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# Workforce Ageing and the Training Propensity of Italian Firms: Cross-Sectional Evidence from the INDACO Survey\*

Marco Guerrazzi<sup>‡</sup>

## Abstract

*In this paper, I provide a probit analysis in which the propensity of private Italian firms to offer on-the-job training is linked to the age and the gender of the employed workforce as well as to a set of relevant corporate characteristics such as size, sector, geographical location, innovation strategies, R&D investments and the use of social safety valves. Retrieving cross-sectional data from INDACO 2009, I find that the propensity of surveyed firms towards training provision follows an inverted u-shaped pattern with respect to the average age of incumbent workers. Furthermore, I show that larger firms are more willing to offer training and the same attitude holds for productive units that adopted innovation strategies and/or invested in R&D projects. By contrast, I find that the propensity to support training activities is negatively correlated to the percentage of employed women and the use of social valves.*

**Keywords:** Ageing; Older workers; Vocational training; Human capital; Labour turnover; Probit model; INDACO.

**JEL Classification:** J14, J24.

## 1. Introduction

Italy is one of the European countries that during next years will be more seriously hit by ageing concerns. According to reliable demographic forecasts released by Piekkola (2004), in Italy the senility index, i.e., the proportion of people older than 60 years in relation to people younger than 20, the old age dependency ratio, i.e., the number of people older than 60 relative to the number of people between 20 and 59, and the intensity of ageing index, i.e., the proportion of the population

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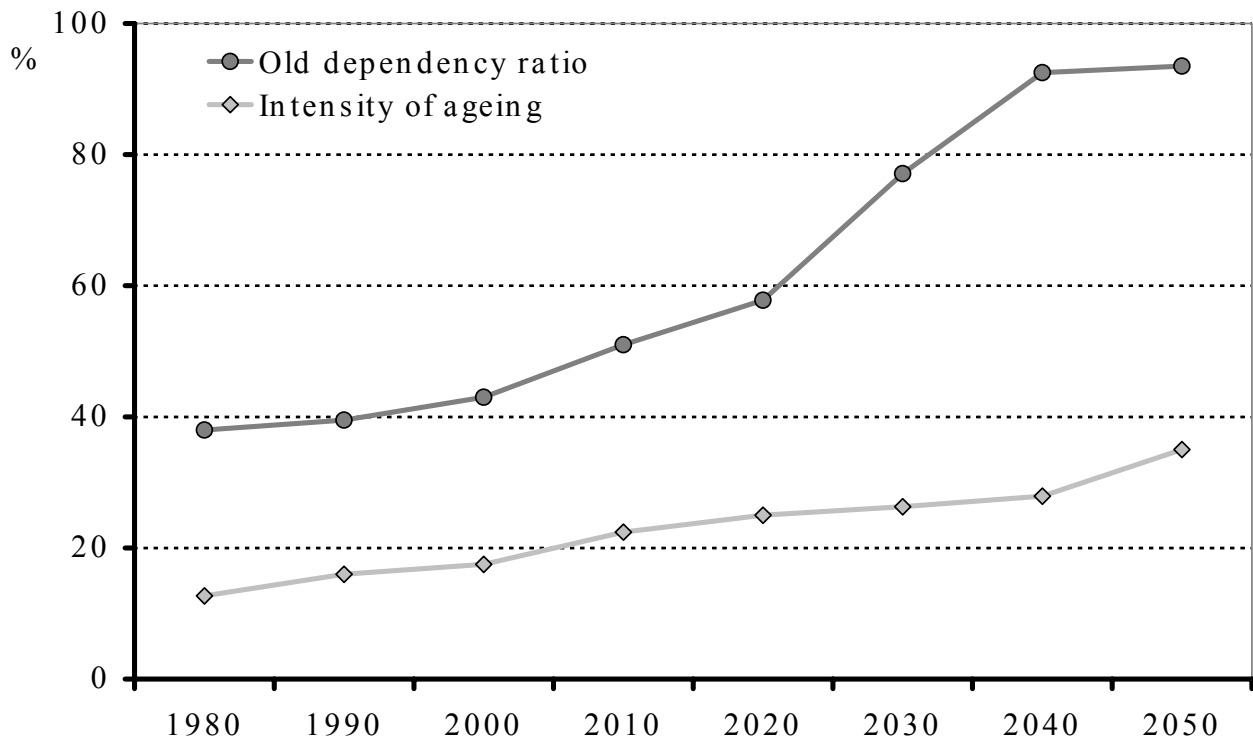
\* This paper draws on the INDACO-CVTS project. I would like to thank Roberto Angotti and Giulio Perani for suggestions and data availability. The usual disclaimer applies.

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older than 80 in relation to the population older than 60, will all dramatically rise over the next decades.

A visual appraisal of those patterns is given in figure 1. Specifically, the time series diagram shows that in Italy, around 2040, the people with more than 60 years will be about as much the number of people between 20 and 59, while the percentage of population older than 80 as a fraction of people older than 60 will exceed 25%.

**Figure 1.** Old age dependency and intensity of ageing in Italy (1980-2050)



Source: Extrapolation from Piekkola (2004)

This accelerated demographic ageing dynamics, together with falling birth rates, is likely to have serious consequences for the labour market; indeed, until recently, in Italy the rate of labour market participation as well as the rate of training participation – like the corresponding figures of many other developed countries – showed a pronounced age-declining path (c.f., respectively, Turcio and Calza Bini 2005 and Bassanini and Brunello 2003).<sup>1</sup> As a consequence, in order to maintain sustainable conditions in terms of output production and a certain balance among welfare provisions of different generations, it will be necessary to start and foster policies aimed at

<sup>1</sup> However, it is worth mentioning that the recent pension reform undertaken in Italy is likely to deeply affect this pattern in the near future. Additional details on the effects of such a reform can be found in Salerno and Pammolli (2012).

encouraging workers to remain longer on the labour market and firms to undertake training programmes targeted at lifelong learning. In Italy, the urgency of this task is also strengthened by the fact that in the European context Italian enterprises are the tail-end in training provision (c.f. Bassanini et al. 2005).<sup>2</sup>

An ageing workforce is likely to deeply affect the decisions of firms regarding vocational training. For instance, especially at the beginning of their working career, young workers are usually characterized by higher turnover rates because they are often engaged in job shopping activities, i.e., the continuous drifting from one job to another (c.f. Neumark 1998; Holzer and LaLonde 1999; Canegallo 2001). If this is case, then firms may find profitable to use training as a screening device in order to reduce turnover rates and gain from the future productivity of its loyal employees (c.f. Acemoglu and Pischke 1998). By contrast, when firms deal with older workers, this kind of incentives is likely to fail because the proximity to retirement may prevent the full pay-back of the resources invested in training provision (c.f. Becker 1962, 1993).

