

# **Employers' higher education and typologies of fixed term contracts: First evidence from Italian firms**

Andrea Ricci<sup>±</sup>

## **Abstract**

This paper analyzes how the higher education of employers affect the firms' use of different forms of fixed term contracts, a novelty with respect to the literature on this field. The initial hypothesis is that having a tertiary level of education is associated to cognitive and no cognitive skills that, in case of an employer, weaken the incentives to use fixed term contracts as a means to face with economic uncertainty and incomplete contracts. Taking advantage of a unique dataset on Italian firms, the empirical analysis shows that this hypothesis holds true. In particular, the presence of an higher educated employer reduce the total share of fixed term workers by firms. Further, this effect is driven by the reduction of apprenticeship contracts rather than by fixed term contract without training clause, typically used to achieve numerical flexibility. These results are robust to different econometrics concerns. Hence, policy implications are derived

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<sup>±</sup> Department of Statistics, Italian Institute for the Development of Vocational Training (ISFOL); email: [an.ricci@isfol.it](mailto:an.ricci@isfol.it); [andr.ricci@gmail.com](mailto:andr.ricci@gmail.com) The contents of the paper are responsibility of the author and do not necessarily represent the official view of ISFOL

## **1. Introduction**

A number of recent studies have shown a negative relation between the use of temporary contracts and the evolution of productivity in European countries since the mid '90s (Damiani, Pompei and Ricci, 2012; Boeri and Garibaldi, 2011; Michie and Sheenen, 2003) .

In particular, the use of fixed term contracts hurts on-the-job training investments and cooperative relationships at workplace, leading to a significant slowdown in productivity growth and inefficient organization of internal labor markets (Belot, Boone and van Ours, 2007; Kleinknecht et al., 2006).

This evidence supports the view that the diffusion of flexible staff arrangements has fostered “low-road” practices to human resource management in those countries that have removed any legal and economic constraints to hire on temporary basis.

There are different reasons that may be argued to rationalize such a “myopic” behaviour of firms. For example, since hiring permanent workers implies an irreversible costs due to firing costs, when demand uncertainty increased firms may find it convenient to postpone decisions to hire workers permanently as a sort of real option (Lotti and Viviano, 2011). As well, incomplete contracts may enhance firms’ propensity to use fixed term contracts as a screening or discipline devices, without considering efficiency losses due to the forgone skill accumulation of temporary workers (Burgess, ecc, 2003; Blanchard and Landier, 2002).

Although economic uncertainty, incomplete contracts and other labour market imperfections play a role in explaining incentives to use temporary workers by firms, other factors should be considered. Among these, one of the most important is likely the human capital of employers (Leazar, 2007; Van der Sulis, van Praag, Vijverberg 2008).

In particular, we see at least three channels through which an high level of employers education may influence significantly firms incentives to use different forms of fixed term contracts.

First, a tertiary level of education favours a direct and indirect knowledge of these modern management practices that point out the competitive advantages deriving from on-the-job

training, workers active involvement in productive process and flat hierarchies inside the firms (Bloon and Van Reenen, 2009; Raghuram and Wulf, 2006). These features of the internal labour markets, in turn, contrasts with an intensive use of fixed term contracts that, typically, discourage workers' attachment and incentives to firm specific skill accumulation.

Second, attending schooling is associated to a range of cognitive skills and capabilities that enhances time patience and long-terminism in economic decisions by individuals (Oreopolous and Salvanes, 2011; Perez-Arce, 2012). In case of an employer, an high level of education is expected to offset the impact of time impatience or "hyperbolic discounting" on the decisions to hire temporary workers. This happens when firms over-weights the short-run gains of temporary contracts in terms of labour savings and numerical flexibility) and under-weights their long run cost in term of forgone innovation and labour productivity (Garibaldi and Boeri, 2007).

Third, it is well known that schooling is correlated with a balance set of cognitive and no-cognitive skills that favour individual attitudes toward cooperation, fairness and proto-social behaviour. These behavioural traits, in turn, are recognized as important mechanism devices to enhance workers efforts, trust and long term employment relationships, even in presence of incomplete labour contracts (Fehr and Gatcher, 2000; Bandiera, Barankay and Rasul, 2005; Fehr, Goette and Zehnder, 2008). As a consequence, an highly educated employer is likely to discourage the propensity to use fixed term contracts as screening or discipline device for workers unobserved ability and effort.

In sum, considering these studies in the field of management practices, entrepreneurship and education one may infer that the presence of highly educated employers might discourage the overall use of fixed term contracts and, in particular, both those used as screening and discipline device when a training investment is concerned and those used as buffer stock to face with demand uncertainty. However the vast literature on the labour market reforms has not yet investigated such an issue.

The present paper aims to fill this gap taking advantage of an unique dataset on a representative sample of Italian firms, operating in both manufacturing and service sector. The data are drawn from the *Employer and Employee Survey* (EES) conducted by ISFOL for the year 2010 and collect a rich set of information about the individual profile of the employers, different forms of fixed term contracts and a number of other firms and workers characteristics.

In this framework, we shows that previous hypothesis holds true. In particular, the presence of an higher educated employer reduces significantly the total share of fixed term workers by firms. Further, this reduction is driven by a decrease of the share of fixed term contracts used to achieve numerical flexibility rather than those used for training and screening purposes.

These results are robust to different econometrics concerns: the skewed and bounded nature of the share of fixed term workers, firms unobserved heterogeneity, the endogeneity issues.

Hence the paper contributes to the literature on the following aspects. First, to the best of our knowledge, it is the first time that relationship between the use of fixed term contracts and employers' education is investigated using micro-data on firms. Second, it provides an example of the potential implication for firms' personnel policies of the cognitive and no cognitive skills associated with schooling. Third, the data used allows to highlight some important feature of small firms behaviour in Italy, an issue not fully accounted by the literature.

The paper is organized as follows. In section 2 we discuss the related literature and hypothesis. Section 3 presents the data and descriptive statistics. In section 4 provides the econometric analysis to test the hypothesis for the total share of fixed term contracts. Section 5 develop an econometric results by distinguishing different forms of fixed term contracts. Section 6 concludes.

## **2. Background discussion and hypothesis**

This paper tries to integrate some hints and suggestions stemming from the literature on entrepreneurship , management practices and education on the current debate on the determinants of firms' use of flexible staff arrangements.

As mentioned before, the vast amount of research devoted to analyse the diffusion of fixed term contracts has paid little attention on the human capital profile of employers. This lack of evidence is quite surprising as the individual characteristics of the employers have been proved to be an important factor underlying the firm performance, competitive behaviour and the organization of internal labour market (Van der Sluis and van Praag ,2008; Lazear, 2007; Bloom and Van Reenen, 2009).

According to Lazear (2002) employer should have a “balanced” human capital endowments and skills in a vast range of fields to operate successfully in complex and dynamic economic organizations. That is entrepreneurship requires general knowledge and attending schooling is expected to increase this. The individual attributes and education of employers are even more important for explaining personnel policies and management decisions in small business and /or family owned firms.

This view originates from “upper echelon” theory which considers an economic organization as a reflection of its owned manager or employers’ characteristics such as age, education, financial position and management heterogeneity characteristics (Bates, 1990). In particular, owned-manager education has proven to be a significant predictor of the growth and profitability, as higher education is expected to be associated with more knowledge capabilities and skills (Roper, 1999).

