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Disentangling factors behind training participation in Italy

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DISENTANGLING FACTORS BEHIND TRAINING PARTICIPATION IN ITALY[*]

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Abstract. This paper analyses the pattern of training participation in Italy. Employing a new survey conducted on a large sample of individuals, we develop a model of bilateral training choices. In order to distinguish between workers and employers choices, we estimate a structural bivariate probit model whose identification relies on some mild assumptions on sample selection. With this approach we attempt to overcome the informative limitations of training participation probability estimates referred to reduced form models. The training participation probability depends on individual, job-specific and firm's characteristics. Among the most relevant results, we find that females demand as much training as males and suffer from poorer chances of firm-provided training. Similarly, employees with a temporary contract are rationed even if their demand is in line with that of their permanent colleagues. Conversely, the lower participation of part-timers is explained by lower demand. A stance for more targeted training public policies is derived.

Keywords: training choices, identification, bivariate probit

JEL classification: J24, J08, C35

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1. Introduction

In recent years, Government institutions assumed education and training of adults as a major leverage to pursue the structural adjustment of the economy as well as to improve the labour market prospects of individuals. In particular, workers' training has been conceived as a remedy to counteract the widening gaps between skilled and unskilled persons. Nonetheless, further investigations are requested to support this policy strategy and to design proper training measures. Groups facing poor training opportunities and factors affecting training participation have to be carefully detected for a more effective implementation of targeted policies. The economic analysis should also attempt to distinguish whether inequalities in training participation result from efficient investments (Leuven 2005) or, on the contrary, imply some inefficiencies too, as the rationales for public intervention in the two cases are different (Snower and Booth 1996, Lynch 2003, OECD 2004, Wöβmann and Schütz 2006).

As a matter of fact, the empirical evidence exhibits large differences in participation rates to training activities of various groups of workers. Explaining training participation has to be regarded as a tricky task since both workers and employers can play a role in training investment decisions. In other words, the observed pattern of participation derives from bilateral decisions and it is not easy to distinguish the factors determining the workers willingness to participate to training and the employers propensity to finance and sponsor it. Oosterbeek (1998) made clear that, because of lack of information, estimates of training participation mostly refer to a reduced form model, whereas a structural model would be requested in order to disentangle factors impinging on workers' and employers' choices.

Employing the information provided by a new survey conducted on a large sample of individuals, in this paper we estimate a model of training choices in structural form. It is a well-known fact that the employers usually play a prominent role in promoting training activities (Bassanini et al. 2005). We are interested to inferring and evaluating the decision criteria they adopt to select participants to these activities. A relevant question is whether firms selectivity, which is assumed to reflect employers' private return on training different groups of workers, also accords with the social return or, conversely, it implies some deviations from it. In the former case, a public intervention aimed at favouring training opportunities of disadvantaged groups implies that the standard trade-off between equality and efficiency would arise, whereas in the latter it could bring about some reduction of inequality together with efficiency improvements.

A general principle in training policy maintains that worker and employer have to sustain the largest part of training costs as they reap most of its benefits. Nevertheless, a number of market failures can justify public intervention (Booth and Snower 1996). Training policies usually consist of a set of measures targeted to groups of workers facing the poorest training chances. This would require empirical analyses to assess if low participation primarily depends on worker's and/or employer's attitudes.

The most relevant feature of our dataset is that it provides information not only on training participation but also on its financing. This information must be considered cautiously as individuals could not perfectly perceive which subjects (employer, government and other public agencies, individual themselves) actually sustain the direct and indirect training costs and how large is their respective cost share. Moreover, the items included in the questionnaire to specify the source of financing only permit an approximate answer. However, in our analysis we do not rely on punctual information on financing as at this stage we merely need to distinguish between the training provided by the employer and that acquired by the worker from other sources.

Accordingly, we group cases of participation to training in two categories: *internal training*, corresponding to training organised and/or financed by the employer, and *external training*, including the training financed by local and regional governments, by the European Social Fund, by the worker himself or free for other reasons. Furthermore, we also exploit additional information concerning workers who did not participate to training activities but declare to have applied for a course. These workers can be considered as "rationed" workers as they searched for training but their demand didn't match any suitable offer.

2. A structural model of training participation

Empirical evidence across countries reveals that employers play a crucial role in financing and providing training opportunities to their employees. Internal training always requires a joint decision by the employer and the worker. Available information usually reports only whether training occurred or not, without any further information allowing to distinguish between the worker and the employer's behaviour. Based on this information, at best only reduced form models of training participation can be estimated (see for example Arulampalam et al. 2003). Even if factors associated to low (high) participation can be detected, it is not possible to establish if and how they impinge on the workers' and/or on the employers' choices.

