Foreign Expansion by Italian Manufacturing Firms in the Nineties: an Ordered Probit Analysis

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1. Introduction

Although national policy makers and analysts are under increasing pressure to assess a country's or an industry's competitiveness in a globalizing world, standard measures based on exports alone are no longer satisfactory. The ability to penetrate international markets of domestic firms now depends on larger commitments in the form of foreign direct investment (FDI), joint ventures abroad and various kinds of collaborative arrangements. While outward FDI by national firms is now commonly measured at the national level allowing the determinants of FDI and international joint ventures to be identified, little has yet been done to develop broader measures of international market penetration. To develop such a measure and to apply it to Italy's manufacturing plants is the purpose of this paper.

While much of the applied work on both export and FDI performance has been based on industry and country-level aggregates, both export and FDI propensities vary enormously across firms, even within industries and countries, calling into question the findings of studies based on aggregate data. Moreover, since organisation theory has brought various organisational characteristics and inter-firm relationships into the explanation of decisions between exports and FDI as alternative means of penetrating international markets, it would appear essential to make use of micro-level data in empirically estimating such relationships.

Several considerations lead us to Italy for our country of application. First, both organisational form and inter-firm relationships have featured in explanations for both these different forms and levels of internationalisation in Italy and for the sharp North-South and other regional differentials within the country. Second, Italy has been the focus for many empirical studies at the firm level on exports (Basile 2001; Bonaccorsi 1992; Castellani 2001; Sterlacchini 2000), though much less so for those on FDI. Third, there is a valuable and extremely appropriate micro-level data set for Italy. This is the three-year survey of Italian manufacturing firms carried out by Mediocredito Centrale described and utilised below. Since this data has been made available to different researchers, it facilitates comparisons across studies with different methods.

Since exports and FDI can be either substitutes or complements, it is clearly incorrect to study them independently. Moreover, since the establishment of overseas offices, collaboration agreements and other activities represent substantial commitments to internationalisation and firm growth (Wagner 1995), the approach taken here is to combine them into a single foreign expansion index (FEI) and investigate the determinants of variations in this index across firms and over time.

Our paper aims to shift the boundaries in such studies from exports alone to the overall degree of internationalization commitment of firms. While exporting is still the most common form of internationalization by Italian firms, it is not necessarily the most important. Although well behind their other European counterparts (and more like the newly industrializing countries (NICs), Italian firms have recently begun to develop other, more advanced forms of foreign expansion, mainly of the non-equity type including establishing sales outlets abroad and inter-firm agreements. Which kinds of firms internationalize most and what strategies do they use to position themselves in foreign markets?

The paper is structured as follows. Section 2 characterizes the debate on the nature of firms' internationalization process and concludes that it is not so much a one-way process going from export markets to FDI as a cumulative one in which the commitment to foreign expansion increases with the number of modes adopted by firms to establish and consolidate their position in foreign markets. To this end, we construct our "foreign expansion index" (FEI) in such a way that higher levels of this index represent greater sunk costs and greater commitment to international activities. In section 3, we conduct a macro analysis to assess the extent to which the FEI of Italian manufacturing firms as a whole has changed as a result of changes in the exchange rate regime. In sections 4 and 5 we go on to micro analysis, outlining the ordered probit model and identifying the explanatory variables. Sections 6 and 7 present our results and conclusions, respectively.

2. Foreign expansion: a brief review of the literature

Until the 1980s international activities in industrial sectors were largely confined to the most highly developed countries and to trade and FDI activities. Other forms of internationalization, such as commercial penetration, technology and commercial collaboration, played only secondary roles.

The predominance of exports and FDI in company strategies for foreign penetration is reflected in both international management theory and the theory of the firm. These two, otherwise quite distinct, fields have been converging towards a common view of the internationalization process. In particular, the various aspects of firms' internationalization are being explained as the outcome of a sequential stage process in a general model of the firm. A typical firm is seen as beginning down the internationalization road with occasional exports, next developing regular exports with the help of agents, then creating a sales subsidiary and ending up with fully owned production facilities abroad (Benito and Gripsrud 1995). Cavusgil (1984) and Luostarinen (1988) characterize this internationalization process

as sequential and stepwise in that firms evolve from low investment and indirect entry modes to ones of progressively higher commitment and FDI.

Buckley and Casson (1985) and Dunning and Norman (1983) use a theory of the firm perspective to hypothesize a deterministic evolution in a firm's foreign expansion. The less common, intermediate forms of internationalization are seen as transitional stages in the sequential process and second best relative to the more efficient polar cases.

The business management literature attributes the sequential nature of the foreign expansion process to higher risks associated with international activities, the tentative nature of managerial expectations and greater genuine uncertainty (Cavusgil 1984). Theory of the firm advocates attribute the same evolutionary process to the informational problems in foreign markets that make internalization of such transactions efficient.

Empirical tests, however, have not yielded unequivocal results. Cavusgil (1984) and more recently Gankema, Snuif and Zwart (2000) provide results confirming the sequential transition model while others (e.g., Benito and Gripsrud (1995), Bonaccorsi and Dalli (1990)) question its validity, based on the fact that Italian firms have steadily increased their activities on all fronts, i.e., exports, FDI and the intermediate forms.[1]

More recent theory has attempted to bridge these different viewpoints by suggesting that the nature of the relationship between exports and FDI - substitutes or complements – may depend on the type of production undertaken, the maturity of the firm and the level of development of the host country (Cantwell 1994)[2]. If firms with much exporting experience do not necessarily substitute for exports by FDI, then each intermediate form of foreign expansion may have its own *raison d'être* (instead of only second-best status) within the "continuous spectrum" of internationalization (Momigliano and Balcet 1983). Each such mode involves a commitment to internationalization that may allow firms to better penetrate international markets (Lall 1980; Momigliano and Balcet 1983). Thus, rather than a sequential process based on objectively differentiated stages of internationalization, foreign expansion is a cumulative one, based on accumulating experience and higher commitment.

