1994) concerning the re-allocation process within the private sector between 1985 and 1990. During the period following the change in ownership, the improvements are ascribed solely to the financial area and not to the industrial strategy.

7. Conclusions

The Data Envelopment Analysis applied to 39 firms privatised during the '80s and the early '90s shows that there have not been significant changes in the conditions of technical efficiency. More particularly, the efficiency improves in the two years that follow the privatization. It then falls, except in the case of foreign acquisitions, to levels even lower compared to the initial ones. The only change statistically significant regards the strong and continuous recovery in labour productivity, that is evident also during the period subject to public control.

Such an evolution, at least as far as Italy is concerned, must not however lead to negative conclusions regarding privatization.

series do not exceed the year $t+3$. Furthermore it would seem that the investments of foreign operators are characterised by better performances (Caves, 1996; Dilling-Hansen, Eriksson, Madsen and Smith, 1999).

²⁴ Cannari, Marchese and Pagnini (1994), with reference to 1991, assert: "from a sample of firms it emerges that the first three shareholders own 71 and 91 per cent respectively of the equity of quoted S.p.A. and joint-stock companies", p. 259.

In fact, it must be considered that the Italian system is not characterised by rules that enable a contestable market for private ownership. The “culture” is insufficient and not yet developed, as well as a “complete economic and political liberal system” (Zanetti and Alzona, 1998). This situation brings about two different consequences interesting the privatized firms. Government interventions into the management are only partially excluded, especially in the public utility sector²⁵. Even if state interference stops completely, the re-allocation mechanisms of the private control are insufficient. Consequently, the efficiency increases foreseen by theory can not be obtained.

The problem to be faced in the immediate future is not therefore linked to the opportunity to privatise but to facilitate the access onto the product and corporate market control.

²⁵ In concluding the analysis geared towards "understanding privatizations" Zanetti and Alzona (1998) maintain that Italy can have only “imperfect privatizations” compared to the liberal model that totally limits government interference. These operations would anyway be preferable to public control, especially in view of the greater incentives resulting from the constraints of the European Community currency and the pressure made by the globalisation of the market.

Table 1 - Main empirical studies

<i>Authors</i>	<i>Years</i>	<i>Firms and period covered</i>	<i>Methodology</i>	<i>Empirical findings</i>
Molyneux and Thompson	1987	State-owned versus privately-owned UK firms in various sectors between 1978 and 1985.	Labour and total factor productivity.	Productivity growth is faster in the state-owned firms.
Vickers and Yarrow	1988	9 UK state-owned firms over the two periods 1968-78 and 1978-85.	Labour and total factor productivity.	Improvement in the performance, specially on labour, between 1978 and 1985, but for public utilities. Capacity of public sector to achieve good performance.
Hutchinson	1991	17 UK state and privately-owned firms in several industrial grouping (SIC), in the 1970s and 1980s.	Labour productivity, profitability and technology mix.	Privately-owned firms outperformed comparable state-owned ones in the 1970s and in the 1980s in terms of profitability only. Scarce evidence of privatisation gains.
Dunsire, Hartley and Parker	1991	9 UK organisations that were privatised or underwent changes in their organisational status within public sector from 1969 to the mid-1980s.	Labour and total factor productivity, employment and financial ratios.	The relationship between status change in direction of private sector or commercial pressure is not guaranteed. Only three cases of actual privatisation.
Hartley, Martin and Parker	1991	10 UK organisations that were privatised or underwent changes in their organisational status within public sector. Observations over the 4 years before and after status change.	Labour and total factor productivity.	Discordant conclusions specially with introduction of the business cycle variable. The removal of the political power doesn't guarantee improvements in efficiency. Only three cases of actual privatisation.
Hartley and Parker	1991 a	9 UK organisations that were privatised or underwent changes in their organisational status within public sector. Observations over the 4 years before and after status change.	Financial ratios: <ul style="list-style-type: none"> • profitability (ROCE) • sales to fixed assets • stocks to sales • debts to sales • labour's share in costs • value added per employee. 	The ratios show no substantial improvement in the performance after organisations are subjected to private sector or commercial pressures.
Hartley and Parker	1991 b	9 UK organisations that were privatised or underwent changes in their organisational status within public sector over the period 1959-88.	Estimate of employment functions for verifying shake-out processes and labour productivity indices.	Concordant results between the two types of methodology. More substantial is the weight of transformation, greater the improvement in labour productivity. Only three cases of actual privatisation.
Bishop and Thompson	1992	9 UK state-owned firms over the two periods 1968-78 and 1978-85.	Labour and total factor productivity.	The productivity show a faster growth during the 1980s in comparison with the 1970s. The evidence is stronger for labour factor.