In this paper, retrieving cross-sectional data from INDACO 2009, I take into consideration the propensity to offer vocational training, i.e., the decision to support internal training activities, of a large sample of Italian private firms. In details, I provide a probit analysis in which the age and the gender composition of the employed workforce as well as a set of relevant corporate characteristics such as size, sector, geographical location, innovation strategies, R&D investments and use of social safety valves are linked to the willingness of firms to supply on-the-job training.

While there is a number of papers that study the age patterns of training participation by using workers' data retrieved from personnel and/or labour force surveys (e.g. Sousa-Poza and Hennerberger 2003; Ripham and Trübswetter 2006; Pfeifer et al. 2012), this work, to the best of my knowledge, is the first attempt to provide a probabilistic assessment of the decisions of Italian firms regarding training provision by taking into account the ageing perspectives of the incumbent workforce.<sup>3</sup>

The choice to focus only on the side of firms follows from the informative limitations usually suffered by traditional contributions on training participation (c.f. Croce and Tancioni 2007). In practical terms, it may be difficult to disentangle the factors determining the willingness of workers to participate (demand side) and the propensity of employers (supply side) to support internal learning programmes (c.f. Maximiano 2012). By contrast, the approach followed in this

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<sup>2</sup> A possible rationale for the low willingness of Italian firms to sponsor vocational training is the rather modest effect of this intervention to boost productivity (e.g. Conti 2005; Brunello 2007; Colombo and Stanca 2008; Guerrazzi 2014).

<sup>3</sup> Schweri and Mueller (2007), Arvanitis and Stucki (2008) and Arvanitis (2010) implement similar techniques to estimate the propensity to train of Swiss firms.

paper should have the advantage to sidestep – at least in part – the tricky issue of compliance to training activities; indeed, while firms may be in the position to force the training participation of their employees by threatening layoffs or carrying out softer moral suasion activities (e.g. Bassanini and Ok 2007), workers – especially in small business units – can hardly lead unwilling employers to offer training. As a consequence, in comparison with training participation records, corporate data on training propensity should be less sensitive to the willingness of workers to receive training. This feature appears particularly appealing with regard to older workers that usually are mentioned as being less willing to participate in training programmes (e.g. Thijssen and Rocco 2010).

The main findings of the present empirical exploration are the following. First, as far as the average age of the whole employed workforce is concerned, I find that according to the standard theories of human capital and labour turnover (e.g. Becker 1962, 1993; Janovic 1979) the propensity of surveyed firms towards training provision follows an inverted u-shaped pattern. In other words, the productive units taken into consideration are less incline to offer training both to young and older workers but, at the same time, more willing to invest in the human capital of middle-aged workers. Furthermore, corroborating well-established theoretical and empirical results (e.g. Black et al. 1999; Baldwin et al. 1995; Ballot et al. 2001), I show that larger firms have a higher training propensity with respect to small firms and the same attitude holds for productive units that adopted innovation strategies and/or invested in R&D projects. By contrast, I find that the propensity to support training activities is negatively correlated to the percentage of employed women and the use social values.

The paper is arranged as follows. Section 2 reviews the theoretical literature underlying the econometric analysis. Section 3 describes data. Section 4 introduces the empirical model exploited for the estimations. Section 5 discusses the regression results. Finally, section 5 offers some concluding remarks, some policy implications and directions for further research.

## 2. Theoretical background

From a theoretical perspective, corporate training propensity is likely to be seriously affected by the age of the incumbent workforce; indeed, human capital and labour turnover theories suggest that returns to training investments are quite different among young and older workers and this is likely to have an influence on the internal training decisions of employers. Moreover, according to deep-rooted theories and circumstantial evidence, different patterns in training provision are expected according to firms' size and depending on whether firms adopted innovation strategies and/or invested in R&D projects.

As I mentioned in the introduction, there is a number of reasons why firms could be particularly willing to offer training to young workers. First, employer-provided training may act a screening device for this kind of workers (c.f. Statt 1998). As a consequence, offering labour contracts in which some training activities are actually provided, employers can attract high-quality young applicants. Moreover, young workers' productivity can be considered as an experience good (c.f. Jovanovic 1979). In other words, the productivity of young individuals with short working experiences may be not well revealed by conventional market signals and it may become known more accurately as workers' job tenure increases. Therefore, from the perspective of firms, there may be a trade-off between wages and labour turnover; indeed, the higher the wage paid by the individual employer, the lower the probability that employees will quit by accepting job offers from other firms. This trade-off provides the incentives for training young workers since it increases the expected duration of the match as well as the length of the period over which the employer can get back its investment in human capital (e.g. Rosholn and Svarer 2000). Furthermore, in an economy where young workers are asked to be endowed with qualified working experiences, training sponsored by employers may trigger beneficial spill-over effects (c.f. Shintoyo 2008). The more the firm-sponsored training, the greater is the amount and quality of young skilled labour in the whole economy, which stimulates business activities. This, in turn, leads firms to sponsor training provision for young workers even more.

By contrast, firms could have fewer incentives to train older workers. First, being closer to retirement, mature employees are normally characterised by shorter pay-back periods so that their employers may find difficult to gain from the benefits of past training expenditures (c.f. Becker 1962, 1993). As a consequence, given that mature workers are expected to leave the labour market soon, investments aimed at augmenting their knowledge and skills are discouraged. Second, training costs associated to older workers are typically assumed to be higher than those associated to younger workers because the learning ability and the flexibility of mature employees are supposed to be lower (c.f. Casey and Bruche 1981). For instance, older workers are expected to be more costly than younger workers because of higher absenteeism, higher wages, higher pensions and increased use of health care and other benefits. Furthermore, net returns to vocational training may be decreasing with respect to the age of the workers because of faster human capital depreciation (c.f. Neumann and Weiss 1995).<sup>4</sup> Specifically, mature workers are assumed to forgets

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<sup>4</sup> In recent years, the depreciation argument received a lot of attention and became the theoretical underpinning for the so-called age (and skill) biased technical change, i.e., the idea that knowledge depreciation and lower incentives to invest in human capital may lead older employees within a certain skill group to be more affected by technological

knowledge and loses physical capabilities in a rapid manner making training investments less attractive for their employers.