Few recent papers tried to overcome this limitation and to estimate structural models of participation. Oosterbeek (1998) firstly proposed to identify training demand by workers and supply by firms by exploiting the fact that in the International Adults Literacy Survey (IALS) respondents who did not participate to any training are asked if they would like/wanted to do it, so that, in case of affirmative answer, they can be considered as "rationed" workers. Leuven and Oosterbeek (1999), OECD (2003) and Bassanini and Ok (2004) provide further applications of this scheme. All these papers are based on data from IALS for the '90s.

In OECD (2003) it is assumed that firms acquire training in an upstream market and, correspondingly, resell it to the workers in a downstream market. Then, at this second stage, firms supply training while workers demand it. In such a context participation to training as well as rationing represent training demand, whereas participation to internal training has to be attributed also to training supply by firms. However, such an attempt to identify training demand and supply requires rather strong assumptions on the position and the slope of their respective curves. Moreover, taking into account the distinction between internal and external training would add further analytical difficulties, as two distinct markets should be considered in principle. For these reasons we prefer to consider a slightly different scheme where internal training depends on the matching of the training demanded by the worker with that offered by the employer. We assume that such a matching occurs when the employer does offer some training to those demanding it and this offer fits the characteristics of training demanded by the worker.

The following two equations give, respectively, the quantities of training demanded and offered

$$\begin{aligned} y_f &= \alpha_f + \beta_f \mathbf{x} + \varepsilon_f \\ y_w &= \alpha_w + \beta_w \mathbf{x} + \varepsilon_w \end{aligned} \qquad (1)$$

(subscript i for the i-th individual has been omitted). More precisely, y_w represents the training demanded by the i-th worker whereas y_f refers to the training offered by the employer and fitting the i-th worker's demand. Moreover, $\mathbf{x}$ is a vector of explanatory variables measuring observed characteristics of workers, jobs and firms, $\boldsymbol{\beta}_f$ and $\boldsymbol{\beta}_w$ are the vectors of coefficients, α_f and α_w are, respectively firm and worker's constant terms and ε_f and ε_w are the group-specific error terms.

We use data from the first wave of *Plus*, a survey conducted by ISFOL in 2005. It represents a new dataset which allows us to apply such an analysis to Italy for the first time.

We assume that the firm will offer suitable training opportunities to the worker, that is $y_f > 0$, if and only if it is profitable for it. On the other hand, a necessary condition for the worker demands for training, that is $y_w > 0$, is that he finds it convenient, which is the case when the benefits overpass the costs. As noted above, worker's participation depends also on qualitative characteristics of the training, like the training contents and the effort requested, or other aspects, as the training timetable, which can conflict with non-monetary constraints.

Even if we do not observe the quantities y_w, demand can be identified through observations of participation. Even when no monetary fee is paid, participation can be always considered as a part of the training demand as it always requires some costs in terms of effort by the worker. Moreover, following Oosterbeek (1998) we assume that the employer is not able to impose training to the worker so that he accepts to take internal training only if he finds it convenient. Furthermore, the demand estimate can take advantage also of information on those individuals who did not participate but declare to have applied for a course, that we can consider as "rationed".

On the other hand, supply cannot be directly estimated as no information on costs and possible rationing of suppliers are available. Difficulties arise even because of the plurality of suppliers. Concerning internal training, we assume that the employer is able to select participants by targeting explicitly the training activities to specific groups or by arranging the set of training characteristics upon which workers participation depends.

Then we can define the dichotomous variables z_f and z_w, where z_f takes value 1 if y_f is positive, meaning that the employer offers some training, and zero otherwise, and z_w takes value 1 if $y_W > 0$, that is when the worker demands training, and zero otherwise .

We thus define two probit equations. In the first one, the dependent variable equals 1 if the worker underwent training during the three years before the interview, either inside or outside the firm, or if he declares himself to be rationed, and zero otherwise. According to our scheme, this equation should capture the effects of each variable on the probability that training occurs or that worker reports some rationing. This corresponds at estimating the vector of parameters for the explanatory variables defining the *unconditional* probability model:

$$P(\text{internal or external training or rationing occur}) \equiv P(z_W = 1). \qquad (2)$$

In other words, from this probit equation we get an estimate of the vector of coefficients $\boldsymbol{\beta}_W$ measuring how factors affect worker's willingness to take training, that is his *demand* for training.