Thus, the predictive power of this theory on entrepreneurship for hiring policies (and the use of fixed term contracts) may be substantial. In small business, the capabilities and skills associated with the education of an employer are key factor to favor an “high road” to human resource management, mainly in intensive period of technological and economic change. It is well known that the use of new products, informational technologies and decentralized (holistic) forms of workplace including, for example self-managed teams, multi-tasking and delegation of decision rights largely contribute to give increasing importance of human capital motivation and cooperative behavior within the firms. The need of continuous skill adoption, cooperation and

motivations requires, in turn, training investment and job stability typically are negatively correlated with the use of fixed term contracts. It follows that employers (or owned-manager) with high educational level are expected to be aware of the value of these competitive strategies and HRM and, then, discourage an intensive use of temporary contracts.

Similar arguments may be derived from the literature on management practices (Bloom, Genakos, Sadun and van Reenen 2011; Bloom and Van Reenen, 2009).

However the negative impact of employer education on temporary contracts may be also derived from recent contributions about the literature on education. Indeed attending schooling provides cognitive and non cognitive skills that are expected such as time preferences, social norms and fairness that, in case of an employer, may significantly affect incentives to hire on temporary basis.

As for time preference, it is useful to mention the study of Perez-Arce (2012). He uses a natural experiment to show a causal estimates of the positive impact of schooling on patience and time preferences by individuals, even when controlling for family background. This evidence supports the intuition of Becker and Mulligan (1997) according which schooling helps the learn the art of scenario simulation and makes educated people are more productive at reducing the remoteness of future pleasures (see also Oreopolous and Salvanes, 2011). It is straightforward to use similar arguments to predict a potential role for the schooling level of the employers in affecting the firms' propensity to hire temporary workers, especially as "buffer stock" and/or churning in presence of demand uncertainty. In particular, education may neutralize the impact of "hyperbolic discounting" that makes it attractive to use fixed term contracts as a means to save labor costs in the short period, despite they could entail productivity losses in the long run<sup>1</sup>. In this case, an high educated employer is expected to be more "patient" about hiring policies and, as a consequence, to

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<sup>1</sup> In this case "myopic" employers tend to put more weight on the short time rewards from hiring on temporary basis while put less weight on their long run opportunity costs. A broader discussion on hyperbolic discounting in economic decisions is found in Shane, Lowenstein and O'Donoghue, (2002)

have a lower probability to recover temporary contracts as a means to face with the economic uncertainty (Lotti and Viviano, 2011)<sup>2</sup>.

Other useful suggestions come from recent studies that emphasize the role of no cognitive skills and social attitudes related to formal education for the outcomes of labor markets of these (Cunha, Heckman and Schennach 2010; Bowles, Gintis and Osborne, 2001).

Indeed, attending schooling enhances the development of a set of no-cognitive skills and psychological forces such as motivations, worth ethics, self-control, fairness and cooperative attitudes that represent an important enforcement mechanisms for labor discipline and long-term employment relationships, mainly in workplace characterized by incomplete contracts (Fehr, Goette and Zehnder, 2008; Fehr and Gächter, 2000). As well, schooling influences the evolution of social norms, values and learning processes among individuals by altering the returns to relationship-specific investments such as reputation-building, trust and learning processes (Bowles and Gintis, 2001). Based on these considerations, one may infer that the higher education of an employers is favorable to a reduction of fixed term contracts used as screening and/or discipline device (to avoid shirking) when the abilities and efforts of workers are not observable by the firms. It is well known that type of contractual incompleteness, happens typically when on-the-job training is concerned, as human capital investment are not verifiable, and the consequent *hold up* problems generates inefficient outcomes (Hoshimoto, 1981).

In this context, the presence of an employer with higher education is likely to favor norms of fairness and reciprocity that leads to gift exchange as an efficient contract enforcement device without recover to an extensive use of fixed term contracts with training clause<sup>3</sup>.

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<sup>2</sup> The most traditional models have rationalized the use of flexible staff arrangements as a dynamic optimization problem with firms trying to maximize their profits in an adjustment costs framework due to firing restrictions. In this context, the availability of fixed term contracts is a way of providing numerical flexibility to the firms, allowing them to adjust employment with low costs in the presence of fluctuations in demand and productivity. As fixed term contracts are associated with lower firing costs than permanent contracts, firms tend to use temporary workers as a “buffer stock”, reducing them during recession and allowing a faster increase of employment during recoveries (Bentolila and Bertola, 1990; Saint Paul, 2002).

<sup>3</sup> Another strand of literature have emphasized the role of fixed term contracts as an institutional device to screen workers’ ability and efforts in presence of incomplete information about the quality of the matches

In sum, schooling level of employers provides a multidimensional set of observable and unobservable skills as well as behavioral traits that are expected to be negatively associated to the utilization of flexible contractual arrangements. However all these features associated with investment in schooling are well suited to tackle with more traditional theories about firms' incentive to use fixed term contracts.

## 2.1 Institutional setting

The Italian labor market has experienced a significant process of legislative change in the last decades. The foundations of this process have been the introduction and regulation of temporary help agencies and fixed-term contracts through Laws 196/97 (the so called Treu package")<sup>4</sup>. Agency contracts give firms the option of employing manpower hired by an agency on a temporary basis, while fixed-term contracts give the option of establishing a definite duration to labour contracts for technical and productive reasons.

The process of reform was further reinforced by the Law 368/2001 and 30/2003 (the so-called "Legge Biagi"). These legislative acts operated on a dual scheme: on the one hand, they introduced new atypical contractual arrangements such as the "job on call", "staff leasing", "job sharing" and "job insertion" contracts; on the other, they reformed the apprenticeship contracts (which includes a compulsory training content) increasing its eligibility until 29 years olds (Lucidi, 2006).

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i.e. as a step in process toward a permanent employment position (Bentolila and Dolado, 1994; Guell, 2000). This hiring strategy is expected to enhance productivity and skill accumulation on the job if there is a high transition rate to permanent position; otherwise excess job turnover may have a negative effect on firm specific skills for temporary workers (Belot, Boone and van Ours, 2007; Booth et al, 2002). In particular, the lower costs of firing temporary workers, may induce firms to hire on fixed term contracts to fill routine and low-productive jobs, while reducing the incentives to keep them in permanent positions, even if their revealed productivity and effort is high. In presence of "churning", i.e. worker turnovers in excess to job turnovers, high contractual flexibility may turn out into lower productivity and welfare both for firms and workers (Blanchard and Landier, 2002; Burgess et al., 2000; Cappelli and Neumark, 2004).

<sup>4</sup> The Treu law also deregulate the use of "employers-coordinated free-lance workers" (*collaboratori coordinati e continuativi*). This contractual typology identifies free-lance workers who are formally self-employed, but in practice economically dependent on a single employer. The introduction of this fund in 1995 gave an impulse to the proliferation of these contracts, which were entitled to the lowest degree of protection (due to their "self-employment" nature) and paid very low social contribution rates.

After this phase of liberalization, the adoption of no permanent contracts by firms markedly increased. Between 1997 and 2008 the increment of the share of non-permanent jobs in Italy has been the highest in Europe (OECD 2008). Young workers have been affected by the new contractual forms more than other kinds of workers. Especially since 2003, new job opportunities for young workers in Italy have been almost exclusively limited to the new forms of non-permanent jobs (Carrieri, Di Novi, Jacobs, Robone, 2012).