On the whole, the theories reviewed above reveal that that the propensity of firms towards training is expected to be non-linear with respect to the average age of the incumbent workforce. In other words, the willingness of firm to support training activities should increase (decrease) when workers are young (old). This allows to put forward the following testable hypothesis:

*H1: The propensity of firms towards training provision follows an inverted u-shaped pattern with respect to the average age of the incumbent workforce.*

Monotonic patterns are instead expected as far as size, innovation strategies and R&D investments are concerned. First, larger firms are likely to be more prone towards training supply with respect to smaller business units. Rationales underlying this view are found in the typical features that characterize investment expenditures in larger firms, i.e., economies of scale in the provision of formal and informal training (c.f. Black et al. 1999) and better and cheaper access to capital markets to finance investments in human capital (c.f. Hashimoto 1979). Second, everything else being equal, firms engaged in the adoption of innovation strategies should be more willing to offer training with respect to more conservative firms. For instance, the use of new technologies may require specific knowledge and skills that are not readily available in the incumbent workforce and vocational training may be the way of acquiring such skills (c.f. Baldwin et al. 1995; Korpi and Mertens 2004). In a similar manner, it may be in the best interest of business units that launched new products to support training for sales or technical staff, while those that implemented process innovations may need to provide their production workers with technical training (c.f. Alba-Ramírez 1994; Li et al. 2006). Moreover, *ceteris paribus*, business units that invested in R&D projects should find quite profitable to implement training programmes; indeed, recognising that human capital facilitates the adoption and the diffusion of new productive technologies, a number of authors claim the complementarity between training and R&D investments (e.g. Nelson and Phelps 1966; Redding 1996). Those arguments allow to derive three additional hypotheses to test on INDACO data:

*H2: Larger firms are more willing than small firms towards training provision.*

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change than younger ones (e.g. Hujer and Radić 2005; Beckmann 2007; O'Mahony and Peng 2009; Behagel et al. 2011).

H3: *The propensity of firms towards training provision increases when they adopt innovations strategies.*

H4: *The propensity of firms towards training provision increases when they invest in R&D projects.*

### 3. Data

The data set explored in this paper is build by retrieving information from INDACO 2009. INDACO is a survey on job-related vocational training carried out by the Italian Institute for the Development of Vocational Training (ISFOL) and the 2009 release is currently the latest available after some years of stop.

The general purpose of INDACO is the collection of information about training policies of firms, the role of learning and training processes and the diffusion of knowledge inside Italian private productive units. Specifically, for each surveyed firm is it possible to have information, among the other things, about training activities and their costs, the size and the gender of employed workforce grouped in age classes, the sector, the adoption of innovation strategies, the geographical location, the use of social safety valves such as redundancy payments (cassa integrazione guadagni), R&D investments and so on.<sup>5</sup> As a consequence, this survey can be straightforwardly utilized to assess how the age and the gender of workers as well as the mentioned corporate characteristics affect the propensity of firms to offer vocational training.

In details, INDACO 2009 surveyed 7,306 private enterprises with 6 or more employees. On the whole, those firms employed 737,481 workers. According, respectively, to the Italian official archive of active firms (ASIA) and the Italian Labour Force Survey, in the reference year the productive units taken into consideration represented 0.16% of total active firms and they employed 4.21% of total salaried employment (c.f. ISTAT 2009). Those figures immediately suggest that the sample under investigation is somehow biased towards larger firms.

As far as the propensity to offer vocational training is concerned, the share of productive units entering INDACO 2009 that decided to supply training activities to their workforce was equal to 53.90%. Such a fraction is quite close to the figure of the national propensity to train retrieved for Italy by the European survey CVTS4 which provided an average point value of about 56% (c.f. ISTAT 2010). As a consequence, along this dimension, the sample of surveyed firms appears quite representative of the Italian case. In what follows, I will provide some descriptive diagrams that show of the percentage of business units that offered job-related vocational training varies

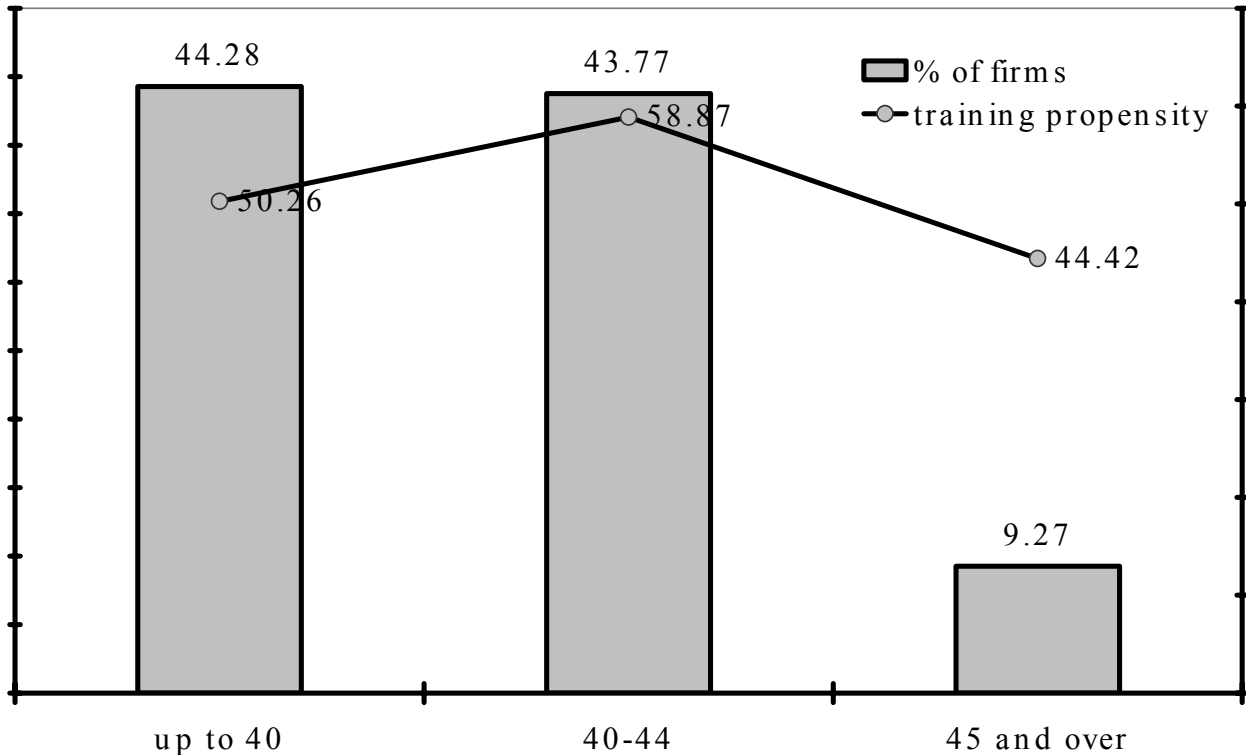
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<sup>5</sup> Additional details on INDACO can be found in Angotti (2013).



according to selected corporate characteristics such as the average age of incumbent workers, the size, the sector and the geographical location of surveyed enterprises.

