Training Subsidies and the Wage Returns to Continuing Vocational Training.

Evidence from Italian Regions.

by

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Abstract

Since training grants affect wages and the probability of employment only indirectly by affecting the costs of training, their variation can be used to identify the causal effect of (formal continuing vocational) training on earnings. Using Italian data, we estimate that one additional week of training increases monthly net earnings by 1.36 percent, substantially less than the 3 percent or more often found in the literature. Estimated returns vary significantly by firm size, and range from 0.32 percent in firms with more than 100 employees to 2.51 percent in smaller firms, the bulk of the Italian private sector. A simple back of the envelope comparison of the marginal costs and benefits of training policy suggests that the latter are higher than the former.

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Introduction

There is broad consensus among policy makers that training is important for employment, productivity and individual well – being[1]. Yet applied economists have long recognized that estimating the wage returns to training is complicated by the fact that selection into training is not random, and that assignment to training is correlated with unobserved individual ability. Since ability affects earnings, a simple regression of earnings on training fails to identify the causal effect.

The predominant approach adopted by the empirical literature so far has been to remove the effects of time invariant unobserved heterogeneity on earnings by using a fixed effects estimator. This method effectively eliminates the source of endogeneity in training participation or intensity if this is due exclusively to time invariant individual effects. However, when the wage growth experienced by individuals receiving training is different from that experienced by untrained individuals, fixed effects estimators fail to recover the causal effect of training on wages[2] (Frazis and Lowenstein, 2006).

Approaches based on instrumental variables have not been as popular, mainly because it is difficult to find plausible exclusion restrictions (Lee, 2005). Yet theoretical models provide guidance for the selection of instruments. For instance, a feature of the by now standard model of training in imperfect labour markets (Acemoglu and Pischke, 1999) is that training policies that affect the marginal costs of training qualify as valid instruments of training in earnings regressions because they influence training directly but wages and the probability of employment only indirectly, via their effects on training. This feature results from the fact that, when

[1] See for instance Lynch and Black, 1998. In the current paper, we consider only formal and continuing vocational training (CVT), which takes place after completion of full time education and labour market entry, and the policies which subsidize CVT.

[2] Pischke, 2001, takes this problem into account by estimating fixed effects wage growth equations.

investments are specific and workers cannot commit to a wage policy before the investment, there is a hold up problem. With hold up, there is under-investment in training and wages are set after training.

In this paper, we propose regional training policy – which consists of *planned* training subsidies – as the source of exogenous variation which identifies the causal effect of continuing vocational training (CVT) on earnings. *Planned* subsidies are the invitations to tender issued by regional governments and the resources allocated to subsidize CVT in regional budgets. Compared to *actual* training subsidies, which are affected also by the decisions of individuals and firms to apply for available funds, *planned* subsidies are more likely to reflect exogenous regional training policies.

We apply this idea to Italian data. Italy is an interesting laboratory to study the effect of regional training policies, because Italian regions differ substantially both in their economic performance and in the efficiency of regional governments, especially along the North-South divide[3]. Since training is an important ingredient of EU regional policies (see Puga, 2002 and Bassanini et al, 2007), we believe that our approach can be extended to other European countries as well[4].

Policies aimed at supporting CVT have been implemented in Italy since the mid 1990s, when Objective 4 of the European Training Fund (budget period 1994-1999) introduced measures to help workers adapt to industrial change. The regional differences in policy priorities and in the ability to rapidly implement training policies have generated significant variations both across regions – especially between the North and the South of Italy - and over time in the real resources per head allocated to CVT subsidies.

[3] See for instance Afonso and Scaglioni, 2005.

[4] Becker, Egger, Von Ehrlich and Fenge (2008) assess the causal effect of transfers from the EU Structural Funds Programme (Objective 1) on the growth of employment and GDP per capita in European regions, and provide a simple cost-benefit analysis which suggests that Objective 1 transfers are cost-efficient.

We exploit these variations to estimate the wage returns to CVT in Italy during the period 1999 - 2005. We find that regional training subsidies have a positive, moderate and statistically significant effect on individual training. Ceteris paribus, our estimates suggest that one additional real euro per head devoted by regional governments to training subsidies increases the average training stock two years later by 1.03 percent[5].

When we treat training as exogenous, we find that adding one week of training in year *t* increases average monthly net earnings in the same year by 0.41 percent. When we instrument training with the second lag of regional training grants, we find that the marginal effect of an additional week of training on current earnings is about four times as large (1.36 percent), but still substantially less than the 3 percent or more often found in the literature. Due to the slow depreciation of human capital, this effect declines mildly over time and is about 70 percent of its initial value ten years after the investment.

These estimated returns are local average treatment effects (LATE) and suggest that the individuals who change their training because of training grants enjoy high returns that slowly dissipate over time. High returns can occur if employees and firms face resource constraints in the absence of subsidies. These constraints are more likely to bind the investment decisions of small firms and of their employees. Consistently with this view, we show that the estimated returns to training are positive, large and statistically significant only for the employees of small firms with at most 100 workers, the bulk of the Italian private sector.

[5]In order to increase this stock by 10 percent, regional governments would have to allocate to training incentives an additional sum of about 9.7 real euro per head, a 16.5 percent increase with respect to the sample average. For the average region with a population of 1.94 million individuals aged 15 to 64, this increase corresponds to 18.8 million real euro.

The paper is organized as follows. Section 1 reviews the literature; in Section 2 we use the model of training by Acemoglu and Pischke, 1999, to highlight the relationship between training policies, training investments, employment and earnings. Italian training policies are described in Section 3, and our empirical approach is discussed in Section 4. Section 5 introduces the data and Section 6 presents our results. Conclusions follow.

1. Review of the Literature

Public policies that offer financial support to firms and workers involved in continuing vocational training are typically co-financing schemes, and include levy / grant packages, train or pay, tax deductions and allowances, vouchers, training certification and individual learning accounts. In spite of their diffusion, rigorous evaluation of their impact and effectiveness is uncommon, especially in Europe (see Heckman, Lalonde and Smith, 1999; Oosterbeek and Patrinos, 2008 and Bassanini et al, 2007 for reviews).

The impact of training grants on the training investments undertaken by recipients is likely to be smaller when public spending simply substitutes for private spending. Moreover, when training is organized by external providers, training grants to employers and employees who demand training services may alter the price of these services, thereby reducing the impact of grants on the quantity of training. Last but not least, when subsidies are large enough, firms may end up using subsidized trainees as cheap labour without providing any training (Malcomson, et al , 2003). Holzer et al, 1993, study the effects of state subsidies to private sector training in a sample of manufacturing firms in Michigan. They ask whether these subsidies actually raise the amount of training that firms provide, as opposed to merely providing windfalls for

the firms receiving them, and conclude that receipt of a training grant substantially increased the amount of training observed in the year of receipt, though not beyond that year.

