The determinants of small-medium firm internationalisation and its effects on productive efficiency

by
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Introduction

The empirical literature on the determinants of multinational and large firm internationalisation is wide and mainly centred on the positive relationship between firm efficiency and export (Aw-Hwang, 1995; Clerides-Lach-Tybout, 1998). This finding is explained by two non mutually excluding rationales: i) export is a learning process that improves firm productivity; ii) export markets select the most efficient firms (Delgado-Farinas, 1999). Many other papers focus on more evolved forms of internationalisation and analyse the determinants of FDI (Graham, 1995; Graham-Krugman, 1993; Onida, 1989), or of the choice between FDI and alternative forms of internationalisation such as licensing (Kumar, 1985; Saggi, 1996) or joint-ventures (Cleeve, 1997; Kogut-Chang, 1991).

Very few papers focus on the first steps of small and medium sized firms toward intermediate forms of internationalisation (Wagner-Schnabel, 1994; Duarte, 1994). The decision to create sale structures abroad (from now on also CSSA) and to manage them either directly or by local traders, or even by creating new participated companies, has never received attention even though it often represents the most advanced form of internationalisation for small entrepreneurs and a first step toward the creation of a foreign subsidiary. The CSSA decision presents the interesting theoretical feature of being an investment under uncertainty which entails some

degree of irreversibility under the form of sunk costs. Its determinants may therefore be analysed within the framework of the "real option" theory (Dixit, 1998a and 1998b). To this purpose it has been shown that, even under the form of exports, the access to foreign markets implies significant sunk (informational and opportunity) costs which are substantially higher for smaller firms for which costs of diverting human resources from their productive activity are higher. In the same line, when a firm is affiliated to a group or to a consortium[1] sunk costs may be shared with partners therefore significantly reducing the value of the option to wait to the individual firm (Becchetti-Sierra, 1999).

Recent theoretical findings lead to think that ownership structure may affect this decision as well in theoretical models in which risk is "objectively" and "subjectively" modelled. In the first case uncertainty is incorporated in the stochastic process of expected profits. In this framework it is demonstrated that, even when we consider a risk neutral decision maker, ownership concentration increases the exercise price of the CSSA when this is viewed as a real option with the effect of raising the threshold over which closely held firms opt for this form of internationalisation (Becchetti-Martini, 1999)[2]. In the second case decision makers are

[1] Consortia are contractual agreeements ruled by Italian Civil Law among firms which choose to cooperate, to provide common funds and to share information for the development of some common activity (usually internationalisation, R&D and access to credit). They may lead or not to the creation of an independent corporation even though constituents always maintain their independent identity. Consortia differ from cartels and are tolerated by antitrust authorities because their goal is not to restrict competition by altering prices or quantities but just to promote cooperation and economies of scale among associates in order to improve their performance and efficiency.

[2] Dixit (1989a and 1989b) provides the theoretical background for this approach. Roberts-Tybout (1997) apply it to a model of export participation

risk averse portfolio maximisers. In this framework Zhang (1998) and Saint Paul (1992) theoretical results simply show that, the less diversified the investor portfolio, the lower the propensity to invest in risky activities. Under the assumption of a positive relationship between ownership concentration and the share of personal wealth invested in the firm by controlling shareholders this simple theoretical principle leads to the prediction of a negative relationship between ownership concentration and investment in risky activities such as, in our case, the intermediate form of internationalisation represented by the creation of sale structures abroad.

The marginal contribution of this paper in this literature is that of being, to our knowledge, the first: i) to provide empirical evidence on the determinants of this first step of internationalisation for small and medium sized firms; ii) to test the above mentioned theoretical hypotheses on the impact that size, age, affiliation to group and consortia and ownership structure should have on the CSSA decision.

The paper is divided into four sections (including introduction and conclusions). The first section presents a descriptive and econometric analysis on the determinants of the CSSA decision on a representative sample of around 5000 (mainly small and medium sized) firms for which this decision represents the most advanced form of internationalisation. Results from the first section are commented in the light of the real option model of the decision to create sales structure abroad presented in the introduction. The second section tests the correlation between the CSSA decision and firm productive efficiency with a stochastic frontier approach. In this section we test the hypothesis that the CSSA decision has a marginal and independent correlation with productive efficiency after controlling for the traditional impact of export.

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in Colombia which is successfully tested with a time series empirical analysis.

2. The determinants of the decision to create sale structures abroad: descriptive and econometric findings

We test the hypothesis presented in the theoretical section of the paper on the Mediocredito database. The database includes a sample of more than 5000 firms drawn from the whole set of Italian manufacturing firms. The sample is stratified and randomly selected (it reflects sector's geographical and dimensional distribution of Italian firms) for firms from 11 to 500 employees. It is by census for firms with more than 500 employees. For a subsample of 4404 firms both qualitative and quantitative data (balance sheets for the 1995-1997 period) are collected. Qualitative data provide, among other things, information on ownership structure, degree of internationalisation, entitlement to state subsidies, and successful introduction of innovative products and processes. [3]

The richness of the dataset of Italian firms allows to overcome some traditional problems in the estimates of the impact of ownership and control on firm internationalisation. The first problem is about the proxy adopted to identify ownership-controlled (OC) and manager-controlled (MC) firms which is usually based on percentage ownership criteria (Short, 1994). It is well known that, as firms grow in size, control may be exerted with a limited ownership share and that, therefore, a univocal relationship between the two

[3] The following selection bias of the Mediocredito dataset must be taken into account. More than 90 percent of observed small firms (below 50 employees) are "*società di capitali*" (entrepreneurs have limited liability) while in the universe of Italian small firms this share is much lower and unlimited liability is widespread. When interpreting empirical results we must therefore consider that we are analysing the subset of Italian small and medium sized firms with the most "evolved" form of corporate governance.

variables does not exist at low ownership-control shares.[4] Our analysis uses the direct declaration of firm managers in qualitative questionnaires in which an explicit demand on ownership share and effective and direct control of the first three (or more) shareholders is included.

A second advantage is that our empirical analysis draws on a large sample which includes a large amount of small and medium sized firms in an economy in which the market for corporate control is not fully developed. This reduces the impact of two types of selection bias. The first (Cable, 1978) occurs when only large firms are included in the sample, since only the most efficient OC firms maintain this status when they grow in size. The second occurs in samples containing only small firms when, under an effective market for corporate control, less efficient firms are taken over and excluded from the sample.

