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Summary

This study explicitly takes into account that the decision to enter into a cooperative R&D relationship is related to the antecedent decision to carry out R&D. This calls for a methodological approach that, at the same time, allows the joint analysis of the determinants of the two decisions and corrects for the sample selectivity that is intrinsic in the analysis of cooperative R&D. The results indicate the need to explicitly consider the selectivity issue in the empirical analysis of cooperative R&D. Moreover, the empirical evidence suggests that the role of the organizational form, the pursuit of multiple innovative objectives, the incentives to conduct R&D for those firms that are involved in close-knit vertical relationships are important drivers of a firm's decision to engage in R&D both independently and with external partners.

Keywords: Cooperative R&D, bivariate probit, selectivity, outsourcing, business groups

JEL: L1, O3

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1 Introduction

The paper sets out to clarify some methodological issues that have been often overlooked in previous empirical analyses concerning the determinants of an innovative firm's decision to cooperate in R&D. First, we argue that it may not be appropriate to analyse the decision to cooperate using a single equation framework, since the cooperation decision may be related to the antecedent decision to carry out R&D. This implies that the two binary decisions need to be studied jointly using a Bivariate Probit framework, thereby taking into consideration the possibility that the disturbances in the cooperation equation are correlated with those in the R&D equation. The use of separate Probit regressions is appropriate only under the hypothesis that such disturbances are uncorrelated (Greene, 1997). To our knowledge, the test of such hypothesis is never explicitly carried out in the existing literature. For instance, Kleinchnecht and Rejinen (1992) study the determinants of R&D cooperation in a sample of Dutch firms by confining their analysis to less than 50% of the firms which reported any R&D activity, thereby disregarding any link between the behaviour of the firms in the two subsamples. Similarly, Cassiman and Veugelers (1998) estimate a Probit model of the same decision on the subsample of the innovative firms that constitute 60% of the total sample of Belgian firms at their disposal.[1] In this paper, we study the two decisions jointly by estimating a Bivariate Probit model using a sample of Italian manufacturing firms. It turns out that in our sample the disturbances of the two equations are uncorrelated. However, we show that the use of a single Probit equation may still yield biased coefficients, unless the issue of sample selectivity in the cooperative R&D equation is taken into account.

Indeed, the sample used in the analysis of the cooperation decision is not randomly selected, but depends on the decision to conduct R&D activities. For instance, Veugelers and Cassiman (1999) acknowledge that they never observe firms cooperating while not performing any in-house R&D. That is, many studies (including the present) use data whereby, due the characteristics of the survey design, the observation of cooperative behaviour is conditional on the observation of innovative behaviour. This selectivity issue calls for a further refinement of the Bivariate Probit model, which we used in the paper.[2] However, as the disturbances in the model's two equations are uncorrelated, we show that - at least in this particular study - the sample selection bias can be tackled by simply running the Probit model of the collaborative decision using the restricted subsample of firms that report positive R&D budgets, thereby

[1] See also, *inter alia*, Bayona *et al.* (2001) and Fritsch and Lukas (2001) for other articles that considered a single equation setting.

[2] Such a methodology is used in Montmarquette *et al.* (2001) to study the determinants of university dropouts. See Greene (1997, p.912) for other applications of the Bivariate Probit with Sample Selection model.

reconciling the present study with those cited above.[3] Moreover, we present evidence of the bias that arises when the selectivity issue is not taken into account, by reporting the coefficients of the same Probit model using the full unrestricted sample. It turns out that the bias is particularly severe for one of the variables that are recorded only if the firm is engaged in R&D, namely the extent to which the firm carries out both process and product R&D in equal proportions.

Another contribution of the study is the empirical support found for the new hypotheses that it puts forward. Indeed, our econometric models of firms' innovative behaviour include variables that were not previously considered in the analysis of collaborative behaviour, such as ownership concentration and the above mentioned impact of a strategy focused on one specific objective (only process or product innovations) viz-à-viz one whereby the firm pursues multiple objectives (both process and product). Previously unexplored determinants of the decision to engage in R&D, such as the degree of product diversification, the hierarchical position within a group organizational structure and the extent to which a firm is involved in a vertical relationship, were also usefully included in the analysis. Furthermore, evidence supporting previous findings in the literature is also found for the role of a firm's financial structure and profitability, its size and the effects of the competitive environment it faces.

The paper is organised as follows. Section 2 describes the characteristics of the dataset used, while the model is developed in sections 3 and 4, which also provides some descriptive statistics. The methodological features of the Bivariate Probit model with Sample Selection are analysed in section 5. The main findings are reported in section 6, which is followed by some concluding remarks.

2 Data

All the variables in this study originate from a survey conducted in 1998, where both balance sheet data and questionnaire answers were gathered. The questionnaire was prepared by an Italian investment bank, *Mediocredito Centrale* (see www.mcc.it). The unit of observation is the firm, not its plants or establishments. For each firm, more than 500 variables are included, with balance sheet data for up to 9 years (1989-1997) relating to 4496 businesses with more than 10 employees. The procedures for data collection are mixed: a sampling procedure was adopted for firms hiring less than 500 employees. The stratification was made according to size, industry and location. The sample dimension for each stratum was determined according to the Neyman's formula, so as to allow rescaling to the universe at the level of each administrative geographical region. For firms with more than 500 employees,

[3] It is important to stress that the two-equations approach constitutes the correct methodology when disturbances are correlated.

the survey covers the entire universe. Overall, the survey constitutes a statistically significant representation of the Italian manufacturing industry.

The survey design considered three types of data: 1) balance sheet data for the 1989-1997 period; 2) data related to measurable company characteristics for the 1995-1997 period (i.e. employment, investment and R&D outlays etc.); 3) questionnaire data regarding the firm's relationship with customers and suppliers, composition of sales, competitive environment, group membership and position within the group, industry characteristics, ownership concentration, at the time the survey was conducted.