Estimating the effects of work related training on wages is fraught with difficulties. Perhaps the most obvious is that training is not randomly allocated but subject to choice. The existing empirical literature has addressed this problem using three approaches: a) Heckman style correction for selection into training; b) instrumental variables; c) fixed effects estimates. Good reviews of these approaches include Frazis and Lowenstein, 2006 and Leuven and Oosterbeek, 2008. Parametric selection models need to make potentially restrictive assumptions on the distribution of un-observables. They share with the second approach the difficulty of finding credible exclusion restrictions, or variables that affect training participation without directly affecting wages or selection into employment (see Lee, 2005). The last approach removes permanent individual effects from the estimating equation but fails to identify the causal effect of training on wages when the wage growth experienced by individuals receiving training is different from that experienced by untrained individuals.

Estimated private returns to workplace training tend to vary substantially in the empirical literature. Relatively low returns are found by Lynch, 1992, who uses the US National Longitudinal Survey of Youth and estimates that one week of training raises (hourly) earnings by 0.2 percent. Similarly, Parent, 1999, finds that one year of training raises earnings by 12 percent. Assuming that one year corresponds to 48 weeks of training, this implies a 0.25 percent return for a week of training. Higher returns are found by Frazis and Lowenstein, 2006, who estimate that a median training spell of 57 hours (about one and a half week of training) yields a 2.3 percent

wage return, and Bartel, 1995, who uses company data and finds that one day of training increases wages by 2 percent.

Blundell et al, 1996, report that having done one employer provided training course which leads to a higher vocational qualification increases the earnings of British males by close to 15 percent for off – the – job training and by close to 12 percent for on – the – job training. These returns fall to 6.6 and 6.3 percent for training spells that do not lead to a qualification. Booth, 1993, also uses British data and finds that one week of training in the first year of the job increases earnings by 1 percent. Veum, 1995, uses the NLSY as done by Lynch, but for a different period of time. His fixed effects estimates imply that one additional hour of training raises (hourly) wages by 0.7 to 0.9 percent. After reviewing this evidence, Leuven and Oosterbeek, 2008, conclude that ".. the literature often finds returns of at least 3% for a week of private-sector training.." (p.424), a substantial payoff when compared to one year of additional full time education, which yields a 10 percent return.

2. The effect of training subsidies on training, employment and wages

In this section we illustrate the relationship between training grants, wages and employment using the by now standard Acemoglu and Pischke model of investment in general training in imperfectly competitive markets (Acemoglu and Pischke, 1999). A key feature of this model is that firms operating in markets with imperfections may be willing to bear the cost of training even if the imparted skills can be transferred to other firms. This is in line with the empirical evidence (see Bassanini et al, 2007). In imperfectly competitive markets, transferrable training acquires specific and non transferrable traits. Specific investments drive a wedge between the lowest wage for which an employee will work and the highest wage the employer will pay. Unless the

employee can commit to a given wage before investing in training, the rent generated by the investment creates an incentive to renegotiate, and ex-post bargaining may result in the employee capturing part of the rent (hold up). With hold up, training investments take place before wages are bargained over by the parties (see Malcomson, 1997).

To illustrate, consider the following two-period setup. In period one the employer trains the employee and pays the training costs[6]. Let the investment in training be denoted by τ. In period two the employer and worker either separate or continue their match. In the latter case, they bargain over the wage $w(\tau)$ and production $y = f(\tau)$ occurs, where f is increasing, differentiable and concave. Denote with $v(\tau)$ the worker's outside option. Labour market frictions imply that $f(\tau) > v(\tau)$. The match is affected at the start of period two by a negative productivity shock $\varepsilon \approx G(0, \sigma^2)$, and continues if $f(\tau) - w(\tau) \geq \varepsilon$. Therefore, the probability of being employed in period two is equal to $q = G\left[f(\tau) - w(\tau)\right]$.

If the match continues, the wage is bargained between the parties. Assuming Nash bargaining and a zero outside option on the firm side, the outcome of the bargain is

$$w(\tau) = v(\tau) + \beta\left[f(\tau) - v(\tau)\right] \qquad [1]$$

where β is the worker's bargaining power and $\left[f(\tau) - v(\tau)\right]$ is the rent originated by the specificity of the investment, which derives from the presence of market frictions. Importantly, the wage does not depend on training costs, because these are bygones at the time of the bargain[7].

[6] Training costs are borne by employers when workers are credit constrained. Acemoglu and Pischke show that firms are willing to pay these costs even when workers are not credit constrained. The key implications of the model for the purposes of this paper do not change if the training cost is born by the employee.

[7] Notice that a similar result holds in the more standard Becker-Hashimoto (Hashimoto, 1981) model where the parties can make binding wage contracts at the time training takes place. In this model, the post-training

In the first period, the firm decides the investment in training to maximize real profits

$$\pi(\tau) = q(1-\beta)\left[f(\tau) - v(\tau)\right] - c(\tau) + s\tau \qquad [2]$$

where *c* is the training cost function and *s* is the training subsidy per unit of training. It turns out that optimal training $\tau^* = \tau(s,\beta)$ is increasing in the training subsidy and decreasing in the worker's bargaining power.

A property of the model is that training grants affect wages and the probability of employment only indirectly by affecting the investment in training. This property is the consequence of the hold-up problem: trained workers bargain over wages after the investment to capture part of the rents generated by training. An implication of the model for the empirical analysis is that omitting training grants from the regression of earnings on the stock of training and additional controls is a valid exclusion restriction. Validity, however, is only one criterion that an instrumental variable should meet. The other criterion is relevance (see Angrist and Pischke, 2009). If training grants partly substitute private with public expenditure, the training stock is only marginally affected and relevance can fail.

3. Continuing Vocational Training Policies in Italy

In Italy, government subsidies to continuing vocational training are managed by regional authorities. Public intervention is organized along three lines: 1) the European Social Fund (ESF); 2) national measures (Laws 236/93 and 53/00) and 3) industry based training funds (ITF), managed by the social partners[8]. By and large,

wage maximizes the joint return to the match by minimizing inefficient separations. The subsidy does not affect post-training separation decisions and therefore is irrelevant for the post-training wage.

[8] Since training funds became operational from the second half of 2004 and our sample ends in 2005, we ignore them for the purposes of this paper.

these measures are funded by the European Community (Objectives 1 and 3, directives D1 and D2 during the financial period 2000 to 2006 and Objective 4 during the financial period 1994 to 1999) and by a compulsory levy of 0.30% on national payroll (see the Appendix for further details). We estimate that, during the period 1994-2005, about 3.37 billion euro at constant prices have been allocated by regions to support CVT, with 2.7 billion euro funded by the European Social Fund and the rest from the levy on national payroll[9].

These resources are transferred from the Community and the national government to regional authorities, which have substantial discretion and autonomy in the management of training funds. For instance, funds received by the national government in a given fiscal year are not necessarily allocated to regional budgets nor tendered within the same period. While some regions have managed to issue invitations to tender a few months after receiving their funds, other regions have either not been able or have decided not to do so. The Labour Ministry has repeatedly threatened regions which have delayed the budgeting of allocated resources with the withdrawal of funds, but no effective action in this direction has ever been taken (see ISFOL, 2005)[10]. To illustrate, the time lag between the allocation of Law 236 funds from the Ministry of Labour to the regions and the first invitations to tender issued by regions ranged in 2003 from 17 days in Trentino to 484 in Lazio. Planned and actual regional expenditures for CVT can also differ in a given fiscal year either because some grants are not awarded or because there are delays between awards and expenditures.