Descriptive features of this sample illustrate some important characteristics of the Italian economy (Tab. 1) in the three years considered: i) the relative specialisation in Traditional sectors and the underspecialisation in High-Tech sectors (respectively 40 and 4 percent of sample firms); ii) the relevant weight of small firms (no more than 50 employees) which account for more than 60 percent of the sample; iii) the striking difference between firms in the North and firms in the South, where the latter are smaller, younger and subsidised (exporting) in a larger (smaller) share. Ownership structure is highly concentrated throughout all the country. The average number of controlling shareholders is around two with an aggregate control share of more than 80 percent.[5] Family ownership

[4] Cubbin-Leech (1982) and Leech-Leahy (1991) are among the few exceptions to the use of the ownership percentage criteria. They consider complex patterns of shareholdings, kinship networks and interlocking directories.

[5] This aggregate control share is not surprisingly high if compared to results from La Porta et al. (1998) which find that the three largest

involves more than 60 percent of the sample. Network relationships among productive units seem to be quite important as well since more than 37 percent of sample firms produce under subcontracted modality, the share being higher in the Northern areas.

Table 2 provides descriptive evidence on the share of firms creating sale structures abroad and on their features in different macroareas. We identify here at least nine nice descriptive findings. When passing from the small to the large firm subsample the share of CSSA firms raises by 10 percent. The average size of CSSA firms is 70 percent higher than that of non CSSA firms. CSSA firms are older and the larger share of them belongs to the Specialised sector. The decision to invest in R&D and to create sale structures abroad seems to be positively correlated as R&D participation is almost twice as higher for CSSA firms. A larger share of CSSA firms is subsidised and belongs to "non-diversified" groups[6] (groups whose products belong to the same four digit industrial sector according to the ATECO classification), a smaller share of CSSA firms are subcontractors and ownership concentration in CSSA firms is lower. Finally, the share of investors in information technology (computer software, hardware and telecommunications) is higher among CSSA firms.

Additional information on the distribution of quantitative variables which we will subsequently use in econometric estimates is provided in tab. 3. We find here that more than 20 percent of sample firms have no access to (or do not choose) bank lending, half of sample firms have almost less than 30 employees and a control group with 100 percent share of firm equity, 60 percent of firms do not invest in R&D. In the left tail of the distribution of financial

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shareholders in Italy have a share of .58 on a sample of the 10 largest, non financial, domestic (no foreign multinationals), totally private (no government ownership), publicly traded firms.

[6] Groups whose products belong to the same four digit industrial sector according to the ATECO classification

pressure and market rents we find one percent of sample firms with negative values which are respectively net creditors and produce below the break-even point.

To estimate the determinants of the decision to create sale structures abroad we regress the dichotomic CSSA variable on a list of potential determinants. The estimation procedure is selected by adopting a GLM approach (Nelder-Weddelbrun, 1972; McCullagh-Nelder, 1989). This approach considers the following specification for our model: $g(E(y)) = \boldsymbol{b}'\mathbf{x}, \qquad y \approx F$ where g(.) is the link function and F the distributional family. Since our dependent variable is dichotomic we consider three possible representations, all of them having a binomial link function: i) a probit model where the distributional function is Gaussian: $P(Y=1) = \int_{-\infty}^{b'x} \boldsymbol{f}(t)dt = \Phi(\boldsymbol{b}'\mathbf{x})$ and $\Phi(.)$ is a standard normal; ii) a logit model where the distributional function is logistic: $P(Y=1) = \frac{e^{b'\mathbf{x}}}{1+e^{b'\mathbf{x}}} = \Lambda(\boldsymbol{b}'\mathbf{x})$ and Λ (.) indicates the logistic cumulative distribution function; iii) a complementary log-log model where the distributional function is as follows $P(Y=1) = 1 - \frac{1}{e^{b'\mathbf{x}}} = \Lambda(\boldsymbol{b}'\mathbf{x})$ and Λ (.) indicates the logistic cumulative distribution function. The difference between the logistic and the probit approach is in the cumulative distribution function wich maps predicted values in the 0-1 interval of the dependent variable. The logistic distribution has ticker tails so that its cumulative is flatter than the cumulative normal. The difference becomes significant if important regressors have wide variation and if the distribution of the dependent variable is highly skewed (very few 1 or 0 cases).

The estimated model is:

$$CSSA = \alpha_0 + \sum_{i=1}^{m-1} \alpha_i Ind_i + \sum_{j=1}^{p-1} \delta_j Pavitt_j + \sum_{k=1}^{n-1} \gamma_k Macroarea_k + \beta_1 Size + \beta_2 Birth + \beta_3 Group +$$
$$+ \beta_4 Capogr + \beta_5 Family + \beta_6 Qtnosep + \beta_7 Contr\ln m + \beta_8 Socbank + \beta_9 Subsidy + \beta_{10} Ration +$$
$$+ \beta_{11} Quot + \beta_{12} Lev + \beta_{13} Confidi + \beta_{14} \Pr esfi + \beta_{15} Tang + \beta_{16} Consex + \beta_{17} Innovat +$$
$$+ \beta_{18} R\&Dinv + \beta_{19} Qlowsk + \beta_{20} Wage + \varepsilon \qquad (1)$$

where *CSSA* is a dummy taking value of one if the firm created sale structures abroad managed either directly or through local traders in the 1995-1997 period,[7] *IND* are *m-1* industry dummies based on a three-digit ATECO classification (m=1,..,20),[8] PAVITT are *p-1* macrosector dummies (p=1,..,4), *MACROAREA* are *n-1* macroarea dummies (n=1,..,4), *SIZE* are firm's employees in 1995, *BIRTH* is the firm's year of establishment.

Ownership structure: to test the effect of ownership and control on export participation we use six regressors: *GROUP* is a dummy which takes value of one for firms affiliated to groups (subsidiaries or parent companies) and zero otherwise and *CAPOGR*, is a dummy for holdings. *FAMILY* is a dummy which takes value of one if the firm is "family controlled" (all controllers are linked by kinship)[9],

[7] We carefully control that non CSSA firms do not have adopted more advanced forms of internationalisation (such as FDI) to avoid that they are more internationalised than CSSA firms.

[8] These are three of the four Pavitt dummies (Scale, Specialised, High-Tech and Traditional sectors). We adopt both the Pavitt and the 21-sector extended classification since firms within the same sector often belong to different Pavitt macrosectors. The inspection of the correlation matrix shows that this choice does not create severe multicollinearity problems in the estimate. The correlation matrix is available from the authors upon request.

