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Absenteeism, unemployment and employment protection legislation: evidence from Italy

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Abstract

Efficiency wages theories argue that the threat of firing, coupled with a high unemployment rate, is a mechanism that discourages employee shirking in asymmetric information contexts. Our empirical analysis aims to test the role of unemployment as a worker discipline device, considering the different degree of job security offered by the Italian Employment Protection Legislation to workers employed in small and large firms. Controlling for a number of individual and firm characteristics, we investigate the relationship between worker's absences which act as a proxy for employee shirking and local unemployment rate (at the provincial level). We find a strong negative association between unemployment and absenteeism rate, larger in magnitude in small firms due presumably to a significantly lower protection from dismissals in these firms. As an indirect test of the role of unemployment as worker discipline device, we show that public sector employees, almost impossible to fire, do not react to the local unemployment.

JEL codes: J41; M51; J45

Keywords: Shirking; Absenteeism; Employment protection legislation; Unemployment

1 Introduction

In their seminal paper, Shapiro and Stiglitz (1984) showed that unemployment can represent a "worker discipline device" in moral hazard contexts. Because of the threat of unemployment, the incentives to shirk for employees decrease in high unemployment states in which it would be hard to find a new job in case of dismissal, while shirking increases, for the opposite reason, when labor markets are tight.

Due to the difficulty in observing shirking behavior, the empirical evidence of this relationship has been rather scant. Cappelli and Chauvin (1991) showed an inverse relationship between local unemployment and disciplinary sanctions for employees working in different plants of a large US firm. Similarly, Campbell (1994) found out that when local and industry unemployment rates are lower, worker dismissals are higher because presumably shirking is more frequent.

More recently, worker's shirking has been proxied by the absenteeism rate: since the worker is typically fully covered by the national insurance system (or by the employer) when sick and her effective state of health cannot be observed by the employer, the worker has an incentive to take days off while preserving the whole wage, causing pecuniary and

non-pecuniary costs to the firm. Along these lines, a few papers have shown an inverse relationship between industry or regional unemployment and absenteeism at individual level (Leigh 1985; Askildsen et al. 2005). A much larger literature shows that employees' sickness absences are positively related to the degree of job security (Ichino and Riphahn 2005, among others).

The main aim of this paper is to investigate the relationship between unemployment and worker's absenteeism at the individual level. We exploit a large Italian dataset of individual work histories based on Social Security administrative records (WHIP) in which, in addition to standard information on individuals and firms, we observe employees' absence rates that we relate to the local unemployment rate. Differently from the existing literature, we refer to the unemployment rate at provincial level (NUTS3 level). This turns out to be particularly important in Italy where individuals' mobility is extremely low (see Faini et al. 1997) and workers mainly look at their local labor market. We exploit cross-sectional (103 provinces) and time (10 years) variations of unemployment and take into account possible heterogeneity in social capital and work ethics controlling for workers' region of birth (or, alternatively, for individual fixed effects).

A neglected aspect in the literature relating absenteeism and unemployment is the role played by the degree of job security enjoyed by the employees. The effectiveness of the unemployment threat for shirking employees heavily depends on firing restrictions: when the Employment Protection Legislation (EPL) makes it extremely costly for firms to dismiss workers, the level of unemployment should have little impact on employees' decisions to work hard; on the other hand, the threat of unemployment is more effective if job security is low. Whereas we are aware that a number of papers in the literature have analyzed separately the relationships between absenteeism and EPL and between absenteeism and unemployment, the contribution of this paper is to bring together these elements to show their interdependence.

The structure of the Italian labor market characterized by different degrees of job security offered by the EPL to workers employed in small firms (with 15 or less employees) and large firms (more than 15 employees) gives us the unique opportunity to investigate if unemployment has a different influence on workers' behavior employed in the two types of firms.

Controlling for a number of individual and firm characteristics, we find that the individual absenteeism rate is negatively and strongly related to the provincial unemployment rate. In particular, we find that in high unemployment Southern areas shirking is dramatically lower than in Northern areas, notwithstanding South Italy is characterized by lower levels of social capital and more widespread opportunistic behavior (Ichino and Maggi 2000; Guiso et al. 2004). In addition, the association between unemployment and shirking behavior is significantly stronger in small firms than in large firms, arguably because of the significantly lower protection from dismissal in the former. These results are consistent through different robustness checks.