Many features of the Italian liberalization process are common to the reforms occurring in other European countries. However, due to certain characteristics of the Italian institutional setting, labour market and welfare system, the impact of the labour reform on Italian society has been particularly acute. First, the adoption of non-permanent positions in Italy has been more rapid: no other country in Europe had a comparable growth rate of temporary contracts (Damiani, Pompei and Ricci, 2011). Second, on average, the jobs characterized by the new contractual forms are paid less well than traditional ones. This wage policy has been adopted by firms in many European countries (Bentolila and Dolado 1994), but is particularly common in Italy. Third, there is evidence that in Italy after the end of a contract, an employee with a temporary contract is more likely to be hired with another temporary contract, or become unemployed, than to be hired with a permanent contract (Garibaldi and Pacelli, 2008). Forth, the diffusion of flexible contractual arrangement has significantly decreased labor productivity and firm performance in the same period, not only the income and career perspectives of temporary workers (Boeri and Garibaldi and 2008; Lotti and Viviano, 2011; Damiani, Pompei and Ricci, 2012).

These specific features make it emerge a crucial concern about whether the availability of different typologies of fixed term contracts have been used by Italian firms to gain “functional flexibility” or merely to exploit “numerical flexibility” and saving labor costs.

Indeed these two kind of labor flexibility have different implications for training investment, industrial relations, the organization of internal labor market and, thus, for firm performance. In particular “functional flexibility” is associated with firms ability to respond to external shocks by

organizing the workforce internally (without resorting to the external labor market), and providing employees with multiple skills, so that they can be re-employed relatively quickly from one task to another (Kalleberg, 2001). This kind of practices relies heavily on firm-sponsored training and on a high degree of commitment of workers to firms, and requires workers provided with an in-depth knowledge of the firms and its competitive strategies (Valverde et al., 2000).

Numerical" flexibility, conversely, allows firms to adjust the total number of workers in response to changes, by making use of flexible staffing arrangements or through relaxed hiring and firing regulations ("external" numerical flexibility), or resorting to variations in the distribution of working time and other features in the organization of the internal labor market ("internal" numerical flexibility). This kind of personnel practices typically does not generate an high attachment of temporary workers to firms, are vulnerable to moral hazard problems on training investment and affects heavily bargaining process between union and firms about the relative claims of insiders and outsiders workers.

Given the focus of our paper, these considerations rationalize the distinction into two broad categories of the number of temporary contracts provided by Italian labor law: the fixed term contracts mainly used for functional flexibility and those mainly used for numerical flexibility.

Accordingly, the first category is composed by on the job training contracts (*contratti a causa mista*) which includes apprenticeship contracts and training and work contracts (*contratti di formazione lavoro*) a contractual typology introduced in 1984 to facilitate the inclusion of young workers into the labour market, but currently no more available to firms, having being banned by the European Commission since 1999 (the last authorizations were agreed in October 2003).

The second category is composed, instead, by fixed-term employees covered by collective bargaining, whose utilization has been fully liberalized by the legislative decree 368 of 2001, though the legislation had already been relaxed previously (mainly by law 196 of 1997, best known as "Pacchetto Treu"). The analysis of this category appears crucial, as their only difference from

“regular” contracts stands in their temporary nature: therefore, they are a perfect candidate to study the exploitation of numerical flexibility by firms<sup>5</sup>.

Thus adopting this taxonomy of flexible staffing arrangements (the overall share of fixed term contracts, fixed-term contracts covered by collective bargaining, on-the-job training contracts) we are able to test our hypothesis.

### 3. Data

To carry out the empirical analysis we use the Employer and Employee Survey (RIL), conducted by ISFOL in 2010 on a representative sample of over 25000 partnership and limited firms operating in the non-agricultural private sector<sup>6</sup>.

The RIL data collects a rich set of information about the individual profile of the employers, the use of different forms of flexible labor contracts and other information about firms’ characteristics and internal labor markets (see Appendix for detailed definitions of all variables).

In particular, RIL data allows to link the educational level of the employers and the firms’ use of two typologies of fixed term arrangements: on-the job training contracts (or fixed term contracts with training mandates) and fixed term contracts covered by collective bargaining. As stressed before, the difference between these typologies of temporary contracts appears crucial for firms’ personnel strategies. In fact, on-the-job training contracts (FTT, hereafter) are conceived as

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<sup>5</sup> We limit the analysis concerning employees to these two typologies, because of their higher diffusion: in fact, other “atypical” contracts introduced in 2003, such as the job insertion contract (*contratto di inserimento lavorativo*), the job sharing contract (*contratto di lavoro ripartito*) and the job-on-call contract (*contratto di lavoro a chiamata*), formally included among economically dependent workers, are still hardly used by firms.

<sup>6</sup> The RIL Survey sample is stratified by size, sector, geographic area and legal form of firms. The sample design of the RIL involves the use of variable probability of inclusion in the sample, where the range of inclusion depends on firm size, measured by the total number of employees. This choice has required the construction of a “direct estimator”, able to take account of the different probability of inclusion among the firms belonging to a specific stratum. In particular the direct estimator is defined for each sample unit (firm) as the inverse of the probability of inclusion in the sample.

The estimates obtained without the use of the direct estimator are therefore biased as large firms are over-represented with respect to their effective incidence in the reference population, having a probability of inclusion in the sample higher than that associated with small firms. Further the direct estimator has been modified by suitable calibration techniques, obtaining a final estimator calibrated according to a set of constraints. In such a way this estimator is able to reproduce, through the RIL sample, the total of active firms for each stratum and, simultaneously, the total number of employees in the same stratum (size, sector, etc.).

instruments to provide training (and screening period) to younger workers. They can also be viewed as institutional devices to stimulate the workers' efforts and the quality of training investment in the presence of labor contracts incompleteness. For these contracts a "stepping stones" effect towards regular contracts is more evident as shown by empirical analysis on transition rates (CNEL, 2006). Conversely, fixed term contracts covered by collective bargaining (FTCB, hereafter) are typically used to cope with numerical flexibility needed in a volatile economic environment without explicit perspective to transform these fixed term contracts into permanent ones.

The richness of this data is valuable also because the RIL sample is representative of both limited and partnership Italian firms. Then it allows to highlight the aspects of employers' behavior and personnel policies in small business firms. A feature almost unknown for the Italian productive system.

As for sample selection, the empirical analysis is limited to firms with at least five employees to guarantee a minimum level of organization of the internal labor markets. Further, the sample is restricted to these firms with no missing data on the key variables. Then the final sample over 10000 firms.

### **3.1. Descriptive statistics**

The weighted descriptive statistics of the RIL sample are displayed in Table 1.

The first figures to note is that on average the share of temporary workers is about 14% of the total employment. The majority of these workers is employed under fixed term contracts without training clause (9.4%) while the remaining part is employed under fixed term contracts with on-the-job training provisions (4.4%).

As for employers' characteristics, Table 1 shows a low incidence of employers with higher education: on average, only 23% of firms are managed by an employer with a tertiary level education. Similarly, our sample presents a small incidence of firms with employers younger than 40 years (12%) with respect to those managed by employers aged between 40 and 59 years (61%)

those with employers older than 60 years (27%). Indeed the individual profile of the Italian employers is associated with the predominant presence of firms small in size (76%) and family-owned (90%), which typically require less formal education and skills to be managed than firms large in size and market-owned (Leazar, 2009).

As for workforce characteristics, Table 1 indicates that the share of employees with a tertiary education is 8%, while the share of employees with upper secondary and lower secondary education are 48% and 49%, respectively. The low average educational attainment of employment reflects the weakness of labor demand for qualified workers in Italy already found by previous studies (Naticchioni, Ricci and Rustichelli, 2010). The share of employees who have attended a training course organized by firms is only 20% on average. A result in line with both the low propensity of Italian firm to invest in formal training and the positive complementary between training investment and schooling at workplace (Colombo and Stanca, 2010).

Table 1 indicates also other important firms characteristics such as innovative investments, the incidence of firm level bargaining and competitive pressures.