3. Foreign expansion as a cumulative process

In this study we subscribe to this modified view in which the internationalization of firms is seen as a complex cumulative commitment process with many modes. However, a prerequisite to such an analysis is the development of a satisfactory index.

[1] A similar finding has been observed in other countries (e.g., Lipsey and Weiss 1984 for the United States).
[2] Complementarity, e.g., would seem much more likely in industries characterized by product differentiation and iintra-firm trade (e.g., Benvignati 1990).

To our knowledge, the only serious attempt to construct such a measure was that of Blecker and Feinberg (1995). These authors did two things. First, they used the same set of explanatory variables to explain variations in the export share of production, the number of export markets and FDI intensity across 37 different manufacturing industries in the United States. Second, they then combined the three measures two at a time in different, though somewhat arbitrary, ways[3], and used a subset of the explanatory variables in the first step to explain variations in these indexes over the same 37 industry-level observations. The main finding was that different aspects of internationalisation have different determinants.

In approaching the construction of our internationalisation index, we wanted to allow for the findings of Blecker and Feinberg (1995) and others, suggesting that different factors can play a role in different aspects or levels of internationalisation and yet also be consistent with the modified and increasingly supported view in which the internationalisation of firms is seen as a complex cumulative commitment process with many modes. The higher the internationalisation level, the greater is the cumulative commitment to foreign markets and the better the firm's position in those markets.

To test this hypothesis we attempt to "order" the process by constructing a ranked foreign expansion index (FEI) to reflect its cumulative nature. We assume only that a firm having an observed index value of j is more internationalized than a firm with a value of j-1. As detailed in section 4, FEI does not presume any cardinal relationship between different values. In particular, and based on the extent of commitment or sunk costs in each foreign penetration activity, we assume that the FEI of a firm that only exports is lower than that of another firm which exports but also carries out commercial penetration operations (such as having an agent abroad or trade agreements), which in turn is lower than another firm that, along with exports and commercial penetration, also has FDI abroad.

In our analysis, we make use of firm-level data collected by Italy's Mediocredito Centrale in 1992 for the 1989-91 period, 1995 for 1992-94 and 1998 for 1995-97. Each Mediocredito survey covers a sample of more than 4000 Italian manufacturing firms. The main forms of internationalization identified in the database are: a) exports; b) operations of commercial penetration (i.e., various types of sales outlets, promotional initiatives; trade agreements); c) FDI. Table 1 shows the possible combinations of the various internationalization modes, whose frequencies for 1991 are depicted in figure 1.

[3] Specifically, they combined export shares and FDI intensity by adding them, then dividing them to show export intensity, and finally dividing the number of export markets by export shares to measure market diversification.

INSERT TABLE 1

Several interesting features emerge from the data: a) the internationalization of Italian manufacturing firms is mainly confined to export, i.e. the simplest foreign expansion mode; b) the percentage of firms steadily decreases as we move on from export (38.6%) to more complex modes of internationalization, exports enhanced by penetration operations[4] (19.7%), to the highest level of internationalization, consisting of firms that export with penetration operations abroad and FDI (3.3%); c) the relative frequencies of firms which pursue the remaining and somewhat disparate modes of internationalization (respectively and in decreasing order: export and FDI; solely penetration operations; solely FDI; penetration operations and FDI) are quite low, accounting for only 1.1% to 2,8% of the Italian manufacturing firms, depending on the year.

INSERT FIGURE 1

For the remaining firms (ranging from 97.2% in 1991 to 98.9% in 1997) the evidence seems to support our framework of analysis wherein the internationalisation process is a cumulative one of progressive increases in the number of internationalisation modes; thus allowing us to apply the FEI index developed above to Italian firms with little risk of distorting the results. Thus, the FEI index ranges in value from zero to three: zero for no exposure to international markets, one if the firm solely exports; two if the firm exports and is engaged into penetration operations, and three if the firm exports, does penetration operations and produces abroad (reflecting FDI abroad). While in principle, the intensity of exports could be factored into the construction of FEI, we choose not to do so for the following reasons. First, since as shown in table 2 export intensity and FEI are positively correlated suggesting that in general export intensity is complementary to higher levels of FEI rather than substitutes. Second, from the standpoint of firm strategy, commitment to foreign penetration and sunk costs, the number of modes is much more important than export intensity. Third, were we to include export intensity into the index, since there is no obvious best way to do so, we would have to investigate the sensitivity to the use of different indexes.

INSERT TABLE 2

3.1. Without exchange rate leverage: the FEI indexes of 1991

In the following sections, concentrating solely on the FEI values, we analyze the extent to which the foreign expansion process varied over time as the exchange rate regime changed. While in 1991 Italy had a fixed exchange rate system, in September 1992 the Italian lira fell

outside the Exchange Rate Mechanism (ERM), implying devaluation, before returning to it (implying an appreciation) in 1995. Also, within each period, we examine the extent to which firm location affects the value of FEI. Locations are distinguished by the following regions: North West (where the country's earliest industrialization took place); North East (where Italy's industrial districts can be found); Center and, South (the least developed part of the country). Firms located in the South are smaller in size and benefit less from market and technology spillovers than firms in other regions. As a result, they should face higher transaction and transport costs and have lower FEI indexes than firms in the North. Indeed, this expectation is fulfilled as the underdeveloped South (also called "Mezzogiorno") accounted for only 8% of Italy's exports but 13% of its manufacturing value-added in the 1980s and early 1990s. Recently, however, Southern firms have increased their FEI scores, mainly due to their greater price competitiveness following the devaluation of 1992 and depressed domestic demand. While from 1992 to 1997 exports of Italy as a whole increased by 12.1% per year, those of the South increased by 13.7% per year.

As already noticed, under the fixed exchange rate regime of 1991, for the vast majority of Italy's firms, international expansion was limited to mere exports (FEI=1). Table 3 shows that there was considerable variation in the incidence of FEI=1 across regions, 41.4% of firms in the North-West, 41.6% in the North East, 33.8% in the Center and 25.7% of those in the South. This backwardness in FEI was also reflected in relatively low frequencies of FEI>1 in all regions. In particular, FEI=2 accounted for but 21.8% of firms in the North West, 20.5% in the North East, 19.1% in the Center and only 9.8% in the South, and exports, penetration operations and FDI (FEI=3), accounted at most for 4.2% of firms in the North West and North East and just 1.8% in the South.