On the other hand, in the second probit equation, which applies only to the sub-sample of trained and rationed workers (those with value 1 in the first equation) the dependent variable takes value 1 when internal training occurred and zero in case of external training or rationing. In this case we estimate the effects of our set of regressors on the *conditional* probability of internal training (conditional to the existence of workers' demand)

$$P(\text{internal training occurs given the worker's demand}) \equiv \Pr\left(z_f = 1 \middle| z_W = 1\right). \qquad (3)$$

In other terms, we are estimating the probability that the employer offers a suitable training to the worker, who is demanding it, so that the matching of training offer and demand takes place. Though we are not able to directly estimate the coefficients vector $\boldsymbol{\beta}_f$, representing the effects of the explanatory variables on the training supply, the comparison of the unconditional and conditional probability model results allows us to make some inferences about the employers' willingness to train each specific group of workers. This represents a valuable step forward in explaining the distribution of training across different groups of workers.

3. Empirical model and estimation strategy

Operationally, the basic empirical formulation of our model is the bivariate probit model, based on the dichotomous representation in z_w, z_f of y_w and y_f:

$$\begin{aligned} y_{if} &= \alpha_f + \boldsymbol{\beta}_f \mathbf{x}_{if} + \varepsilon_f, \quad z_{if} = 1 \text{ if } y_f > 0, \quad z_{if} = 0 \text{ otherwise} \\ y_{iw} &= \alpha_w + \boldsymbol{\beta}_w \mathbf{x}_{iw} + \varepsilon_w, \quad z_{iw} = 1 \text{ if } y_w > 0, \quad z_{iw} = 0 \text{ otherwise} \end{aligned} \tag{4}$$

where $\lfloor \varepsilon_{if}, \varepsilon_{iw} \rfloor \sim \text{BVN (bivariate normal)} [0,0,1,1,\rho]$. Notice that the standard univariate case arises if $\rho = 0$, which occurrence is testable employing the Lagrange multiplier statistic on $H_0 : \rho = 0$. Given the approach employed here, we do not expect to find independence between the two equations, as they are estimated employing (partially) overlapping sample information.

Differently from standard structural models, instead of imposing theory-based coefficient restrictions, identification is obtained from sample selection[1]. In other terms, we do not restrict neither the variables nor the signs of the coefficients of the two equations. This is possible given our theoretical apparatus briefly sketched in the preceding section, which implies that identification can be obtained by discriminating the possible dichotomous outcomes on z_i.

[1] The estimator is proposed by Wynand and van Praag (1981). For an extensive application which uses sample selection see Boyes, Hoffman, and Low (1989).

In order to highlight the differences between our structural approach and the standard reduced-form model estimates, we start our analysis by estimating an univariate probit model in which the dependent variable is 1 if training occurs and 0 otherwise. Results are thus compared with those from the bivariate probit model (4), estimated on the same set of regressors.

As in any nonlinear model, the estimated coefficients of (4) are not the parameters of interest, as they do not necessarily represent the marginal effects. For this reason, we also calculate the marginal effects of our probit models. Since in the bivariate probit framework there are several definitions of the marginal effects, we will restrict our attention to those of theoretical interest for our scopes.

For expositional convenience, we define a vector $\mathbf{x} = \mathbf{x}_f \cup \mathbf{x}_w$ and define the starting bivariate probability as $P[z_f = 1, z_w = 1] = \mathbf{\Phi}_w[\boldsymbol{\gamma}'_f \mathbf{x}, \boldsymbol{\gamma}'_w \mathbf{x}, \rho]$, where $\boldsymbol{\gamma}'_f \mathbf{x} = \boldsymbol{\beta}'_f \mathbf{x}_f$, $\boldsymbol{\gamma}'_f$ containing the nonzero elements of $\boldsymbol{\beta}'_f$ and the zeroes corresponding to variables potentially entering in $\mathbf{x}_f$ only. $\boldsymbol{\gamma}_w$ is defined likewise. On the basis of our specific interest for the one or zero outcome, signs are changed accordingly (Greene, 2000); as an example, $P[z_f = 1, z_w = 0] = \mathbf{\Phi}_w[\boldsymbol{\gamma}'_f \mathbf{x}, -\boldsymbol{\gamma}'_w \mathbf{x}, -\rho]$

Given our sample selection, when we focus our interest on the probability model (2), our objective is the evaluation of the marginal effects for the probability of workers participating to a training programme irrespective of firms availability to sponsor it (demand). Formally, this corresponds to evaluating the marginal effects for the *unconditional* mean function $E[z_w | \mathbf{x}] = \mathbf{\Phi}(\boldsymbol{\gamma}'_w \mathbf{x})$. The marginal effects for the bivariate probability model are the following:

$$\frac{\partial \mathbf{\Phi}_w}{\partial \mathbf{x}} = h_f \boldsymbol{\gamma}_f + h_w \boldsymbol{\gamma}_w \qquad (5)$$ [2].