In particular, it is worth to noticing that the adoption of a decentralized bargaining scheme on wages and labor issues regards 6% of the samples firms while about 30% of those have invested in product and process innovations over the period 2007-2010.

To capture the competitive pressure of the economic environment, one may consider the incidence of firms operating in foreign market (23%) and the average level of profits, as formalized by the (log) return on equity (11.6). Instead, the province level of the unemployment rate in 2009 aim at capturing the tightness of the local labor market in which a firm operates.

Still, Table 1 shows that firms are mainly localized in Northern regions and small in size: on average, 76% of firms employ less than 15 workers while only 1% employ more than 250 employees. The descriptive picture is completed by observing that a relative concentration in manufacturing (28%), construction (14%) and some service sectors like retail and wholesale (23%) and hotels and restaurants (11%). Instead, there is a limited presence in those service sectors highly

intensive of human capital and skills: financial intermediation and insurance (1%), information, communication and other business services (7%) and health, education and private social service (2%).

In sum, the descriptive analysis already makes it evident a possible link between the low incidence of employers with higher education and the specific characteristics of the Italian productive system, managerial markets and ownership structure.

[Table 1 here ]

#### 4. Econometric analysis

The aim of the econometric analysis is to address our hypothesis about the negative effect of high educated employers on the firms' propensity to hire on temporary basis. In this framework, the proportion of fixed term contracts is estimated as a function of variables measuring individual profile of employers and a set of firm levels controls using RIL Survey.

Then, the equation of interest is the following:

$$(1) \quad \%FT_i = \alpha \cdot employer\_educ + \beta \cdot X_i + \delta \cdot Y_i + \varepsilon_i$$

where the dependent variable %FT is the share of fixed term workers over the total employment and *employer\_educ* is a dummy variable indicating whether the employer of firm *i* is graduated. Regarding controls,  $X_{it}$  is a vector which describe the composition of workforce,  $Y_i$  is a vector containing other firms and workplace characteristics and  $\varepsilon_i$  is an idiosyncratic error term (for details see Appendix).

Then, different specification of equation (1) are estimated by using a linear (OLS) regression model that makes it easier the interpretation of the coefficient estimates and is indicated for

estimating limited variable models with a dummy endogenous regressors (Angrist and Pischke, 2009).<sup>7</sup>

Indeed, a potential problem with standard OLS estimates of equation (1) is firms unobserved heterogeneity and endogeneity concerns.

In particular, if there are unobservable factors influencing both the average incidence of higher educated employers and firms' propensity to hire on temporary basis, the OLS estimates would suffer from omitted variable bias. Indeed, employers with a tertiary education might be more likely concentrated in those firms operating in sectors and/or final markets requiring on the job training, technological investments and cooperative employment relations which, themselves, are more favorable to longer job tenure and less temporary workers. In this case, the estimated effect of highly educated employers on the use of fixed term contracts may reflect unobserved heterogeneity rather than the human capital of the employers.

On the other hand, the reverse causality problem does not seem relevant in the context of equation (1). This is because the intensity of flexible staff arrangements used by firms are expected not affecting directly the probability of finding an employers with a tertiary level of education.

To deal with these concerns, we also perform an instrumental variable approach to estimate equation (1).

#### **4.1 Main Results**

The columns of Table 2 report the OLS estimates of different specifications of equation (1).

The first columns of Table 2 present the estimates under *Model 1*, in which the total share of FT contracts depends on the individual profile of the employer and some firms' controls, like size, geographical localization and sector of activity. Under this basic specification, an employer with

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<sup>7</sup> Indeed equation (1) can be estimated using a no linear regression. In particular Tobit model has been proposed by various authors dealing with the share of fixed term workers, as %FT is a fractional and skewed variable with significant number of observations equal to zero (Houseman, 2001; Cappelli and Neumark, 2004; Lee and Kim, 2005). We also preform Tobit estimates, that are available on request.

a tertiary education decreases (on average) by 2.1 percentage points the share of temporary workers over the total employment. As well, employers with more experience and informal skills, that is those with more 60 years old, discourage the use of flexible staff arrangements. This result emerges by observing that the coefficient estimates indicated that the presence of a “young” or “middle age” employer is associated to a reduction of the total share of fixed term workers equal to 4.6 and 1.7 percentage points, respectively (the omitted category is a dummy for employer with more than 60 years old). Further *Model 1* reveals that the intensity of use of fixed term contracts increases with firms size and their localization in North-East and Centre regions, as already stressed in the literature.

A second specification of equation (1) also includes a set of firms characteristics that are expected to control for ownership structure, industrial relations and competitive pressure of the economic environment: the incidence of family firms, local bargaining, level of profit, foreign market and innovative investments (*Model 2*). Under *Model 2* the negative impact of the employers’ tertiary education on the total share of temporary workers remains substantially unchanged with respect that found under *Model 2*: now the decrease is about 1.2 percentage points. As well, the impact of the age profile of employers remains unchanged with respect to previous results.

As for other covariates, it interesting to note the negative estimates associated with the incidence of local bargaining could indicate that cooperative industrial relations tends to oppose the dualism of internal labor markets. Further the OLS estimates obtained for the profit variable,  $\ln(ros)$ , is consistent with the literature that shows a positive association between financial constraints and the diffusion of flexible staff arrangements. Instead, the weak statistical significance of the dummy variables for foreign markets and innovation is partially related to the lack of better indicator to describe innovative firms and competitive pressure of the environment in which a firm operates.

The most complete specification of equation (1) contains also a number of variables for workforce characteristics (*Model 3*).

Under *Model 3* OLS estimates confirms the role of higher education of employers in reducing the total share of FT workers: in this case the decrease is found of about 1.9 percentage points. Clearly, such an estimate is not so different in magnitude and statistical significance from those found under more parsimonious specifications of equation (1).

On the other hand, *Model 3* shows a remarkable direct impact of employment composition on the type of labor contract offered by firms. In particular, firms with high proportion of higher educated workforce is likely to use more fixed term contracts: the average partial effects associated with the share of workers with tertiary education is 7.8 percentage points. This finding support the previous evidence about an occupational mismatch for highly educated workers in Italy. The labor market reforms enacted have progressively favored a personnel policies based on labor cost-saving for newly hired workers. This has increased, in turn, the likely that young workers with a tertiary education were assigned to low “quality” job under fixed term contracts (Naticchioni, Ricci and Rustichelli, 2008)<sup>8</sup>.

Further, an high proportion of trained workers discourages an intensive use of temporary contracts. This is in line with expectations, as the returns of on the job training for a firm typically require long job tenure and firing a trained worker implies the loss of the shared investment in specific skills. As well, employees subject to fixed term contracts are likely to exert a lower effort with respect to permanent ones performing the same task given the higher probability to lose their jobs (Boone, Belot, van Ours, 2007).

In sum, comparing the pattern of OLS estimates in Table 2, it emerges that the sequential introduction of firms and workforce characteristics does not alter the robustness of the negative

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<sup>8</sup> To better understand this results that sharply contrast with the international literature, one may refer to the following argument (Portugal and Varejio, 2009). It is well known that a key factor behind the choice of the contract firms offer is related to its hiring technology. In turn, the hiring technology crucially will depend on the cost of “employment failure” that is expected to increase as we move up in firms hierarchy positions (Rosen, 1982) . However the cost of failure increases with the educational level of employment if more skilled workers are hired to fill higher rank position inside the firm. This does not happens when it emerges a significant “mis-match” between the human capital of the employees and the average “quality” of jobs offered by firms. In this case, the positive correlation between the cost of employment failure and the educational attainments of workforce is considerably weaker. We argue that a situation characterizes the Italian productive system

relationship between the employers' higher education and the total share of fixed term contracts. This gives a first support of the hypothesis about the importance of accounting the educational level of employers as determinant of firms hiring policies<sup>9</sup>.