Haskel and Szymanski	1993	12 UK firms privatised between 1972 and 1989.	Labour productivity functions using economic, dummies and business cycle variables.	The business cycle and the degree of competition have significant and positive impact on labour productivity. The coefficients of ownership (private versus public) are not significant.
Sarno	1993	10 Italian privatised firms observed over the 3-4 years before and after privatisation.	Economic and financial indicators and estimate of production function.	Only the short-run profitability and the labour productivity show a considerable improvement after privatisation.
Meggison, Nash and Van Randenborgh	1994	61 privatized firms, from 18 countries and 32 different industries, observed pre and post privatization over the global period 1961-90.	Profitability, operating efficiency, dividend payout and capital spending indicators; leverage ratios; real sales and employment level.	Statistically significant increase in real sales, profitability, operating efficiency, capital spending and dividend payments. Increase also in level of workforce. Significant decrease in debt ratios.
Martin and Parker	1995	11 UK privatised firms. The observations are split into five sub-periods: state ownership, pre-privatisation, post-announcement, post privatisation, recession (1989-92).	Labour and total factor productivity.	Decrease in post-privatisation period and increase in pre-privatisation one (anticipation effect) for labour indices. Increase of performance in post-privatisation period for total factor indicators.
Waddam Price and Weyman-Jones	1996	12 regional firms of British Gas, over the period 1977-91.	Analysis of productivity conditions through Malmquist index.	The technical progress coefficient (frontier shift) overcome the productivity endogenous increase one (catching up). The privatisations appears poorly incisive.
Bousofiane, Martin and Parker	1998	9 UK privatised firms observed over the period 1973-95.	Definition of technical efficiency scores using Data Envelopment Analysis.	No clear finding of positive impact of privatisation over productivity gains. Business cycle and technical progress don't alter substantially the results.
Dewenter and Malatesta	1998	500 privately and publicly-owned large firms around the world for each of the three years considered 1975, 85, 95 (total of 1500 firms-year). Complete time series for 63 privatized companies around the world for up to 10 years before and 5 after privatization.	Profitability, leverage and labour efficiency indices.	Cross-section analysis (over the three years 1975, 85, 95) shows that publicly-owned firms are less profitable, more leveraged and more labour intensive than privately-owned ones. Time series analysis shows mixed results for privatization. There is evidence of an anticipation effect, specially in profitability indicators.
Fraquelli and Fabbri	1998	20 Italian privatised firms observed over 3 years before and after privatisation.	Profitability, productivity and financial ratios that have been normalised through "public", "private" and "sectorial" control sample.	Statistically significant increase of operative profitability and labour efficiency. Strong persistence of financial leverage.

Table 2 – Arithmetic means of DEA scores without business cycle variable
(CRS at constant prices relating to SAL and VA) ^a

	Unbalanced sample			Balanced sample 25 units		Balanced sample 16 units			
	No.	CRS SAL	CRS VA	CRS SAL	CRS VA	CRS SAL	CRS VA		
t-5	22	96.8	87.0						
t-4	28	97.1	85.4			98.0	85.9		
t-3	33	97.5	86.9	97.8	87.3	97.3	85.3		
t-2	39	97.9	87.9	98.1	86.9	97.7	83.9		
t-1	39	97.5	86.5	97.3	85.9	96.9	84.3		
t	39	97.3	87.2	96.8	86.5	96.9	86.1		
t+1	39	98.0	87.8	97.6	86.6	97.0	84.9		
t+2	39	98.4	91.8	98.6	92.8	98.3	90.4		
t+3	31	96.6	86.1	96.1	84.7	94.2	77.5		
t+4	22	97.6	87.7			96.7	83.5		
t+5	16	96.8	86.9						
average before	(t-5; t-1)	97.4	86.7	(t-3; t-1)	97.7	86.7	(t-4; t-1)	97.5	84.9
average after	(t+1; t+5)	97.5	88.1	(t+1; t+3)	97.4	88.0	(t+1; t+4)	96.5	84.1
average before	(t-2; t-1)	97.7	87.2	(t-2; t-1)	97.7	86.4	(t-2; t-1)	97.3	84.1
average after	(t+1; t+2)	98.2	89.8	(t+1; t+2)	98.1	89.7	(t+1; t+2)	97.7	87.6

(a) On the basis of the Wilcoxon test the ratings relating to the year before and after privatization are not statistically different.

Table 3 - Arithmetic means of DEA scores with business cycle variable
(CRS at constant prices relating to SAL and VA) ^b

	Unbalanced sample			Balanced sample 25 units		Balanced sample 16 units			
	No.	CRS SAL	CRS VA	CRS SAL	CRS VA	CRS SAL	CRS VA		
t-5	22	97.2	90.8						
t-4	28	97.9	88.1			98.6	88.5		
t-3	33	98.0	87.9	98.4	88.2	98.1	86.8		
t-2	39	98.4	89.1	98.5	88.0	98.1	85.2		
t-1	39	97.8	87.4	97.7	87.0	97.5	85.9		
t	39	97.7	88.3	97.3	87.9	97.4	87.6		
t+1	39	98.2	88.1	98.0	87.9	97.4	85.7		
t+2	39	98.4	91.9	98.7	93.5	98.3	91.4		
t+3	31	96.8	86.2	96.3	85.1	94.4	77.7		
t+4	22	97.7	88.0			96.8	84.1		
t+5	16	96.8	87.3						
average before	(t-5; t-1)	97.9	88.7	(t-3; t-1)	98.2	87.7	(t-4; t-1)	98.1	86.6
average after	(t+1; t+5)	97.6	88.3	(t+1; t+3)	97.7	88.8	(t+1; t+4)	96.7	84.7
average before	(t-2; t-1)	98.1	88.2	(t-2; t-1)	98.1	87.5	(t-2; t-1)	97.8	85.5
average after	(t+1; t+2)	98.3	90.0	(t+1; t+2)	98.3	90.7	(t+1; t+2)	97.9	88.6

(b) On the basis of the Wilcoxon test the ratings relating to the year before and after privatization are not statistically different.