Notice that they are statistically equivalent to those obtainable with the univariate probability model only if $\rho = 0$.

[2] See Greene (2000) for technical details on the definition of the scalars $h_{(f,w)}$.

Employing the same apparatus, we also evaluate the *conditional* marginal effects for the case $P[z_f = 1 | z_w = 1]$ which implies of considering the marginal effects based on the conditional mean $E[z_f | z_w = 1, \mathbf{x}]$, i.e. the case of interest for the probability model (3):

$$P[z_f = 1 | z_w = 1, \mathbf{x}] = \frac{P[z_f = 1, z_w = 1 | \mathbf{x}]}{P[z_w = 1 | \mathbf{x}]} = \frac{\mathbf{\Phi}_w[\boldsymbol{\gamma}'_f \mathbf{x}, \boldsymbol{\gamma}'_w \mathbf{x}, \rho]}{\mathbf{\Phi}[\boldsymbol{\gamma}'_w \mathbf{x}]} \qquad (6)$$

From (6) we obtain an evaluation of the probability of a firm sponsoring a training programme (supply) conditional to the participation availability (i.e. demand) of the worker. Conditioning on the worker's participation availability is consistent with a worker's veto option assumption. The definition of the marginal effects in this case is given by the following:

$$\frac{\partial E[z_f | z_w = 1, \mathbf{x}]}{\partial \mathbf{x}} = \frac{1}{\mathbf{\Phi}[\boldsymbol{\gamma}'_w \mathbf{x}]} \left\{ h_f \boldsymbol{\gamma}_f + \left(h_w - \mathbf{\Phi}_w \frac{\phi[\boldsymbol{\gamma}'_w \mathbf{x}]}{\mathbf{\Phi}[\boldsymbol{\gamma}'_w \mathbf{x}]} \right) \boldsymbol{\gamma}_w \right\}. \qquad (7)$$

4. Sample selection and the definition of the independent variables set

The Isfol PLUS survey contains information on the characteristics of 40386 individuals, selected according to their status of participation to the labour market (active unemployed, employed, pensioners). The employed group is composed by 21397 individuals, of which 12736 (nearly 60%) are dependent workers. Given our aim of identifying training supply and demand, we restrict our attention to the latter subset only.

The high variability and idiosyncrasies emerging for the younger in the Italian labour market suggests of selecting individuals aged 20 or more only, which leads to a further sample reduction (12446 dependent workers). Moreover, since in the survey questionnaire the individuals are asked to answer on the basis of a three years training participation record, we further restrict our sample to those declaring an employment status persisting for three years or more. This guarantees that the sample, other things equal, is balanced in terms of training opportunities of the representative worker. Given the last restriction, the final sample is composed of 12050 individuals, which we define “operational”.

After having imposed our sample selection strategy discussed in section 2 to the operational sample, we end up with the following data structure:

i) 3205 individuals (26.3% of the operational sample) participating to an internal training programme;

ii) 5939 individuals (49.3% of the operational sample) participating to an internal/external training programme;

iii) 6130 individuals (50.9% of the operational sample) being trained (internally or externally) or not being trained even having declared to have applied for a training course;

iv) 191 (1,6%) are those who have not participated to a training programme even having applied for a training course.

Concerning the definition of the independent variables set, we select a very general set in which individual, job-specific and firm’s characteristics are considered. Our set consists of twelve variables, of which three are continuous and nine dichotomous.

The continuous variables are:

1) age of the employee (*age*);
2) seniority, i.e. the number of years of work within the present-time job contract/firm (*sen*);
3) size of the firm in which the individual works, defined in terms of dependent workers in the firm (*f_size*).

The dichotomous variables are:

1) sex of the employee (*f*, being *m* the control variable);
2) the employee is the head of the family (*head*);

3) presence of family members economically depending from the employee (*members*);
4) regional area of residence of the employee (*nw*, *ne*, *south*, being *center* the control variable);
5) level of education of the employee (*edu1*, *edu3*, *edu4*, *edu5*, being *edu*2 the control variable. See appendix for levels definitions);
6) economic sector to which the firm belongs to. We consider 12 sectors: agriculture (*agric*), manufacturing (*manuf*), public utilities (*publ_ut*), constructions (*constr*), trade (*trade*), transports and commerce (tr_comm), financial (*fin*), government (*gov*), educational (*edu*), health (*health*), other services (*oth_serv*), being electricity (*electr*) the control variable;
7) duration of the job contract, temporary or permanent (*temp_c*, being *perm_c* the control variable);
8) part-time worker (*p_time*), being full-time (*f_time*) the control variable;
9) job position, defined in five levels from high to low (*pos_h*, *pos_mh*, *pos_ml*, *pos_l*, being *pos_m* the control variable).