INSERT TABLE 3

3.2. Transition to flexible exchange rates: after the 1992 devaluation

How did the transition to a system of flexible exchange rates, accompanied by a significant devaluation of the lira in 1992, affect these patterns? Some argue that greater price competitiveness would lead firms to concentrate on elementary modes of internationalization since the more costly investments and greater "commitment" reflected in FEI>1 would be unnecessary.

The data provided in table 3 show that the 1992 devaluation and exit from the ERM allowed Italian manufacturing firms to achieve higher levels of FEI in all regions. The

[4]Penetration operations include any one or more of: a) sales outlets, b) sales through local traders, c) sales

percentage of export only firms (FEI=1) grew in all regions except the North East but the price advantage also led to somewhat greater investments in commitment to international penetration. Indeed, the percentages of FEI=2 firms in the country as a whole increased from 19.7% in 1991 to 28.4% in 1994, with the largest increases registered in the North East and North West, the regions that had the highest percentages of FEI=2 firms in 1991.

Thus, the price advantage produced significantly different effects in different regions. For the less internationalized firms (in the Center and South), devaluation mainly served to encourage the simplest and least costly mode of penetrating foreign markets (exports only FEI=1). For the more internationalized regions of the North East and North West, however, the devaluation had the effect of further deepening the commitment to international market penetration to the FEI=2 level. At the FEI=2 level, the internationalization gap between firms in the already internationalized North West and North East and those in the Center and the South widened. The rise of the FEI indexes of firms in the South has been interpreted in quite different ways. Some (Guerrieri 2000) argued that these increases implied little in the way of future gains because they could be due primarily to the temporary contraction of the domestic market. A more optimistic view (Bodo and Viesti 1997), however, argued that the increases signaled structural changes in Southern industry that reinforced the economies of agglomeration in a way similar to what had happened earlier in the Italian districts.

Decreases in all regions were instead registered for the FEI = 3 mode, indicating that devaluation did not trigger more FDI, presumably because devaluation would raise the cost of production abroad.

3.3. 1997: The return to the ERM

After the second quarter of 1995 the real effective exchange rate of the lira appreciated sharply, returning it to the level of 1993. After a brief decline in 1996, export volumes resumed their relatively high (and above-trend) rate of growth by 1997 due to a steep rise in world demand. Our analysis shows that there was an increase in exporting only (FEI=1) firms but this was confined to the North West and North East.

Although the percentage of FEI=2 firms dipped slightly between 1994 and 1997 for the country as a whole and more so in the North, the percentages of FEI=2 firms in the Center and South increased quite sharply. It was this increase in commercial penetration that accounted for the substantial increase in internationalization of firms in the South. Thanks to the appreciation, penetration abroad (FEI=2) became less expensive, especially for the

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arrangements with firms belonging to the group; d) others promotional initiatives, or e) trade collaboration.

smaller and generally less sophisticated firms in the Center and in South**.** With regard to FEI=3, there was a slight increase in the frequency in the North West and in the South and a modest decrease in the North East and in the Center.

Thus, despite the significant appreciation of the lira between 1994 and 1997, there was no appreciable decline in internationalization of Italian firms and indeed some further increases largely concentrated in the South. The ability of Italian firms to retain their presence in international markets in the face of appreciation of the lira can be attributed to four factors: (1) the aforementioned steep rise in world demand, (2) the asset-specificity and sunk costs of the already realized investments in commercial penetration and commercial agreements which made such investments largely irreversible, (3) the effect of lira appreciation on reducing the costs of new such investments abroad, and (4) the international position-enhancing effect of these investments independent of cost factors.

4. Econometric modeling of the foreign expansion

In this section we turn to an ordered probit model of internationalization in Italian manufacturing[5] that we deem more appropriate for explaining variations in FEI than a linear regression model. Whereas in a linear regression, a firm with FEI of 2 would be twice as internationalized as one with FEI of 1, in the ordered probit model, no such presumption of cardinality is made; FEI = 2 simply indicates more internationalization than FEI = 1.

The basic notion underlying the model is the existence of a latent or unobserved continuous variable, FEI*, ranging from - ∞ to + ∞, indicating the degree of internationalization of a firm. This latent variable is related to a set of explanatory variables by the standard linear relationship:

$$FEI^*_i = \mathbf{x_i}\beta + \varepsilon_i \qquad \varepsilon_i \sim N(0,1)$$

where, $\mathbf{x_i}$ is a vector of explanatory variables, which may include firm-, industry- and regional-level factors (to be identified in the next section) influencing the level of FEI. β is the associated parameter vector, and ε is a random error term drawn from a standardized normal distribution. Although FEI* is unobserved, the integer index FEI is observed and is related to FEI* by the following relationship:

$FEI_i = 0$ *iff* $FEI^*_i < 0$

$FEI_i = 1$ *iff* $0 < FEI^*_i < \mu_1$

[5] The ordered probit model was developed by McElvey and Zavoina (1975). For recent survey see Amemiya (1981, 1985) and Greene (2000).

$FEI_i = 2$ *iff* $\mu_1 < FEI^*_i < \mu_2$

…….