Table 4 – Arithmetic means of DEA scores for firms under foreign and Italian control without business cycle variable (CRS at constant prices relating to SAL and VA)

	<i>Foreign groups</i>			<i>Italian groups</i>		
	No.	CRS SAL	CRS VA	No.	CRS SAL	CRS VA
t-5	6	92.5	83.6	16	98.4	88.2
t-4	6	94.2	74.7	22	97.9	88.3
t-3	7	96.1	80.1	26	97.8	88.7
t-2	8	95.3	80.4	31	98.6	89.9
t-1	8	97.8	84.7	31	97.5	87.0
t	8	97.8	88.5	31	97.1	86.9
t+1	8	97.9	87.5	31	98.0	87.9
t+2	8	98.8	93.0	31	98.3	91.5
t+3	6	99.7	96.7	25	95.8	83.6
t+4 ^c	2	-	-	20	97.4	86.7
t+5 ^c	2	-	-	14	96.4	85.8
average before	(t-5; t-1)	95.2	80.7	(t-5; t-1)	98.0	88.4
average after	(t+1; t+3)	98.8	92.4 ***	(t+1; t+5)	97.2	87.1
average before	(t-2; t-1)	96.5	82.5	(t-2; t-1)	98.1	88.4
average after	(t+1; t+2)	98.3	90.2 ***	(t+1; t+2)	98.2	89.7

Wilcoxon test: statistically significant to 1%*, 5%** , 10%***

(c) The corresponding CRS average values are omitted because of the small number of observations.

Table 5 – Arithmetic means of the factors productivity indices

	<i>Unbalanced sample</i>						<i>Balanced sample 25 units</i>					<i>Balanced sample 16 units</i>						
	No.	SAL NEMPL	VA	SAL GFA+NCS	VA	SAL CMAT	SAL NEMPL	VA	SAL GFA+NCS	VA	SAL CMAT	SAL NEMPL	VA	SAL GFA+NCS	VA	SAL CMAT		
t-5	22	47.2	57.5	66.4	71.6	88.3												
t-4	28	54.5	58.2	71.0	69.8	84.7						49.4	57.3	69.9	76.7	86.6		
t-3	33	59.3	61.7	75.7	73.4	85.8	56.9	59.6	74.4	72.9	85.6	55.5	63.4	65.6	72.1	87.1		
t-2	39	60.5	63.5	76.7	75.6	87.7	58.9	60.5	74.0	71.4	85.0	56.5	61.8	64.8	68.6	85.5		
t-1	39	62.5	65.5	73.6	72.6	87.2	61.6	65.1	70.6	70.2	84.3	57.2	66.4	64.1	69.8	84.0		
t	39	64.8	68.5	72.3	71.0	86.4	64.1	68.6	71.0	69.8	83.7	60.4	71.6	66.5	71.6	83.5		
t+1	39	71.2	73.0	72.5	70.0	85.8	64.7	68.7	69.6	68.3	84.0	61.2	69.9	68.7	70.8	83.0		
t+2	39	79.6	80.8	76.7	73.0	85.1	78.2	82.0	74.9	72.5	83.1	72.4	81.1	74.3	75.6	81.7		
t+3	31	74.9	72.6	71.7	65.6	83.1	75.2	72.8	70.8	63.9	80.0	68.2	68.3	68.4	63.8	77.7		
t+4	22	75.3	76.4	70.2	68.2	83.7						73.0	74.1	66.2	62.0	77.5		
t+5	16	70.7	73.6	72.2	71.0	84.2												
average before	(t-5; t-1)	56.8	61.3	72.7	72.6	86.7	(t-3; t-1)	59.1	61.7	73.0	71.5	85.0	(t-4; t-1)	54.6	62.2	66.1	71.8	85.8
average after	(t+1; t+5)	74.3	75.3	72.7	69.5	84.4	(t+1; t+3)	72.7	74.5	71.8	68.2	82.3	(t+1; t+4)	68.7	73.3	69.4	68.0	80.0
		*	*			*		*	**				**			**		
average before	(t-2; t-1)	61.5	64.5	75.1	74.1	87.4	(t-2; t-1)	60.2	62.8	72.3	70.8	84.6	(t-2; t-1)	56.9	64.1	64.5	69.2	84.8
average after	(t+1; t+2)	75.4	76.9	74.6	71.5	85.4	(t+1; t+2)	71.5	75.4	72.3	70.4	83.5	(t+1; t+2)	66.8	75.5	71.5	73.2	82.4
		*	*				**	*					**					