The continuous variables are entered both linearly and squared in order to take into account possible nonlinearities among the dependent variable and the specific regressor. Thus, the actual number of continuous variables is six.

Given the level of aggregation considered for the dichotomous variables and considering those omitted for normalisations, the actual number of dichotomous variables is 28.

The total number of independent variables, once the constant term has been introduced in the explanatory variables space, is thus 35. Table 1 gives a means-based sample description for the set of regressors employed in the starting specification, distinguishing between demand and matching and the respective dichotomous outcomes (0 and 1).

5. Estimation results

Estimation results are summarized in Table 2, which illustrates the marginal effects of the explanatory variables. The first column reports the results obtained from the estimation of the univariate model. The second column illustrates the marginal effects on the probability that workers demand any training, and the third one those on the probability that internal training occurs conditional to the workers' demand. Below the table the number of observations, the log-Likelihood value and the LR test results for the hypothesis of off-diagonal zero error correlation are reported. The LR test for zero off-diagonal correlation rejects the null hypothesis, indicating that the bivariate probit is the appropriate model.

The results of the univariate model (first column) illustrate the marginal effects of regressors on the probability that training occurs. According to them, training is a less frequent event for women than for men. Less educated workers face a lower probability of training. Participation increases with firm size and, contrary to what is expected, also with age. Moreover, it decreases in case of temporary contract and part-time employment.

The estimate of the bivariate model makes somewhat clearer the causal relationships underlying such findings. Indeed, it helps us to distinguish whether the observed distribution of training among different groups has to be attributed mainly to the workers' or to the employers' choices, or both. For example, we find that the training gap suffered by temporary employees mainly depends on employers' unwillingness to train them whereas that of part-timers can be attributed also to weak training propensity of workers.

By comparing different groups of workers it is possible to analyse the distribution of training among them. It is a well known fact that training participation is unevenly distributed among different groups and that this could represent a disadvantage for those with less frequent participation as they fail to accumulate skills during their working life. What is less clear, is whether such inequalities of the training distribution imply also some inefficiencies from a social point of view. In this case, low participation rates depend on insufficient investments, meaning that some net benefits that could arise from further investments are lost.

As employers play a crucial role in promoting skills acquisition of the employed population, we focus our analysis on the distribution of internal training. In particular, if a group of workers has a high probability of demanding training but faces a low probability of taking internal training, it could be reasonable to regard such situation as inefficient. High demand reveals that training represents a valuable activity for the workers. Then, low participation to internal training likely depends on the employers' choices. More precisely, this group does not receive enough training offers from the employers, or it finds these offers unsuitable with regard to the balance of benefits and costs or, finally, the characteristics of the offered training do not match with the preferences and the constraints of the workers.

The theoretical literature suggests various explanations of the fact that the employer does not offer much training to a specific group of workers (Bassanini et al. 2005). This is what happens when the gap between productivity and wage stays constant or decreases instead of increasing when skills are accumulated, meaning that wage gains following skills acquisition are larger than productivity gains leaving the employer without incentives to invest. Employers are also reluctant to train those groups of employees with a higher probability of quitting the firm towards inactivity or other firms. Older workers are likely to receive less training as the remaining duration of their career could be too short to recoup the costs. Another reason can derive from complementarities between education and training. If the amount of previously acquired human capital strengthens the beneficial effect of the present training, then the employers will find more profitable to train the high educated than those with low education. Furthermore, the employers can suffer from informational asymmetry about unobservable characteristics of individual workers affecting training outcomes. Then it is likely that employers avoid to offer training to newly hired and postpone it until they can select carefully the participants. In this case we should observe that training participation increases with tenure, at least within a certain threshold. Finally, discriminations and other cultural factors can condition the criteria of selection adopted by the employers.

In some of these cases, if employers do not offer enough training to their workforce, an underinvestment could arise (Leuven 2005). This is the case, for example, when positive externality deriving from labour mobility (poaching) depresses the employer's incentives without increasing the worker's ones. The same happens when workers could reap most of the benefits from training but are unable to invest because of a liquidity constraint. Even time constraints can prevent workers who do not receive internal training from participating to external courses in leisure time. Underinvestment is more likely also if internal and external training are not perfect substitutes as the internal one blends general and specific elements. In this case workers who do not receive enough training by the employer are left with poor chances of acquiring the same bundle of skills outside.