$FEI_i = J$ *iff* $FEI^*_i > \mu_{J-1}$

where μ_i are the unobserved thresholds defining the boundaries between the different levels of FEI. The μs are free parameters, with no significance to the unit distance between the different observed values of FEI. Given the relationship between FEI and FEI* and the distribution of the error term ε, one may express the probability of observing an individual as having a zero value of the index FEI as:

$$p(FEI = 0) = p(FEI^* \le 0)$$
$$= p(\varepsilon \le -X\beta)$$
$$= \int_{-\infty}^{-X\beta} (2\pi)^{-\frac{1}{2}} \exp\left(-\frac{u^2}{2}\right) du$$
$$= \Phi(-X\beta)$$

where $\Phi(.)$ indicates the standard normal distribution function[6]. Similarly, one may specify the other probabilities:

$$p(FEI = 1) = \Phi(\mu_1 - X\beta) - \Phi(-X\beta)$$
$$p(FEI = 2) = \Phi(\mu_2 - X\beta) - \Phi(\mu_1 - X\beta)$$
.....
.....
$$p(FEI = J) = 1 - \Phi(\mu_{J-1} - X\beta)$$

with $\mu_j > \mu_{j-1}$ $\quad \forall\, j \in 1, \ldots, J.$

As noted above, the only restriction is that a firm with an observed index value of j is more internationalized than one of value j-1. The values of the thresholds μ_j are estimated as additional parameters of the model. Estimates are obtained by maximum likelihood.

5. Determinants of foreign expansion behavior: some hypotheses

Among the determinants of FEI allowed for are different firm-level factors, such as the structural characteristics of firms, interfirm relationships, their innovation strategies, their sector and region and some policy variables. The full set of variables used in the analysis is identified in Table 4 and their hypothesized effects are identified below.

INSERT TABLE 4

5.1. Structural variables

Size – Consistent with the large literature on the subject (e.g., Calof 1993, Kim *et al.* 1997), we hypothesize that the more advanced forms of internationalization (FEI=2,3) are subject to economies of scale, and thus constitute the arena in which size of firm would have its greatest (positive) effect. By contrast, empirical studies of merely exporting, e.g., Sterlacchini (2000, p. 28), Bonaccorsi (1992), Calof (1994), De Toni and Nassimbeni (2000), have shown that increases in size become redundant as far as exporting only is concerned at very low size. FEI=1 may also be observed among small firms that export only occasionally when favorable price and other conditions prevail.

Age - Age of the firm may be considered a crude proxy for both its accumulated experience in general and the resulting effect on the perceived risk of investments in international marketing. Hence, AGE would be expected to increase FEI.

As a result of the mixed results with age variables in empirical studies to date (De Toni and Nassimbeni 2000), such authors suggest that the positive effect of age as a proxy for experience may be offset by negative one due to the fact that older firms would not have adapted as well or been designed to deal with increasingly global environmental conditions.

5.2. Relationships with other firms

Subcontracting - Two variables have been chosen as proxies for relations with other firms: subcontracting and membership in a consortium, the former vertical, and the latter horizontal. Subcontracting is included as a determinant due to the notion that it has encouraged specialization among Italian firms (especially large ones), making them more competitive in niche markets. Yet, since empirical studies on the export behavior of Italian and other firms often find a negative correlation between subcontracting and exports (Sterlacchini 2000), additional explanations have been suggested. For example, Porter (1986) explained this by arguing that subcontracting firms in automobile, aeronautical and electronics industries feed world markets via downstream users, counting as indirect but not direct exports. Another such explanation is that the need to engage in subcontracting may reflect weakness in marketing and risk-bearing abilities, and hence in ability to export.

Consortium - By joining in a consortium, partners are able to exploit economies of scale and scope that cannot be pursued by the individual firm. Access to consortia is believed to have been one of the major factors lying behind the competitive advantage of firms operating in Italy's industrial districts. Such horizontal relations should be especially efficacious when exporting is accompanied by direct promotion by an agent (FEI=2), and thus where "the

[6] Several variants of this model can also be estimated, e.g., the ordered logit model (Greene 2000) where the

effort of an agent generates non-negative effects on the payoff of the other partners in the consortium" (Bagella and Becchetti 1999, p. 240). The influence of consortium participation on FEI might be greater under a fixed exchange rate regime and an appreciated currency than under a depreciated one (Bagella and Becchetti 1999). To the extent that higher levels of FEI would require assets abroad to be purchased, however, access to consortia could be seen as a way of overcoming the disadvantage of having to purchase them with a depreciated currency.

5.3. Technological innovations

R&D and investment strategies - Different empirical studies have recently analyzed the relationship between innovation and export at the firm level (Basile 2001; Wakelin 1998; Kumar and Siddhartan 1994; Enthorf and Pohlmeier 1990; Hirsch and Bijaoui 1985). These studies generally find that technological innovation, proxied by R&D expenditure or the number of innovations, improves export performance. For Italy, with the same database used here, Basile (2001) used the Cragg specification of the Tobit model to estimate the effects of technological innovation on the firm's decision to export before and after the devaluation of 1992 and again after the subsequent return to the fixed rate regime in 1997.

An important limitation of such studies is that, by focusing exclusively on exports, they ignored other forms of internationalization that may be more closely related to innovation. Indeed, given the imperfections and information asymmetries of the markets for technology and know-how, innovating firms should prefer to expand their activity abroad through agents and commercial agreements abroad than through arms-length market transactions. Specifically, we hypothesize that innovating firms are more likely not only to export but also to have agents and commercial agreements abroad.

As proxies for innovation we use two kinds of variables: *'R&D strategies'* measured by dummy variables for whether or not the firm realized a product innovation (with or without a process innovation) (PRODPROC) or only a process innovation (ONLYPROC), and *'Investment strategies'* measured by two categorical variables on an ordinal scale (from zero to three) for the importance of two different objectives of new investments in advanced equipment (if any): NEWPROD and LABOUR.

6. Econometric results

6.1. Specification choice and coefficient estimates

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error terms are distributed by standard logistic rather than standard normal.

In this section the estimation results of our empirical model of international expansion are reported. Bayesian Information Criterion (BIC) tests have been used to select the most reliable specification among four competing nested and non-nested models. The results reported in table 5 suggest that, for each period considered, the regression with the full set of explanatory variables (Model 1) is the most reliable one.