[9] Additional training policies during this period include a national tax deduction scheme for training expenditures, which operated in 2001 and 2002. This national policy is controlled in our empirical setup by time dummies.

[10] In an effort to curb these delays, the European Commission has introduced in 2002 the so called "n+2" rule, which forces regional authorities to use the allocated resources within 2 years from the award.

Define UTS_{rt} as the undiscounted stock of planned CVT subsidies per head (at constant prices) in region r from the outset of training policies in 1994 to time t[11]. Table 1 shows the value of UTS_{rt} in 2005 for each Italian region – with the exclusion of tiny Val d'Aosta and Molise – and by source of funds. In the first column we consider the European Social Fund and in the second column the resources provided by national laws. There is substantial variation across regions, with Puglia in the South planning to spend the least (about 22.6 euro per head) and Trentino Alto Adige in the North planning to spend the most (about 286.7 euro per head). The North – South divide is not sufficient, however, to account for cross regional differences: for instance, the resources per head allocated to training by Lombardia, the richest region, and Sardinia, a relatively under-developed Southern region, are very similar. Furthermore, there is no evidence that regions which plan to use relatively less the training incentives from national sources compensate by using more intensely the resources received from the European Social Fund. If anything, Table 1 shows that the two sources of funds are complements, not substitutes.

Not only the level but also the dynamics of UTS_{rt} exhibit genuine regional variation, which does not merely reflect regional trends in productivity (and wages). To illustrate, we regress UTS_{rt} on real regional GDP per head, take the residuals and normalise them to 1 in the year 1998. Figure 1 plots these residuals for 13 regions – obtained after grouping some small regions with neighbouring larger regions - and highlights the difference in regional dynamics. One source of this variation is the political orientation of regional governments, which have changed on several

[11] The value per head is obtained by dividing real expenditures by population aged 15 to 64 in the region. Since training funds associated to Law 236 were first allocated to regions in 1997, and ESF Objective 4 funds started in 1994, we consider the latter as the year when CVT policies began in Italy.

occasions during the period 1998-2005. When we regress the undiscounted stock of planned incentives on this variable after controlling for regional confounders, we find that having a government with a centre-left political orientation increases the stock by about 14%[12].

Finally, when we decompose the total standard deviation of UTS_{rt}, we find that the within component (variation over time) is broadly similar in size to the between component (variation across regions). Therefore, UTS_{rt} contains useful variation both across regions and over time.

4. The Empirical Setup

We consider the following empirical model

$$\ln w_{irt} = \kappa_W + \gamma_{wr} + X_{irt}'\beta_W + \delta_W Y_{rt-1} + \rho_W TR_t + \theta T_{irt} + \varepsilon_{irt} \quad [3]$$

$$T_{irt} = \kappa_T + \gamma_{Tr} + X_{irt}'\beta_T + \delta_T Y_{rt-1} + \rho_T TR_t + \alpha TS_{rt,-2} + \nu_{irt} \quad [4]$$

where κ is a constant, γ_r and X are vectors of regional dummies and individual controls, TR is a dummy equal to 1 for the years 2001 and 2002, when a national tax deduction scheme for training expenditures was in place, Y is a vector of regional time varying effects, which include the unemployment rate and the (log) real GDP per capita - w is monthly real net wages, T the individual discounted stock of training, TS the discounted stock of planned training subsidies, ε and ν are errors, $Cov(\varepsilon_t, \nu_t) \neq 0$, and the subscripts i, r and t are for the individual, the region and time respectively.

Discounted stocks are obtained by cumulating flows with the perpetual inventory method, and by allowing for the depreciation of human capital. Equation [4]

[12] The set of confounders includes regional dummies, the regional unemployment rate and the regional GDP per capita and a dummy for the presence of a national tax deduction scheme on training expenditures in the years 2001 and 2002.

associates the discounted stock of training to the discounted stock of planned training incentives *TS*. Measuring the latter simply as the sum of past and current incentives – which corresponds to UTS - would not be appropriate because it would imply that the timing of subsidies does not matter. Therefore, we also discount the sum of incentives with the same discount rate used for *T*[13].

We include in the vector *X* a third order polynomial in age and dummies for gender, education, occupation, industry, part time job and firm size (equal to 1 if the worker is in a firm with more than 100 employees and to 0 otherwise). On the one hand, regional GDP per capita (in logs) captures regional trends in productivity and wages, given that the latter is closely related to the former. On the other hand, the regional unemployment rate and the vector of sector dummies pick up local labour market conditions and the importance of research and development, which varies by sector and affects both the propensity to train and earnings.

The ordinary least squares estimates of parameter θ, which captures the marginal effect of training on earnings, are likely to be biased for two reasons: a) the individual training stock *T* is correlated with unobserved ability, which affects wages: more talented individuals earn higher wages and have a higher training stock; b) the stock *T* is measured with error, for instance because individuals fail to report short training spells[14].

In this paper, we address these biases by using training subsidies *TS* as instrumental variable for endogenous *T*. We exploit two facts: first, training policy in Italy is the responsibility of regional authorities; second, regional governments have

[13] To illustrate, assume only two periods and let the training flow at time zero and one be given by $t_0 = bi_0$ and $t_1 = bi_1$, where i_0 and i_1 are the flows of training incentives. The training stock at time one is $T_1 = t_1 + (1-\delta)t_0 = b\left[i_1 + (1-\delta)i_0\right]$.

[14] See Frazis and Lowenstein, 2006, for a detailed discussion.

implemented different training policies over time, as shown by Table 1 and Figure 1. By measuring the discounted stock of planned training expenditures, the variable *TS* reflects in our view the policy decisions of local governments better than actual outlays, which depend also on the decisions to apply for grants by employers and employees and on the success of their applications.

The key exclusion restriction in equation [3] is that the stock *TS* does not affect earnings directly, but only indirectly via its effect on the individual stock of training. This restriction can be violated in the presence of contextual effects that influence both earnings and training subsidies. This can happen if there are regional trends or if richer regions have both higher wages and can afford to spend more to subsidize training. We control for regional trends with real GDP per capita and for region specific contextual effects with regional dummies. Regional dummies also help in controlling for the quality of training investment, which depends on existing facilities – such as regional training centres - and varies slowly over time. The inclusion of these dummies implies that we can estimate the effect of *TS* on *T* only if the former varies both over time and across regions. We have documented in the previous section of the paper that this variation exists even after controlling for regional productivity trends.

An additional source of concern with our identification strategy is that temporary negative shocks which affect wages in a single region could induce regional governments to increase training subsidies. While the speed of response of regional governments to temporary shocks is unlikely to be fast in Italy, we address this concern by using the second lag of the stock of training incentives rather than its current value.

A final source of concern is that the instrument is correlated to time invariant individual effects. This could happen if more talented individuals and firms decide to migrate to the regions that offer more generous training plans. This seems unlikely in the Italian context, where the richest region, Lombardia, has a positive net immigration rate but about the same stock of planned training subsidies as Basilicata, one of the poorest regions in the country with a negative net immigration rate.