Training policies – as subsidised courses or training vouchers – targeted to specific groups can try to increase their training participation. In a situation of underinvestment public interventions aim at reducing inequality of training distribution at the same time that they improve its efficiency. In the other cases, training can be seen as a measure to help disadvantaged groups but a more standard trade-off between equality and efficiency likely arises.

Most of our explanatory variables result to be significant. The marginal effects derived from the bivariate model suggest that **females** demand as much training as it is demanded by males. Nevertheless they suffer from poorer chances of training inside the firms. As we control for the kind of contract, industrial dummies, and other variables traditionally associated to women disadvantage, it can be argued that lesser internal training of women can be attributed to employers' reluctance to train them. In its turn, this can depend on higher turnover or on discrimination. This finding confirms previous studies reporting that females demand tends to be similar to that of their male peers but it is constrained by a shortage of training supply[3].

As expected, training demand steeply increases with the worker's **educational level** (*edu*) while, more surprisingly, no similar effects of education on the internal training are noticeable. Training demand by graduate workers (*edu4*) is some 30% more frequent than that from the *edu2* group. This evidence can be explained by the presence of complementarities between education and further training, which represents a widely accepted fact (Brunello 2001, Arulampalam et al. 2003), and supports the idea that "learning begets learning" (Heckman 2000). Nevertheless the figures in the third column show that highly educated workers, who can reap the largest benefits from training, do not find adequate opportunities in their firms. The probability of participation to employer-provided

[3] Similar outcomes are reported by Oosterbeek and Leuven (1999), who estimated a tobit model with censoring, whit the dependent variable representing the quantity of training, in their study conducted on IALS data for Canada, Netherlands, Switzerland and United States in the mid-90's; by OECD (2003), based on the same dataset related to a larger number of advanced countries and by Bassanini et al. (2005) on ECHP data on European countries for the period 1995-2001. On the contrary, Arulampalam et al. (2003), estimate for Italy a greater probability of training for women.

training seems to be unaffected by educational levels and tends to be higher for the intermediate level. These findings suggest that the low participation of the less educated reflects weak training propensity on the workers' side rather than scarcity of employers-provided chances.

Explanations of this fact can rely both on the benefits and costs elements. On the one hand, one can argue that occupational needs of Italian enterprises are concentrated on low and intermediate positions, because of the relative scarcity of innovative activities in the economy. However, explanations cannot rely only on national factors as similar results are obtained also for other countries (see Oosterbeek and Leuven 1999, OECD 2003 and Bassanini et al. 2005). On the other hand, it can also be presumed that firms cannot afford to provide inside training for high skilled as this would imply sophisticated and costly requirements. For this reason external training tends to substitute the internal one, and the role of employers becomes less prominent.

In short, these findings suggest that the low educated do not suffer from a shortage of training chances due to employers' selectivity. On the contrary, low participation depends on workers' weaker preference for it. Then, training policies should be addressed to workers rather than to firms. Nevertheless, other measures, like adults education and active labour policies could be more effective than training policy to help people with very low education.

Both workers' demand and internal training probability rise with respect to **age**, although the estimates of squared age, negative and significant, reveal that its effect tends to decrease. At first, this finding is not consistent with human capital theory which predicts that younger individuals are more likely to take training. It can be argued that the higher turnover experienced by young workers discourage employers from offering training to them. At the same time, even workers tend to postpone investments given initial employment instability.

Evidence from earlier studies appears somewhat mixed to this regard. In Bassanini et al. (2005) the age-training profile results to be downward-sloped. Also Oosterbeek and Leuven (1999) find a negative effect of age on the workers' demand. OECD (2003), on the other hand, reports an increasing effect of age on employer's offer of training while Arulampalam et al. (2003) find that Italy is the only country where age does not affect training probability.

Training participation increases with **seniority** (*sen*), that is the number of years of employment with the present-time employer. This effect parallels that of age. At the initial stage of the relationship uncertainty about the quality of the matching and the expected duration of it make the workers and employers less eager to invest in skills acquirement. Afterwards, their investment propensity increases as the relationship proves satisfactory and the employment prospects become less volatile.

Even the **employment contract** affects training investments. Employees with a temporary contract (*temp_c*) demand as much training as their permanent colleagues but, conversely, they are short of training chances inside the firm. More precisely, their probabilities are reduced by 8,5% with respect to the permanent workers[4]. The bivariate model reveals that temporary workers do not enjoy enough employer-sponsored training even if this could be beneficial to them. Firms choices, in this case, are negatively affected by poor prospects of recuperating the training cost, due to the shorter expected duration of employment. For this reason the socially efficient result appears to be far from being attained. Temporary employment seems to imply not only inequality in training participation but also a loss of efficiency. Following this result, policy measures could be addressed to temporary workers in order to increase their opportunities of training outside the firm. A voucher program which entitles them to expend a certain amount of money on participating to a course could represent a proper measure in this case (which should be complemented by provision of information and counselling to the individuals in order to help them to choose the right training offer).