INSERT TABLE 5

Table 6 reports the estimated coefficients for each year (by column) based on Model 1 of table 5. Asterisks identify the statistically significant parameters[7]. Single, double and triple asterisks indicate significance at the 0.10, 0.05 and 0.01 levels, respectively. Standard errors have been corrected for multiplicative heteroscedasticity of the form $\text{var}(\varepsilon) = \sigma = \exp(\gamma' Z)$ (Harvey 1976). This form of heteroscedasticity implies that an additional parameter vector should be added to the model[8]. All threshold values (μ_j) are statistically significant and their coefficients (especially μ_2) different from 1, implying that the ordinal categories are not equally spaced.

INSERT TABLE 6

Due to the large number of coefficients in each equation, the analysis concentrates on the most consistent and statistically significant findings. Consider first the effect of the firm structural characteristics. In each period, the estimated coefficients on the three SIZE dummy variables (MEDIUM FIRMS, LARGE FIRMS and VERY LARGE FIRMS) are positive and highly significant (p=0.01). Since the reference category is SMALL (firms with less than 50 employees), this implies that larger size has a highly significant positive effect on FEI. Firm age (AGE) also has a positive effect on FEI, but is statistically significant only in 1994. Among sectors, SCIENCE BASED is the omitted dummy variable. Thus, firms belonging to SPECIALISED SUPPLIERS sectors have significantly higher levels of FEI than firms in SCIENCE BASED sectors, especially in 1994 and 1997.

The relationships with other firms are also found to be very important for the international projection of Italian firms, thereby supporting our hypothesis. Specifically, subcontracting relationships (SUBCONT) have a significant negative influence on FEI whereas the effects of CONSORTIUM are as expected positive and highly significant.

The notion that innovation capabilities have a strong positive influence on FEI of Italian manufacturing firms is strongly supported by the positive and highly significant effects of

[7] Due to the large number of available observations in the sample and the non-linearity of the ordered probit model, multicollinearity is not a serious problem in this case.
[8] In our case Z=LnSIZE, LnSIZE^2, CE and SOUTH.

PRODPROC and ONLYPROC in all periods. NEWPROD also has positive and significant effects on FEI in 1994 and in 1997; and LABOUR in 1994.

Finally, compared to the reference category NORTH WEST, the coefficients of the regional dummy variables CENTER and especially SOUTH are negative and significant in all three years, although the magnitudes of these effects declined sharply after the devaluation. Note also that the coefficient of the dummy variable NORTH EAST, the "industrial districts" area, changed from negative to positive beginning in 1994.

6.2. Marginal effects

As noted above, the results of model 1 suggest that firm size, age, relationships with other firms, technological innovation and location are all important in explaining individual heterogeneity in FEI among Italian manufacturing firms. Additional information, especially on the impacts on specific values of FEI, can be extracted from the marginal effects, i.e., the effects of changes in the covariates on the cell probabilities. These are

$$\partial \text{Prob[cell j]} / \partial x_i = [\phi(\mu_{j-1} - \beta' x_i) - \phi(\mu_j - \beta' x_i)]*\beta$$

where $\phi(.)$ is the standard normal density. Since the marginal effects depend on the levels of all variables, we computed them at the mean values of all variables ($\bar{x}$). For continuous variables the marginal effects may be interpreted as elasticities. For dummy variables (that constitute most of the variables in the model), the marginal effects are changes in the predicted probabilities for unit changes in x_k[9].

The marginal effects are reported in Table 7 for the four categories of FEI in each of the three years. We confine our attention to those variables with the greatest statistical significance for all three periods.

INSERT TABLE 7

We begin with the SIZE variable. Clearly, under fixed exchange rates and the high lira of 1991, the predicted probability of being an exporter only (FEI=1) rose with firm size, thus supporting the hypothesis that smaller firms are strongly disadvantaged when competition is on the basis of non-price factors. With the depreciated lira after the devaluation of 1992, however, the marginal effect of size on the predicted probability in 1994 became negative. Surprisingly, with the return of the Italian lira to the ERM, in 1997 the marginal effect of size on FEI=1 fell further, thus providing evidence of persistence in exports by small firms. The predicted probability of exporting and carrying out operations for commercial penetration (FEI=2) also rose with size, especially after the lira's devaluation in 1992.

[9] Note that the marginal effects sum to zero, which follows from the fact that the probabilities must sum to 1.

Next we turn to the variables grouped under "relationships with other firms". In 1991 the effect of participating in a consortium (CONSORTIUM =1) had a predicted probability of being an exporting only or FEI=1 firm that is 0.7% higher than for one not in a consortium. As expected (see section 5.2), the advantage of consortium participation declined with the greater competitiveness afforded by the devaluation of 1992. That advantage, however, actually increased after the devaluation for the higher levels of FEI, FEI=2 and FEI=3. Indeed, the predicted probability of FEI=2 for a firm participating in a consortium in 1994 was 8.4% higher than for one not in a consortium. After the lira's appreciation and return to the ERM, it remained 8.8% higher in 1997. The extra advantage of consortium participation in the period of lira appreciation might derive from the reduced per capita lira cost borne by members of the consortium in the purchase of direct sales structures.

As already mentioned, SUBCONTRACTING had a strong (but declining) negative effect on FEI. From the entry for SUBCONTRACTING in the FEI=0 column of Table 7 for the year 1991, a subcontracting relationship had the effect of increasing the probability of having no internationalization whatsoever by 19.1%. Correspondingly, the probabilities of being a FEI=1, 2 and 3 firm were reduced by 2.7%, 13.7% and 2.7%, respectively. After the devaluation of 1992, however, the effect of SUBCONTRACTING on FEI = 1 became positive, though those for FEI=2, 3 remained negative and fairly large.

Next we consider the marginal effects of innovation variables. As noted above, the effects of PRODPROC, ONLYPROC and NEWPROD were stronger than that of LABOUR. Clearly, in each period considered, innovating firms of any of the first three types are more likely to have a higher FEI than non-innovating firms. However, there seems to have been a shift in these effects over time. In particular, the positive effects of innovation variables on FEI=1 were larger before the devaluation of 1992 than after that. For example, in 1991, if PRODPROC were to rise from 0 to 1, the predicted probability of exporting through arms-length market transactions (FEI=1) rose by 2.4% (holding all other variables at $\bar{x}$), whereas in 1994 and 1997, it would have fallen. On the other hand, after the devaluation, the same innovation would have raised the probabilities of being in FEI=2 by even more. Thus, contrary to popular opinion, innovation and greater price competitiveness can be complementary in encouraging investments in deeper forms of foreign market penetration. Such findings are important in identifying subtler effects on internationalization than can be obtained from similar studies that focus on exports alone (as in Basile 2001).