To corroborate our findings, using the Bank of Italy's Survey on Household Income and Wealth which includes both public and private employees, we show that public employees, who are almost not dismissable, do not react in terms of sickness absences to the unemployment rate in their local labor market.

An important hypothesis in the mechanism relating sickness absences to the local unemployment is that firms effectively adopt the strategy of firing employees who are

more frequently absent. To provide more evidence on this aspect we estimate a model for the employee's probability of becoming unemployed and verify whether his/her absence behavior is related to his/her risk of becoming unemployed in the future. The results indicate that an increase in the frequency of sick spells are associated with a higher risk of being dismissed in the near future. Although data limitations do not allow us to exclude other possible explanations for this result, it is consistent with the role of unemployment as a worker discipline device.

The remainder of the paper is organized as follows. Section 2 provides a brief review of the existing literature. Section 3 describes the institutional background. Section 4 presents the data and the sample selection procedure. Estimates of the relationship between unemployment and absenteeism and its differential effect in small and large firms are presented in Section 5. A number of robustness checks are carried out in Section 6. Section 7 investigates the correlation pattern of sickness absence behavior and the risk of subsequent unemployment. Finally, Section 8 concludes.

2 Literature review

A wide literature has analyzed worker absenteeism in relation to individual characteristics and to contractual and institutional aspects (see, among others, Barmby et al. 1994; Johansson and Palme 1996, 2002; Ichino and Riphahn 2005). In particular, a number of papers has studied the impact of labor market conditions and employment protection systems on worker's sickness absences.

Unemployment has been found to have a negative impact on workers' decision to take sick leaves. This inverse relationship has been explained by two different mechanisms. First, it has been argued that during periods of low unemployment individuals have better chances of finding a job and, as a consequence, they have higher incentives to shirk due to lower expected costs from losing the job. In other words, a high level of unemployment acts as a worker discipline device, curbing opportunism. In the second place, the inverse relationship may be the result of a change in the composition of the labor force. It is likely that workers with low absence rates are retained during economic recessions while more absence-prone workers are laid off, giving rise to a pro-cyclical pattern of the aggregate absence rate ("selection effect").

A few studies have investigated the cyclicality of workplace absenteeism. Leigh (1985) has been the first study to find support for the hypothesis that in the US a pro-cyclical absence rate can be due both to a fear of being fired during periods of high unemployment and to a selection effect. Askildsen et al. (2005) find that county-specific unemployment rates in Norway are negatively related to both the probability of having a sickness spell in a given year and to the duration of absence. Since this also holds for a subsample of high tenured workers, they conclude that the selection effect is not driving the cyclical behavior and the incentive effect dominates the composition effect for explaining cyclical fluctuations in absenteeism. A limitation of their study is that they only observe absences longer than 15 days while opportunistic behavior could manifest especially in short term absences. The same result has been found by Fahr and Frick (2007) who find clear evidence in favor of an incentive effect when examining the impact on monthly absence rates of changes in the unemployment benefit entitlement system in Germany for the years 1991–2004.

Arai and Thoursie (2005) investigate the correlation between sick rates and the share of temporary contracts in Sweden. They find that temporary workers have lower sick-rates (generating a negative correlation between the absenteeism rate and the fraction of temporary contracts), implying that an employee incentive effect is at work, rather than a selection effect, since the latter would have instead generated a positive correlation between absenteeism and temporary contracts.

Complementary to these works, Hesselius (2007) shows that an increase in current or previous sickness absences has a negative effect on the probability of retaining the job: the absence behavior of the worker can be seen as a signal to the employer of the worker's health status and/or her shirking attitude. Similarly, Markussen (2012) has shown that sick leave has a negative effect on subsequent earnings and employment.