3 Dependent Variables

The two dependent variables of interest are binary. The first one, denoted as "R&D", indicates whether a firm has made, or not, any investment in R&D during the 1995-1997 period. If a firm has indeed invested in R&D, then the second dependent variable, denoted as "Ext. R&D", is observed. It takes the value of 1 if the firm declares to have carried out its R&D projects using the research facilities of other external organizations, such as universities, specialised research centres or other firms, and zero if the innovative activity was carried out using exclusively internal facilities. The definition of "Ext. R&D" lends itself to the following interpretations. First, it can be used to shed some light on the determinants that lead a firm to outsource, at least partly, the execution of various parts of an innovative project. It is noteworthy that "Ext. R&D" mostly represents the decision between *full integration*, i.e. a value of zero, and *tapered integration*, i.e. the value of 1, whereby the firm organizes its innovation both by "Making" (internal research structures) and "Buying" (external ones) (Veugelers and Cassiman, 1999). Indeed, only a minority of firms in the sample (8.6% of firms with positive R&D outlays) entirely delegated their R&D projects to an external organization, that is, have adopted a pure "Buy" strategy, while the majority of innovating firms (53%) have used exclusively internal facilities, that is, have resorted to a pure "Make" strategy. Second, various recent studies report the "joint use of equipment and laboratories" as an instance of cooperative R&D (Fritsch and Lukas, 2001), or consider the decision to cooperate or "Buy" as equivalent (Veugelers and Cassiman, 1999). Thus, in the remainder of the paper, we will not try to distinguish between the decision to cooperate in R&D and the decision to outsource R&D, but rather they will be used interchangeably. From a theoretical viewpoint, the present analysis refers to the fourth scenarios in Kamien *et al.* (1992), where firms cooperate in order to share R&D efforts and avoid duplication of R&D activities, although in the present context it is not possible to ascertain whether cooperating firms achieve full internalisation of the spillovers effects.

Finally, as the emphasis of the analysis is on the effects of the sample selection mechanism that the construction of "Ext. R&D" entails (see below), no attempt is made to verify if differences exist in the factors that explain the recourse to the various contracting organizations available to the firm, as for instance in Fritsch and Lukas (2001), whereby a distinction is made between cooperation with customers, suppliers, other firms and publicly funded research institutions.[4] The same study however finds evidence supporting the notion that the propensity to cooperate with different kinds of partners is driven by similar factors. This justifies the approach in the present study to merge into the same variable, i.e. "Ext. R&D", the decision to collaborate with universities, other specialised research institutions or other firms.

4 The explanatory variables

This section introduces and describes the regressors used in the study and the main rationales underlying their adoption. It is noteworthy that some of these variables are observed only if the firm invested in R&D and therefore they are used only in the "Ext. R&D" regression. We begin by introducing the regressors used in the "Ext. R&D".

4.1 The determinants of collaborative R&D

The dummy variable "Stateown" is equal to 1 if another State-run company owns, at least partly, the responding firm. This variable is included to test whether the participation in the ownership structure of a State-run firm facilitates the recourse to external sources such as universities, which in Italy are also publicly funded, or public research centres. The underlying assumption for the inclusion of such a variable is that state ownership can act as a catalyst that brings various public organization into contact. The presence of state ownership is a distinguishing feature of the Italian system, which the literature has recognised as the source of severe failures (Bianco and Casavola, 1999). However, a positive and significant coefficient for this variable would suggest the beneficial role that state ownership plays in supporting the establishment of links between different innovative organizations, and in reducing the risk of opportunistic behaviour that characterises the outsourcing decision.

The data set contains three variables detailing the ownership shares of the first three largest shareholders (or owners if the firm's capital is not divided in shares) that exercise direct control of the firm. The variable "Herfown" is obtained by taking the square root of the sum of the squared values of these variables, and dividing it by 100. Thus, high values of "Herfown" indicate a more concentrated ownership. Holderness and Sheehan (1988) provide empirical evidence that concentrated shareholdings are associated with higher levels of R&D.

[4] For a similar distinction, see also Kleinknecht and Reijnen (1992).

However, the relationship between ownership concentration and the decision to do R&D jointly with other organizations is largely unexplored. A traditional agency argument could be usefully applied to the analysis of such relationship. A more concentrated ownership implies that the incentives to behave opportunistically are reduced as cheating engenders a greater loss if the relationship is terminated. Therefore, ownership concentration can work as a credible signal that induces compliance among the partners. Hence, a higher ownership concentration should be positively related with the likelihood to engage in R&D collaboration.

Kleinknecht and Reijnen (1992) find that the use of various types of government facilities for the promotion of innovation, such as credits and subsidies for R&D works, seems to increase the probability that firms cooperate in R&D. The data set provides information on whether the firm obtained any financial subsidy for applied research and technological innovation in the period 1995-1997 via the Italian National law N. 46/82. It is noteworthy that such a law does not specifically require the applicants to engage in innovative activities jointly with other partners. A value of 1 is attributed to the variable "Subsidy" if the firm was successful in its application; the inclusion of "Subsidy" assesses whether obtaining a financial incentive to R&D determines, as a potentially beneficial side-effect, an increase in a firm's propensity to seek the collaboration of external partners. Following Kleinknecht and Reijnen (1992), we expect this to be the case and hence a positive coefficient for the dummy "Subsidy".

The extent to which a firm focuses its innovative efforts on pursuing a specific objective, as opposed to being involved in reaching a number of different goals, is captured by the variable "Rddiver", obtained using the formula $\sqrt{\sum_{i=1}^{2} r_i^2}$, where r_i are the shares of the R&D budget used for innovating processes and products.[5] It is noteworthy that the information on process and product R&D is available only if the firm conducts R&D, a fact with relevant bearings for the subsequent analysis. Here, it is assumed that the complexity entailed by a more diversified innovative strategy aimed at combining both process and product R&D, as opposed to a more focussed one, is a driver of cooperation. Furthermore, note that the maximum value of "Rddiver" is 100, when the firm pursues only a single strategy, either process or product R&D, while its minimum value is 70.71 when the total R&D budget is equally shared among the two strategies. Thus a negative coefficient for "Rddiver" is expected.