5. The Data

We merge the regional data on planned training subsidies for CVT with individual panel data drawn from *ILFI* (Longitudinal Survey of Italian Households).[15] The ILFI panel consists of five waves, one every two years, starting in 1997 and ending in 2005, and contains information on mobility, education, training, household resources and work of a representative sample of Italian households.[16] This dataset is particularly well suited for the purpose of this paper because it contains information on current individual (monthly) net earnings, the number and duration of training episodes and several individual characteristics, including education and occupation. Since the survey includes also retrospective questions on relevant events occurring from age 18 onwards, it is possible to recover the adult history of each sampled individual in terms of her geographical mobility, education and vocational training and work.[17]

[15] This dataset has been used extensively in recent years both by sociologists (see for instance Pisati and Schizzerotto, 2004) and by economists (see Gagliarducci, 2005, Silva, 2007, and Bison, Rettore and Schizzerotto, 2009).

[16] Respondents to the survey who left home and formed new households were followed by ILFI across the five waves, and their spouses were interviewed as well.

[17] In the first interview, individuals are asked both current and retrospective information. Later interviews refresh this information by adding new events. Additional information on ILFI is provided in the Appendix.

Training in these data includes any program organized by firms, local authorities and industrial associations that takes place after completion of upper secondary education and is not included in vocational tertiary education. Even though the survey is done every two years, we can retrieve for each individual the annual number of training episodes (flows) using the information on the year and the month when each episode was started. We allocate to year *t* all training episodes that start in the year and use these flows to compute individual training stocks with the perpetual inventory method. To implement this method, we need a measure of human capital depreciation. Following Rosen, 1975, we estimate [3] after conditioning on a particular depreciation rate δ within the range [0.01, 0.15] and select the rate which yields the highest R Squared. It turns out that the best fit is obtained when δ=0.03. This rate implies that the impact of a training episode occurring at time *t* on monthly wages at time $t+n$ to is 0.97^n of the impact of the same episode on contemporaneous wages.

For each training episode, the survey asks the duration in days. Unfortunately, this information is missing for close to 30 percent of the episodes in the sample. Because of this, we have decided against using duration in the empirical analysis. Therefore, our measure of training is based exclusively on the number of training episodes. While this is certainly a limitation of the analysis, it is still a substantial improvement with respect to using training incidence, as it is often done in this literature (see Bassanini et al, 2007, for a review).

In order to avoid having region by year cells with too few observations, we aggregate the original 18 regions into 13.[18] In the aggregated regions, the stock of training expenditures *TS* and the other region by time variables are obtained as

[18] The 13 regions are: Piemonte, Lombardia, Trentino Alto Adige and Veneto, Friuli Venezia Giulia, Emilia Romagna, Toscana, Liguria, Marche and Umbria, Lazio and Abruzzi, Campania, Puglia, Basilicata and Calabria, Sicilia and Sardegna.

weighted averages of the original regional data, using active population in each region as weight. We restrict our original sample by: a) including only individuals aged 20 to 55 who are employed in the private sector; b) excluding individuals with missing data on earnings; c) excluding the very few individuals (less than 2 percent of the sample) who have changed region of residence during the sample period. Since the first wave in 1997 does not include information on individual earnings, our sample starts from 1999.

In the selected sample, the average undiscounted training stock (or the sum of training episodes) during the period 1999 to 2005 is 0.775 (with a minimum of zero and maximum of 25 episodes), which increases to 2.115 for the sub-sample with at least one training episode since labour market entry (36.6 percent). The discounted stock is lower, at 0.609 and 1.663 respectively. Table 2 shows the undiscounted stock in each of the 13 regions. It turns out that both this stock and the percentage of employees receiving any training from labour market entry to 2005 is highest in Friuli Venezia Giulia – a Northern region – and lowest in Campania, a Southern region. Interestingly, the most economically advanced region in the country, Lombardia, lags behind most of the Northern regions in terms both of training episodes and of trained employees. The data about Lombardia may seem puzzling. Notice however that the low training incidence in this region is in line with the information provided by alternative datasets. If we use the 2001 wave of the European Community Household Panel, for instance, we find that the percentage of workers in the private sector receiving any training during the last year was only 3.9 percent in Lombardia,

compared to 8.9 percent in the North-East, 6.5 percent in Emilia Romagna and 4.6 percent in Lazio[19].

For each individual in the sample we have information on monthly earnings[20], years of schooling, occupation, type of contract, firm size and sector of activity. The panel is unbalanced, with 50 percent of individuals present in all waves, 20.7 percent present in three waves and the rest present in one or two waves. The final sample consists of 1874 employees and 4719 observations. Table 3 presents the summary statistics of the key variables in 2005.

6. The Estimates

Table 4 shows the estimates of the first stage equation [4]. The table is organized in two columns: the former column is based on a larger sample of annual data spanning the period 1998 to 2005, and the second column is based on the smaller sample with data on earnings, which covers the odd years from 1999 to 2005. Since the instrument *TS* varies by region and year, we cluster standard errors accordingly[21]. We report that the F-test for the inclusion of the selected instrument is well above the threshold value of 10 in both samples, and conclude that the hypothesis that the instrument is not weak cannot be rejected[22].

We find that lagged *TS* has a positive and statistically significant effect (at the 1 percent level of significance) on the training stock. The estimated effect is very similar in the larger and in the smaller sample. Our estimates suggest that one

[19] The relatively low training intensity in Lombardia is also confirmed by the PLUS 2005 survey carried out by ISFOL (the Italian Training Institute).
[20] Unfortunately the number of hours worked in waves later than the first is asked only to respondents who have changed their job.
[21] There are 117 clusters in the larger sample and 52 clusters in the smaller sample, both above the threshold of 42 clusters reported by Angrist and Pischke, 2009.
[22] Clustering by region only rather than by region and year yields a lower F-test (22.6 in the larger sample and 16.7 in the samller sample), which remains above the threshold value in both samples.

additional (real) euro per head allocated to training subsidies increases the discounted training stock by 1.03 to 1.05 percent, a moderate effect. There are several potential explanations for this result: i) the take up rate of training grants has been less than complete; ii) there have been delays between the allocation of resources to regional budgets and the implementation of additional training investments; iii) some of the available resources have subsidized training episodes that would have occurred anyway; iv) the presence of subsidies has induced training providers to raise the price of their services; v) since the marginal benefits of training decline rapidly with the amount of training, shifts in the marginal cost of training induced by subsidies have had limited effects on the training stock.[23]

The table also shows that training is higher among the better educated and those working in firms with more than 100 employees. Having a part-time job does not have a statistically significant effect on training. There is evidence that an increase in the (log) GDP per capita is associated to a lower training stock. Similarly, the coefficient of the regional unemployment rate has a negative sign but is not statistically significant in the smaller sample. Overall, this suggests a counter-cyclical pattern in the stock of training, which is not new in the literature; see for instance Bassanini et al, 2007.

Table 5 is organized in four columns: columns (1) and (3) show the OLS and IV estimates of the effect of training on wages when we cluster standard errors by region and year - as in Table 4; columns (2) and (4) present the random effects and the

[23] The linear specification of equation [4] does not take into account the fact that the dependent variable is either positive or zero. This is not a problem for 2SLS estimates, which remain consistent when the first stage equation is specified as linear even when it is nonlinear (see Angrist and Pischke, 2009). We verify the robustness of the relationship between incentives and training by using the undiscounted training stock and by treating our dependent variable as count data with over-dispersion (variance higher than the mean). We estimate [4] with a negative binomial specification and find that one additional euro per head in training grants increases the (undiscounted) training stock by 0.32 percent, smaller than the value reported in Table 4 for our baseline specification.

random effects two stages least squares. By using random effects, we cluster standard errors at the individual rather than at the region by year level.