Finally, as far as location effects are concerned, the results show that in 1991 location outside of the North West had a very strong negative effect on the internationalization level of the firm, even for the first stage of the internationalization process (FEI=1). This evidence appears particularly strong for firms in the South in that such firms had a probability of being in a FEI >= 1 that was almost 25% below that of firms in the North West. By 1997, however, the disadvantage of location in the South for FEI>=1 had fallen to 11.5%.

7. Concluding remarks

In contrast to much of the earlier literature that viewed exports, FDI and penetration operations as independent forms of behavior, this paper views them as jointly made and interdependent. Similarly, in contrast to the few studies that analyze these phenomena together and which view exports and FDI as substitutes for one another, this study views them as well as other forms of internationalization as supplementary or even complementary to one another. To operationalize this considerably broadened scope of analysis, we have developed a cumulative index of the commitment to foreign expansion (FEI). Our working hypothesis in constructing this index is that the FEI achieved by a firm increases with the number and depth of the modes exploited by the firm to enhance its position in foreign markets. The FEI index varies from zero for a firm with no internationalization to three for one with exports, penetration operations and production abroad (FDI).

The FEI index and associated analytical framework are applied to Italian manufacturing firms for a period of time (1991-97) that allows us to examine the influences of exchange rate changes. Whereas with the fixed exchange rate system of the early '90s Italian firms had relatively low levels of FEI, the lira devaluation of 1992 and the transition to a flexible exchange rate system favored increased internationalization by firms. Notably, the percentages of firms which were exporters only (FEI=1) and of those which also had penetration operations abroad (FEI=2) both increased from 1991 to 1994. But, after the lira's appreciation and return to the fixed rate regime in 1995, perhaps somewhat surprisingly the FEI of Italian firms increased further. As noted, this may have been the result of several influences not directly related to exchange rate appreciation, such as delayed reactions to the earlier devaluation or to EU strengthening.

From our micro-level, ordered probit model, we obtain results suggesting that firm size, vertical (subcontracting) as well as horizontal (consortium) relations with other firms, various kinds of innovation and location are all very important factors in explaining variations in FEI

scores across firms at different points in time. Not only does the broadened FEI measure allow us to capture forms of internationalization not captured by exports alone, but the results show many instances in which the direction and magnitude of the effects of the explanatory variables differ from one level of FEI to another. Another important finding is that the exchange rate regime can exert considerable influence on the effects of the explanatory variables. Some of these effects are dampened by devaluation whereas others are strengthened. For example, from Table 7, some evidence of alternative sources and explanations for the aforementioned increase in FEI after appreciation in 1995 of the lira can be identified. In particular, the FEI increase seemed to be due to significant declines in the disadvantages of location in the South and small firms. Quite conceivably, these were due to lower transaction costs derived from the continuing improvements in communications technology. Given that the sharpest of these changes were in the FEI=2 category, it also suggests that currency appreciation may have helped rather than hindered since for the type of investments involved in foreign market penetration, the effects of currency appreciation should be expected to be positive.

The significance of our use of the broader and more comprehensive FEI index instead of simply exports as in most existing studies is demonstrated by several findings that differ substantially from those obtained by Basile (2001) with the same data set. For example, our results show that the devaluation-induced increases in exports observed by Basile among Southern and non-innovating firms were indeed confined to exports only (FEI=1) rather than something more fundamental and longer-lasting signified by increases in FEI>1. Another important difference derives from comparing our estimates of the effects of product and/or process innovation (PRODPROC) for different years on the probability of different types of internationalization. Our results suggest that, contrary to popular opinion, innovation and greater price competitiveness can be complementary to one another in encouraging investments in deeper and broader forms of foreign market penetration. Such findings are important in identifying effects on internationalization that are much more subtle than can be obtained from similar studies that focus on exports alone.

Several extensions of the study would be highly desirable. First, if one could obtain the firm identifiers, it would allow us to make a panel of the data so that with fixed effects we could control for unobserved sources of heterogeneity in the firms. Second, it would be desirable to enlarge the scope of the paper by examining the effects of tax and other policy measures designed to promote competitiveness and internationalisation.

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Table 1 Modes of Foreign Expansion

MODES OF FOREIGN EXPANSION	EXPORT	PENETRATION OPERATION [a]	FOREIGN DIRECT INVESTMENT
No Internationalization			
Only Export	*		
Export and penetration Operations	*	*	
Export, Penetration Operations and FDI	*	*	*
Export and FDI	*		*
Only Penetration Operations		*	
Only FDI			*
Penetration Operations and FDI		*	*

[a] Includes any one or more of: a) sales outlets, b) sales through local traders, c) sales outlets through firms belonging to the group; d) other promotional initiatives, e) trade collaboration.