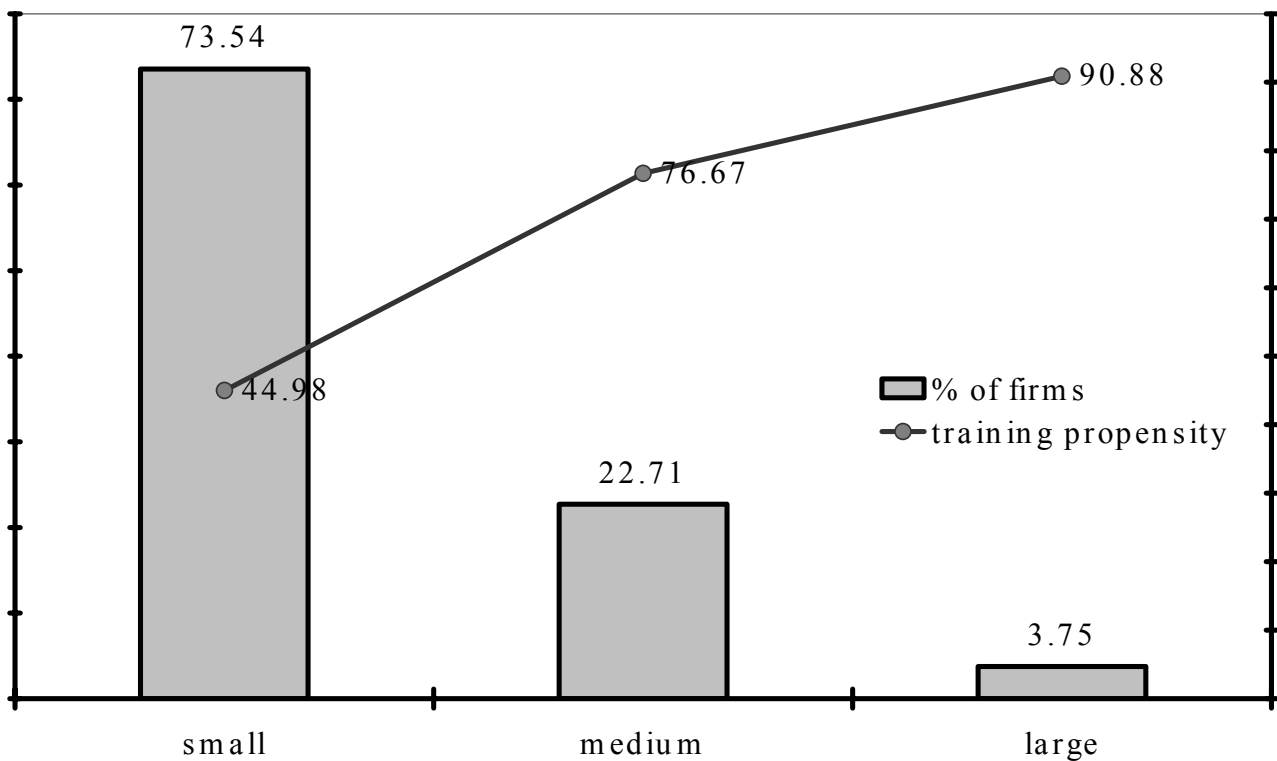
**Figure 2.** Distribution of firms according to the average age of the employed workforce versus training propensity



Source: INDACO 2009

First, figure 2 shows the distribution of firms according to the average age of the employed workforce *vis-à-vis* the corresponding measure of the propensity to offer vocational training.<sup>6</sup> The histograms reveal that the large majority of surveyed productive units employed workers below 45 years old. Unsurprisingly, this data mirrors the poor employment prospects of Italian workers in the final stage of their working careers (e.g. Leombruni and Villosio 2005). Moreover, on a descriptive perspective, the propensity to offer on-the-job training displays an inverted u-shaped pattern in the sense that firms with young and old workers are on average less willing to provide training activities with respect to enterprises in which the employed workforce is in its middle age. In section 4, the estimation of a probit model will allow to assess whether the shape of this profile is statistically significant or not.

<sup>6</sup> INDACO 2009 grouped the employees of each firm in three age classes, i.e., 15-24, 25-54 and over 55. I computed the individual average age of the incumbent workforce by weighting the central values of each class.