[Table 2 here]

### 5.1 Instrumental variable estimates

A potential problem with standard OLS estimates of equation (1) is the presence of endogeneity issues. In this section, then, we perform an instrumental variable approach to estimate different specifications of equation (1).

At this aim we use two excluded instruments: the occurrence of an external management at firm level obtained by the RIL in 2010 and the province share of population with a tertiary degree drawn from Census data in 2001.

Actually the RIL questionnaire allows to identify those firms which adopt a recruitment policy to select its own management. The existence of a recruitment procedure to select on efficient basis a management outside the firms' ownership ties is expected to be positively associated with an highly educated employer. This is because an employer with a tertiary education is expected to be more sensitive to the use of modern management practices than less educated ones. Such an argument is particularly important in Italian productive system when a predominant proportion of firms are family-owned and characterized by a "dynastic management". In such a context, those employers who chose to "share" or delegate some firms policies to a management selected outside the families ties is likely to have a "modern" culture of entrepreneurship that, in turn, should be positively correlated with their level of education. On the other hand, there are no clear reasons to

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<sup>9</sup> It is worth to note that similar results are obtained if a Tobit regression is performed to take into account the bounded and skewed nature of the dependent variable FT. In particular, the Tobit estimates of the average marginal effect (AME) for different Models of equation (1), obtained by using a maximum likelihood approach, are similar in magnitude and statistical significance from those derived by OLS regression.

suspect that the presence of an external management should influence the employers' decision about the use of flexible staff arrangements. This is because in firms small and size and family owned generally is the employers that directly decide about personnel policies (Bertrand and Schoar 2006).

As for the second instrument, we recover is the province share of individuals with a tertiary level of schooling over the total population obtained from Census data in 2001.

The rationale behind this choice is that average human capital endowments found in the "local markets" in 2001 is expected to be persistent over time and significantly associated with the schooling level of employers operating in the same geographical area/sector of activity in the year 2010. To put it differently, Italian provinces characterized by a large share of graduates in 2001 predicts an increase in the probability to find well-educated employers in operating in the same area ten years later. Conversely, the share of individuals with a tertiary level of schooling found in a given province in 2001 is unlikely to be correlated with the share of fixed term contract used in firm  $i$  operating in the same area/sector in 2010. This is because the diffusion of flexible staff arrangements depends on the exogenous process of labor market reforms and it is significantly variable over time. Thus we assume that the share of temporary workers employed in 2010 by firm  $i$  is expected to be not significantly correlated with the average level of education in the population resident in the same area ten years before.

At this point, Table 3 shows the 2SLS-IV estimates for different models of equation (1) reporting also the first stage regression in order to examining the explanatory power of the excluded instruments.

As for second stage regression, the IV estimates under *Model 1* points out that the presence of an employer with a tertiary education strongly reduces the proportion of fixed term workers by about 11 percentage points.

It is worth to note that IV estimates does not change markedly in magnitudes and statistical significance when in equation (1) are included a full set of control variables for workforce and

firms characteristics. This result may be derived by observing that under *Model 2* and *Model 3* the presence of an employer with a tertiary education decreases the total share of fixed term contracts by 8.9 and 11 percentage points, respectively. In other words, the “stable” pattern of IV estimates across different Models of equation (1) suggests that the negative impact of employers education on the use of flexible staff arrangements does significantly not depends on a full set of firms’ characteristics and/or workforce composition.

The sizeable negative effect of employers’ tertiary education obtained by IV estimates is further specified if we examine the results of age structure: young and middle age employers are considerably more likely to use fixed term contracts than employers with more than 60 years old (omitted variable), even though the magnitude of these effects are comparable to that found in Table 2.

In addition, comparing the magnitudes of OLS estimates (displayed in Table 2) and those of 2SLS-IV estimates (displayed Table 3) give us the importance of accounting for the endogeneity of employer education.

Actually, the first stage estimates of *Model 3* displayed in Table 3 allows us to demonstrate the robustness of our excluded instruments. In particular the estimates associated to both the occurrence of external management and the (province) share of population with tertiary education in 2001 are positive and strongly significant in predicting the presence of an employer with an university degree. Further both of these variables standard tests indicate no sign of weakness of the excluded instruments, supporting the hypothesis of strict exogeneity for the dependent variable (Stock-Yogo Weak test, Hansen J statistics, ecc).

Other interesting results emerge from the first stage regression. Among these, we note that firm size, the human capital of the workforce and the external recruitment of management positively predicts the occurrence of a graduated employer (see also Bugamelli et al. 2012; Ricci, 2012).

In sum the instrumental variable estimates confirms our hypothesis that improved education of employer could therefore reduce the firm need to increase labor flexibility through atypical employment contracts

[Table 3 here]

## 5. Distinguishing between different types of temporary contracts.

In this section the econometric analysis is performed by distinguishing on-the-job training contracts (FTT) and fixed term contracts without training clause (FTNT). As mentioned before, in such a way it is possible to verify whether the tertiary education of an employer affects comparatively more the diffusion fixed term contracts used to face with demand uncertainty (FTNT) than those used for screening and apprenticeship programs.

At sake of simplicity, we present only the standard OLS and IV estimates for a linear regression of the preferred specification of the equation (1).

In particular Table 4 reports the estimates of *Model 3* of the equation (1) when the dependent variables are the share of FTNT. Here OLS estimates indicate that the presence of an highly educated employer is associated to a reduction in the share of temporary workers without training clause of about 1 percentage points. However this small the negative effect is not more statistical significant when one perform an instrumental variable regression of equation (1).

This evidence, then, seems to give partial support to the hypothesis that attending schooling is associated with a multidimensional (and no separable) set of cognitive and non cognitive skills that, in the case of an employer, tends to weaken the positive impact of time impatience or

“hyperbolic discounting” on the diffusion of those fixed term contracts mainly used to face with demand uncertainty<sup>10</sup>.

[Table 4 here]

To complete the empirical picture, Table 5 displays the OLS and IV estimates of equation (1) when the dependent variable is the share of fixed term contracts used for on the job training and screening devices (FTT). In this case it is straightforward to note that the incidence of an employer with a tertiary education decreases the proportion of FTT by 0.9 percentage points and by 8.3 percentage points, if one examine OLS and IV estimates respectively.

Hence, the results of Table 5 seems to verify the hypothesis according which attaining an high level of education increase the probability that an employer face the incompleteness of labor contracts by favoring inclusive and cooperative employment relations rather than using fixed term contracts as a screening and discipline device.

[Table 5]

## 6. Conclusions

This paper shows that the education of employers significantly reduce the firms’ use of different forms of fixed term contracts in a large sample of Italian firms. This result is robust to the use of different estimation strategies in order to deal with endogeneity concerns and firms unobserved heterogeneity. To the best of our knowledge, this paper is the first one to shed light on this issue.

These findings appear valuable for policy implications since they to point out the importance of individual profile of employers for the adoption of “high road” human resource management practices as opposed to “low road” ones (Michie and Sheenan, 2003).

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<sup>10</sup> The first stage estimates displayed in Table 4 do not deserve further comments, being analogous to what found in Table 3.

An high educational level for employers is associated with those cognitive and no cognitive skills that make them to be aware that an extensive use of flexible job arrangement lower incentives to acquire firm specific skills and cooperative employment relations at workplace. Then, policy measures aimed at enhancing the human capital of employers may significantly contrast the perverse effect of fixed term contracts on labor market, favoring competitive strategies based on innovative performance, accumulation of firm specific skills and productivity growth (Oecd, 2008).