Different implications derive from **part-time** (*p_time*) employment. Part-timers exhibit a lower training demand with respect to those working full-time in addition to a lesser participation to internal training (this result is close to that provided by Bassanini et al. 2005). Lower demand likely depends on the same factors preventing these employees from working full time[5]. Even in this case the results from the bivariate model prove to be more informative than those from the univariate one. They suggest that low training participation of part-timers depends on workers' demand more than on employers' selectivity. Then, the

[4] In Arulampalam et al. (2003) training probability for Italian workers results to be unaffected by the duration of the contract.

[5] This hypothesis should be further verified by distinguishing between voluntary and involuntary part-timers. Indeed, OECD (2003) reports that involuntary part-timers prefer training as much as workers with full-time contract do.

hypothesis of underinvestment can be excluded in this case while it was accepted for temporary workers.

As far as **regional areas** are concerned, Northwest and Northeast – which are confronted to the Centre in our specification – display a different pattern. In both regions internal training is a more frequent event than in other areas. However, workers' demand in Northeast results to be stronger than anywhere. Tentative explanations can point to structural differences between regional labour markets with respect to labour mobility and wage structure. A fiercer mobility and a less compressed wage structure in the Northeast , with a higher share of small and medium firms in the economy (Trivellato et al. 2005), partly shift the incentive to invest in training from the employers to the workers. Besides this, more advanced technological and organisational characteristics as well as union influence and managerial culture, not fully captured by firm size and industrial dummies, can also contribute to explain the higher probability of internal training in all the Northern regions.

The **occupational position** (*pos*) strongly influences workers' willingness to take training as demand increases with the rank of the job. The probability that workers in high level (managers, professionals and highly specialised technicians) and in medium-high level (teachers and other technicians) occupations demand training is 10%-13% higher than in case of workers in medium level occupations (the reference group, comprising clerks and specialised workmen). On the other hand, the same probability decrease by 13-16% for those in medium-low level (call center operators, service, shop assistants, craftsmen, plant and machine operators and generic workmen) and in low level occupations (elementary occupations). On the other hand, our results indicate that the employers' investments favour only clerks and specialised workmen. Workers in higher occupational levels have to resort to external training given the shortage of training opportunities for them inside the firms.

These findings parallel the effect of education discussed above. Higher hierarchical positions in large and medium enterprises require sophisticated knowledge, which workers more often acquire by themselves. In addition, higher positions in small firms are mainly characterised by tacit knowledge, which is accumulated through experience and informal relationships rather than formal courses. In both cases internal training does not play a primary role.

Training probabilities are affected also by the **firm size**. Both its effects on the worker demand and on internal training are positive and significant. However, the inclusion of the squared size reveals some non-linearity in the size-training profile.

Finally, the employees in public utilities, transport and communications, finance, government, education, health and other services, demand training more frequently than their peers in electricity, which represents the benchmark industry. Nevertheless, it is only in transport and communication and in the financial sector that they do receive more training, while those employed in tourism and education participate less.

6. Conclusions

The observed pattern of participation to training derives from bilateral decisions by the workers and the employers and it is not easy to distinguish the factors determining the workers willingness to receive training and the employers propensity to finance it. Because of lack of information, estimates of training participation usually refer to a reduced form model, whereas a structural model would be requested in order to disentangle factors impinging on workers' and employers' choices. Employing the information provided by a new survey conducted on a large sample of individuals, the paper provided an estimate of a model of the training choice in its structural form. This represents a valuable step forward in explaining the distribution of training across different groups of workers.

A bivariate probit model with a very general specification of the regressors space has been estimated. We also presents the standard univariate model on the same set of regressors.

Our findings suggest that employers are reluctant to train women and temporary workers, though they would like to receive as much training as their peers do. Highly educated workers, whose training can yield the largest benefits, are prone to acquire it outside the firm as they do not find adequate opportunities inside. At the same time, the low level of training participation of the less educated seems to depend on workers' weaker preference rather than on employers' selectivity. Contrary to the prediction of the human capital theory, the age-training profile is proved to be upward-sloped. Indeed, both the demand and the supply of training increase with age. Part-time workers exhibit a lower demand respect to those working full-time.