Wilcoxon test: statistically significant to 1%*, 5%** , 10%***

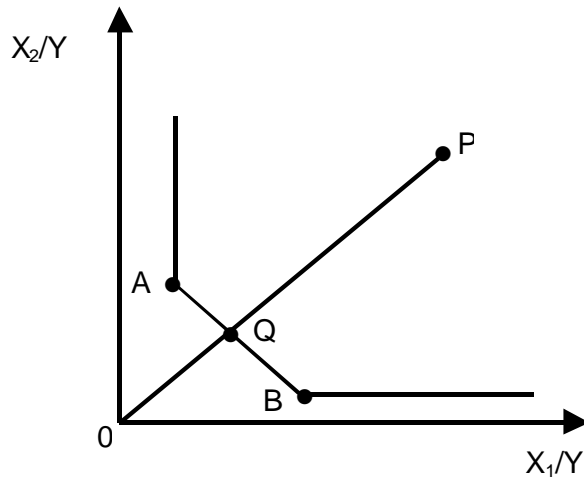


Figure 2 - Trend of the average DEA scores
(CRS at constant prices relating to SAL without business cycle variable)

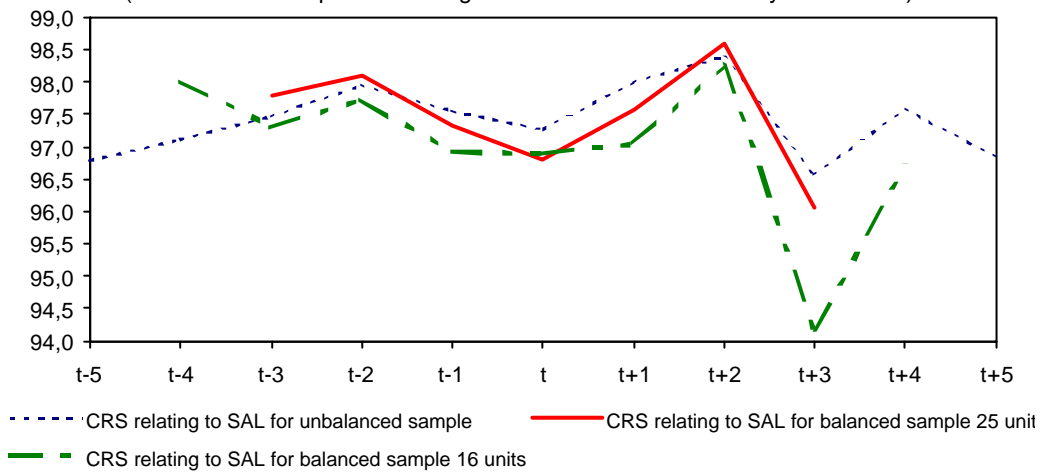
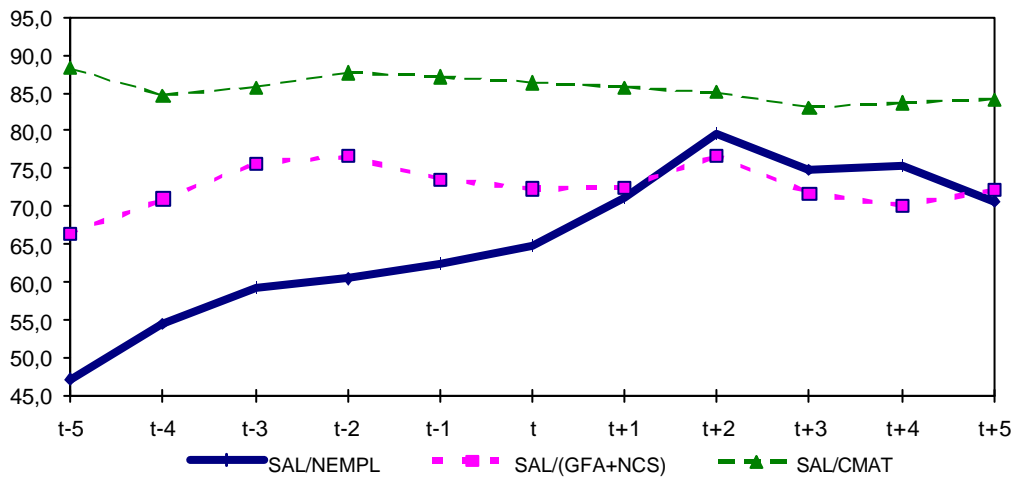


Figure 3 - Trend of the average factors productivity indices relating to SAL for the unbalanced sample