[9] La Porta et al. (1999) have recently emphasized the importance of family ownership on corporate structure in the world. They find that in 1995, for firms with a market capitalisation of at least 500 million dollars, family

QTNOSEP measures the total amount of ownership held by shareholders controlling the firm, *CONTRLNM* is the number of controlling shareholders, *SOCBANK* is a dummy for firms having financial intermediaries among controlling shareholders.[10]

Availability and cost of external finance: five additional regressors give us information on the availability and costs of external and internal finance: *SUBSIDY* is a dummy indicating if the firm received soft loans in the 1995-97 period, *RATION* is a dummy indicating type I or type II credit rationing (the firm declares she asked and did not received credit (additional credit) at the prevailing rate in the considered period), *QUOT* is a dummy taking value of one for firms which went public, *LEV* is the 1995 ratio of debt versus banks to total assets,[11] *CONFIDI* is a dummy for firms affiliated to credit consortia, *PRESFI* measures firm financial pressure and is calculated as interest expenditures /(gross profits +

owned firms represented from 60 to 80 percent of the sample in Italy, up to 40 percent in the UK and 20 percent in the US. Countries like Israel, Honk Kong, Mexico, Argentina and Sweden all had in 1995 a share of family owned firms higher than 50 percent.

[10] When financial intermediaries are also controlling shareholders the traditional divergence of incentives existing between (lenders) financiers and entrepreneurs is eliminated. Therefore it should be easier for firms to finance investment in risky activities such as internationalisation.

[11] In balance sheet data the following debt items are registered: i) debt versus banks; ii) debt versus partners; iii) debt versus group; iv) debt versus suppliers - customers anticipated payments; v) bonds. Items ii) and iii) should be considered as equity more than debt, because non individual firms are often participated with a share higher than 50%. Item iv) is commercial debt more linked to operating expenses than to investment financing. We use total assets and not equity capital as a scale variable because all firms are small and medium sized, not listed in the stock exchange and most of them family owned. As a consequence, equity capital is often a symbolic balance sheet item, extremely volatile and not representative of firm's stock of total assets.

depreciation+ interest expenditures), *TANG* is the total tangible capital stock after depreciation scaled by total assets and is considered as a proxy of firm sunk costs. Both of these last two variables are in 1995 values, *CONSEX* is a dummy for firms affiliated to export consortia.

Human capital and innovation: we include two controls for technological innovation as regressors. *INNOVAT* is a dummy taking value of one if the observed firm declares to have successfully innovated their products or processes, *R&DINV* is a dummy for firms with nonzero R&D investment in 1995. To measure human capital we use *QLWSK* , the 1995 share of low skilled workers on total employees and *WAGE*, the 1995 cost of labour per employee. This last variable may be considered as a proxy for human capital if we assume that more skilled workers are less substitutable and are therefore more able to capture rents under the form of higher wages (Roberts-Tybout, 1997).

We estimate the three possible specifications of the model (logit, probit, conditional log-log) with the GLM approach and select the model with the lowest dispersion. The differences in dispersion are very small but the logit model has the best performance in terms of both residuals deviance and Pearson X^2 (tab. 4).[12] To highlight the interaction between firm size and the impact of the various determinants on the dependent variable we estimate the model for the overall sample and for the subgroups of small, medium and large firms.[13]

[12] Mc Cullagh and Nelder (1989) suggest that deviance residuals have the best properties for examining the goodness of fit in a GLM, while Pearson residuals have the defect of skewed distributions for non-normal family distributions.

[13] The alternative approach of estimating the model for the overall sample and adding dummies testing for significant changes in the coefficients for size subgroups has the advantage of increasing degrees of freedom but the disadvantage of increasing multicollinearity among

Econometric results show that internationalisation is not equally distributed across macroregions and that North-East firms are significantly more likely to create sale structures abroad (tab.5). The positive and significant effect of size in the small firm sample is consistent with the hypothesis that upsizing significantly reduces sunk costs (under the form of opportunity costs from diverting labour from production to the activity of investigating on foreign market opportunities) when internationalisation is modelled as an investment under uncertainty (Roberts-Tybout, 1997; Becchetti-Sierra, 1999). Endogeneity in this result should be avoided as we use the beginning of period labour force (Wagner-Schnabel, 1994). The ratio of tangible capital stock to total assets is again a proxy of firm sunk costs and its negative and significant impact on the decision to create sale structures abroad is consistent with predictions from the "real option" approach to internationalisation.

The (weak) significant impact of affiliation to groups suggests that the experience of industrial partners may reduce informational sunk costs of the internationalising firm. Another interesting result is the positive and significant correlation between innovation output (the manager's declaration of successful introduction of innovation) and the CSSA decision. This is consistent with the hypothesis that firm-specific knowledge incorporated in intangible assets increases the advantage from the access to foreign markets as profits expected from this decision are augmented by the technological competitive advantage of the firm (Caves, 1982; Dunning, 1988; Wagner-Schnabel, 1994; Becchetti-Rossi, 2000). It is interesting to note that innovative input (R&D investment) is not significantly related to the CSSA decision so that, without the

regressors. Therefore the approach of running separate estimates has been preferred. The regressors correlation matrix for each of the four estimates is available from the authors upon request.

variable on innovation output, we would have missed the innovation-internationalisation relationship.

The negative correlation between ownership concentration and the CSSA decision is strong in all estimates with the exception of the large firm sample. The result is consistent with the hypothesis that ownership concentration reduces wealth diversification of the control group and leads to underinvestment in risky activities (Saint Paul, 1992; Zhang, 1998). Here again though, we need to control carefully for endogeneity problems.[14] Export consortia reveal to be a support for internationalisation mainly for small firms. The same occurs for participation to credit consortia (an organisation in which small and medium sized firms realise economies of scale in lobbying for financial support). Here again, our interpretation is that these cooperative agreements among independent productive units which do not generate changes in their ownership structures may substantially reduce sunk costs of internationalisation.[15]

[14] The CSSA decision may in fact entail the creation of new participated companies abroad with the potential effect of generating a dilution also in the internationalising firm. We therefore exclude from the sample all those CSSA firms which created participated companies abroad. Estimates including also these CSSA firms have nonetheless be performed and do not present significant differences. These estimates are available from the authors upon request.

[15] This result is obviously affected by the fact that many firms among those not participating to consortia do not seek access to foreign markets. On the other hand, if those looking for access to foreign markets accept to participate to consortia (and participation has nonzero costs) this means that they may have some positive effect on internationalisation. The relevance of the variable is therefore more that of a control which allows to meaure the effect of other regressors on internationalisation net of affiliation to consortia. To avoid endogeneity effects estimates without the variable have been performed without any significant change on overall regression results. These estimates are available from the authors upon request.