These entrepreneurship policies may be also integrated with the introduction of fiscal incentives to turn the closed-end contracts into permanent contracts in order to address the negative effect for firms and workers of an unstable job arrangements, while preserving some margins of contractual flexibility (Lotti and Viviano, 2011).

However it is worth noticing that our evidence is based on cross sectional data. Then the long run effect of the individual profile of employers on the diffusion of flexible staff arrangements may be different from the ones found in the short run. As well, it would be interesting to investigate how the type (not simply the level) of employers' education affect the proportion of fixed term contracts which are transformed into open ended contracts after a probation period which allow firms to better screen the most productive workers. These questions are left for future research.

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**Table 1: Descriptive statistics with sampling weights**

|                                     | Mean  | Std dev | Min  | Max  |
|-------------------------------------|-------|---------|------|------|
| <b>Fixed term workers</b>           |       |         |      |      |
| % total fixed term                  | 0.14  | 0.22    | 0    | 1    |
| % fixed term with training          | 0.04  | 0.10    | 0    | 1    |
| % fixed term without training       | 0.09  | 0.20    | 0    | 1    |
| <b>Employers characteristics</b>    |       |         |      |      |
| Tertiary education (0/1)            | 0.23  | 0.42    | 0    | 1    |
| entrep. age =Young                  | 0.12  | 0.32    | 0    | 1    |
| entrep age = middle                 | 0.61  | 0.49    | 0    | 1    |
| entrep. age =Young                  | 0.27  | 0.44    | 0    | 1    |
| <b>Workers characteristics</b>      |       |         |      |      |
| % tertiary education                | 0.08  | 0.17    | 0    | 1    |
| % upper secondary education         | 0.44  | 0.30    | 0    | 1    |
| % lower secondary education         | 0.47  | 0.34    | 0    | 1    |
| % female                            | 0.37  | 0.29    | 0    | 1    |
| % trained                           | 0.20  | 0.33    | 0    | 1    |
| <b>Firms characteristics</b>        |       |         |      |      |
| family firm                         | 0.90  | 0.30    | 0    | 1    |
| product innovation                  | 0.39  | 0.49    | 0    | 1    |
| process innovation                  | 0.31  | 0.46    | 0    | 1    |
| local bargaining                    | 0.06  | 0.24    | 0    | 1    |
| foreign market                      | 0.23  | 0.42    | 0    | 1    |
| ln (ros)                            | 11.66 | 1.21    | 3.14 | 19.5 |
| unemployment rate 2009 (at prov)    | 0.07  | 0.03    | 0.02 | 0.19 |
| <b>Size</b>                         |       |         |      |      |
| 5 <n. employees <15                 | 0.76  | 0.43    | 0    | 1    |
| 14 <n. employees <50                | 0.19  | 0.39    | 0    | 1    |
| 49 < n. employees <250              | 0.04  | 0.20    | 0    | 1    |
| n. employees> 249                   | 0.01  | 0.08    | 0    | 1    |
| <b>macro regions</b>                |       |         |      |      |
| North Ovest                         | 0.31  | 0.46    | 0    | 1    |
| North East                          | 0.26  | 0.44    | 0    | 1    |
| Centre                              | 0.21  | 0.41    | 0    | 1    |
| South                               | 0.22  | 0.41    | 0    | 1    |
| <b>Sector</b>                       |       |         |      |      |
| Quarrying, Mining etc               | 0.00  | 0.05    | 0    | 1    |
| manufacturing                       | 0.29  | 0.45    | 0    | 1    |
| gas, water and gas distribution     | 0.01  | 0.10    | 0    | 1    |
| Construction                        | 0.14  | 0.34    | 0    | 1    |
| retail and wholesale                | 0.22  | 0.42    | 0    | 1    |
| trasportation                       | 0.03  | 0.18    | 0    | 1    |
| hotels and restaurants              | 0.11  | 0.31    | 0    | 1    |
| insurance, financial intermediation | 0.01  | 0.12    | 0    | 1    |
| real estate and rental              | 0.05  | 0.21    | 0    | 1    |

|                                                        |       |      |   |   |
|--------------------------------------------------------|-------|------|---|---|
| information, communication and other business services | 0.09  | 0.28 | 0 | 1 |
| health, education and social services                  | 0.02  | 0.15 | 0 | 1 |
| sports, entertainment and other services               | 0.03  | 0.17 | 0 | 1 |
| <b>N of obs</b>                                        | 11026 |      |   |   |

**Table 2: OLS estimates: dep var: total share of FT**

|                                  | Model 1 |     |        | Model 2 |     |              | Model 3 |     |        |
|----------------------------------|---------|-----|--------|---------|-----|--------------|---------|-----|--------|
|                                  | coeff   |     | std er | coeff   |     | std er       | coeff   |     | std er |
| <b>Employer characteristics</b>  |         |     |        |         |     |              |         |     |        |
| employer tertiary educ           | -0.021  | *** | 0.003  | -0.012  | *** | 0.004        | -0.019  | *** | 0.004  |
| employer age =Young              | 0.046   | *** | 0.006  | 0.043   | *** | 0.006        | 0.043   | *** | 0.007  |
| entrep age = middle              | 0.022   | *** | 0.003  | 0.022   | *** | 0.003        | 0.021   | *** | 0.003  |
| <b>Workforce characteristics</b> |         |     |        |         |     |              |         |     |        |
| % tertiary education             |         |     |        |         |     |              | 0.078   | *** | 0.012  |
| % upper secondary education      |         |     |        |         |     |              | 0.006   |     | 0.007  |
| % female                         |         |     |        |         |     |              | 0.035   | *** | 0.008  |
| % trained                        |         |     |        |         |     |              | -0.019  | *** | 0.004  |
| unemployemnt rate 2009           |         |     |        |         |     |              | 0.036   |     | 0.093  |
| <b>Firm charateristics</b>       |         |     |        |         |     |              |         |     |        |
| Family firm                      |         |     |        | 0.012   | *** | 0.004        | 0.015   | *** | 0.004  |
| foreign market                   |         |     |        | -0.008  | **  | 0.003        | -0.013  | *** | 0.004  |
| product innov                    |         |     |        | 0.008   | **  | <b>0.004</b> | 0.011   | *** | 0.004  |
| process innov                    |         |     |        | -0.001  |     | 0.004        | -0.004  |     | 0.004  |
| local bargaining                 |         |     |        | -0.033  | *** | 0.004        | -0.029  | *** | 0.004  |
| ln (ros)                         |         |     |        | -0.013  | *** | 0.001        | -0.013  | *** | 0.001  |
| North Ovest                      | -0.021  | *** | 0.004  | -0.013  | *** | 0.005        | -0.010  |     | 0.007  |
| North East                       | 0.000   |     | 0.005  | 0.008   | *   | 0.005        | 0.012   |     | 0.008  |
| Centre                           | -0.002  |     | 0.005  | 0.004   |     | <b>0.005</b> | 0.008   |     | 0.007  |
| 14 <n. employees <50             | 0.015   | *** | 0.003  | 0.019   | *** | 0.004        | 0.021   | *** | 0.004  |
| 49 < n. employees <250           | 0.011   | *** | 0.004  | 0.025   | *** | 0.005        | 0.022   | *** | 0.005  |
| n. employees >249                | -0.003  |     | 0.006  | 0.021   | *** | 0.007        | 0.017   | **  | 0.007  |
| sector dummies                   |         | Yes |        |         | Yes |              |         | Yes |        |
| constant                         | 0.049   | *** | 0.007  | 0.191   | *** | 0.018        | 0.190   | *** | 0.023  |
| F(.)                             |         |     | 51.17  |         |     | 45.85        |         |     | 31.650 |
| Prob > F                         |         |     | 0.00   |         |     | 0.00         |         |     | 0.000  |
| R-squared                        |         |     | 0.14   |         |     | 0.15         |         |     | 0.146  |
| <b>N of obs</b>                  |         |     | 14298  |         |     | 13663        |         |     | 11016  |