Figure 1 - Italy - Modes of Foreign Expansion
(frequencies and cumulative freq. of 4173 sample firms in 1991)

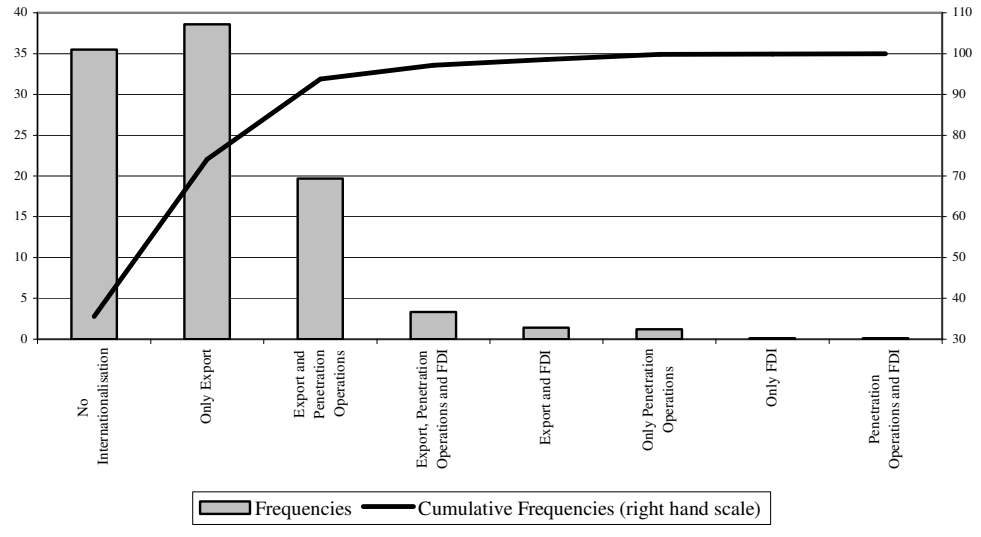

Table 2 Export Intensity and FEI

FEI	1991	1994	1997
1	29.4	32.6	34.8
2	36.8	43.6	43.6
3	41.1	43.0	50.6

Source: Authors' computations based on Mediocredito data

Note:
FEI =1: exports=1; penetration operations=0; FDI=0
FEI =2: export =1; penetration operations=1; FDI =0
FEI = 3: export =1; penetration operations=1; FDI =1

Table 3 The Distribution of Foreign Expansion Index Scores by Region and Year

North West						
FEI	*Frequency*	*Cumulative frequency*	*Frequency*	*Cumulative frequency*	*Frequency*	*Cumulative frequency*
	1991		*1994*		*1997*	
0	30.2	30.2	23.9	23.9	22.4	22.4
1	41.4	71.6	43.2	67.0	48.9	71.4
2	21.8	93.3	30.6	97.7	24.7	96.1
3	3.4	96.7	1.2	98.8	2.7	98.8
North East						
0	30.4	30.4	26.2	26.2	24.5	24.5
1	41.6	71.9	36.4	62.6	41.8	66.3
2	20.5	92.5	34.1	96.7	31.5	97.7
3	4.6	97.0	1.9	98.6	1.6	99.3
Centre						
0	43.1	43.1	32.7	32.7	32.7	32.7
1	33.8	76.9	43.1	75.8	38.7	71.4
2	19.1	96.0	20.9	96.8	25.7	97.2
3	2.2	98.2	1.6	98.3	1.0	98.2
South						
0	61.6	61.6	51.9	51.9	44.8	44.8
1	25.7	87.3	32.5	84.5	32.5	77.3
2	9.8	97.1	13.6	98.1	20.8	98.1
3	1.0	98.0	0.2	98.3	0.7	98.8
Italy						
0	35.5	35.5	28.8	28.8	27.6	27.6
1	38.6	74.1	40.1	68.8	43.0	70.6
2	19.7	93.8	28.4	97.2	26.4	97.0
3	3.3	97.2	1.4	98.6	1.8	98.9

Source: Authors' computations based on Mediocredito data

Note: The percentage do not add up to 100 because we left out those firms which pursue modes of foreign expansion different from those include in the FEI index. To this regard, see figure 1.

Table 4 - Description of Variables

GROUP OF VARIABLES	VARIABLES	DESCRIPTION
INTERNATIONALISATION	FEI	See Table 1
STRUCTURAL CHARACTERISTICS	SMALL	<51 employees
	MEDIUM	51-250 employees
	LARGE	250-500 employees
	VERY LARGE	> 500 employees
	LnAGE	Logarithm of the firm's age
	TRAD	TRAD=1 if the firm belongs to a 'traditional' sector
	SI	SI=1 if the firm belongs to a 'scale intensive' sector
	SS	SS=1 if the firm belongs to a 'specialized supplier' sector
	SB	SB=1 if the firm belongs to a 'science based' sector
RELATIONSHIP WITH OTHER FIRMS	SUBCONT	SUBCONT =1 if the firm is a subcontractor
	CONSORTIUM	CONSORTIUM=1 if the firm belongs to a consortium
R&D STRATEGIES	- PRODPROC	PRODPROC=1 if the firms realized a product innovation (either combined or not with a process innovation) through R&D investments
	- ONLYPROC	ONLYPROC=1 if the firms realized only a process innovation through R&D investments
INVESTMENT STRATEGIES	- NEWPROD	Investments in capital equipment oriented to develop new products (intensity from 0 to 3)
	- LABOUR	Investments in capital equipment oriented to employ less labor (intensity from 0 to 3)
LOCATION (REGION)	NW	NW=1 if the firm is located in the North-West
	NE	NE=1 if the firm is located in the North-East
	CE	NEC=1 if the firm is located in the Center
	SOUTH	SOUTH=1 if the firm is located in the South

Table 5 – Foreign Expansion Index (FEI) : Ordered Probit Specification Tests

	Model 1	Model 2	Model 3	Model 4
STRUCTURAL CHARACTERISTICS	X	X	X	X
RELATIONSHIPS WITH OTHER FIRMS	X	X		
R&D STRATEGIES	X			X
INVESTMENT STRATEGIES	X			X
REGIONAL DUMMIES	X	X	X	X
	1991			
Num. of obs.	4,173	4,173	4,173	4,173
Log-likelihood	-4,351	-4,428	-4,523	-4,437
BIC	-1,019	-898	-726	-864
R^2	0.74	0.72	0.71	0.73
	1994			
Num. Of obs.	4,152	4,152	4,343	4,343
Log-likelihood	-4,176	-4,280	-4,588	-4,433
BIC	-1,065	-891	-661	-939
R^2	0.74	0.72	0.69	0.72
	1997			
Num.of obs.	4,027	4,436	4,440	4,031
Log-likelihood	-4,283	-4,793	-4,842	-4,324
BIC	-536	-457	-386	-480
R^2	0.71	0.68	0.67	0.70

Source: Authors' Calculations based on Mediocredito data

Note: BIC (Bayesian Information Criterion) = -Chi-squared + df * lnN, where lnN = logarithm of the number of observations, Chi-squared = , df = number of regressors.