Expenditures over time on R&D, advertising, staff training etc. create stocks of knowledge, reputational and human capital etc. that constitute the intangible resources supporting a firm's ability to sustain a competitive advantage. Such resources encompass a firm's image, its knowledge of market demand that facilitates the adaptation of its products to specific

[5]Note that these shares of R&D expenditures include both the introduction of new processes and products and the enhancement of the existing ones.

users' needs, its ability to create new products or to enter new markets, its flexibility in adopting new technological opportunities. Often such competencies are acquired through cooperation with other domestic and foreign organizations (Bayona et al., 2001). While the accounting measures of such intangible assets can hardly be used to represent an accurate account of a single form of tacit knowledge, both in the human, commercial and technological areas, they certainly constitute a proxy for the unique competencies developed over the firms' histories. The variable "Intass94", measuring the ratio of total intangible assets over total assets in 1994 is included to assess its impact on the likelihood to enter a cooperative relationship and to engage in innovation. Note that this variable refers to the year before the period over which the sample firms' innovative behaviour is observed. Following Bayona *et al.* (2001), we expect that the accumulation of market and technological competencies was facilitated by previous collaboration with external organizations, and that in this case firms are more likely to replicate collaborative and innovative strategies over time.

The lack of internal financial resources can limit the capacity of a firm to conduct innovation, thereby inducing it to seek the collaboration of external organizations. Therefore, highly leveraged firms are more likely to establish an external relationship, while the opposite is to be expected from firms with good levels of profitability. The coefficients of the 1995 ratios of total debt over total assets (Debt95) and of the accumulated retained earnings over total assets (Reserve95) are expected to be, respectively, positive and negative.

The theoretical literature has shown that when the level of exogenous spillovers is sufficiently high, cooperation in R&D is associated with higher levels of R& D expenditures than in the competitive case (Kamien et al., 1992; d'Aspremont and Jacquemin, 1988). Such a result also holds when spillovers are endogenized (Kamien and Zang, 2000; Poyago-Theotoky, 1999). All the cited papers consider only the case of symmetric firms and multidirectional spillovers, and therefore may not be particularly useful for empirical purposes, especially when firms are characterised by heterogenous degrees of R&D intensity and it is not possible to identify which firms cooperate within the same project. Amir and Wooders (1999) develop a duopoly model with one-way spillovers, whereby know-how may flow from the more R&D-intensive firm (the innovator) to the other firm (the imitator), but never in the opposite direction. They show that such an asymmetry does not necessarily hinder cooperation, and that, depending on the convexity of the R&D cost function and the size of the market, their analysis can be reconciled with that of previous studies with and without endogenous spillovers. To sum up, the game theoretical literature suggests a positive relationship between R&D cooperation and R&D intensity, measured here as the average of R&D expenditures per employee in the period 1995-1997 (RDI). While the theoretical predictions point in one specific direction, the empirical evidence is mixed. For instance, Kleinknecht and Reijnen

(1992) do not find compelling evidence supporting the notion that R&D intensity enhances the propensity of Dutch firm towards cooperation, while Arora and Gambardella (1990) document that the number of agreements concluded by a sample of US chemical and pharmaceutical companies is positively correlated with R&D intensity. Similarly, in the sample of German enterprises used in Fritsch and Lukas (2001), the firms engaged in R&D cooperation tend to have a higher share of R&D employees. Such a finding suggests that R&D intensity can also be interpreted as an indicator for the absorptive capacity of an enterprise (Kamien and Zang, 2000; Cohen and Levinthal, 1989)

A firm that purchases a great share of inputs and services from subcontractors via an outsourcing agreement, rather than relying on market transactions, should find it easier to extend such an approach to the organization of its innovative activity. Levin and Reiss (1988) consider the extent to which upstream materials suppliers and equipment suppliers contribute to the expenditure in process R&D. Fritsch and Lukas (2001) identify as cooperative agreements between an enterprise and its manufacturing suppliers, those relationships based on the establishment of "casual contact for informational purposes", "organised exchange of information and experiences", "involment in planning and operation of projects" and "pilot use of an innovation". Thus the variable "OutsourceP", measuring the percentage of total purchases of input goods and services from outsourcing agreements, should be positively related with the likelihood of striking cooperative agreements.

Kleinknecht and Reijnen (1992) find that while exporting firms have a higher probability to cooperate with foreign partners, it is not however appropriate to draw the general conclusion that firms operating in global markets have a higher propensity to engage in R&D cooperation, because the export-intensive firms in their study do not generally cooperate with domestic organizations. In the present study it is not possible to differentiate national and foreign partners. We control however for the possibility that firms facing a tougher competitive environment may exhibit a stronger tendency to cooperate. Miyata (1996) finds a strong positive relationships between cooperative R&D and the existence of foreign competitors. To construct an index of the intensity of competition from foreign firms faced by the respondent firms, we took the square root of the sum of the three dummy variables specifying whether the main competitors are localised, respectively, in the European Union, in other industrialised countries and in developing countries. The variable thus obtained, "Compabr", takes the minimum value of zero when the firm competes only with national firms, and the maximum value of $\sqrt{3}$ when competitors are from all the above mentioned regions.[6]

[6] Note that a measure of export intensity, although available, was not included in the study because of the impossibilty to establish the direction of the causality links between the export and innovative activities.

4.2 Factors affecting the decision to engage in R&D

Some of the variables defined above, namely "Intass94", "Debt95", "Reserve95", and "Compabr" are assumed to influence a firm's decision to engage in R&D in manners similar to those identified above. They are used in the regression of "R&D" together with the following variables, on which we now focus the attention.