Results on the impact of financial variables show that the presence of financial intermediaries among controlling shareholders (SOCBANK) is a significant help for medium firms in their internationalisation effort. This result is consistent with the hypothesis that this presence eliminates the divergence of incentives between lenders and shareholders and therefore reduces financial constraints to investment in risky activities. Finally, export subsidies are significantly and positively correlated with the CSSA decision only for large firms.

3. The impact of internationalisation on productive efficiency: a stochastic frontier approach

The underlying (and often not made explicit) assumption of authors and of readers of many empirical analyses on the determinants of internationalisation is that it is a good choice for the firm. This paper tries to see whether this is true or not by testing if the CSSA decision has a positive influence of firm productive efficiency. The approach we follow is the estimation of a stochastic frontier production function (Jondrow,Lovell, Materov and Schmidt, 1982; Battese and Coelli, 1988, 1995). We therefore jointly estimate a two equation system which includes i) a production function and ii) its asymmetrical residual component with negative mean which is specified as a function of various efficiency/inefficiency factors. [16] We specify the frontier model as follows:

$$Y / L_{it} = a_0 + a_1 K / L_{it} + \sum_{j=1}^{m-1} b_j K / L_{it} * Ind_j + v_{it} - u_{it} \qquad (2).$$

[16] One reason to prefer this to nonparametric approaches is that it avoids that outliers are considered as very efficient firms (Signorini et al., 1999)

Y/L is the log of real output per worker of the i^{th} firm at time t *(i=1,…,N; t=1,…,T); K/L* is the log of the capital stock per worker where the capital stock is evaluated at the replacement cost of capital. We rewrite the Cobb-Douglas production function in terms of output per worker and capital per worker in order to remove potential problems of heteroskedasticity, multicollinearity and measurement of output (which should better be physical but is value output in our data) (Hay-Liu, 1997). Since any industry is likely to have a different production function we add to the specification *m-1* dummies accounting for differences in the output per worker-capital per worker elasticity between the reference sector and all other industries. We consider 21 sectors aggregated on the basis of the four digit ISTAT-ATECO classification.

The residual of the production function includes a symmetrical term v_{it} and a nonnegative asymmetrical term measuring the inefficiency with respect to the productive frontier (which represents the best technological practice). In order to have consistent estimates we require the following distributions for residual components: v_{it} is *iid* $N(0, \sigma^2_v)$; u_{it} is assumed to be independently distributed as a truncated normal, with variance σ^2_u and mean $m_{it} = z_{it}\delta > 0$, where z_{it} is a vector of variables that influence individual inefficiencies, and δ a vector of unknown parameters. We estimate the model simultaneously by maximum likelihood to provide efficient estimates.[17] The likelihood function is expressed in terms of the variance parameters $\sigma^2 = \sigma^2_v + \sigma^2_u$ with $\gamma = \sigma^2_u / \sigma^2$, being the

[17]Until recent developments of the literature (Battese and Coelli, 1995), applied works on stochastic frontier production functions have dealt with this issue mainly by adopting a two-stage approach in which the inefficiency effects predicted in the first step are regressed, in the second step, against some explanatory variables.

predicted measure of firm's inefficiency.[18] The test on the significance of the parameter is a test on relative amount of variability explained by the non random component of the production function residual and therefore a test on the validity of the stochastic frontier specification (the non rejection of the null hypothesis that the true value of the parameter equals zero implies that σ^2_u is zero).
The residual of the production function is regressed on a series of factors which are expected to affect efficiency:

$$u_{it} = \alpha_0 + \sum_{i=1}^{m-1} \alpha_i Ind_i + \sum_{k=1}^{n-1} \gamma_k Macroarea_k + \delta_1 CAP + \delta_2 Mkshare + \\ + \delta_3 \mathrm{Re}nts + \delta_4 \mathrm{Pr}esfi + \delta_5 Small + \delta_6 L\arg e + \delta_7 Group + \delta_8 CSAT + \\ + \delta_9 Old + \delta_{10} Young + \delta_{11} QTNOSEP + \delta_{12} CSSA + \delta_{13} FAMILY + \\ + \delta_{14} EXPORT \qquad (3)$$

First, we introduce factors traditionally considered in the literature (Hay-Liu, 1997; Nickell, 1996 and Nickell-Nicolitsas- Dryden, 1997) such as *CAP* (the degree of capacity utilisation declared by the manager in the questionnaire), *MKSHARE* (firm net sales over sector total net sales in 1995), *RENTS* - (profits before tax+depreciation+interest payments-cost of capital*capital stock)/value added) . and *PRESFI* - interest payments/ (interest payment + cash flow). *SECT, MACROAREA, SIZE, GROUP, QTNOSEP,* and *FAMILY* are specified as in (1). *EXPORT* and

[18] γ takes a value between zero and one and is derived as: $EFF_i = \frac{E(y_i|u_i, x_i)}{E(y_i|u_i = 0, x_i)}$ which depends on the conditional probability function $f(u_i|v_i - u_i)$ and hence on the joint distribution assumed for $(u_i, v_i\text{-}u_i)$. The expressions for the conditional expectations, given the assumptions of the model, are presented in Battese and Coelli (1993).

CSSA are respectively two dummies for firms which exported and created sale structures abroad in the 1995-1997 period.

We then add four dummies (*OLD*, *YOUNG*, *SMALL* and *LARGE*) respectively picking up the older, the younger, the smaller and the larger 20 percent of sample firms. An additional control (which we expect to be positively related with productive efficiency) is represented by CSAT, a dummy which takes value of one if the firm declares to monitor customer satisfaction

We estimate two versions of the stochastic frontier model: a cross-section for the last year of the panel (1997) and a three year panel. The test on g confirms that the hypothesis of the validity of the stochastic frontier specification is not rejected in both specifications (tab. 6 and 7).

The result on rents is apparently at odds with previous findings. According to the traditional literature competition should have a positive effect on efficiency in three ways (Short, 1994; Nickell, 1995; Vickers, 1995): i) by making it easier for owners to compare managerial performance with that of competitors and therefore reducing the capacity of the manager to capture rents under the form of slack; [19] ii) by increasing the advantage of higher efficiency under the form of cost reductions as the latter are more profitable under competition where demand elasticities are higher; iii) by increasing the probability of bankruptcy and therefore leading managers to work harder in order to avoid it (Schmidt, 1996; Aghion-Howitt, 1996). This counterintuitive result may be explained by the fact that high rents may have been obtained by creating competitive advantages in specific market segments and therefore they persist over time and signal higher quality firms. This is likely to occur: i) in high-tech markets and in financially developed systems where

[19] The relationship between competition and efficiency becomes unambiguous only when productivity shocks across competitors are more correlated than managerial abilities (Holmstrom, 1982)

innovators obtain patents and market rents for limited periods of time; ii) in industrial systems with less developed financial markets where relative competitive advantages tend to persist as the emergence of higher quality competitors is prevented by financial constraints.