Table 6 – Foreign Expansion Index: Ordered Probit Results by Year
(coefficients and heteroscedastic-consistent standard errors. Percentage values)

Variable	1991		1994		1997	
STRUCTURAL CHARACTERISTICS	Coeff.	Std.err.	Coeff.	Std.err.	Coeff.	Std.err.
- MEDIUM (51-250 employees)	44.5***	7.7	33.3***	6.3	34.0***	7.4
- LARGE (251-500 employees)	55.8***	10.2	50.6***	9.9	50.1***	11.1
- VERY LARGE (> than 500))	67.6***	12.4	59.8***	12.4	53.2***	13.2
--AGE	0.6	1.4	3.8***	1.5	1.8	1.9
- TRADITIONAL (TRAD)	1.7	8.5	13.7**	5.9	6.4	6.7
- SCALE INTENSIVE (SI)	-6.4	8.5	11.6**	5.8	-3.0	6.7
- SPECIALISED SUPPLIERS (SS)	12.6	8.9	21.9***	6.9	28.2***	8.8
RELATIONSHIPS WITH OTHER FIRMS						
- SUBCONTRACTING	-40.6***	7.5	-29.8***	5.9	-20.5***	4.9
- CONSORTIUM	10.7***	3.8	15.3***	4.4	22.2***	6.4
R&D STRATEGIES						
- PRODPROC	35.1***	6.9	30.2***	6.0	41.1***	9.6
- ONLYPROC	28.3***	8.8	27.9***	6.9	13.9**	6.2
INVESTMENT STRATEGIES						
- NEWPROD	2.0	1.5	3.6***	1.3	8.9***	2.3
- LABOUR	2.3*	1.3	2.0**	1.0	-0.2	1.4
LOCATION (REGION)						
-SOUTH	-61.9***	12.2	-37.5***	8.4	-35.2***	9.0
-NORTH EAST (NE)	-3.6	2.9	4.1*	2.5	3.8	3.4
-CENTER (CE)	-19.5***	5.2	-6.2**	3.1	-11.8**	5.1
μ_1	98.3***	16.7	69.5***	12.6	106.9***	20.7
μ_2	189.3***	32.5	185.3***	33.9	241.6***	47.6

Source: Authors' calculations based on Mediocredito data

Note: Intercept coefficients have not been reported.

Table 7 – Marginal Effects for Ordered Probit model *(Percentage values)*

Variables		FEI=0	FEI=1	FEI=2	FEI=3
STRUCTURAL CHARACTERISTICS					
MEDIUM (51-250 employees)	*1991*	-21.8	2.9	14.9	2.9
	1994	-19.2	-0.7	19.0	0.9
	1997	-12.9	-0.9	12.6	1.2
LARGE (251-500 employees)	*1991*	-25.9	3.7	18.6	3.6
	1994	-29.1	-1.1	28.9	1.3
	1997	-18.6	-1.3	18.1	1.7
VERY LARGE (more than 500 employees)	*1991*	-32.2	4.5	23.1	4.5
	1994	-34.9	-1.3	34.7	1.6
	1997	-20.4	-1.4	19.9	1.9
AGE	*1991*	-0.3	0.0	0.3	0.0
	1994	-2.1	0.0	2.1	0.0
	1997	-0.7	0.0	0.7	0.0
TRADITIONAL (TRAD)	*1991*	-1.4	0.2	1.0	0.2
	1994	-8.0	-0.3	8.0	0.3
	1997	-3.1	-0.2	3.0	0.3
SCALE INTENSIVE (SI)	*1991*	2.8	-0.4	-2.0	-0.4
	1994	-6.6	-0.3	6.6	0.3
	1997	1.4	0.1	-1.4	-0.1
SPECIALISED SUPPLIERS (SS)	*1991*	-5.8	0.8	4.2	0.8
	1994	-12.4	-0.5	12.3	0.6
	1997	-10.8	-0.7	10.5	1.0
RELATIONSHIPS WITH OTHER FIRMS					
SUBCONTRACTING	*1991*	19.1	-2.7	-13.7	-2.7
	1994	16.8	0.6	-16.7	-0.8
	1997	8.3	0.6	-8.1	-0.8
CONSORTIUM	*1991*	-5.1	0.7	3.7	0.7
	1994	-8.5	-0.3	8.4	0.4
	1997	-9.1	-0.6	8.8	0.8
R&D STRATEGIES					
PRODPROC	*1991*	-17.1	2.4	12.3	2.4
	1994	-17.0	-0.6	16.9	0.7
	1997	-16.2	-1.1	15.8	1.5
ONLYPROC	*1991*	-13.5	1.9	9.7	1.9
	1994	-16.1	-0.6	16.0	0.7
	1997	-5.9	-0.4	5.8	0.6
INVESTMENT STRATEGIES					
NEWPROD	*1991*	-1.0	0.2	0.7	0.1
	1994	-1.9	0.0	1.9	0.0
	1997	-3.1	-0.2	3.1	0.3
LABOUR	*1991*	-1.0	0.2	0.7	0.1
	1994	-1.1	0.0	1.1	0.0
	1997	0.4	0.0	-0.4	0.0
LOCATION (REGION)					
SOUTH	*1991*	24.9	-3.5	-17.9	-3.5
	1994	19.4	0.7	-19.2	-0.8
	1997	11.5	0.7	-11.1	-1.1
NORTH EAST	*1991*	1.8	-0.3	-1.3	-0.2
	1994	-2.5	-0.1	2.5	0.1
	1997	-1.2	0.0	1.1	0.1
CENTER	*1991*	8.7	-1.2	-6.3	-1.2
	1994	3.3	0.1	-3.2	-0.2
	1997	3.9	0.3	-3.8	-0.4