There is evidence that training has a positive and statistically significant effect on log monthly net earnings: the marginal effect of an additional training episode ranges between 1.7 and 2.4 percent when training is treated as exogenous and between 5.2 and 5.8 percent when it is treated as endogenous[24]. The finding that IV estimates are higher than OLS estimates is rather common in the education literature. As argued by Oreopoulos, 2006, in a model where individuals and firms weight the costs and benefits of additional training, LATE estimates could exceed OLS estimates because compliers are credit constrained[25].

We can use the available information on the duration of training episodes, which is missing for about 30 percent of the sample, to obtain a rough estimate of the average duration of a training episode - 21.33 days or 4.26 weeks - and compute the estimated wage return per week of training, which turns out to range from 0.41% (1.7%/4.26) to 1.36% (5.8%/4.26), depending on the estimation method.

This estimate is an upper bound to the effect of training on the hourly wage if additional training increases hours worked. Even so, it is much lower than the 3 percent or higher return for a week of private sector training often found in the literature (see Leuven and Oosterbeek, 2008). Notice that the estimated return measures the impact of a *current* week of training on the *current* wage. The effect on *future* wages declines slowly over time because of the obsolescence of human capital, and is about 73 percent of the initial effect 10 years after the investment.

[24] The estimates also show that log earnings are increasing in age, higher for males and the better educated, and lower for part – timers and workers in small firms. There is also evidence that wages increase with the log of GDP per capita.
[25] See, however, Carneiro and Heckman, 2002, for a critical view of this interpretation.

Our baseline estimates in Tables 4 and 5 imply that an additional euro per capita allocated to training incentives increases the training stock by about 1.3 percent and real monthly net earnings by 0.036 percent[26]. This is a local average treatment effect, which corresponds to the marginal percentage return accruing to the individuals in the sample who have changed their training because of variations in the selected instrument (compliers), not the average treatment effect[27]. Clearly, the relevance of our IV estimates depends on the relative size of the sub-population of compliers, which we estimate as follows: first, we compute for each individual in the sample the value of the (undiscounted) training stock during the period 1990-1993, before the introduction of regional policies aimed at encouraging CVT. Second, we estimate a version of [4] on this pre-treatment sample by using a negative binomial specification. Last, we use these estimates to predict the training stock for all individuals in the post-treatment period (i.e. 1999-2005), by allowing the regional unemployment rate and GDP per capita to vary over time. For each individual, we select the last available post-treatment year.[28]

This prediction provides an estimate of the counter-factual stock of training – that is, the stock of training that would have prevailed in the absence of incentives. The prediction error in the-post treatment period includes both the effect of training incentives, which were switched on in 1994, and a residual prediction error, which we remove by assuming that it is equal to the prediction error in the pre-treatment period 1990-1993. Defining compliers as the employees with an actual training stock above the predicted stock, we estimate that this group comprises 37.4% of the relevant

[26] This percentage is obtained by multiplying the change in the training stock induced by one additional euro per head of training subsidies (0.0063) by the estimated coefficient of the training stock in Table 5 (0.058).
[27] Unlike the LATE, the ATE (or the expected gain from training among all individuals) does not depend on the particular instrument or on who gets treated. See Oreopoulos, 2006.
[28] For example, if an individual drops out of the sample in 2001, this is the selected post-treatment year.

population, and conclude that our estimates cover an important share of private sector employees aged between 20 and 55.

6.1 Estimates by firm size

It is a stylized fact that small firms train substantially less than large firms (see for instance Bassanini et al, 2007). According to the 2005 wave of the Continuing Vocational Training Survey, conducted by Eurostat, fewer than 15 percent of the employees in Italian firms with less than 50 employees participated to training, compared to 56 percent in firms with more than 1000 employees. Reasons put forward to explain why larger firms train more include: a) access to cheaper capital for financing training (Hashimoto, 1979); b) lower investment risks as they can pool these risks (Holtmann and Idson, 1991); c) scale economies in the provision of formal and informal training (Black et al, 1999); d) higher monitoring costs, which can be reduced by training (Barron et al, 1987).

Do returns to training also vary by firm size? To answer this question, we estimate Eqs. [3] and [4] by interacting both the instrument and the stock of training with a dummy equal to 1 if the individual is employed in a firm with more than 100 employees and to zero otherwise. Our results are reported in Table 6. We find that the impact of training incentives on the stock of training *T* does not vary significantly by firm size: the estimated percentage change in *T* induced by an additional euro per head of training incentives is 1.21 percent for small firms and 0.76 percent for large firms, but the difference is not statistically significant.

We also find that the marginal effect on earnings of an additional week of training is 10.7 percent (statistically different from zero) in small firms and 1.8 percent (statistically not different from zero) in large firms. In this case, the difference in

returns (-8.9%) is statistically significant. Evaluated at the same value of the duration of training episodes, the estimated marginal effect of an additional week of training is about six times as large in smaller firms (2.51 versus 0.40 percent).

There are several explanations consistent with these results. One candidate is that marginal returns to training are decreasing: since smaller firms train less, they enjoy higher returns. Another candidate is that large firms have higher monopsonistic power, and can afford to train more without raising wages significantly. Last but not least, the presence of resource constraints in smaller firms implies that even high productivity workers in these firms do not have access to training opportunities, which only become available with training subsidies[29]. These workers earn high returns from training. Compared to small firms, large firms have fewer constraints and are likely to train their high productivity employees even in the absence of subsidies. In these firms, the availability of public resources is likely to encourage the training of less productive employees, who earn small benefits from the investment.

Conclusions

Estimates of the monetary returns to training are often based on the fixed effect estimator. This approach is problematic when the wage growth experienced by treated and untreated individuals differs. An alternative approach - instrumental variables – needs to identify credible exclusion restrictions. In this paper, we have argued that regional training policies – measured by the stock of planned training subsidies – are a plausible restriction, because they affect training investments and decisions but have no direct effect on earnings and the probability of employment. This approach has been applied to Italian data, but has potentially wider applications, especially in the

[29] As remarked by Bassanini et al, 2007, most training episodes are organized or initiated by the employer.

European context, where training policy is an important ingredient of EU regional policy.

We have found that regional training policies in Italy have a statistically significant impact on individual training. The size of this effect is moderate: one additional euro per head spent in training subsidies in the average Italian region increases the average (discounted) stock of training by 1.03 percent in the baseline specification. The marginal effect of an additional week of training on monthly earnings is equal to 1.36 percent. Due to the depreciation of human capital, this effect declines slowly over time.

We have shown that these returns – which capture local average treatment effects – are close to zero in firms with more than 100 employees and equal to 2.51 percent in smaller firms. Differences in returns by firm size could be due to decreasing marginal returns, the presence of liquidity constraints or the fact that larger firms enjoy some degree of monopsonistic power. While we warn against easy generalizations of our results, we speculate that returns to training may be lower than those found for Italy in economic environments – such as Continental and Northern Europe – where the presence of small firms is more limited.