The result that efficiency is positively related to ownership concentration is consistent with evidence surveyed by Short (1994) on several empirical papers comparing performance of closely held and widely held firms. In very small firms such as those in our sample and, under the particular features of the corporate governance previously described, it appears obvious that ownership concentration raises controlling shareholders' incentives in managing efficiently their firms.[20] On the other side though, the negative impact of family ownership on efficiency may be explained by the fact that family ties may turn into constraints on the entrepreneurial activity limiting the facto the possibility of choice of the entrepreneur.

The coefficient of the utilisation capacity rate is obviously positive as the higher the capacity utilisation, the higher the output for a given level of capital inputs. It should correct for inefficiency determined by demand factors (or by entrepreneurs forecast errors on expected demand).

The positive impact of market share on efficiency may be explained by the fact that, for a given level of rents which reveal the type of market competition, market share signals entry barriers (or MES). In fact, if for a given capacity to collude, market share is higher if there are only two than more than two competitors in the market. The first situation (lower number of competitors) may have

[20] The idea that ownership concentration has different impact of firm performance according to firm size seems supported by recent empirical evidence. Mc Connel-Servaes (1990) find a positive relationship on a large sample of listed and unlisted firms, while Leech-Leahy (1991) find a negative relationship on a small sample of large listed firms.

been determined by the existence of entry barriers under the form of MES or technological competitive advantage which allows incumbent to maintain a competitive advantage on entrants. In both cases, market share should be correlated with higher efficiency.[21]

The traditional hypothesis that financial pressure increases managerial discipline (Jensen, 1986; 1988; Aghion et al. 1995) is not supported by our data. This hypothesis has been developed in a corporate governance framework (separation between ownership and control, market for corporate control, significant informational asymmetries between managers and ownership) which is different from that prevailing in the observed firms. In a sample of small and medium sized firms with scarce contendibility and no separation between onwership, control and management, efficiency types are likely to persist over time and high financial pressure may simply signal less efficient types if past negative performance which generated current financial distress is strongly correlated with actual performance.

Regional dummies show that firms located in North-East and North-West are significantly more efficient than average, while this is not the case for firms located in the South. Small and young firm dummies have positive and significant coefficients, while old firms have significantly negative coefficients. This result may be the effect of a sample selection bias if survival rate is, as it often is, positively correlated with age and size.

Finally the CSSA decision is positively and significantly related to efficiency net of the positive and significant effect of EXPORT. A direct causality interpretation would suggest that this initial step in the process of internationalisation has a marginal

[21] An alternative interpretation suggests that, given the strong correlation between market share and firm size, the positive relationship may just proxy for a positive impact of size on efficiency, in addition to that of the size dummy.

contribution in itself on firm efficiency. The result may obviously be read in the other direction saying that only marginally more efficient firms take the CSSA after the EXPORT decision.

Panel estimates confirm most of cross-sectional results with few exceptions. Financial pressure turns from negative to positive. This finding is consistent with the fact that results from the panel estimate may be more properly interpreted as a causal relationship than cross-sectional results, where higher financial pressure in the cross-section just identifies less efficient firms.

The significance of the CSSA variable is confirmed in the panel version of the model. This result provides additional support for the direct causation effect since the CSSA decision which may have been taken in any of the three years considered in the estimate generates a significant growth in productivity in those three years with respect to the control sample.

Conclusions

The literature on internationalisation always focuses on localisation choices of multinationals neglecting the analysis of the behaviour of small and closely held firms which represent a dominant share of the world economy (La Porta, 1999). These firms have been shown to exhibit higher than average rates of growth (Hall, 1987; Evans, 1987) and therefore the analysis of their behaviour is fundamental to understand the mechanisms of economic development.

Small and closely held firms can not often afford sunk costs embedded in foreign direct investment and therefore opt for intermediate forms of internationalisation. The decision to create sale structures abroad is one of them. This decision possesses the characteristics of being both an investment under uncertainty and a multiwinner game in which benefits from cooperation are higher than

costs of competition for small and medium sized firms. The paper investigates the determinants of this form of internationalisation finding that these two features of the CSSA decision explain many of its determinants such as the positive effect of size, age, affiliation to groups and to consortia.

Finally, the stochastic frontier approach finds a significant and robust positive correlation between productive efficiency and the CSSA decision, net of the positive correlation between efficiency and export which is already well established in the empirical literature. The significance of this effect both in the cross-section and in the panel version of the model does not contradict the hypothesis of a causation which goes in both directions. More efficient firms evolve toward more advanced forms of internationalisation and the latter improve firm efficiency.

A final interesting finding of the paper is the effect of ownership structure on the CSSA decision and, ultimately, on firm efficiency. The literature on the relationship between law and finance (La Porta et al., 1998) finds that non common-law countries like Italy generally have weaker small shareholder protection and higher ownership concentration. The unanswered issue, though, is what is the consequence of ownership concentration on efficiency and growth. In this paper we show the ambivalence of this relationship for small and medium sized firms. On one side, ownership concentration increases control group residual claims on firm profits and therefore the incentive to perform well or to monitor more closely managerial performance if manager and controlling shareholders do not coincide. On the other side, it leads to underinvestment in risky activities such as internationalisation since reduced financial diversification of the control group stimulates technological diversification and despecialisation (Saint Paul, 1992). This reduced incentive to risky choices such as internationalisation limits small firms' access to further efficiency gains.