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Table 1: Sample means for the set of regressors

Variable	Zf Dep=0	Zf Dep=1	Zw Dep=0	Zw Dep=1
age	40.142	43.542	39.719	42.328
f	0.542	0.491	0.518	0.539
head	0.529	0.442	0.523	0.489
members	3.196	3.162	3.198	3.176
nw	0.251	0.239	0.266	0.231
ne	0.220	0.244	0.217	0.235
south	0.327	0.329	0.312	0.343
edu_1	0.034	0.006	0.050	0.005
edu_3	0.542	0.575	0.556	0.545
edu_4	0.205	0.310	0.118	0.344
edu_5	0.012	0.022	0.003	0.027
f_size	123.897	176.999	130.903	144.895
agric	0.020	0.007	0.025	0.008
manuf	0.174	0.105	0.225	0.088
pub_ut	0.019	0.020	0.022	0.017
constr	0.033	0.016	0.043	0.015
trade	0.137	0.076	0.162	0.081
tour	0.039	0.012	0.045	0.019
tr_comm	0.058	0.071	0.064	0.059
fin	0.029	0.076	0.030	0.053
gov	0.142	0.251	0.114	0.226
edu	0.150	0.173	0.089	0.222
health	0.081	0.123	0.048	0.135
oth_serv	0.105	0.063	0.118	0.070
temp_c	0.150	0.072	0.144	0.115
p_time	0.177	0.078	0.202	0.102
pos_h	0.075	0.118	0.041	0.130
pos_mh	0.199	0.288	0.119	0.323
pos_ml	0.210	0.080	0.276	0.079
pos_l	0.053	0.014	0.069	0.017
sen	13.456	17.441	12.931	16.046

Table 2: Estimation results from the univariate and bivariate probit models

	Univariate probit		Bivariate probit			
			P(zw=1, zf=0,1)		P(zf=1 | zw=1)	
Regressor	dy/dx	z-stat	dy/dx	z-stat	dy/dx	z-stat
age	0,012	3,01	0,011	2,88	0,014	3,58
age_sq	0,000	-4,32	0,000	-4,11	0,000	-3,15
f	-0,021	-1,57	-0,012	-0,89	-0,035	-2,67
head	-0,014	-1,08	-0,006	-0,49	-0,006	-0,45
members	0,003	0,73	0,004	0,99	0,001	0,19
nw	0,008	0,56	0,014	0,92	0,034	2,3
ne	0,080	5,21	0,075	5,06	0,037	2,47
south	0,004	0,26	-0,005	-0,33	0,008	0,61
edu_1	-0,143	-3,49	-0,145	-3,59	-0,017	-0,41
edu_3	0,187	12,51	0,194	13,23	0,039	2,69
edu_4	0,310	17,84	0,299	17,67	-0,005	-0,32
edu_5	0,413	14,6	0,404	15,04	-0,032	-1,17
f_size	0,000	3,97	0,000	4,34	0,000	3,18
f_size_sq	0,000	-2,71	0,000	-2,9	0,000	-2,73
agric	-0,012	-0,19	0,015	0,25	-0,065	-1,09
manuf	0,003	0,06	0,007	0,15	0,059	1,3
pub_ut	0,069	1,24	0,090	1,66	0,057	1,06
constr	0,017	0,31	0,020	0,38	0,010	0,19
trade	0,051	1,1	0,051	1,11	0,016	0,35
tour	0,035	0,66	0,043	0,84	-0,091	-1,77
tr_comm	0,138	2,93	0,159	3,54	0,089	1,99
fin	0,203	4,4	0,217	4,93	0,194	4,42
gov	0,278	6,67	0,288	7,17	0,059	1,47
edu	0,213	4,8	0,220	5,1	-0,079	-1,83
health	0,308	7,69	0,305	7,9	-0,015	-0,39
oth_serv	0,083	1,77	0,091	2	-0,002	-0,04
temp_c	-0,014	-0,81	0,001	0,04	-0,085	-5,20
p_time	-0,109	-7,11	-0,114	-7,61	-0,062	-4,13
pos_h	0,102	4,65	0,100	4,61	-0,112	-5,18
pos_mh	0,129	8,12	0,130	8,22	-0,025	-1,61
pos_ml	-0,163	-10,46	-0,157	-10,07	-0,078	-5,02
pos_l	-0,137	-4,89	-0,133	-4,86	-0,078	-2,85
sen	0,013	5,73	0,013	6,05	0,010	4,89
sen_sq	0,000	-3,6	0,000	-3,98	0,000	-3,91

Note: Likelihood ratio test of rho=0: chi2(1) = 4446.23, Prob > chi2 = 0.0000; when dummy variables are considered, dy/dx is for discrete change of dummy variable from 0 to 1

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