References

- Anderson S. P., De Palma A., Thisse J. F., 1997, "Privatization and efficiency in a differentiated industry", *European Economic Review*, no. 41, 1635-1654.
- Barca F., 1994, "Allocazione e riallocazione della proprietà e del controllo delle imprese: ostacoli, intermediari, regole", in *Il mercato della proprietà e del controllo delle imprese: aspetti teorici e istituzionali*, Special edition of "Contributi all'Analisi Economica", Banca d'Italia, 11-60.
- Barca F., Ferri G., 1994, *Crescita e riallocazione del controllo: Teoria e prime evidenze empiriche per l'Italia*, in *Il mercato della proprietà e del controllo delle imprese: aspetti teorici e istituzionali*, Special edition of "Contributi all'Analisi Economica", Banca d'Italia, 363-406.
- Bertero E., Rondi L., 1998, "Managerial discretion and investment decisions of state-owned firms: evidence from a panel of Italian companies", *Public Choice*, forthcoming.
- Bertero E., Rondi L., 1997, "Does debt discipline state owned firms? Evidence from a panel of Italian firms", *Special Paper no. 98, Financial markets group*, London School of Economics.
- Bishop M., Thompson D., 1992, "Regulatory reform and productivity growth in the UK's public utilities", *Applied Economics*, no. 24, 1181-1190.
- Bös D., 1991, *Privatization: a theoretical treatment*, Clarendon Press, Oxford.
- Bousofiane A., Martin S., Parker D., 1997, "The impact on technical efficiency of the UK privatization programme", *Applied Economics*, no. 29, 297-310.
- Bousofiane A., Dyson R. G., Thanassoulis E., 1991, "Applied Data Envelopment Analysis", *European Journal of Operational Research*, no. 52, 1-15.
- Boycko M., Shleifer A., Vishny R. W., 1996, "A theory of privatization", *The Economic Journal*, no. 106, 309-319.
- Cannari L., Marchese G., Pagnini M., 1994, *Forma giuridica, quotazione e struttura proprietaria delle imprese italiane: prime evidenze comparate*, in *Il mercato della proprietà e del controllo delle imprese: aspetti teorici e istituzionali*, Special edition of "Contributi all'Analisi Economica", Banca d'Italia, 257-297.
- Caves R., 1996, *Multinational enterprise and economic analysis*, Cambridge University Press, Cambridge.
- Centrale dei Bilanci, 1995, *Economia e finanza delle imprese italiane*, Bancaria Editrice.
- Charnes A., Cooper W. W., Rhodes E., 1978, "Measuring the efficiency of decision making units", *European Journal of Operational Research*, no. 2, 429-444.
- Coelli T., Prasada Rao D.S., Battese G.E., 1998, *An introduction to efficiency and productivity analysis*, Kluwer Academic Publishers, Boston/Dordrecht/ London.
- De Fraja G., 1993, "Productive efficiency in public and private firms", *Journal of Public Economics*, no. 50, 15-30.
- Dewenter K. L., Malatesta P.H., 1998, "State-owned and privately-owned firms: an empirical analysis of profitability, leverage and labour intensity", School of Business, University of Washington.
- Dilling-Hansen M., Eriksson T., Madsen E. S., Smith V., 1999, "The influence of competition

- and ownership structure on the performance of Danish manufacturing firms”, EARIE Conference, Torino.
- Dunsire A., Hartley K., Parker D., 1991, “Organisational status and performance: summary of the findings”, *Public Administration*, vol. 69, 21-40.
- Farrell M.J., 1957, “The measurement of productive efficiency”, *Journal of the Royal Statistical Society*, series A, no. 120, 253-281.
- Fraquelli G., 1997, *Elementi di economia manageriale, costi, produttività, investimenti*, Utet Libreria, Torino.
- Fraquelli G., Fabbri P., 1998, “Prima e dopo la privatizzazione: un confronto tra imprese operanti in concorrenza”, *Economia e Politica Industriale*, no. 98, 127-153.
- Grossman S.J., Hart O.D., 1986, “The costs and benefits of ownership: a theory of vertical and lateral integration”, *Journal of Political Economy*, vol. 94, no. 4, 691-719.
- Hart O. D., 1990, “An economist’s perspective on the theory of the firm”, *Columbia Law Review*, 1757-1774.
- Hart O. D., Moore J., 1990, "Property Rights and the nature of the firm", *Journal of Political Economy*, vol. 98, no. 6, 1119-1158.
- Hartley K., Martin S., Parker D., 1991, “Organisational status, ownership and productivity”, *Fiscal Studies*, vol. 12, no. 2, 46-60.
- Hartley K., Parker D., 1991a, “Do changes in organizational status affect financial performance?”, *Strategic Management Journal*, vol. 12, 631-641.
- Hartley K., Parker D., 1991b, “Organizational status and performance: the effects on employment”, *Applied Economics*, no. 23, 403-416.
- Haskel J., Szymanski S., 1993, “The effects of privatization, restructuring and competition on productivity growth in UK public corporations”, *Working Paper* no. 286, Department of Economics, Queen Mary and Westfield College, University of London.
- Hay D.A., Liu G.S., 1997, “The efficiency of firms: what difference does competition make?”, *The Economic Journal*, no. 107, 597-617.
- Hutchinson G., 1991, “Efficiency gains through privatization of UK industries”, in Hartley K., Ott A. F., *Privatization and economic efficiency: a comparative analysis of developed and developing countries*, Aldershot: Edward Elgar.
- Kay J.A., Thompson D.J., 1986, “Privatization: a policy in search of a rationale”, *The Economic Journal*, no. 96, 18-32.
- Laffont J. J., Tirole J., 1986, “Using cost observation to regulate firms”, *Journal of Political Economy*, vol. 94, 614-641.
- Molyneux R., Thompson D., 1987, “National industry performance: still third rate?”, *Fiscal Studies*, vol. 8, no.1, 48-82.
- Margon D., Sembenelli A., Vannoni D., 1995, “Panel Ceris su dati di impresa: aspetti metodologici e istruzioni per l’uso”, *Working Paper Ceris-Cnr*, no. 7.
- Martin S., Parker D., 1995, “The impact of privatization on labour and total factor productivity”, *Scottish Journal of Political Economy*, vol. 42, no. 2, 201-220.
- Martin S., Parker D., 1998, *The impact of privatization: ownership and corporate performance in the UK*, Routledge, London and New York.
- Megginson W. L., Nash R. C., Van Randenborgh M., 1994, “The financial and operating