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Tab. 1 Descriptive features of the Mediocredito sample

	North West	North East	Centre	South.	Italy
Small (11 - 50 empl.)	60.36	63.98	75.06	61.78	64.07
Medium (51 - 100 empl..)	14.9	15.69	11.57	18.15	14.95
Large (oltre 100 empl.)	24.74	20.33	13.37	20.07	20.97
Traditional sectors	36.61	39.35	53.86	48.17	41.81
Scale sectors	29.53	24.07	25.84	30.89	27.57
Specialised Sectors	29.06	32.52	16.71	11.52	25.64
High-tech sectors	4.79	4.07	3.6	9.42	4.98
Family owned	62.34	60.24	56.3	57.77	60.14
Exporters	76.98	74.72	65.81	53.93	71.5
Affiliated to groups	25.31	26.63	20.05	26.88	24.96
Affiliated to consortia	8.7	9.92	12.34	11.34	10
Quality certification	34.47	26.49	21.94	29	29.42
Subsidised firms	35.96	35.02	34.41	53.89	37.69
Share of subcontractors	41.56	37.15	34.7	27.4	37.37
Credit rationed	12.60	10.10	12.60	26.40	13.70
Avg. share of controlling shareholders	86.54	82.56	82.48	74.07	83.12
Avg. Number of controlling shareholders*	2.01	1.88	1.98	1.65	1.92
Size* (avg. N. of employees 1995-1997)	147.54	107.51	85.4	94.83	119.11
Year of birth *	1969	1975	1977	1977	1973

Percent values except *

Tab. 2 Descriptive features of CSSA and non CSSA firms: breakdown by size classes
(Percent values except *)

	All sample		Firms with less than 50 employees		50-100 employees		Firms with more than 100 employees	
	CSSA firms	**Non CSSA firms**	**CSSA firms**	**Non CSSA firms**	**CSSA firms**	**Non CSSA firms**	**CSSA firms**	**Non CSSA firms**
All firms	25.68	74.32	8.23	91.77	14.43	86.67	19.54	81.45
North-West	23.75	76.25	16.56	83.44	26.85	73.15	39.78	60.22
North-East	29.15	70.85	23.41	76.59	39.06	60.94	45.45	54.55
Centre	24.21	75.79	21.43	78.57	27.45	72.55	28.79	71.21
South	18.71	81.29	19.16	80.84	14.46	85.54	22.97	77.03
Year of birth*	1971	1974	1975	1976	1970	1976	1965	1967
Average firm size (avg. n. of employees 1995-1997)*	171.61	100.92	28.51	24.91	71.40	71.48	462.72	448.46
Net sales per worker (millions of liras)*	367.57	346.43	402.54	344.57	318.47	345.10	338.23	397.74
Traditional sectors	24.06	75.94	20.40	79.60	29.28	70.72	36.27	63.73
Specialised sectors	33.51	66.49	26.15	73.85	41.48	58.52	48.76	51.24
Scale sectors	21.42	78.58	14.46	85.54	23.33	76.67	35.95	64.05
High-tech sectors	22.62	77.38	19.08	80.92	25.00	75.00	29.03	70.97
Family owned firms	61.13	64.12	59.22	62.34	57.46	63.12	67.34	74.12
Firms investing in R&D	52.34	27.57	40.36	19.71	47.24	33.13	74.37	54.62
Avg. R&D expenditure per employee (millions of liras)*	2.92	2.38	2.79	2.45	1.90	2.45	3.66	3.21
Firms declaring successful product or process innovation	84.35	69.62	78.97	66.55	86.24	74.78	91.22	78.19
Subsidised firms	51.66	38.35	43.76	34.23	56.56	54.99	62.41	42.18
Ownership share of the control group	83.5	84.09	79.08	84.19	76.28	84.08	85.31	86.80
Firms declaring to be credit rationed	4.44	3.39	3.90	3.75	5.16	4.18	3.86	2.14
Firms listed at the stock exchange	2.45	1.61	0.24	0.12	0.56	3.86	6.75	4.37
Affiliation to consortia	14.66	8.32	15.74	8.64	12.13	11.06	15.03	8.35
Firms affiliated to groups	33.38	22.67	15.06	11.71	28.07	29.51	65.73	61.08
Holding	8.42	3.07	3.52	1.07	7.62	5.42	19.52	9.42

Subsidiaries	13.24	14.15	8.35	7.9	13.65	18.94	21.15	34.05
Non diversified industrial group	8.19	8.16	8.4	8.2	6.8	8.0	8.5	8.2
Firms investing in information technology	76.46	63.86	66.24	58.08	80.95	68.17	9.06	79.64
Subcontractors	19.81	30.96	18.98	31.79	21.28	31.76	19.85	27.93

Tab. 3 Distribution of quantitative variables used in the estimates

Percentiles	Leverage (95/97 average)	Employees (95/97 average)	Avg. share of control group	Avg. number of controlling shareholders	Net sales (95/97 average) (millions of liras)	Capital per employee (95/97 average)	Net sales per employee (millions of liras)
1	0	11.28	8	0	793.666	2.206	32.728
10	0	15.67	40	1	3266.667	10.339	128.451
20	0	18.67	59	1	4452.933	19.312	165.458
30	0.03	22	80	1	5670.6	27.425	194.252
40	0.09	27.53	99	1	7180	36.392	226.395
50	0.15	33.33	100	2	9559.333	47.093	259.568
60	0.21	44	100	2	13100	59.107	300
70	0.27	63	100	3	19283.7	75.376	359.087
80	0.34	102	100	3	340000	99.860	452.628
90	0.42	261.27	100	4	79744.06	148.606	624.693
95	0.48	446.53	100	4	158000	204.726	875.779
99	0.58	1451.6	100	4	588238.5	412.752	1531.81
Percentiles	Financial pressure (95/97 average)	Market rent (95/97 average)	Market share	Capacity utilisation	Total cost of labour/ employees (95/97 average - millions of liras)	Tangible capital/total assets	R&D expenditures per employee
1	-1.446	-0.538	0.000003	40	9.36	0.004	0
10	0	0	0.000005	70	30.82	0.025	0
20	0.043	0.066	0.00004	70	37.04	0.047	0
30	0.103	0.125	0.00006	80	41.16	0.066	0
40	0.163	0.170	0.00009	80	44.79	0.081	0
50	0.229	0.216	0.00012	80	48.13	0.098	0
60	0.307	0.259	0.00017	90	51.41	0.119	0
70	0.396	0.308	0.00025	90	55.46	0.141	0.011
80	0.494	0.373	0.00046	94	60.26	0.169	1.350
90	0.648	0.453	0.0011	100	68.49	0.216	3.809
95	0.827	0.525	0.0023	100	78.33	0.264	7.877

99	2.442	0.702	0.0104	100	125.63	0.343	27.305

TABLE 4: Diagnostics from GLM procedure for model selection

Model	Deviance	Dispersion	Pearson X^2
All firms			
Logit	2913.02	1.021	2715.41
Conditional log-log	2685.57	1.010	2917.78
Probit	2913.34	1.042	2771.13
Firms with more than 100 employees			
Logit	716.01	1.099	647.46
Conditional log-log	716.26	1.086	640.14
Probit	716.64	1.092	643.23
Firms with 50-100 employees			
	512.51	1.045	485.24
Logit	515.48	1.042	483.91
Conditional log-log	512.31	1.029	477.63
Probit			
Firms with less than 50 employees			
Logit	1295.39	1.069	1469.07
Conditional log-log	1295.78	1.049	1441.43
Probit	1297.46	1.091	1499.27

The table presents diagnostics for the specification of the model estimated on the overall sample (see tab. 6). The ordering of dispersion indexes across logit, probit and log-log specifications does not change when different specifications are considered.