Our estimated returns are significantly lower than the 3 percent or higher found in the empirical literature. While this literature looks at the effects of training on the hourly wage, we only have data on monthly wages. If additional training leads to higher working hours, the effect of training on the hourly wage is bound to be even lower than the one currently estimated.

Although Heckman, Lalonde and Smith (1999) and Martin and Grubb (2001) go in this direction, the existing literature often lacks a cost-benefit analysis of training programs. The estimates presented in this paper can be used to perform a simple back

of the envelope analysis of the costs and benefits of regional CVT policy in Italy. Assume that marginal changes in this policy do not affect the decision rules used by agents in their investment decision. Further assume that marginal benefits consist exclusively of higher earnings for the employed population. Under these assumptions, a policy that adds in the average region one euro per head in training subsidies costs 1.94 million real euro. Two years after its introduction, the policy is estimated to generate a 0.036 percent (0.058*0.0063) increase in annual earnings. Evaluated at the sample mean annual earnings in 2005 (14209 euro), this corresponds to 5.11 euro per employee. Since average regional employment in the private sector and in the age range 20 to 55 was equal to 0.423 million individuals in 2005, the total expected increase in monetary benefits is 2.16 million real euro (5.11*0.423), about the size of the cost. If we add the benefits accruing to additional years in the labour market, as well as the additional tax revenues, it seems clear that the policy pays off rather well, mainly by increasing the earnings of workers in small firms.

Appendix

1. Subsidies to continuing vocational training in Italy

In this appendix we describe the system of subsidies to continuing vocational training (CVT) in Italy. Vocational education and training are administered in Italy at a regional level, under the supervision and guidance of the central government since 1977-78, when the Presidential Decree 616/77 and Law 845/78 were implemented. National resources devoted to CVT are funded by a 0.30% payroll tax, and placed into a common fund (The Single Fund for Training, which co-finances the revolving fund for access to the EU Structural Funds), to which regions have access to finance vocational education and training.

National funds

Law 236/93, containing urgent measures to support employment, introduced subsidies to CVT as a tool of active labour market policy. The law was enacted in 1993 but the first allocation of training resources from the Ministry to regional authorities was in 1997. Funds were used to co-finance successful projects, and applying firms were supposed to pay at least 20 percent of total training costs. Each firm could apply for a maximum of 50 million liras. The initial allocation of resources was close to 32 million euros (1997 prices). Act 37/98 in the following year allowed regions to use up to 25 percent of the assigned resources to fund individual rather than company training plans. This possibility was confirmed also by Act 139/98 (published at the very end of 1998 and thus imputed to 1999 in our database). Act 30/2000 established that all resources not allocated by a region within the next 2 years were to be redistributed among other regions. However, the threatened redistribution never took place.

The large majority of regions (15) decided to use 25% of the received funds to finance individual training projects. Each region was free to choose both the selection mechanism and the delivery of funds: some regions introduced a voucher paid directly to training centres; other regions created a catalogue of courses among which applying workers could choose. Following this experience, a new law was enacted in 2000 (Law 53/00), which introduced a system of subsidies for individual training plans.

At the end of 2000 (imputed to 2001 in our database) a new Act (92/00) allocated training funds to regions in order to finance training plans with an industrial or local content[30]. These plans were complex training actions devoted to the promotion of training in a specific geographical area or in a specific sector of economic activity. Social partners played an active role in planning, programming and implementing these actions. In January 2001 Law 288/00 came into force. With this law, the government established industry based training funds ("*fondi paritetici interprofessionali per la formazione continua*"). These funds were managed by representatives of employees and firms rather than by regional authorities, with the aim of financing company, sector and regional training plans. They started to deliver subsidies at the end of 2004.

[30] A national experiment with these plans took place in 1999 with Act 65/99, which funded 70 projects among 568 applications.

In 2001 Constitutional Law 3/01 increased the empowerment of regions, which were assigned exclusive responsibility for vocational education and training. Funds allocated by the national government could be used by region with full autonomy in the invitations to tender, which were published in the official regional bulletins. The government explicitly asked regional administrations to favour the integration of each training action with similar actions funded by ESF. The greater autonomy enjoyed by regions meant an increase in the between - regions variation of training policies. An important consequence of increased autonomy was to raise the time lag between the allocation of national resources to regions and the issue of invitations to tender. There is substantial heterogeneity in the ability to spend of Italian regions. For instance, by 2005 many Southern regions had not yet issued the calls for projects funded by the Ministry of Labour in 2003.

We collect data on planned training subsidies using Ministerial Acts until 2000 and the calls for tender[31] published by each region in their official regional bulletins from 2001 onwards.

The European Social Fund

In the province of European Structural funds[32], only the European Social Fund finances continuing vocational training initiatives. According to the Framework Regulations (2052/88), the Structural Funds have the following priority goals:

- Objective 1: structural adjustment of the regions with delayed development. Funds used: ERDF, ESF and the EAGGF-Guidance Section;
- Objective 2: economic reconversion for declining industrial areas. Funds used: ERDF and ESF;
- Objective 3: reduction of long-term unemployment and improvement of professional placement for young people and people excluded from the labour market;
- Objective 4: support to industrial restructuring. Funds used: ESF;
- Objective 5: promotion of rural development. Funds involved: EAGGF, Guidance section, FIFG. Structural adjustment of rural areas. Funds involved: EAGGF, Guidance section, ESF, ERDF.

During the six-year programme running from 1994 to 1999, training incentives funded by ESF involved only 14 regions out of 20: Piemonte, Valle d'Aosta, Liguria, Lombardy, the autonomous provinces of Bolzano and Trento, Veneto, Fruili Venezia Giulia, Emilia-Romagna, Tuscany, Umbria, Marche, Lazio and Abruzzo (only from 1997). These funds were mobilized under three multi-regional programmes run by the Ministry of Labour (Innovative Actions, Retraining and Requalification of Employees, System Reinforcement). The implementation of training programs funded by the ESF was rather heterogeneous across regions. We collect the data on planned regional expenditures at the regional level during the period 1994-1999 from the publication "*Relazione annuale: i rapporti*

[31] This database is available on the web site www.eformazionecontinua.it

[32] The main European Structural funds are: the European Social Fund (ESF), the European Regional Development Fund (ERDF) the European Agricultural Guidance and Guarantee Fund (EAGGF), and the Financial Instrument for Fisheries Guidance (FIFG).

finanziari con l'Unione Europea e l'utilizzazione dei fondi comunitari" by Corte dei Conti, and from ISFOL annual reports.

Turning to the 2000-2006 programming period, the European Social Fund was involved in the support of the European Employment Strategy, which consisted mainly in combating unemployment and developing human resources and social integration. Training incentives for the employed were funded under Directives D1 and D2. A database collecting information on regional training policy funded by the ESF was created at the Ministry of Finance (IGRUE) during this period. Our data on planned training expenditures for this period were kindly provided by ISFOL from the IGRUE database.