- performance of newly privatized firms: an international empirical analysis”, *Journal of Finance*, vol. 49, no. 2, 403-452.
- Nickell S., 1996, “Competition and corporate performance”, *Journal of Political Economy*, vol 104, no. 4, 724-746.
- Nickell S., Wadhvani S., Wall M., 1992, “Productivity growth in UK companies, 1975-1986”, *European Economic Review*, no. 36, 1055-1091.
- Niskanen W. A., 1971, *Bureaucracy and representative government*, New York.
- Nomisma, 1996, “Privatizzazioni 1983-1995”, *Banca Dati, Laboratorio di Politica Industriale*, Nomisma, Bologna.
- Pint E.M., 1991, “Nationalization vs regulation of monopoly. The effects of ownership on efficiency”, *Journal of Public Economics*, no. 41, 151-164.
- Sarno D., 1993, “Un’analisi comparata della performance di imprese di proprietà pubblica e di proprietà privata: il caso di un campione di imprese ‘dismesse’ dalle PP.SS”, *Politica Economica*, no.3, 367-396.
- Schmidt M.K., 1996, “The costs and benefits of privatization: an incomplete contracts approach”, *The Journal of Law, Economics & Organization*, vol. 12, no. 1, 1-24.
- Tirole J., 1988, *The theory of industrial organization*, MIT Press, Cambridge, Massachusetts.
- Trento S., 1992, “Proprietà ed efficienza: est e ovest di fronte alle privatizzazioni”, *Politica Economica*, no. 2, 201-223.
- Vickers J., Yarrow G., 1988, *Privatization: an economic analysis*, Mit Press, Cambridge, Massachusetts.
- Waddams Price C., Weyman-Jones T., 1996, “Malmquist indices of productivity change in the UK gas industry before and after privatization”, *Applied Economics*, no. 28, 29-39.
- Williamson O. E., 1975, *Markets and hierarchies: analysis and antitrust implications*, New York, Free Press.
- Yarrow G., 1986, “Privatization in theory and practice”, *Economic Policy*, no. 2, 323-377.
- Zanetti G., Alzona G., 1998, *Capire le privatizzazioni*, Universale Paperbacks, Il Mulino, Bologna.

WORKING PAPER SERIES (1999-1993)

1999

- 1/99 *La valutazione delle politiche locali per l'innovazione: il caso dei Centri Servizi in Italia*, by Monica Cariola and Secondo Rolfo, January
- 2/99 *Trasferimento tecnologico ed autofinanziamento: il caso degli Istituti Cnr in Piemonte*, by Mario Coccia, March
- 3/99 *Empirical studies of vertical integration: the transaction cost orthodoxy*, by Davide Vannoni, March
- 4/99 *Developing innovation in small-medium suppliers: evidence from the Italian car industry*, by Giuseppe Calabrese, April
- 5/99 *Privatization in Italy: an analysis of factors productivity and technical efficiency*, by Giovanni Fraquelli and Fabrizio Erbetta, March
- 6/99 *New Technology Based-Firms in Italia: analisi di un campione di imprese triestine*, by Anna Maria Gimigliano, April
- 7/99 *Trasferimento tacito della conoscenza: gli Istituti CNR dell'Area di Ricerca di Torino*, by Mario Coccia, May
- 8/99 *Struttura ed evoluzione di un distretto industriale piemontese: la produzione di casalinghi nel Cusio*, by Alessandra Ressico, June
- 9/99 *Analisi sistemica della performance nelle strutture di ricerca*, by Mario Coccia, September
- 10/99 *The entry mode choice of EU leading companies (1987-1997)*, by Giampaolo Vitali, November
- 11/99 *Esperimenti di trasferimento tecnologico alle piccole e medie imprese nella Regione Piemonte*, by Mario Coccia, November
- 12/99 *A mathematical model for performance evaluation in the R&D laboratories: theory and application in Italy*, by Mario Coccia, November
- 13/99 *Trasferimento tecnologico: analisi dei fruitori*, by Mario Coccia, December
- 14/99 *Beyond profitability: effects of acquisitions on technical efficiency and productivity in the Italian pasta industry*, by Luigi Benfratello, December
- 15/99 *Determinanti ed effetti delle fusioni e acquisizioni: un'analisi sulla base delle notifiche alle autorità antitrust*, by Luigi Benfratello, December