Tab 5 The determinants of the creation of sales structures abroad*

	All sample		Firms with less than 50 employees		50-100 employees		Firms with more than 100 employees	
	Dependent variable:CSSA		Dependent variable:CSSA		Dependent variable:CSSA		Dependent variable:CSSA	
Logit specification								
N. of obs.	2573		1419		500		635	
	Coeff.	Z-stat	Coeff.	Z-stat	Coeff.	Z-stat	Coeff.	Z-stat
Food, beverages, tobacco	-0.378	-0.768	-0.594	-0.773	-0.495	-0.488	0.474	0.639
Textile, clothing	-0.083	-0.173	0.065	0.085	-0.778	-0.797	0.037	0.058
Leather, shoes	-0.237	-0.456	-0.273	-0.342	-0.517	-0.455	-0.110	-0.134
Wood and wooden furniture	0.188	0.380	-0.144	-0.187	0.202	0.200	0.762	1.057
Paper and printing	-0.029	-0.097	-0.052	-0.109	0.691	0.970	-0.250	-0.446
Chemicals	-0.394	-1.281	0.181	0.420	-0.544	-0.531	-0.633	-1.140
Rubber and plastics	-0.325	-1.236	-0.065	-0.164	-0.666	-1.074	-0.334	-0.610
Glass, ceramics	0.292	0.838	0.965	1.822	-1.612	-1.124	0.246	0.423
Construction materials	-1.030	-2.736	-1.197	-1.949	-1.091	-1.304	-0.414	-0.557
Metal extraction	-0.383	-1.063	-0.050	-0.092	0.134	0.160	-0.768	-1.176
Metal products	-0.474	-1.045	-0.943	-1.254	-0.828	-0.866	0.278	0.462
Mechanical materials	0.238	0.770	0.875	1.715	-1.033	-1.445	0.064	0.121
Mechanical Equipment	0.478	2.051	1.064	2.945	0.096	0.171	-0.339	-0.819
Electronics	-0.112	-0.267	-0.357	-0.411	-0.679	-0.841	-0.043	-0.069
Electrical equipment	0.425	0.869	-0.081	-0.065	-1.930	-1.355	0.239	0.377
Precision instruments and apparels	-0.988	-1.452	-0.661	-0.506	0.607	0.842	-1.890	-1.936
Vehicles and vehicle components	0.172	0.503	-0.429	-0.596			0.154	0.296
Energy	-0.409	-0.652	0.330	0.264			-0.090	-0.110

Other manufacturing	0.321	0.464	0.382	0.508			1.521	1.069

Tab. 5 The determinants of the creation of sales structures abroad (follows)

	All sample		Firms with less than 50 employees		50-100 employees		Firm with more than 100employees	
	Dependent variable: CSSA		Dependent variable: CSSA		Dependent variable: CSSA		Dependent variable: CSSA	
Logit specification								
N. of obs.		2573		1419		500		635
	Coeff.	Z-stat	Coeff.	Z-stat	Coeff.	Z-stat	Coeff.	Z-stat
Nest	0.565	3.208	0.001	0.002	1.374	3.128	1.191	3.116
Size	0.000	1.048	0.027	4.045	-0.001	-0.130	0.000	-0.617
Birth	-0.004	-1.346	0.000	0.029	-0.007	-1.084	0.002	0.457
Ownership structure								
Group	0.219	1.743	0.149	0.668	-0.129	-0.435	0.116	0.508
Capogr	0.184	0.809	-0.120	-0.262	-0.182	-0.322	0.456	1.372
Family	-0.217	-2.108	-0.239	-1.653	-0.139	-0.581	-0.284	-1.239
Qtnosep	-0.006	-2.727	-0.009	-2.693	-0.011	-2.041	-0.002	-0.338
Contrlnm	-0.008	-0.147	0.010	0.127	0.014	0.116	0.061	0.549
Socbanc	0.621	3.386	-0.066	-0.136	1.009	2.547	0.517	1.829
External finance and participation to consortia								
Subsidy	0.502	5.055	0.388	2.691	0.155	0.650	0.924	4.577
Ration	0.449	1.662	0.081	0.210	1.191	2.330	0.989	1.456
Quot	-0.284	-0.625	1.094	0.823			-0.365	-0.755
Lev	0.068	0.248	0.270	0.729	-0.376	-0.511	-0.663	-1.020
Confidi	0.330	1.466	0.631	2.077	0.097	0.192	-0.279	-0.560
Presfi	-0.003	-0.994	-0.075	-1.234	-0.001	-0.202	-0.003	-0.882
Tang	-3.324	-4.495	-3.143	-2.781	-6.658	-3.568	-4.244	-2.619
Consex	0.758	2.300	0.738	1.827	1.983	1.867	-0.818	-0.860
Innovation								
Innovat	0.844	6.556	0.779	4.377	0.964	3.112	0.956	3.228
R&Dinv	-0.001	-0.768	0.000	-0.853	-0.005	-0.187	-0.005	-1.330
Qlowsk	-0.200	-1.482	-0.227	-1.231	0.399	1.427	-0.343	-0.848
Wage	0.000	-0.318	0.000	-0.041	-0.004	-0.708	-0.003	-0.605
Const	5.466	1.036	-2.248	-0.228	14.928	1.114	-6.236	-0.707

N. of obs.		2573		1419		500		358
R2		.10		.12		.15		.12
Log likelihood		-1340.67		-647.69		-255.45		-635.42

Tab. 6 Productive efficiency, export and creation of sales structures abroad (1997 Cross-section)*