Some researchers recognise the existence of two different innovation systems in Italy: a core R&D system and networks of small firms; the former stresses that the bulk of R&D investment is concentrated in a few industries and carried out by a small number of big firms (Malerba, 1993). However, most industrial districts in recent years have experienced the rapid development of local industrial groups. These groups adopt the same pyramidal structure identified in Bianco and Casavola (1999): legally independent firms are controlled by the same legal entity (either an individual entrepreneur or a firm), through a chain of ownership relationship. Various study have recognised that the group organisation tends to play an important role in promoting and supporting innovations (Filatotchev et al., 2000). Moreover, group organisation facilitates a more rapid diffusion of process technology within the district. Given the peculiarities of this organizational form, it is important to ascertain whether the task of conducting innovative projects is centralised, i.e., the holding company determines its innovative strategy. Thus, the dummy variable "Headgrp", which is equal to 1 if the firm is the holding or controls other firms in the group, aims at capturing the effects that being part of a network of companies engender on the likelihood to engage in innovative activities. It is also important to assess the role played by the group's subsidiaries, identified in this study by the dummy "Subsgrp". A positive coefficient for both these variable would indicate that, within the group, the tasks involved in the carrying out of innovative projects are divided among the group members. Opposite signs would suggest centralization of the R&D activity at the level of either the holding or the subsidiary.

R&D and economies of scope are closely linked. The new ideas developed in one research project may be of help in another project. Thus a firm with a diversified portfolio of products may be better positioned to determine the general applicability of new ideas than a firm with a narrower portfolio of products because it can capture the internal knowledge spillovers (Henderson and Cockburn, 1996). We constructed an index of product diversification as follows: Proddiver=$\frac{1}{\sqrt{\sum_{i=1}^{3} s_i^2}}$, where s_i is the percentage of total sales from product category i. Such an index is increasing in the degree of diversification: the lowest value is obtained when the firm sells only one category of products. Its expected sign is positive.

The Schumpeterian notion that large firms are especially likely both to undertake and be successful in research activities has constituted a constant theme in the literature (Schumpeter, 1943). Such a notion was challenged from a theoretical point of view (Arrow, 1962) and has found mixed empirical evidence to support it (Breschi et al., 2000; Audretsch, 1991; Audretsch, 1995; Cohen and Levin, 1989). Although the present study does not aim to provide conclusive evidence, a measure of size is included as a standard determinant of the decision to conduct R&D. Here size is measured as the natural log of total sales in 1995 ("Lnsales").[7]

To study how being involved in a close-knit vertical relationship affects the decision to conduct R&D, we refer to the Property Rights approach to the theory of the firm (Grossman and Hart, 1986; Hart and Moore, 1990). In particular, we are interested in understanding which party is more likely to invest in the specific asset represented by an innovative project. The theory predicts that the ownership of such an asset will be held by the party that can use it more efficiently, thereby creating the greatest surplus gain. When contracts are incomplete, by holding the residual rights of control over the asset, the owner can determine the use of the asset when there are missing contractual provisions. Consider the extreme case of a supplier that sells all its output to a downstream buyer. Developing an innovative equipment reduces the supplier's cost of production, but by investing in such a relationship-specific asset the supplier exposes itself to the risk of being held-up, that is, the buyer can appropriate all the rents generated by the seller's innovative efforts. In such a situation, it is optimal for the buyer to invest and maintain the ownership of the innovative equipment, allowing at the same time the supplier to use the asset to produce the input. We should therefore expect the coefficient of "Main3cli", which denotes the percentage of total sales to the firm's 3 main clients, to be negative. However, we also control for other forms of the hold-up problem that may arise in vertical relationships by including the variable "OutsourceS", that measures the percentage of sales made within outsourcing agreements. It is not clear *a priori* if a firms that operates mainly as a supplier of other firms within an outsourcing agreement will tend to show a higher propensity towards innovation. On the one hand, the presence of many other potential suppliers may provide the firm with the incentive to keep abreast of the latest technological opportunities. On the other, if the buyer is locked into the relationship, and cannot easily find substitutes for the firms' products, then the firms may be induced to slack by reducing its innovative efforts.

Finally, to take into account how the competitive pressure affects the firms' innovative behaviour, we use two dummies: "Smallcomp" and "Bigcomp", that equal 1 if the firm's main competitors are, respectively, firms of small and big size.[8]

[7] Size is also found to influence the composition of R&D, i.e. a firm's fraction of process and product R&D (Cohen and Klepper, 1996).

[8] Note that there is another category, i.e. competition from medium-sized firms, that was not included, and that a "yes" could be reported for all these variables.

Table 1 briefly describes the regressors used in the study and their expected signs in the two regressions.

Table 1: The variables and their expected signs

Variables	Description	Ext. R&D	R&D
Stateown	Dummy=1 if a State owned company has an ownership stake in the responding firm	+	
Headgrp	Dummy=1 if a firm is the holding or controls other firms within a group organization		+/-
Subsgrp	Dummy=1 if a firm is a subsidiary within a group organization		+/-
Herfown	Index of the three largest ownership shares	+	
Subsidy	Dummy=1 if the firm has received a subsidy for applied research and technological innovation	+	
Rddiver	Inverse Index of Diversification in product and process R&D	-	
Proddiver	Index of Production Diversification		+
Intass94	Ratio of 1994 Intangible Assets over Total Assets	+	+
Debt95	Ratio of 1995 Total Debt over Total Assets	+	-
Reserve95	Ratio of accumulated retained earnings in 1995 over Total Assets	-	+
Lnsales	Size measured as the natural log of 1995 total sales		+
RDI	Index of R&D intensity measured as the average of R&D expenditure per employee in the 95-97 period	+	
Main3cli	% of total sales to the three main clients		-
OutsourceP	% of total purchases of goods and services from outsourcing agreements	+	
OutsourceS	% of sales made within outsourcing agreements		+/-
Compabr	Index of extent of competition from foreign firms	+	+
Smallcomp	Dummy=1 if the main competitors are small firms		-
Bigcomp	Dummy=1 if the main competitors are big firms		+

4.3 Analysis of the regressors

Table 2 describe the variables by providing some statistics derived both from the full sample and from the subsample of innovative firms. Apart from the obvious differences concerning “Rddiver” and “RDI” (these variables are observed only in the case of innovative firms), the only notable difference in the subsample, relative to the full sample, regards the intensity of competition from foreign firms, which is greater for the innovative firms. The latter also tend to sell less via outsourcing agreements and depend less on purchases from their three main clients.