Source: RIL-ISFOL data. Note: omitted variable, employer with lower education and with age more than 60; south, <4 n. of employees<15; Statistical significance \*\*\* at 1%, \*\* at 5%, \* at 10%

**Table 3: 2SLS Instrumental variable regression; var dip: total share of FT**

|                                                            | Model 1    |        |  | Model 2    |        |  | Model 3    |        |  | First Step |        |  |
|------------------------------------------------------------|------------|--------|--|------------|--------|--|------------|--------|--|------------|--------|--|
|                                                            | coef       | std er |  | coef       | std er |  | coef       | std er |  | coef       | std er |  |
| <b>Employer characteristics</b>                            |            |        |  |            |        |  |            |        |  |            |        |  |
| employer tertiary educ                                     | -0.109 *** | 0.017  |  | -0.089 *** | 0.024  |  | -0.108 *** | 0.031  |  |            |        |  |
| employer age =Young                                        | 0.056 ***  | 0.007  |  | 0.052 ***  | 0.007  |  | 0.052 ***  | 0.008  |  | 0.105 ***  | 0.015  |  |
| entrep age = middle                                        | 0.028 ***  | 0.003  |  | 0.026 ***  | 0.003  |  | 0.025 ***  | 0.004  |  | 0.050 ***  | 0.009  |  |
| <b>Workforce characteristics</b>                           |            |        |  |            |        |  |            |        |  |            |        |  |
| % tertiary education                                       |            |        |  |            |        |  | 0.124 ***  | 0.021  |  | 0.483 ***  | 0.028  |  |
| % upper secondary education                                |            |        |  |            |        |  | 0.015 *    | 0.008  |  | 0.113 ***  | 0.014  |  |
| % female                                                   |            |        |  |            |        |  | 0.038 ***  | 0.008  |  | 0.037 **   | 0.017  |  |
| % trained                                                  |            |        |  |            |        |  | -0.019 *** | 0.004  |  | 0.005      | 0.011  |  |
| unemployment rate 2009                                     |            |        |  |            |        |  | 0.105      | 0.098  |  | 0.803 ***  | 0.211  |  |
| <b>Firm characteristics</b>                                |            |        |  |            |        |  |            |        |  |            |        |  |
| family firm                                                |            |        |  | -0.002     | 0.006  |  | 0.002      | 0.006  |  | -0.103 *** | 0.013  |  |
| foreign market                                             |            |        |  | -0.003     | 0.004  |  | -0.008 **  | 0.004  |  | 0.048 ***  | 0.010  |  |
| product innov                                              |            |        |  | 0.010 **   | 0.004  |  | 0.011 ***  | 0.004  |  | -0.001     | 0.010  |  |
| process innov                                              |            |        |  | -0.001     | 0.004  |  | -0.002     | 0.004  |  | 0.020 **   | 0.010  |  |
| local bargaining                                           |            |        |  | -0.023 *** | 0.005  |  | -0.018 *** | 0.006  |  | 0.109 ***  | 0.014  |  |
| ln (ros)                                                   |            |        |  | -0.011 *** | 0.001  |  | -0.012 *** | 0.002  |  | 0.022 ***  | 0.004  |  |
| North Ovest                                                | -0.019 *** | 0.005  |  | -0.007     | 0.007  |  | -0.005     | 0.008  |  | 0.015      | 0.018  |  |
| North East                                                 | -0.004     | 0.005  |  | 0.010      | 0.008  |  | 0.010      | 0.008  |  | -0.042 **  | 0.019  |  |
| Centre                                                     | -0.004     | 0.005  |  | 0.006      | 0.007  |  | 0.005      | 0.007  |  | -0.075 *** | 0.017  |  |
| 14 <n. employees <50                                       | 0.023 ***  | 0.004  |  | 0.023 ***  | 0.004  |  | 0.026 ***  | 0.004  |  | 0.054 ***  | 0.009  |  |
| 49 < n. employees <250                                     | 0.033 ***  | 0.006  |  | 0.035 ***  | 0.006  |  | 0.034 ***  | 0.007  |  | 0.129 ***  | 0.015  |  |
| n. employees >249                                          | 0.038 ***  | 0.010  |  | 0.040 ***  | 0.010  |  | 0.037 ***  | 0.011  |  | 0.219 ***  | 0.024  |  |
| sector dummies                                             | Yes        |        |  | Yes        |        |  | Yes        |        |  | Yes        |        |  |
| management external recruitment                            |            |        |  |            |        |  |            |        |  | 0.134 ***  | 0.019  |  |
| share of population with tertiary education in 2001 (prov) |            |        |  |            |        |  |            |        |  | 3.129 ***  | 0.358  |  |
| constant                                                   | 0.061 ***  | 0.008  |  | 0.177 ***  | 0.022  |  | 0.179 ***  | 0.024  |  | -0.292 *** | 0.060  |  |
| F()                                                        | 49.120     |        |  | 42.340     |        |  | 29.810     |        |  | 150.07     |        |  |
| Prob > F                                                   | 0.000      |        |  | 0.000      |        |  | 0.000      |        |  | 0.00       |        |  |
| Centered R2                                                | 0.102      |        |  | 0.125      |        |  | 0.108      |        |  | 0.27       |        |  |
| Uncentered R2                                              | 0.353      |        |  | 0.370      |        |  | 0.352      |        |  | 0.51       |        |  |
| <b>Number of obs</b>                                       | 14105      |        |  | 13493      |        |  | 10926      |        |  | 10926      |        |  |

Source: RIL-ISFOL data. Note: omitted variable, employer with lower education and with age more than 60; south, <4 n. of employees<15; Statistical significance \*\*\* at 1%, \*\* at 5%, \* at 10%