First equation			Residual	Equation	
	Coeff.	T. stat		Coeff.	T. stat
Constant	5.460	138.609	Constant	3.313	6.874
Ln(K/L)	0.153	8.685	CAP	-0.036	-9.326
Ln(K/L)*Ind1	0.100	5.483	MKTSHARE	-40.375	-7.468
Ln(K/L)*Ind2	0.044	2.335	RENTS	-0.006	-7.623
Ln(K/L)*Ind3	0.072	2.898	PRESFI	0.002	0.109
Ln(K/L)*Ind4	-0.046	-2.571	SMALL	-2.577	-14.982
Ln(K/L)*Ind5	-0.023	-1.217	LARGE	0.081	0.650
Ln(K/L)*Ind6	0.066	3.213	Ind1	-2.367	-5.946
Ln(K/L)*Ind7	-0.025	-1.420	Ind2	1.614	6.852
Ln(K/L)*Ind8	-0.076	-3.270	Ind3	0.643	1.481
Ln(K/L)*Ind9	-0.047	-2.416	Ind4	-3.802	-13.597
Ln(K/L)*Ind10	0.137	5.718	Ind5	-3.300	-5.991
Ln(K/L)*Ind11	-0.046	-2.576	Ind6	-0.317	-0.802
Ln(K/L)*Ind12	-0.007	-0.302	Ind7	-4.150	-13.254
Ln(K/L)*Ind13	-0.014	-0.723	Ind8	-1.301	-2.690
Ln(K/L)*Ind14	0.013	0.438	Ind9	-4.201	-9.573
Ln(K/L)*Ind15	0.026	0.977	Ind10	1.479	3.691
Ln(K/L)*Ind16	-0.108	-3.670	Ind11	-3.533	-12.342
Ln(K/L)*Ind17	0.027	0.933	Ind12	0.188	0.413
Ln(K/L)*Ind18	-0.003	-0.085	Ind13	-1.626	-4.153
Ln(K/L)*Ind19	0.426	6.367	Ind14	2.491	5.557
			Ind15	-4.845	-15.174
			Ind16	-3.067	-7.115
			Ind17	1.192	2.463
			Ind18	0.900	1.527
			Ind19	4.622	4.767
			NORTH-WEST	-1.439	-6.369
			NORTH-EAST	-1.777	-7.845
			SOUTH	0.643	2.654
Sigma-squared	3.832	16.470	GROUP	-0.804	-5.848

Gamma	0.943	224.066	CSAT	-0.793	-7.177
Log likelihood		3025.15	OLD	0.552	5.199
LR test of one sided error	Error	2128.14	YOUNG	-0.190	-1.798
N. of obs.		3322	QTNOSEP	-0.015	-7.357
			CSSA	-1.581	-14.633
			FAMILY	0.407	5.033
			EXPORT	-2.157	-13.077

*Note that, given the specification of the stochastic frontier model, coefficients indicate deviations from the average distance of sample firms from the efficient frontier. Therefore positive (negative) signs indicate lower (higher) than average efficiency.

Tab. 7 Productive efficiency, export and creation of sales structures abroad (panel)*

First equation			Residual	Equation	
	Coeff.	T. stat		Coeff.	T. stat
Constant	5.675	31.104	Constant	3.812	10.631
Ln(K)	0.192	9.044	CAP	-0.033	-10.369
Ln(L)	0.699	19.599	MKTSHARE	-55.953	-21.316
Defl. Y	0.017	0.312	RENTS	-0.028	-2.966
Defl K	0.176	1.116	PRESFI	0.007	1.947
Ln(K)*Ind1	0.059	2.319	SMALL	-2.378	-13.713
Ln(K)*Ind2	0.024	0.898	LARGE	-0.128	-1.320
Ln(K)*Ind3	0.115	3.046	Ind1	-2.047	-7.833
Ln(K)*Ind4	-0.095	-3.085	Ind2	1.372	6.423
Ln(K)*Ind5	-0.076	-2.675	Ind3	-0.977	-2.248
Ln(K)*Ind6	-0.077	-2.611	Ind4	-1.700	-4.869
Ln(K)*Ind7	-0.015	-0.505	Ind5	-1.358	-4.147
Ln(K)*Ind8	-0.087	-1.907	Ind6	0.840	2.920
Ln(K)*Ind9	-0.055	-1.722	Ind7	-3.467	-9.102
Ln(K)*Ind10	0.140	3.961	Ind8	1.108	2.418
Ln(K)*set11	-0.012	-0.446	Ind9	-2.646	-7.923
Ln(K)*set12	-0.078	-1.949	Ind10	1.109	3.640
Ln(K)*set13	-0.124	-4.382	Ind11	-2.465	-6.373
Ln(K)*set14	-0.100	-2.214	Ind12	-4.517	-13.135
Ln(K)*set15	0.025	0.421	Ind13	1.207	4.261
Ln(K)*set16	-0.283	-4.794	Ind14	2.282	6.886
Ln(K)*set17	-0.082	-2.363	Ind15	-3.009	-9.978
Ln(K)*set18	-0.024	-0.443	Ind16	-4.185	-14.245
Ln(K)*set19	-0.430	-3.871	Ind17	-0.359	-0.926
Ln(L)*Ind1	-0.053	-1.102	Ind18	1.033	2.345
Ln(L)*Ind2	-0.028	-0.605	Ind19	1.751	2.390
Ln(L)*Ind3	-0.178	-2.636	NORTH-WEST	-1.781	-8.022
Ln(L)*Ind4	0.125	2.204	NORTH-EAST	-2.773	-13.156
Ln(L)*Ind5	0.128	2.489	SOUTH	0.580	3.367
Ln(L)*Ind6	0.213	3.950	GROUP	-1.088	-9.880
Ln(L)*Ind7	-0.034	-0.624	CSAT.	-0.580	-7.173
Ln(L)*Ind8	0.111	1.362	OLD	0.187	1.695
Ln(L)*Ind9	0.030	0.486	YOUNG	-0.741	-6.412
Ln(L)*Ind10	-0.171	-2.664	QTNOSEP	-0.011	-9.404
Ln(L)*set11	-0.046	-0.913	CSSA	-1.113	-9.515
Ln(L)*set12	0.088	1.249	FAMILY	0.093	1.347

Ln(L)*set13	0.217	4.464	EXPORT	-2.127	-14.286
Ln(L)*set14	0.191	2.475			
Ln(L)*set15	-0.037	-0.380	Sigma-squared	2.850	17.744
Ln(L)*set16	0.418	4.251	Gamma	0.928	208.189
Ln(L)*set17	0.138	2.339	Log likelihood		5222.05
Ln(L)*set18	0.042	0.472	LR test of one sided error		2128.14
Ln(L)*set19	1.246	5.716	Numb. of. Obs.Periods		7653

*Note that, given the specification of the stochastic frontier model, coefficients indicate deviations from the average distance of sample firms from the efficient frontier. Therefore positive (negative) signs indicate lower (higher) than average efficiency.