The linear correlation analysis is not reported to save on space. As far as the regression of "R&D" is concerned, the highest correlation is between "OutsourceS" and "Main3cli", with a value of 0.24, which does not raise any problem of multicollinearity. Actually, "Debt95" and "Reserve95" exhibit a higher linear correlation of -0.33 in the full sample and -0.37 in the subsample. Thus, the two variables are never used contemporaneously in the econometric analysis. In the other regression, the highest correlation is between "Reserve95" and "Intass94" (-0.16); the latter is only weakly correlated with R&D intensity (0.09).

Table 2: Descriptive Statistics

Variables	Mean		Std. Dev		Min		Max		N	
	Full	R&D	Full	R&D	Full	R&D	Full	R&D	Full	R&D
Herfown	.60	.70	.29	.22	0	.017	1.0	1.0	4460	1416
Rddiver	28.36	85.2	41.5	18.1	0	70.71	100	100	4490	1495
Proddiver	1.21	1.27	.48	.58	1.0	1.0	12.3	12.3	4354	1457
Intass94	.017	.02	.037	.04	0	0	.47	.41	3315	1226
Debt95	.197	.20	.17	.16	0	0	.77	.69	3145	1206
Reserve95	.12	.12	.13	.13	-.43	-.21	1.46	1.46	3145	1206
RDI	1.5	4.87	5.0	8.12	0	0.06	86.0	86.0	4324	1329
Lnsales	9.3	9.88	1.66	1.78	0	0	15.8	15.6	4443	1490
OutsourceP	15.6	16.3	28.7	27.5	0	0	100	100	4361	1457
OutsourceS	28.1	23.7	42.2	39.2	0	0	100	100	4469	1491
Main3cli	35.6	32.7	25.5	24.1	0	0	100	100	3992	1349
Compabr	.33	.52	.52	.58	0	0	1.73	1.73	4496	1501

Table 3 outlines that R&D intensity tends to increase with size: this is why these two variables are not used together in the econometric analysis. Both shares of innovative and cooperative firms within a class increase with size, although only slightly for the cooperative share. Indeed, the econometric analysis did not show any significant impact of size on the likelihood to engage in collaborative projects, and thus size was dropped from the regression of "Ext. R&D".

The statistics in Table 4 show that R&D intensity and the share of innovative firms within an industry tend to have similar ranks. For instance, the Chemical sector scores the highest level of R&D intensity and has the highest share of innovative firms. Similarly, the Instruments sector ranks second for R&D intensity, and third for the share of innovative firms. To take into account some of the industry-specific effects that these findings suggest, in the "R&D" regression 13 industry dummies were included (the Miscellaneous sector was

Table 3: R&D intensity, percentage of innovative firms[a] and percentage of cooperative firms[b] by size class (1995 sales in million lire)

Class size	RDI	%R&D	%Ext	N
<= 7000	0.89	21.4	45.4	1728
7000 – 13100	1.19	25.2	46.5	957
13100 – 30000	1.73	38.7	47.9	793
> 30000	2.83	58.5	51.2	948
Total	1.50	33.0	48.4	4479

[a] number of innovative firms over total number of firms in a class; [b] number of firms engaged in cooperative R&D over total number of innovative firms in a class.

used as control).

Quite interestingly, no relationship seems to exist between an industry's R&D intensity and the propensity of firms in that industry to enter into collaborative relationships. Indeed, in the ranking of the share of cooperative firms in an industry, the Chemicals and the Instruments sectors are only fourth and twelfth. However, the relationship between the propensity to enter into a cooperative agreement and a firm's R&D intensity is further explored in the econometric analysis. Given the observed rank correlation between "RDI" and sectors, the industry dummies were not included in the regression of "Ext. R&D". However, we test the hypothesis that the propensity to enter into collaborative agreements is enhanced by the geographical proximity with other innovative firms. Thus, we included 10 regional dummies, each representing the 10 regions with the highest number of firms in the sample, in the "Ext. R&D" regression.

5 Methodology

In the bivariate probit model with censoring setting, data on y_1 may be observed only when another variable, y_2, is equal to 1 (Greene, 1997). Formally, the model is as follows:

$$\begin{aligned}
y_{i1}^* &= \beta_{i1}' \, x_{i1} + \epsilon_{i1}, \;\; y_{i1} = 1 \,\text{if}\, y_{i1}^* > 0, \, 0\,\text{otherwise} \\
y_{i2}^* &= \beta_{i2}' \, x_{i2} + \epsilon_{i2}, \;\; y_{i2} = 1 \,\text{if}\, y_{i2}^* > 0, \, 0\,\text{otherwise} \\
(\epsilon_1, \epsilon_2) &\sim \text{BVN}(0,0,1,1,\rho) \\
(y_{i1}, x_{i1}) &\;\text{is observed only when}\; y_{i2} = 1. \qquad (1)
\end{aligned}$$

Table 4: R&D intensity, percentage of innovative firms[a] and percentage of cooperative firms[b] by industry