**Figure 3.** Size distribution of firms versus training propensity

**Source:** INDACO 2009; Medio Banca – Unioncamere (2012) size classification

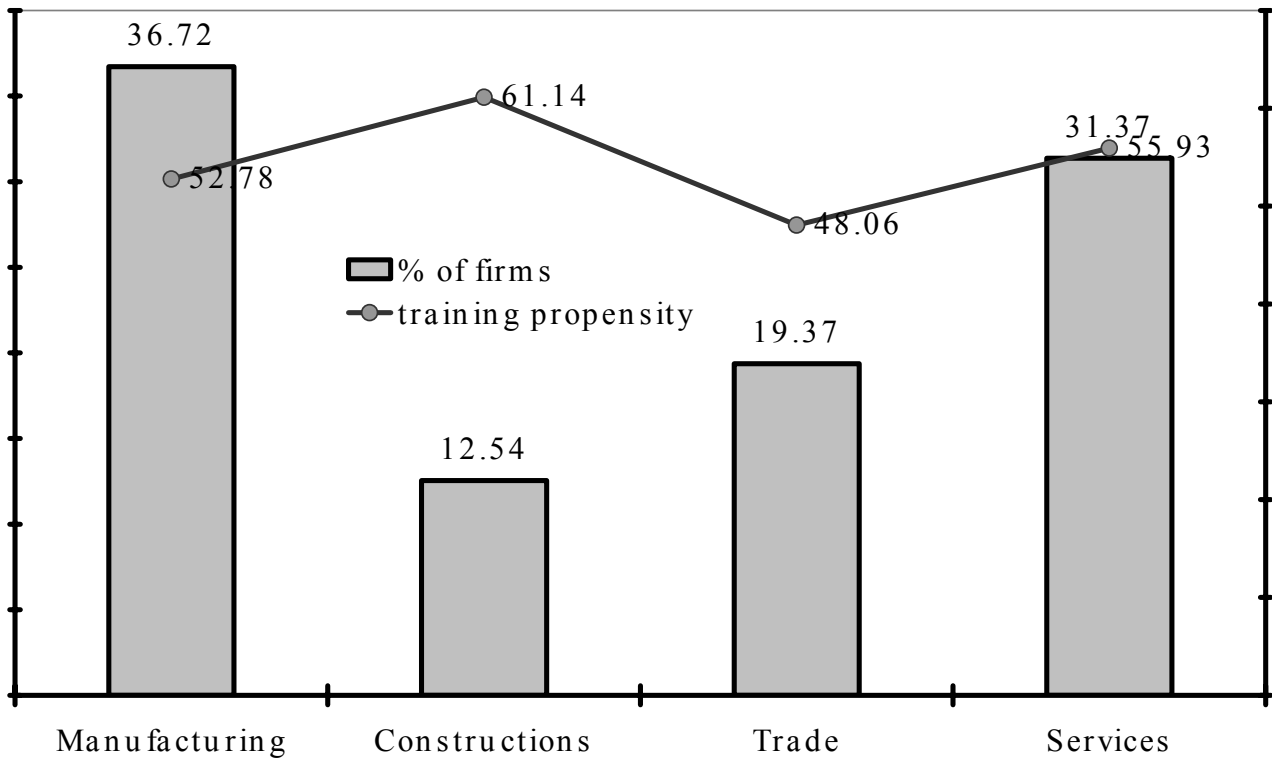
Second, borrowing the employment-size classification outlined in Medio Banca – Unioncamere (2012), figure 3 provides the size distribution of surveyed business units together with the parallel percentage of firms that offered vocational training.<sup>7</sup> Consistently with the size distribution prevailing in the whole country, the diagram shows that – despite the size bias mentioned above – the sample of interest has a strong degree of concentration around small productive units (c.f. ISTAT 2009). Furthermore, in line with world-wide evidence on training propensity, the percentage of enterprises engaged in training activities is definitely increasing with the size of firms (e.g. Barron et al. 1987; Bartel et al. 2000).

Third, figure 4 shows the sector distribution of surveyed firms and the corresponding percentage of business units that offered vocational training. The diagrams reveal that the sample under examination has a bias towards the manufacturing sector while, at the same time, the trade sector is quite likely to be accounted far below the figure prevailing at the national level; indeed, according to the official records of the ASIA archive, in 2009 18.49% of Italian firms were concentrated in manufacturing, 14.86% in constructions, 40.06% in trade while the remaining

<sup>7</sup> By small-size firms I mean firms with less than 50 employees, medium firms are firms in which employment is between 50 and 499 employees and large firms are firms with 500 or more employees. See Medio Banca – Unioncamere (2012).

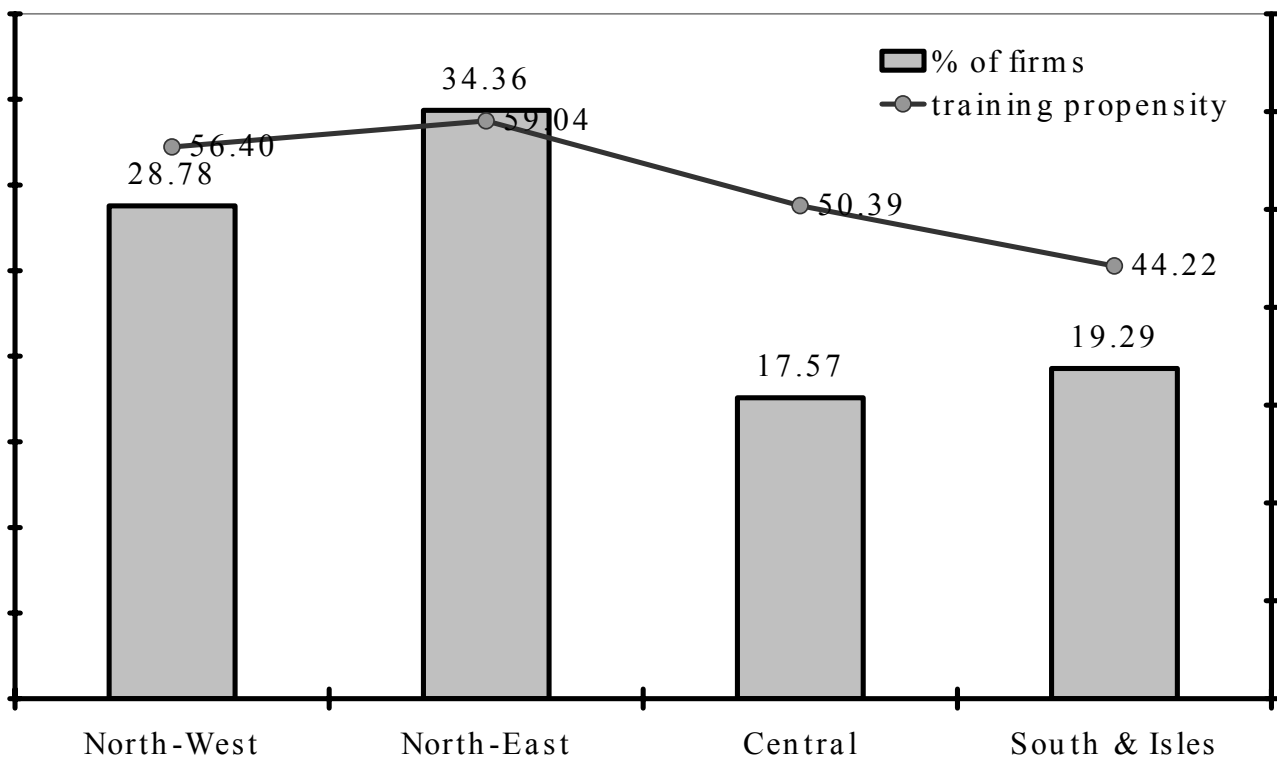
26.20% operated in the sector of services (c.f. ISTAT 2009). The shape of the line also conveys that the pattern of training propensity is fairly heterogeneous across the different sectors. On the one hand, the highest level is found in productive units operating in constructions as well as in services. On the other hand, the lower level is found in trading firms.