2. The ILFI Dataset

The ILFI panel consists of five waves, with each wave being implemented in an odd year, starting with 1997 and ending with 2005. In the first wave, the survey collects both current and retrospective information from more than 4000 Italian households. In the follow-ups, interviews update the initial information with additional events and collect all retrospective information for the newly interviewed. The questionnaire is designed to recover individual life histories from birth to the time of the interview, which are organized in episodes. The selected topics include geographical mobility, education and vocational training, work, social origins, and family structure. In the first wave all the significant events in the lives of the interviewed individuals were collected.

Around 10.000 individuals were interviewed in each wave. In 1997 households were sampled according to a two-stage stratified procedure. The primary sampling unit was the universe of Italian municipalities in 1996. The final sample consisted of 272 municipalities: the 12 metropolitan municipalities (selected with probability equal to 1) plus a random sample of 260 municipalities extracted with probability proportional to the number of residents from 30 strata defined by region and population size. The secondary sampling unit was the household: within each municipality a random sample of household was extracted and all the individuals in the household older than 18 were interviewed.

The sample is representative of the Italian population at the regional level. A comparison of the main characteristics of this dataset with the 1997 wave of *Indagine Multiscopo*, a much larger national representative survey carried out by the national statistical institute (ISTAT), was run by Bernardi and Pisati (2003). They find that the differences between the two surveys are very small. When we compare the 1999 wave of ILFI dataset with the 1998 wave of the Survey on the Income and Wealth of Italian Households by the Bank of Italy, we find that the percentage of individuals aged 20 to 55 and employment was 48.1 in the former dataset and 46.6 in the latter. Furthermore, the average net monthly wage was equal to 1109.2 (standard deviation 548.1) in the Bank of Italy dataset and to 1116.9 euro (standard deviation: 461) in ILFI.

3. *Sources of additional data*

Regional unemployment rate and regional population aged between 15 and 64: Eurostat web page:

http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/themes

Regional GDP per capita: ISTAT (Italian Statistical Office) web page:
http://www.istat.it/dati/dataset/20091111_00/

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Table 1. Regional Planned Training Expenditures. Cumulated stock 1994-2005. Real Euro per Head.

	European Social Fund	*Laws 236 and 53*
Piemonte	100.74	23.10
Lombardia	64.98	15.58
Trentino Alto Adige	251.36	35.43
Veneto	94.77	21.06
Friuli Venezia Giulia	144.33	32.88
Emilia Romagna	153.32	31.47
Liguria	89.51	19.96
Toscana	71.60	15.75
Marche	62.66	16.82
Umbria	104.14	23.52
Lazio	61.48	16.63
Abruzzi	68.96	19.86
Campania	26.00	12.97
Puglia	10.69	11.91
Basilicata	42.27	30.68
Calabria	18.12	7.36
Sicilia	34.86	5.10
Sardegna	69.27	15.74

Source: see the Appendix

Table 2. Sum of Training Episodes and Percentage of Workers Receiving any Training. By Region. Year: 2005

	Sum of training episodes	*% of trained workers*	*Sum of training episodes for trained workers*
Piemonte	1.208	0.477	2.531
Lombardia	0.798	0.363	2.194
Trentino Alto Adige and Veneto	1.503	0.533	2.819
Friuli Venezia Giulia	2.382	0.735	3.240
Emilia Romagna	0.838	0.500	1.676
Liguria	0.640	0.280	2.285
Toscana	1.371	0.512	2.675
Marche and Umbria	1.022	0.363	2.812
Lazio and Abruzzi	1.100	0.391	2.814
Campania	0.231	0.173	1.333
Puglia	0.903	0.423	2.136
Basilicata and Calabria	1.142	0.228	5.000
Sicilia and Sardegna	0.588	0.294	2.000

Source: see the Appendix

Table 3. Summary Statistics for the Sub-sample with Positive Earnings

	Mean	*Standard deviation*
Monthly earnings	1093.72	450.45
Stock of training episodes (discount rate: 3%)	0.609	1.36
Cumulated number of months of training (discounted at 3%)	3.072	6.33
Stock of planned training incentives (discount rate: 3%)	58.54	37.76
Age	37.60	9.35
Gender (male=1)	0.61	-
Year of Schooling	10.15	3.33
White collar job	0.37	-
Part timer	0.10	-
Regional unemployment rate	8.36	6.46
Regional log real GDP per capita	3.92	0.09
Regional real GDP per capita	50.71	4.97
Percentage of firms with less than 100 employees	25.45	-
Number of observations	4719	

Table 4. First Stage Estimates – Full Sample and Sub-sample with Positive Earnings. Private Sector Employees only. Dependent variable: Discounted Training Stock T. 13 regions.

	(1) Full sample 1998-2005	(2) Subsample with positive earnings 1999,2001,2003, 2005
Age	-0.027	-0.047
	[0.057]	[0.094]
Age squared	0.001	0.002
	[0.002]	[0.003]
Age cubic * 100	-0.002	-0.003
	[0.011]	[0.020]
Gender	0.004	-0.026
	[0.026]	[0.043]
Discounted stock of incentives lagged twice *100	0.597***	0.631***
	[0.158]	[0.102]
Regional unemployment rate	-0.0097***	-0.005
	[0.003]	[0.006]
Regional GDP per capita (log)	-1.457***	-1.535***
	[0.197]	[0.357]
Education: ISCED<3	0.121***	0.128***
	[0.022]	[0.038]
Education: ISCED=3	0.371***	0.414***
	[0.030]	[0.051]
Education: ISCED>3	0.608***	0.575***
	[0.073]	[0.119]
Part time job	0.082	0.099
	[0.059]	[0.101]
Firm with more than 100 employees	0.332***	0.390***
	[0.034]	[0.046]
F-test	105.80	37.51
% change in T induced by one additional euro per head of TS	1.05	1.03
Observations	11174	4719
R-squared	0.193	0.207

Note: Clustered standard errors in brackets; *** p<0.01, ** p<0.05, * p<0.1. Each regression includes a constant, regional, occupation, industry dummies, a dummy equal to 1 if firm size is missing and a dummy equal to 1 for the years 2001 and 2002, when the national tax deduction scheme for training expenditures was in place.

Table 5. OLS, Random Effects (RE), IV and Random Effects IV (RE-IV) Estimates. Private Sector Employees only. Dependent Variable: Log Monthly Real Net Earnings. 13 Regions. Years 1999, 2001, 2003 and 2005.