Code	Description	RDI	Rank	%R&D	Rank	%Ext	Rank	N
DA	Food; Tobacco	.693	10	26	11	69	1	404
DB	Textiles	1.61	4	32	4	44	11	568
DC	Shoes, Leather	.727	9	27	10	45	10	162
DD	Furniture	.334	14	19	13	37	14	139
DE	Paper, Printing	.446	13	15	14	46	8	294
DF	Petroleum, Coal	1.55	5	30	6	67	2	20
DG	Chemicals	3.54	1	48	1	53	4	210
DH	Rubber, Plastics	.97	7	29	8	42	13	290
DI	Stone, clay, glass	.689	11	30	6	49	6	306
DJ	Metals	.474	12	21	12	48	7	615
DK	Industr. Machinery	2.41	3	48	1	46	8	761
DL	Instruments	3.2	2	47	3	43	12	265
DM	Transportation	1.27	6	31	5	53	4	255
DN	Miscellaneous	.85	8	28	9	55	3	207

[a] number of innovative firms over total number of firms in an industry; [b] number of firms engaged in cooperative R&D over total number of innovative firms in an industry.

Thus, there are three types of observations in the sample with unconditional probabilities, that need to be taken into account in the construction of the likelihood function:

$$L_{ss} = \prod_{\substack{y_1=1,\\ y_2=1}} \Phi_2[\beta'_{i1}\, x_{i1}, \beta'_2\, x_{i2}, \rho] \prod_{\substack{y_{i1}=0,\\ y_{i2}=1}} \Phi_2[-\beta'_{i1}\, x_{i1}, \beta'_{i2}\, x_{i2}, -\rho] \prod_{y_{i2}=0} \Phi[\beta'_{i2}\, x_{i2}] \tag{2}$$

where Φ_2 denotes the bivariate normal cumulative distribution function with $\rho = \mathrm{Cov}[\epsilon_{i1}, \epsilon_{i2}]$. Eq. (2) is to be maximised with respect to the parameters β_1, β_2 and ρ.[9]

In other words, the method above takes into account the fact that the observation of y_1 is not random.[10] Note that when no correction for selection is made, we have the standard bivariate probit model, which takes into account the combination of outcomes that are not feasible in the selection model, that is, $(y_{i1} = 1,\, y_{i2} = 0)$ and $(y_{i1} = 0,\, y_{i2} = 0)$. When $\rho = 0$, the standard bivariate model can be estimated using independent probit equations. Only in this particular case, the sample selectivity issues can be addressed by simply running the model for y_1 on the sub-sample of firms reporting $y_2 = 1$.

[9] See Greene (1997, pp. 907-909) for the technical details regarding the calculations of the maximum likelihood estimates.

[10] The methodology subsumed in (2) differs from the procedure due to Heckman (1979) for the case of a continuous dependent variable.

In the present case, we observe data on whether firms did cooperative R&D only if the firm declared that it invested in R&D over the 1995-1997 period. Thus, it is appropriate to use the specification in (2) for estimation purposes. Furthermore, in the subsequent analysis we also provide an example of how failing to consider the selectivity issue in our sample engenders biased estimates.

6 Results

Table 5 reports the estimates from the Bivariate Probit models with sample selection. The sample size, after omitting all the relevant missing values, is reduced to 2260 for the full sample, which is used for the analysis of "R&D", and to 841 for the subsample of innovative firms used to study R&D collaboration. Model 1 uses "Debt95" as a regressor, while Model 2 uses "Reserve95" instead.

We note that all the statistically significant coefficients in both models and regressions carry the expected sign. As far as the analysis of cooperative R&D is concerned, more indebted firms are more likely to enter into agreements, while more profitable firms tend to rely less on external partners. Firms that obtained a subsidy or that have a public firm as a stakeholder tend to be more actively involved in external links. The evidence also suggests that a concentrated ownership structure enhances the chance to establish collaborative agreements, while an opposite effect arises from innovative strategies that are exclusively focused on products or processes. This finding indicates that when firms are actively involved in innovative projects regarding both their products and processes, they tend to rely more on external partners. Indeed, the coefficient of "Rddiver" is significant and negative, indicating that the pursuit of multiple objectives creates an incentive to seek the collaboration of other organizations which can contribute complementary skills and assets. The empirical model also supports the hypothesis of a positive relationship between cooperation and R&D intensity, although it is not possible to ascertain whether this is due to the need to build up absorptive capacity or to strategically control the spreading of spillovers. Moreover, the evidence indicates a positive link between a firm's propensity to procure its inputs through an outsourcing agreement and its propensity to establish a cooperative agreement. Finally, the results of the Wald Test conducted on the set of regional dummies provide no support to the existence of geographical effects.

The results from the "R&D" regression show that the firms selling a high share of their sales to the three main clients are less likely to be involved in the running of innovative projects. Such a result is reinforced by the negative sign of the coefficient for the "OutsourceS" variable. Overall, the evidence suggest that the firms tend to reduce their innovative efforts when they sell a greater proportion of their production to a limited number of influential purchasers. This is consistent with the hypothesis that in such circumstances the greatest benefit from innovation would accrue to the buyer. The results concerning the group organization reveal that the innovative activity seems to be centralised within the holding company, rather than decentralised among the subsidiaries. Centralisation constitutes the optimal organizational solution whenever there is a need to coordinate the technological needs of the subsidiaries, which is more likely when the production activities of the group members are interdependent. Product diversification and innovative activity are found to be closely associated. Indeed, the firms selling only one category of products are less likely to engage in R&D than firms selling a broader range of products. The likelihood to engage in R&D is found to be positively affected by the past investments in intangible assets and positively related to the firm's size. Finally, the competitive environment faced by a firm is found to be a driver to innovation. Indeed, firms competing with large and/or foreign firms tend to be more involved in innovative activities than those firms whose main competitors are represented by small, domestic firms. Finally, the Wald Test suggests that the industry-specific effects are jointly significant in the "R&D" regressions.