**Figure 4.** Sectors versus training propensity



**Source:** INDACO 2009; Macro-sector ATECO 2007

In addition, figure 5 splits the sample according to the geographical location of surveyed firms together with the matching propensity to offer training. The picture of the distribution of surveyed productive units among the different areas of the country is quite representative of the whole economy, indeed, the ASIA archive reveals that in 2009 33.65% of Italian active firms was located in the North-West area, 23.38% in the North-East, 21.70% in the Central area and the remaining 21.25% in the South and Isles area (c.f. ISTAT 2009). Moreover, as far as training propensity is concerned, the percentage of enterprises that supplied vocational training to their workforce appears to be higher in the North and lower in the South with the Central area in an intermediate position.

**Figure 5.** Spatial distribution of firms versus training propensity

Source: INDACO 2009

As stated above, INDACO 2009 also allows to retrieve information about the gender composition of the incumbent workforce, the adoption of innovation strategies, R&D investments and the use of social valves. The whole set of descriptive statistics is given in table 1.

The figures in table 1 mirror additional typical features of the Italian economy. First, the low percentage of female employment observed in many Mediterranean countries (e.g. Casadio et al. 2008). Second, the low propensity to undertake R&D investments; indeed, only about 16% of the business units taken into consideration declared to be involved in such a strategic activity (e.g. Hall et al. 2012). Moreover, the high percentage of firms that used social valves to sustain their workers. This latter attribute is the portrait of the severe recession experienced by the Italian economy in the reference year of the survey; indeed, in 2009 the Italian GDP fell more than 5% (e.g. Cardullo and Guerrazzi 2013).

**Table 1.** Descriptive statistics

VARIABLE	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
training propensity	0.5390	0.4985	0	1
age (average)	40.5810	3.1328	19.5000	60.0000
% women	0.3384	0.2655	0	1
small size	0.7354	0.4411	0	1
medium size	0.2270	0.4189	0	1
large size	0.0375	0.1900	0	1
product innovation	0.3952	0.4889	0	1
process innovation	0.3899	0.4877	0	1
organizational innovation	0.2825	0.4502	0	1
marketing innovation	0.2474	0.4315	0	1
R&D	0.1626	0.3690	0	1
social values	0.3014	0.5727	0	1
manufacturing	0.3672	0.4820	0	1
constructions	0.1253	0.3311	0	1
trade	0.1936	0.3952	0	1
services	0.3137	0.4640	0	1
North-West	0.2878	0.4527	0	1
North-East	0.3435	0.4749	0	1
Central	0.1757	0.3806	0	1
South & Isles	0.1928	0.3945	0	1

Source: INDACO 2009

#### 4. Econometric modelling

The econometric model implemented to estimate the effects of ageing profiles and corporate characteristics on the propensity of surveyed firms to offer vocational training is the following:

$$\Pr(T_i = 1) = \Phi \left( \alpha_0 \text{age}_i + \alpha_1 \text{age}_i^2 + \beta_0 + \sum_{j=1}^k \beta_{j,i} x_{j,i} + u_i \right) \quad (1)$$

where  $T_i$  is a training event in which is involved the workforce of the  $i$ -th firm,  $\Phi$  is the cumulative normal distribution,  $\alpha_0$  and  $\alpha_1$  are the regression coefficients attached, respectively, to the average age and the squared average age of the incumbent workers of the  $i$ -th firm,  $\beta_0$  is a constant of regression,  $[\beta_{1,i} \dots \beta_{k,i}]$  is a vector of regression coefficients,  $[x_{1,i} \dots x_{k,i}]$  is a vector of corporate characteristics while  $u_i$  is an error term normally distributed with zero mean and finite variance.

From a formal point of view, whenever  $\alpha_0$  is positive while  $\alpha_1$  is negative the age-training profile follows an inverted u-shaped pattern. In other words, the probability that a firm will offer

vocational training is low when the corresponding workforce is young and/or old while it achieves a maximum when incumbent workers are in their middle age.

In order to estimate the econometric model in eq. (1), I will exploit all the information collected in table 1. Specifically, aiming at deriving the probability that a given firm will provide vocational training, I will take as dependent variable the dummy for training propensity. This variable is equal to one (zero) when the firm do (not) provide training. Moreover, among the regressors, I will use the average age of the employed workforce and its squared value in order to detect the non-linear patterns mentioned above. In addition, as far as the vector  $[x_{1,i} \dots x_{k,i}]$  is concerned, I will consider the whole set of corporate characteristics taken into consideration in the previous section. However, in order to avoid collinearity problems, I will take as baseline case a hypothetical medium-size firm operating in the manufacturing sector located in the Central area of the country. Those characteristics should select a sensible benchmark; indeed, manufacturing typifies the large majority of surveyed business units (see figure 3), while the latter seems to be the divide between firms with high and low propensity to offer training (see figure 5).

## 5. Results

Here I will provide the probit estimation results of the econometric model outlined in eq. (1).<sup>8</sup> Thereafter, I will graphically show how the implied training propensity of firms varies according to the average age of the employed workforce in small, medium-size and large business units.