**Table 4: OLS and 2sls Instrumental variable estimates; dep var : share of FTNT**

|                                                           | OLS    |     |        | 2SLS-IV |     |        | First Stage |     |         |
|-----------------------------------------------------------|--------|-----|--------|---------|-----|--------|-------------|-----|---------|
|                                                           | coef   |     | std er | coef    |     | std er | coef        |     | std er  |
| <b>Employer characteristics</b>                           |        |     |        |         |     |        |             |     |         |
| employer tertiary educ                                    | -0.010 | *** | 0.004  | -0.026  |     | 0.028  |             |     |         |
| employer age =Young                                       | 0.028  | *** | 0.006  | 0.029   | *** | 0.007  | 0.105       | *** | 0.015   |
| entrep age = middle                                       | 0.008  | *** | 0.003  | 0.008   | **  | 0.003  | 0.050       | *** | 0.009   |
| <b>Workforce characteristics</b>                          |        |     |        |         |     |        |             |     |         |
| % tertiary education                                      | 0.053  | *** | 0.012  | 0.061   | *** | 0.019  | 0.483       | *** | 0.028   |
| % upper secondary education                               | -0.012 | *   | 0.006  | -0.011  |     | 0.007  | 0.113       | *** | 0.014   |
| % female                                                  | 0.022  | *** | 0.007  | 0.023   | *** | 0.007  | 0.037       | **  | 0.017   |
| % trained                                                 | -0.023 | *** | 0.004  | -0.023  | *** | 0.004  | 0.005       |     | 0.011   |
| unemployemnt rate 2009                                    | -0.012 |     | 0.086  | 0.002   |     | 0.089  | 0.803       | *** | 0.211   |
| <b>Firm characteristics</b>                               |        |     |        |         |     |        |             |     |         |
| family firm                                               | 0.001  |     | 0.004  | -0.002  |     | 0.005  | -0.103      | *** | 0.013   |
| foreign market                                            | -0.008 | **  | 0.003  | -0.007  | **  | 0.004  | 0.048       | *** | 0.010   |
| product innov                                             | 0.004  |     | 0.004  | 0.004   |     | 0.004  | -0.001      |     | 0.010   |
| process innov                                             | -0.005 |     | 0.003  | -0.005  |     | 0.003  | 0.020       | **  | 0.010   |
| local bargaining                                          | -0.016 | *** | 0.004  | -0.014  | *** | 0.005  | 0.109       | *** | 0.014   |
| ln (ros)                                                  | -0.009 | *** | 0.001  | -0.009  | *** | 0.001  | 0.022       | *** | 0.004   |
| North Ovest                                               | -0.021 | *** | 0.007  | -0.021  | *** | 0.007  | 0.015       |     | 0.018   |
| North East                                                | -0.008 |     | 0.007  | -0.009  |     | 0.008  | -0.042      | **  | 0.019   |
| Centre                                                    | -0.012 | *   | 0.006  | -0.013  | **  | 0.007  | -0.075      | *** | 0.017   |
| 14 <n. employees <50                                      | 0.029  | *** | 0.004  | 0.029   | *** | 0.004  | 0.054       | *** | 0.009   |
| 49 < n. employees <250                                    | 0.032  | *** | 0.005  | 0.034   | *** | 0.006  | 0.129       | *** | 0.015   |
| n. employees >249                                         | 0.021  | *** | 0.007  | 0.024   | **  | 0.010  | 0.219       | *** | 0.024   |
| sector dummies                                            |        | Yes |        |         | Yes |        |             | Yes |         |
| managment external recruitment                            |        |     |        |         |     |        | 0.134       | *** | 0.019   |
| share of population with tertary education in 2001 (prov) |        |     |        |         |     |        | 3.129       | *** | 0.358   |
| constant                                                  | 0.166  | *** | 0.021  | 0.168   | *** | 0.021  | -0.292      | *** | 0.060   |
| F( 31, 10984)                                             |        |     | 22.570 |         |     | 22.450 |             |     | 150.070 |
| Prob > F                                                  |        |     | 0.000  |         |     | 0.000  |             |     | 0.000   |
| R2                                                        |        |     | 0.136  |         |     | 0.136  |             |     | 0.274   |
| Uncentered R2                                             |        |     |        |         |     | 0.291  |             |     | 0.511   |

|               |       |       |       |
|---------------|-------|-------|-------|
| Number of obs | 11016 | 10926 | 10926 |
|---------------|-------|-------|-------|

Source: RIL-ISFOL data. Note: omitted variable, employer with lower education and with age more than 60; south, <4 n. of employees<15; Statistical significance \*\*\* at 1%, \*\* at 5%, \* at 10%

**Table 5: OLS and 2sls Instrumental variable estimates; dep var : share of FTT**

|                                                           | OLS        |  |        | 2SLS-IV    |  |        | First Stage |  |        |
|-----------------------------------------------------------|------------|--|--------|------------|--|--------|-------------|--|--------|
|                                                           | coef       |  | std er | coef       |  | std er | coef        |  | std er |
| <b>Employer characteristics</b>                           |            |  |        |            |  |        |             |  |        |
| employer tertiary educ                                    | -0.009 *** |  | 0.002  | -0.083 *** |  | 0.016  |             |  |        |
| employer age =Young                                       | 0.016 ***  |  | 0.004  | 0.023 ***  |  | 0.004  | 0.105 ***   |  | 0.015  |
| entrep age = middle                                       | 0.012 ***  |  | 0.002  | 0.016 ***  |  | 0.002  | 0.050 ***   |  | 0.009  |
| <b>Workforce characteristics</b>                          |            |  |        |            |  |        |             |  |        |
| % tertiary education                                      | 0.023 ***  |  | 0.005  | 0.061 ***  |  | 0.010  | 0.483 ***   |  | 0.028  |
| % upper secondary education                               | 0.017 ***  |  | 0.004  | 0.026 ***  |  | 0.004  | 0.113 ***   |  | 0.014  |
| % female                                                  | 0.013 ***  |  | 0.004  | 0.016 ***  |  | 0.004  | 0.037 **    |  | 0.017  |
| % trained                                                 | 0.004      |  | 0.002  | 0.004      |  | 0.003  | 0.005       |  | 0.011  |
| unemployemnt rate 2009                                    | 0.026      |  | 0.042  | 0.080 *    |  | 0.046  | 0.803 ***   |  | 0.211  |
| <b>Firm charateristics</b>                                |            |  |        |            |  |        |             |  |        |
| family firm                                               | 0.013 ***  |  | 0.002  | 0.003      |  | 0.003  | -0.103 ***  |  | 0.013  |
| foreign market                                            | -0.005 **  |  | 0.002  | -0.001     |  | 0.002  | 0.048 ***   |  | 0.010  |
| product innov                                             | 0.007 ***  |  | 0.002  | 0.007 ***  |  | 0.002  | -0.001      |  | 0.010  |
| process innov                                             | 0.002      |  | 0.002  | 0.003      |  | 0.002  | 0.020 **    |  | 0.010  |
| local bargaining                                          | -0.013 *** |  | 0.002  | -0.005 *   |  | 0.003  | 0.109 ***   |  | 0.014  |
| ln (ros)                                                  | -0.004 *** |  | 0.001  | -0.002 *** |  | 0.001  | 0.022 ***   |  | 0.004  |
| North Ovest                                               | 0.011 ***  |  | 0.004  | 0.015 ***  |  | 0.004  | 0.015       |  | 0.018  |
| North East                                                | 0.019 ***  |  | 0.004  | 0.018 ***  |  | 0.004  | -0.042 **   |  | 0.019  |
| Centre                                                    | 0.019 ***  |  | 0.003  | 0.017 ***  |  | 0.004  | -0.075 ***  |  | 0.017  |
| 14 <n. employees <50                                      | -0.007 *** |  | 0.002  | -0.003 *   |  | 0.002  | 0.054 ***   |  | 0.009  |
| 49 < n. employees <250                                    | -0.010 *** |  | 0.002  | 0.000      |  | 0.003  | 0.129 ***   |  | 0.015  |
| n. employees >249                                         | -0.004     |  | 0.003  | 0.014 ***  |  | 0.005  | 0.219 ***   |  | 0.024  |
| sector dummies                                            |            |  |        |            |  |        |             |  |        |
| managment external recruitment                            |            |  |        |            |  |        | 0.134 ***   |  | 0.019  |
| share of population with tertary education in 2001 (prov) |            |  |        |            |  |        | 3.129 ***   |  | 0.358  |
| constant                                                  | 0.024 ***  |  | 0.010  | 0.011      |  | 0.010  | -0.292 ***  |  | 0.060  |
| F( 31, 10984)                                             |            |  | 21.760 |            |  | 18.880 |             |  | 150.07 |
| Prob > F                                                  |            |  | 0.000  |            |  | 0.000  |             |  | 0.000  |

|               |       |        |       |
|---------------|-------|--------|-------|
| R-squared     | 0.059 | -0.053 | 0.274 |
| Uncentered R2 |       | 0.090  | 0.511 |
| Number of obs | 11016 | 10926  | 10926 |