1998

- 1/98 *Alcune riflessioni preliminari sul mercato degli strumenti multimediali*, by Paolo Vaglio, January
- 2/98 *Before and after privatization: a comparison between competitive firms*, by Giovanni Fraquelli and Paola Fabbri, January
- 3/98 **Not available**
- 4/98 *Le importazioni come incentivo alla concorrenza: l'evidenza empirica internazionale e il caso del mercato unico europeo*, by Anna Bottasso, May
- 5/98 *SEM and the changing structure of EU Manufacturing, 1987-1993*, by Stephen Davies, Laura Rondi and Alessandro Sembenelli, November
- 6/98 *The diversified firm: non formal theories versus formal models*, by Davide Vannoni, December
- 7/98 *Managerial discretion and investment decisions of state-owned firms: evidence from a panel of Italian companies*, by Elisabetta Bertero and Laura Rondi, December
- 8/98 *La valutazione della R&S in Italia: rassegna delle esperienze del C.N.R. e proposta di un approccio alternativo*, by Domiziano Boschi, December
- 9/98 *Multidimensional Performance in Telecommunications, Regulation and Competition: Analysing the European Major Players*, by Giovanni Fraquelli and Davide Vannoni, December

1997

- 1/97 *Multinationality, diversification and firm size. An empirical analysis of Europe's leading firms*, by Stephen Davies, Laura Rondi and Alessandro Sembenelli, January
- 2/97 *Qualità totale e organizzazione del lavoro nelle aziende sanitarie*, by Gian Franco Corio, January
- 3/97 *Reorganising the product and process development in Fiat Auto*, by Giuseppe Calabrese, February
- 4/97 *Buyer-supplier best practices in product development: evidence from car industry*, by Giuseppe Calabrese, April
- 5/97 *L'innovazione nei distretti industriali. Una rassegna ragionata della letteratura*, by Elena Ragazzi, April

- 6/97 *The impact of financing constraints on markups: theory and evidence from Italian firm level data*, by Anna Bottasso, Marzio Galeotti and Alessandro Sembenelli, April
- 7/97 *Capacità competitiva e evoluzione strutturale dei settori di specializzazione: il caso delle macchine per confezionamento e imballaggio*, by Secondo Rolfo, Paolo Vaglio, April
- 8/97 *Tecnologia e produttività delle aziende elettriche municipalizzate*, by Giovanni Fraquelli and Piercarlo Frigero, April
- 9/97 *La normativa nazionale e regionale per l'innovazione e la qualità nelle piccole e medie imprese: leggi, risorse, risultati e nuovi strumenti*, by Giuseppe Calabrese, June
- 10/97 *European integration and leading firms' entry and exit strategies*, by Steve Davies, Laura Rondi and Alessandro Sembenelli, April
- 11/97 *Does debt discipline state-owned firms? Evidence from a panel of Italian firms*, by Elisabetta Bertero and Laura Rondi, July
- 12/97 *Distretti industriali e innovazione: i limiti dei sistemi tecnologici locali*, by Secondo Rolfo and Giampaolo Vitali, July
- 13/97 *Costs, technology and ownership form of natural gas distribution in Italy*, by Giovanni Fraquelli and Roberto Giandrone, July
- 14/97 *Costs and structure of technology in the Italian water industry*, by Paola Fabbri and Giovanni Fraquelli, July
- 15/97 *Aspetti e misure della customer satisfaction/dissatisfaction*, by Maria Teresa Morana, July
- 16/97 *La qualità nei servizi pubblici: limiti della normativa UNI EN 29000 nel settore sanitario*, by Efsio Ibba, July
- 17/97 *Investimenti, fattori finanziari e ciclo economico*, by Laura Rondi and Alessandro Sembenelli, rivisto sett. 1998
- 18/97 *Strategie di crescita esterna delle imprese leader in Europa: risultati preliminari dell'utilizzo del data-base Ceris "100 top EU firms' acquisition/divestment database 1987-1993"*, by Giampaolo Vitali and Marco Orecchia, December
- 19/97 *Struttura e attività dei Centri Servizi all'innovazione: vantaggi e limiti dell'esperienza italiana*, by Monica Cariola, December
- 20/97 *Il comportamento ciclico dei margini di profitto in presenza di mercati del capitale meno che perfetti: un'analisi empirica su dati di impresa in Italia*, by Anna Bottasso, December