First, table 2 provides the probit results on the whole sample of surveyed firms. The collected figures convey the following conclusions:

- All the variables taken into consideration are significant at least at 5% and, as I will show below, they all appear with the expected sign. Moreover, the suggested model provides a fit – in terms of (pseudo)  $R^2$  – of the same order of magnitude of similar works (e.g. Arvanitis and Stucki 2008);
- Consistently with H1 and similarly to training participation findings retrieved, respectively, in Germany (c.f. Ripham and Parvati 2006; Pfeifer et al. 2012) and in Switzerland (c.f. Sousa-Poza and Hennerberger 2003), the expected propensity of Italian firms to offer vocational training follows an inverted u-shaped pattern with respect to the average age of the employed workforce. Obviously, mirroring the descriptive pattern of figure 2, this means that the business units under examination are significantly less prone towards training supply both to young and older

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<sup>8</sup> Estimations are run with GRETL 1.6.5. See [gretl.sourceforge.net](http://gretl.sourceforge.net).

workers and more willing to offer training provision to middle-aged employees. Below I will discuss the implications of this finding more extensively;

- Corroborating H2, larger (smaller) firms are more (less) incline towards training supply. As a consequence, the training propensity gaps shown in figure 3 have a clear-cut systematic nature;
- Firms that employ more (less) women are more (less) prone towards training provision. A rationale for this finding can be the following. In comparison with men, women are more likely to quit for maternity and/or in order to take care of disabled elderly people. As a consequence, according to the predictions of labour turnover theories (e.g. Jovanovic 1979), firms may be less willing to invest in their human capital.
- In adherence to H3, the introduction of innovation strategies increases the willingness of firms to provide training. Moreover, as far as marginal effects are concerned, product and organizational innovations are the strategies with the stronger impact on the expected training propensity. This result suggests that those kinds of innovation have a big impact on the training decisions of firms.
- As a companion for the result described above and consistently with H4, the decision to undertake R&D investments increases the training propensity of firms. Along this line, a certain degree of complementarity among training and R&D expenditure has been found in many European countries (e.g. Ballot et al. 2001; Leiponen 2005; González et al. 2012).
- By contrast, the use of social valves has a negative impact on the willingness to offer vocational training. This result is twofold. On the one hand, firms that use social valves usually experiment negative performances and this may lead to reduce training provision; indeed in bear periods, it is often expected that the pay-back of the invested resources in human capital will be quite difficult (c.f. Bellman et al. 2014). On the other hand, especially when training is financed by drawing on public funds, the provision of vocational training itself can actually be a substitute for social valves. Therefore, it can happen that firms providing training avoided to use social valves and vice-versa;
- Firms operating in constructions, trade and services have positive significant gaps in terms of expected training propensity with respect to manufacturing productive units. The highest differences are found for firms that are active, respectively, in constructions and services. This pattern can be explained as follows. On the one hand, in the Italian context building constructors usually implement training programmes not only to boost their productivity but also for safety reasons regulated by the law (c.f. Act of the Italian Parliament 626/1994). On the other hand, among service providers there are IT industries that usually find profitable to encourage intensive and long lasting training programmes (e.g. Kristensen 2012);

- The geographical location of firms does have a significant incidence on the training propensity of firms. Specifically, business units located in North (South) are more (less) willing to support training with respect to firms operating in the Central area. Symmetrically, with the arguments put forward for the size, this means that the patterns shown in figure 5 are not random.

**Table 2.** Training probability, probit estimation

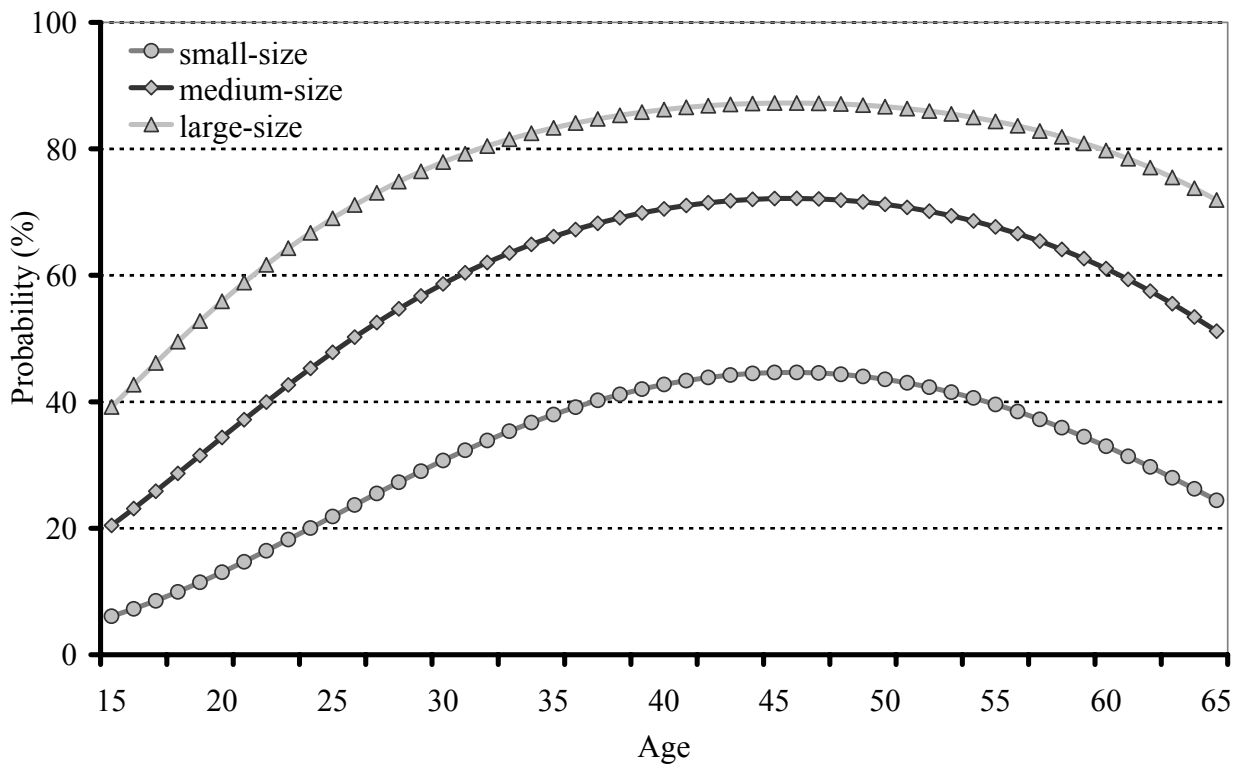
VARIABLE	COEFFICIENT	STANDARD ERROR	MARGINAL EFFECT
constant	-2.7310 (***)	0.9080	-
age (average)	0.1371 (***)	0.0434	0.0541
age (average) squared	-0.0015 (***)	0.0005	-0.0006
% of woman	-0.4290 (***)	0.0677	-0.1694
small size	-0.7222 (***)	0.0416	-0.2692
large size	0.5512 (***)	0.1193	0.2012
product innovation	0.2602 (***)	0.0392	0.1020
process innovation	0.1833 (***)	0.0390	0.0721
organizational innovation	0.4715 (***)	0.0414	0.1810
marketing innovation	0.1020 (**)	0.0425	0.0401
R&D	0.1773 (***)	0.0507	0.0692
social valves	-0.0990 (***)	0.0307	-0.0391
constructions	0.4867 (***)	0.0537	0.1827
trade	0.1557 (***)	0.0475	0.0609
services	0.3125 (***)	0.0442	0.1217
North-West	0.0975 (***)	0.0477	0.0383
North-East	0.1787 (***)	0.0463	0.0701
South & Isles	-0.1234 (***)	0.0517	-0.0489