	(1) OLS	(2) Random Effects (RE)	(3) IV	(4) RE-IV
Age	0.052*	0.076***	0.052*	0.075***
	[0.027]	[0.023]	[0.027]	[0.023]
Age squared	-0.001	-0.001**	-0.001	-0.001**
	[0.001]	[0.001]	[0.001]	[0.001]
Age cubic*100	0.001	0.001*	0.001	0.001*
	[0.000]	[0.000]	[0.000]	[0.000]
Gender	0.206***	0.203***	0.207***	0.205***
	[0.008]	[0.017]	[0.008]	[0.016]
Training Stock	0.024***	0.017***	0.052**	0.058**
	[0.003]	[0.004]	[0.025]	[0.026]
Log GDP per capita	0.943***	0.813***	0.980***	0.828***
	[0.114]	[0.120]	[0.118]	[0.120]
Unemployment rate	0.001	-0.001	0.001	-0.001
	[0.002]	[0.002]	[0.002]	[0.002]
Education: ISCED<3	0.111***	0.109***	0.106***	0.097***
	[0.013]	[0.025]	[0.014]	[0.025]
Education:ISCED=3	0.140***	0.155***	0.127***	0.129***
	[0.016]	[0.027]	[0.021]	[0.031]
Education: ISCED>3	0.328***	0.369***	0.311***	0.334***
	[0.023]	[0.040]	[0.023]	[0.044]
Firm with more than 100 employees	0.071***	0.062***	0.060***	0.052***
	[0.007]	[0.017]	[0.012]	[0.018]
Part time job	-0.343***	-0.368***	-0.346***	-0.369***
	[0.021]	[0.021]	[0.022]	[0.021]
Marginal effect of a week of training (%)	0.58	0.41	1.22	1.36
Marginal effect of a week of training (%) 5 years later	0.50	0.35	1.05	1.17
Marginal effect of a week of training (%) 10 years later	0.43	0.30	0.90	1.00
Observations	4,719	4,719	4,719	4,719

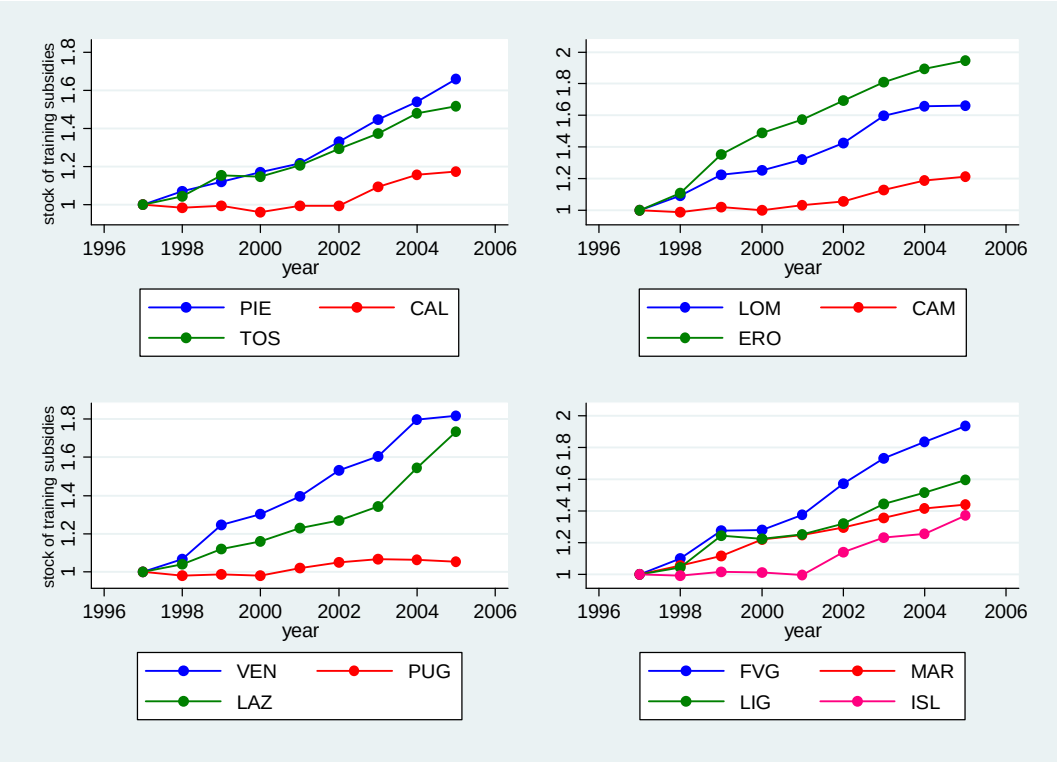
Note: see Table 4

Table 6. First Stage and IV-RE with Firm Size Interactions. Private Sector Employees only. Dependent Variable: Training Stock T. 13 Regions.

	(1) First stage	(2) IV-RE
Age	-0.049	0.068***
	[0.094]	[0.024]
Age squared	0.002	-0.001**
	[0.003]	[0.001]
Age cubic * 100	-0.003	0.001*
	[0.002]	[0.000]
Gender	-0.026	0.208***
	[0.043]	[0.027]
Discounted stock of incentives lagged twice *100	0.559***	
	[0.097]	
Lagged discounted stock of incentives * large firm dummy *100	0.241	
	[0.185]	
Training stock		0.107***
		[0.039]
Training stock * large firm dummy		-0.089***
		[0.036]
Regional unemployment rate	-0.006	-0.002
	[0.006]	[0.002]
Real GDP per capita (log)	-1.568***	0.675***
	[0.346]	[0.146]
Education: ISCED<3	0.128***	0.102**
	[0.038]	[0.038]
Education: ISCED=3	0.417***	0.138***
	[0.051]	[0.045]
Education: ISCED>3	0.575***	0.374***
	[0.118]	[0.064]
Part time job	0.097	-0.367***
	[0.101]	[0.027]
Firm with more than 100 employees	0.279***	0.109***
	[0.102]	[0.033]
% change in T induced by one additional euro per head of TS – small firms	1.21 [0.21]	
% change in T induced by one additional euro per head of TS - large firms	0.76 [0.22]	
Current marginal effect of a week of training – small firm (%)		2.51
		[0.91]
Current marginal effect of a week of training – large firm (%)		0.40
		[1.66]
Marg. eff. of a week of training after 5 years - small firm (%)		2.15
Marg. eff. of a week of training after 5 years - large firm (%)		0.34
Marg. eff. of a week of training after 10 years – small firm (%)		1.85
Marg. eff. of a week of training after 10 years – large firm (%)		0.30

Note: see Table 4. The first stage of training stock * large firm dummy is available from the authors upon request.

Figure 1. Residuals from the Regression of the Stock of Undiscounted Regional Training Grants per Head on GDP per capita. Years 1998-2005. Normalized to 1 in 1998.



Note: PIE: Piemonte; LOM: Lombardia; FVG: Friuli; VEN: Veneto and Trentino; ERO: Emilia; TOS: Toscana; MAR: Marche and Umbria; LAZ: Lazio and Abruzzo; CAM: Campania; PUG: Puglia; CAL: Calabria and Basilicata; ISL: Islands.

Table A1. ILFI number of interviews by waves

	First wave 1997	Second wave 1999	Third wave 2001	Fourth wave 2003	Fifth wave 2005
Interview made in 1997	9759	7918 (81% of the cases of 1997	6794 (70% of the cases of 97)	5944 (61% of the cases of 97)	5278 (54% of the cases of 97)
New cases 1999		720 New cases	633 (83% of the new cases of 99	552 (775 of the new cases of 99)	497 (69% of the new cases of 99)
New cases 2001			333 New cases	293 (83% of the new cases 2001)	266 (80% of the new cases of 01)
New cases 2003				319 New cases	280 (88% of the new cases of 03)
New cases 2005					167 New cases
Number of interviews made in each wave	9759	8638	7760	7108	6495
Municipalities Sampled	272	348	368	395	3.74
Total number of cases in the database	9759	10479	10812	11131	11298

Source: ILFI, official documentation 2005