The coefficient of ρ in Table 5 is never significantly different from zero. Therefore, - at least using our particular sample - separate Probit estimations could be run, although doing so would leave open the issue of sample selectivity. It turns out that such a problem can be solved by estimating the "Ext. R&D" regression using only the subsample of innovative firms. Table 6 compares the Probit estimates in the "Ext. R&D" regressions carried out using both the entire sample (that is, including also those firms that do not innovate) and the subsample of innovative firms. Such a comparison clearly shows the importance of considering the sample selectivity issue. Indeed, while all the coefficients obtained using the restricted sample are similar, both in sign and size, to those reported for the same regressions in Table 5, some notable differences appear when the Probit regression is run over the full sample. In particular, it is noteworthy that the coefficient of "Rddiver" is now positive and accompanied by a very high level of the t-statistic. This is because the value of "Rddiver" is assumed to be zero for all the firms in the sample that do not report any R&D expenditure, while it is greater than zero otherwise. Thus, when the entire sample is used all the firm that collaborate in R&D appear to be characterised by higher values of "Rddiver" than the non-innovating firms: hence the positive sign for the coefficient. This is a classical example of selectivity bias: the effects of the choice to carry out R&D are confounded with the effects of R&D diversification. Table 6 also shows that it is difficult to predict which variables are likely to be biased. Indeed, no relevant bias is observed in the coefficient of the R&D intensity variable (RDI), which has characteristics similar to "Rddiver".

7 Conclusion

Using the Mediocredito Centrale dataset of Italian firms, this paper showed the importance of correcting for the selectivity bias arising when the observation of a binary dependent variable depends on the value of another binary dependent variable. To this end, we considered both a firm's choice of conducting R&D with an external partner and its antecedent, i.e. the choice of whether the firm engages in R&D at all. Thus, a first contribution of the paper is methodological, as the previous literature on the determinants of collaborative R&D has largely overlooked the selectivity bias issue. Another contribution of the study consists in the managerial implications that can be derived from its empirical model, thereby providing a better understanding of the factors driving a firm's approach to innovation. Indeed, while some of the empirical findings in this study support previously obtained results (e.g., the firms that spend more on R&D have a higher probability of engaging in R&D collaboration), others shed new light on some relatively unexplored determinants of a firm's innovative behaviour. For example, the estimates indicate a tendency, within an organizational group form, to have the R&D activity centralised at the holding firm's level. The impact on the propensity to conduct R&D from the extent to which a firm is involved in a vertical relationship was also taken into account. It turns out that the firms selling most of their production to a small number of influential buyers are less likely to engage in R&D. Furthermore, the estimates suggest that a firm with a concentrated ownership structure, partly or wholly owned by the State, and with objectives both in the areas of process and product R&D, exhibits a greater tendency to seek external R&D partners. Finally, it was found that leverage and profitability affect the chance to collaborate in R&D, but not the firm's decision to engage in R&D.

References

Amir, R. and Wooders, J. (1999). Effects of One-Way Spillovers on Market Shares, Industry Price, Welfare, and R&D cooperation. *Journal of Economics and Management Strategy*, 8(2):223–249.

Arora, A. and Gambardella, A. (1990). Complementarity and external linkages: the strategies of the large firms in biotechnology. *Journal of Industrial Economics*, 38:361–379.

Arrow, K. (1962). Economic Welfare and the Allocation of Resources for Inventions. In Nelson, R., editor, *The Rate and Direction of Inventive Activity*. Princeton University Press, Princeton, NJ.

Audretsch, D. B. (1991). New Firm Survival and the technological regime. *Review of Economics and Statistics*, 73:441–450.

Audretsch, D. B. (1995). *Innovation and Industry Evolution.* Mit Press, Cambridge, MA.

Bayona, C., García-Marco, T., and Huerta, E. (2001). Firms' motivations for cooperative R&D: an empirical analysis of Spanish firms. *Research Policy*, 30:1289–1307.

Bianco, M. and Casavola, P. (1999). Italian Corporate Governance: effects on financial structure and firm performance. *European Economic Review*, 43:1057–1069.

Breschi, S., Malerba, F., and Orsenigo, L. (2000). Technological Regimes and Schumpeterian Patterns of Innovation. *Economic Journal*, 110:388–410.

Cassiman, B. and Veugelers, R. (1998). R&D Cooperation and Spillovers: some empirical evidence. Working paper, Universitat Pompeu Fabra.

Cohen, W. M. and Klepper, S. (1996). Firm Size and the Nature of Innovation within Industries: the case of Process and Product R&D. *Review of Economics and Statistics*, 78:232–243.

Cohen, W. M. and Levin, R. C. (1989). Innovation and Market Structure. In Schmalensee, R. and Willig, R., editors, *Handbook of Industrial Organization*, pages 1059–1107. Elsevier Science Publisher, Amsterdam.

Cohen, W. M. and Levinthal, D. A. (1989). Innovation and Learning: the two faces of R&D – implications for the analysis of R&D investment. *Economic Journal*, 99:569–596.

d'Aspremont, C. and Jacquemin, A. (1988). Cooperative and Noncooperative R&D in Duopoly with Spillovers. *American Economic Review*, 78:1133–1137.

Filatotchev, I., Piga, C., and Dyomina, N. (2000). The effects of internal and external systems of innovation on a firms' R&D: a study of Italian manufacturing firms. Working Paper 03, Birbeck College, School of Management and Organizational Psychology, University of London.

Fritsch, M. and Lukas, R. (2001). Who cooperates on R&D. *Research Policy*, 30:297–312.

Greene, W. H. (1997). *Econometric Analysis.* Prentice Hall, Upper Saddle River, NJ, 3rd edition.

Grossman, S. and Hart, O. (1986). The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration. *Journal of Political Economy*, 94:691–719.

Hart, O. and Moore, J. (1990). Property Rights and the Nature of the Firm. *Journal of Political Economy*, 98:1119–1158.