**Source:** Calculations on INDACO 2009; (\*\*\*) significant at 1%; (\*\*) significant at 5%; number of observations: 7,306; number of perfectly fitted observations: 4,948 (67.70%); McFadden  $R^2 = 14.30\%$ ; adjusted  $R^2 = 13.95\%$ ;  $\chi^2 (17) = 1,442.77$  ( $p$ -value  $< 0.0001$ )

Moreover, drawing on data collected in table 2, figure 6 shows how the expected training propensity implied the estimation of eq. (1) varies according to the average age of the employed workforce, respectively, in small, medium-size and large firms. Specifically, the implied probabilities are computed for a hypothetical manufacturing firm located in the Central area in which the percentage of female employment as well as the dummies for innovation strategies, R&D investments and use of social valves are all set at the corresponding mean values of the sample.

The non-linear patterns tracked in figure 6 reveal that the willingness of firms to offer vocational training achieves a maximum when the average age of the incumbent workforce is about 45 years old. Moreover, business units in which the employed workforce has, on average, more than 54 years old have the same training propensity of those that employ workers below 35 years old.



**Figure 6.** Expected training propensity in small, medium-size and large firms

Source: INDACO 2009

As far as the incentives to offer training are concerned, this probabilistic profile seems to somehow accommodate the so-called deficiency hypothesis, i.e., the idea that the development of human life can be seen as a curve showing a peak in physical and mental capabilities during youth followed by a gradual decline starting just before the age of 40 years old (c.f. Lehman 1953). However, in line with more recent studies (e.g. Kaufman 1995), the findings depicted in figure 6 show that the development of older workers is quite likely to go well beyond this critical threshold.

Nevertheless, the parabolic results retrieved from the estimation of the probit model in eq. (1) confirm – at least from the supply side – the existence of considerable learning-age gap among Italian firms (e.g. Angotti and Belmonte 2012). For instance, according to the descriptive statistics in table 1, the average employed worker has a age around 40 years. The probability profiles of figure 6 convey that this worker approximately has a probability to be trained of 42%, 70% or 86% depending on whether she/he is employed in a small, medium-size or big firm. The corresponding probabilities for a worker older than 54 years fall, on average, respectively, to 32%, 60% and 79%.

Despite the (expected) delayed deterioration of physical and mental capabilities mentioned above, the declining willingness to offer training to older workers may still represent a serious issue; indeed, as recently put forward by Picchio and van Ours (2011) firm-provided training may be an effective stimulus to retain employees even when they are close to retirement. In addition,

Behaghel et al. (2011) show that firm-sponsored vocational training has a significant positive impact on the employability of mature workers. As a consequence, taking into account the accelerated ageing patterns set out in the introduction and low propensity of older workers to be involved in training activities, something has to be done by public authorities in order to counterbalance the tendency of firms to avoid training provision when the incumbent workforce seems to become too old.

## 6. Concluding remarks and directions for further research

In this paper, I explore some ageing concerns related to the supply of vocational training by retrieving data from INDACO 2009. Specifically, I provide a probit analysis aimed at testing how the age and the gender of the employed workforce as well as a set of relevant corporate characteristics affect the willingness of firms to offer training to their employees.

The key findings of this empirical investigation are the following. First, the age of the incumbent workforce has a non-linear effect on the training propensity of surveyed firms; indeed, the productive units under examination are more willing to offer vocational training to middle-aged workers than to young and older employees (e.g. Becker 1962, 1993; Janovic 1979). Furthermore, I show that larger firms are more willing to offer training and the same behaviour holds for business units that adopted innovation strategies and/or invested in R&D projects (e.g. Black et al. 1999; Baldwin et al. 1995; Ballot et al. 2001). By contrast, I find that the propensity to support training interventions is negatively correlated to the percentage of employed women and the use of social values.

From a policy point of view, the results shown throughout this paper suggest some broad guidelines. First, especially in small firms, vocational training for young and older workers should be somehow stimulated. Moreover, as far as mature employees are concerned, those interventions should be framed in an active ageing perspective (c.f. Migliore 2006). Specifically, the World Health Organization (2002) defined active ageing as the process of optimizing opportunities for health, participation and security in order to enhance the quality of life as people age. Along this line, as recently recognized by the European Commission (2011), a basic component of active ageing policies are just training activities provided by firms to their older employees.

As far as policy tools are concerned, subsidies as well as targeted job placement programmes are often claimed as being the most appropriate ways to improve the underprivileged position of older workers in training provision and labour market prospects (c.f. Mayhew and Rijkers 2004). However, continuous learning during the whole working life still appears as the most effective device to reduce the dangers of employment disadvantages in the older years (e.g.

Harrison 2002). Reaffirming the importance of a learning environment in which everyone always continues to learn, Ohsako and Sawano (2006) suggest three crucial lifelong learning strategies that facilitate the retention of older workers in the labour market. The first is the development of self-efficacy/self-direction by mature employees in pursuing career planning and vocational training. The second is the joint negotiation, organisation and delivery of vocational training and education programmes by public and private authorities. In addition, the implementation of the necessary legislative and policy measures that support and enhance such interventions. For instance, in the Italian context, the law on safety valves as it stands should be revised in order to discourage firms to use vocational training as a substitute for the existing public tools aimed at supporting employment during recessions.

Finally, I would like to suggest two promising developments of the present analysis. First, the availability of longitudinal (panel) data would certainly increase the robustness of results and would give the possibility – through its time dimension – to identify additional interesting elements related to the deep determinants of the training propensity of firms (c.f. Wooldridge 2002). Moreover, the possibility to retrieve employer-employee linked data would allow to fully address the tricky issue of workers' compliance to training programmes (c.f. Croce and Tancioni 2007; Maximiano 2012). This aspect appears particularly relevant for female workers; indeed, according to the results presented in the previous section, firms are less likely to supply training to their employed women. However, there is evidence that usually women are more willing than men to participate in training activities (e.g. Tharenou 2001; Renaud et al. 2004; Cloutier et al. 2008).

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