1996

- 1/96 *Aspetti e misure della produttività. Un'analisi statistica su tre aziende elettriche europee*, by Donatella Cangialosi, February
- 2/96 *L'analisi e la valutazione della soddisfazione degli utenti interni: un'applicazione nell'ambito dei servizi sanitari*, by Maria Teresa Morana, February
- 3/96 *La funzione di costo nel servizio idrico. Un contributo al dibattito sul metodo normalizzato per la determinazione della tariffa del servizio idrico integrato*, by Giovanni Fraquelli and Paola Fabbri, February
- 4/96 *Coerenza d'impresa e diversificazione settoriale: un'applicazione alle società leaders nell'industria manifatturiera europea*, by Marco Orecchia, February
- 5/96 *Privatizzazioni: meccanismi di collocamento e assetti proprietari. Il caso STET*, by Paola Fabbri, February
- 6/96 *I nuovi scenari competitivi nell'industria delle telecomunicazioni: le principali esperienze internazionali*, by Paola Fabbri, February
- 7/96 *Accordi, joint-venture e investimenti diretti dell'industria italiana nella CSI: Un'analisi qualitativa*, by Chiara Monti and Giampaolo Vitali, February
- 8/96 *Verso la riconversione di settori utilizzatori di amianto. Risultati di un'indagine sul campo*, by Marisa Gerbi Sethi, Salvatore Marino and Maria Zittino, February
- 9/96 *Innovazione tecnologica e competitività internazionale: quale futuro per i distretti e le economie locali*, by Secondo Rolfo, March
- 10/96 *Dati disaggregati e analisi della struttura industriale: la matrice europea delle quote di mercato*, by Laura Rondi, March
- 11/96 *Le decisioni di entrata e di uscita: evidenze empiriche sui maggiori gruppi italiani*, by Alessandro Sembenelli and Davide Vannoni, April
- 12/96 *Le direttrici della diversificazione nella grande industria italiana*, by Davide Vannoni, April
- 13/96 *R&S cooperativa e non-cooperativa in un duopolio misto con spillovers*, by Marco Orecchia, May
- 14/96 *Unità di studio sulle strategie di crescita esterna delle imprese italiane*, by Giampaolo Vitali and Maria Zittino, July. **Not available**
- 15/96 *Uno strumento di politica per l'innovazione: la prospezione tecnologica*, by Secondo Rolfo, September
- 16/96 *L'introduzione della Qualità Totale in aziende ospedaliere: aspettative ed opinioni del middle management*, by Gian Franco Corio, September

- 17/96 *Shareholders' voting power and block transaction premia: an empirical analysis of Italian listed companies*, by Giovanna Nicodano and Alessandro Sembenelli, November
- 18/96 *La valutazione dell'impatto delle politiche tecnologiche: un'analisi classificatoria e una rassegna di alcune esperienze europee*, by Domiziano Boschi, November
- 19/96 *L'industria orafa italiana: lo sviluppo del settore punta sulle esportazioni*, by Anna Maria Gaibisso and Elena Ragazzi, November
- 20/96 *La centralità dell'innovazione nell'intervento pubblico nazionale e regionale in Germania*, by Secondo Rolfo, December
- 21/96 *Ricerca, innovazione e mercato: la nuova politica del Regno Unito*, by Secondo Rolfo, December
- 22/96 *Politiche per l'innovazione in Francia*, by Elena Ragazzi, December
- 23/96 *La relazione tra struttura finanziaria e decisioni reali delle imprese: una rassegna critica dell'evidenza empirica*, by Anna Bottasso, December

1995

- 1/95 *Form of ownership and financial constraints: panel data evidence on leverage and investment choices by Italian firms*, by Fabio Schiantarelli and Alessandro Sembenelli, March
- 2/95 *Regulation of the electric supply industry in Italy*, by Giovanni Fraquelli and Elena Ragazzi, March
- 3/95 *Restructuring product development and production networks: Fiat Auto*, by Giuseppe Calabrese, September
- 4/95 *Explaining corporate structure: the MD matrix, product differentiation and size of market*, by Stephen Davies, Laura Rondi and Alessandro Sembenelli, November
- 5/95 *Regulation and total productivity performance in electricity: a comparison between Italy, Germany and France*, by Giovanni Fraquelli and Davide Vannoni, December
- 6/95 *Strategie di crescita esterna nel sistema bancario italiano: un'analisi empirica 1987-1994*, by Stefano Olivero and Giampaolo Vitali, December
- 7/95 *Panel Ceris su dati di impresa: aspetti metodologici e istruzioni per l'uso*, by Diego Margon, Alessandro Sembenelli and Davide Vannoni, December

1994

- 1/94 *Una politica industriale per gli investimenti esteri in Italia: alcune riflessioni*, by Giampaolo Vitali, May
- 2/94 *Scelte cooperative in attività di ricerca e sviluppo*, by Marco Orecchia, May
- 3/94 *Perché le matrici intersettoriali per misurare l'integrazione verticale?*, by Davide Vannoni, July
- 4/94 *Fiat Auto: A simultaneous engineering experience*, by Giuseppe Calabrese, August

1993

- 1/93 *Spanish machine tool industry*, by Giuseppe Calabrese, November
- 2/93 *The machine tool industry in Japan*, by Giampaolo Vitali, November
- 3/93 *The UK machine tool industry*, by Alessandro Sembenelli and Paul Simpson, November
- 4/93 *The Italian machine tool industry*, by Secondo Rolfo, November
- 5/93 *Firms' financial and real responses to business cycle shocks and monetary tightening: evidence for large and small Italian companies*, by Laura Rondi, Brian Sack, Fabio Schiantarelli and Alessandro Sembenelli, December

Free copies are distributed on request to Universities, Research Institutes, researchers, students, etc.

Please, write to:

MARIA ZITTINO

Working Papers Coordinator

CERIS-CNR

Via Real Collegio, 30; 10024 Moncalieri (Torino), Italy

Tel. +39 011 6824.914; Fax +39 011 6824.966; m.zittino@ceris.cnr.it; <http://www.ceris.cnr.it>

Copyright © 1999 by CNR-Ceris

All rights reserved. Parts of this paper may be reproduced with the permission of the author(s) and quoting the authors and CNR-Ceris