Heckman, J. (1979). Sample Selection Bias as a Specification Error. *Econometrica*, 47:153–161.

Henderson, R. M. and Cockburn, I. M. (1996). Scale, Scope and Spillovers: Determinants of Research Productivity in the Pharmaceutical Industry. *Rand Journal of Economics*, 27:32–59.

Holderness, C. and Sheehan, D. P. (1988). The role of majority shareholders in publicly held corporations. *Journal of Financial Economics*, 20:317–346.

Kamien, M. I., Muller, E., and Zang, I. (1992). Research Joint Ventures and R&D Cartels. *American Economic Review*, 82:1293–1306.

Kamien, M. I. and Zang, I. (2000). Meet me halfway: research joint ventures and absorptive capacity. *International Journal of Industrial Organization*, 18:995–1012.

Kleinknecht, A. and Reijnen, J. (1992). Why do firms cooperate on R&D? An empirical study. *Research Policy*, 21:347–360.

Levin, R. C. and Reiss, P. C. (1988). Cost-reducing and Demand-creating R&D with spillovers. *Rand Journal of Economics*, 19:538–556.

Malerba, F. (1993). The national system of innovation: Italy. In Nelson, R. R., editor, *National innovation systems*, pages 230–259. Oxford University Press, Oxford.

Miyata, Y. (1996). An analysis of cooperative R&D in the United States. *Technovation*, 16:123–131.

Montmarquette, C., Mahseredjian, S., and Houle, R. (2001). The determinants of university dropouts: a bivariate probability model with sample selection. *Economics of Education Review*, 20:475–484.

Poyago-Theotoky, J. (1999). A note on Endogenous Spillovers in a Non-Tournament R&D Duopoly. *Review of Industrial Organization*, 15:253–262.

Schumpeter, J. (1943). *Capitalism, Socialism and Democracy.* Unwin University Press, London.

Veugelers, R. and Cassiman, B. (1999). Make and buy in innovation strategy: evidence from Belgian manufacturing firms. *Research Policy*, 28:63–80.

Table 5: Bivariate Probit estimates with sample selection

Variables	Model 1		Model 2	
	Ext. R&D	R&D	Ext. R&D	R&D
Constant	-.29(.79)	-2.27(-7.64***)	-.07(0.19)	-2.24(7.5***)
Stateown	.58(1.76*)		.5(1.56)	
Headgrp		.171(1.81*)		.17(1.82*))
Subsgrp		-.047(.57)		-.05(.64))
Herfown	.414(2.05**)		.37(1.83*)	
Subsidy	.275(1.99**)		.287(2.07**)	
Rddiver	-.0055(2.11**)		-.0057(2.17**)	
Proddiver		.145(2.44**)		.148(2.5**)
Intass94	1.83(1.53)	3.6(3.9***)	1.4(1.16)	3.51(3.76***)
Debt95	.74(2.63***)	.13(.72)		
Reserve95			-.69(1.91*)	-.19(.92)
RDI	.016(3.57***)		.015(3.36***)	
Lnsales		.22(8.1***)		.22(8.3***)
OutsourceP	.0054(3.24***)		.0053(3.15***)	
OutsourceS		-.001(1.7*)		-.001(1.71*)
Main3cli		-.0042(3.3***)		-.004(3.3***)
Compabr	-.07(-.75)	.25(4.34***)	-.08(.84)	.25(4.33***)
Smallcomp		-.23(3.4***)		-.23(3.4***)
Bigcomp		.2(3.1***)		.2(3.08***)
ρ	.187(1.2)		.152(1.0)	
LogL	-1820.9		-1822.3	
Wald Test Dummies	$\chi^2(10)$=9.14	$\chi^2(13)$=113.6***	$\chi^2(10)$=9.84	$\chi^2(13)$=112.0***
N	841	2260	841	2260

t-statistics in parentheses. *, **, *** Significant at the 10%, 5% and 1% level respectively. 13 industry dummy variables were included in the R&D regression. 10 regional dummies were included in the cooperative R&D regression. The joint significance of both sets of dummies is given by the Wald Test.

Table 6: Probit estimates

Variables	Model 1		Model 2	
	Ext. R&D full sample	Ext. R&D R&D sample	Ext. R&D full sample	Ext. R&D R&D sample
Constant	-2.7(14.8***)	.1(.37)	-2.4(13.3***)	.4(1.42)
Stateown	.53(1.8*)	.55(1.69*)	.48(1.66*)	.48(1.5)
Herfown2	.41(2.42**)	.39(2.07**)	.38(2.26**)	.36(1.89*)
Subsidy	.34(2.7***)	.26(1.96**)	.35(2.79***)	.265(2.03**)
Rddiver	.022(21.25***)	-.007(2.9***)	.023(21.3***)	-.007(3.0***)
Intass94	1.0(1.08)	1.52(1.45)	.76(.82)	1.25(1.18)
Debt95	.67(2.91(***)	.69(2.6***)		
Reserve95			-.52(1.78*)	-.63(1.9*)
RDI	.02(3.6***)	.014(2.54**)	.02(3.4***)	.013(2.4**)
OutsourceP	.004(2.95***)	.005(3.0***)	.004(2.9***)	.005(3.0***)
Compabr	-.023(.34)	-.1(1.34)	-.024(.3)	-.1(1.3)
LogL	-724.9***	-612.3***	-727.5***	-613.9***
% correctly estimated	83.6	60.6	83.4	60.3
Pseudo R^2	0.589	0.421	0.586	0.42
Wald Test	$\chi^2(10)=11.12$	$\chi^2(10)=10.3$	$\chi^2(10)=11.8$	$\chi^2(10)=11.0$
N	2548	929	2548	929

t-statistics in parentheses. *, **, *** Significant at the 10%, 5% and 1% level respectively. 10 regional dummies were included in the regressions. Their joint significance is given by the Wald Test.

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