A parallel literature has investigated the role of EPL in the workers' decisions to take sickness absences. Ichino and Riphahn (2005) show that employees of a large Italian bank are less absent during their probationary period (the initial 3 months of employment, in which they can be fired at will) than when they become permanent employees, when firings become extremely costly for the firm. Similarly, Riphahn and Thalmaier (2001) find that German employees show a higher probability to be absent after their probationary period of 6 months. Along the same lines, Riphahn (2004) shows that German public sector employees with long tenure (virtually impossible to fire) are absent more often than their younger colleagues. Leombruni (2011) and Cristini et al. (2012) find that workers with temporary contracts (introduced in Italy at the end of the 1990s), not covered by the employment protection, take less absences than workers with permanent contracts. Scoppa (2010a) shows that the 1990 reform introducing a more stringent employment protection legislation for small firms in Italy has determined a significant increase in employee absenteeism in these firms compared to large firm employees unaffected by the reform. Olsson (2009) analyzes how sickness absence behavior changes after a reduction of employment protection enacted in Sweden in 2001. He finds that short-term sickness absences are reduced as employees in small firms perceive a higher job insecurity due to the new legislation. Exploring the same reform of job security, Lindbeck et al. (2006) find an overall reduction in the average work absence rate. They also show that people with high absenteeism rates tend to leave those firms affected by the reform and that in turn firms become less reluctant to hire workers with a history of high sickness absences.

3 The institutional background: the sickness benefit system and EPL in Italy

Employees in Italy are almost fully-insured against earnings losses due to illness. The Italian Institute of Social Security (INPS) pays for sick leave benefits after the third day of absence and collective employment contracts establish that employers pay for the first three days. Moreover, for subsequent days of absence, summing up the part covered by INPS with the fraction paid by her employer, a worker ends up obtaining almost 100 percent of her wage for absences due to health problems. The sick leave benefits is computed on the basis of the total salary received in the month preceding the sickness episode. In order to be eligible for sickness benefits, the worker must provide a doctor's certificate, which can be easily obtained and renewed more than once. However, a worker cannot be insured for sickness absences for more than 180 days in the same calendar year.

Since the worker's effective state of health is typically costly to observe for the employer or for public authorities, sickness absences, beyond true health problems, may hide

opportunistic behaviors. In other words, the full-coverage insurance creates a moral hazard problem for employees, who are induced to take days off, preserving the whole wage without providing any effort.

In addition to the possibility of being absent from work without suffering significant wage reductions, employees are highly protected against dismissal by the Italian legislation. As it is well-known, Italy has one of the strictest EPL among OECD countries (see OECD 1999; Boeri and Jimeno 2005), but with significant differences for employees of small and large firms.

Since The Charter of Workers Rights (Law 300/1970), individual dismissals are allowed in large firms only if there exists a "just cause" (for productive reasons or for severe misconduct of the employee). More precisely, a worker can be fired for "justified objective motive" that is, "for justified reasons concerning the production activity or the organization of labor in the firm"; or for "justified subjective motive" that is, "in case of a significantly inadequate fulfillment of the employee's tasks specified by the contract". Moreover, large firms are required to give to the employee a term of notice in order to proceed with an individual dismissal, whose length depends on the tenure of the worker, with detailed indications of the reasons for the dismissal. The worker can easily appeal to a Court against the dismissal. If the judge rules that the dismissal is "unfair", the employee in a large firm has the right to receive as severance payments: 1) all the foregone earnings after the dismissal until the sentence (and the corresponding social security contributions); 2) either an extra financial compensation of 15 months earnings or the reinstatement in the firm (the choice is up to the worker). In addition, the firm has to pay the legal costs and a penalty for the delayed payment of social security contributions of up to 200% of the original sum due.

Since judges ultimately decide on the validity of the motives given by the firm, for large firms the compensation in case of unfair dismissal depends on the duration of the trial, which in Italy can be very long. This implies that it is not so much the law *per se* as the uncertainty surrounding the court's ruling that makes it harder to dismiss workers (Ichino 1996; Ichino and Riphahn 2004). Furthermore, large firms might be worried of the reinstatement in the firm of poorly motivated employees after the attempted firing[1].

Firms with less than 16 employees ("Small Firms") were not mentioned by the Charter and were exempted from the EPL regime until 1990. The EPL reform of 1990 imposed that dismissals must have a "just cause" also in small firms (applying the same criteria of large firms). However, for small firms the Law establishes a different regime of sanctioning if the dismissal is judged "unfair": the employer may choose between the re-employment of the worker or the payment of a financial compensation ranging between 2.5 and 6 months pay. Moreover, small firms are not required to pay all foregone earnings and contributions. Therefore, although the 1990 reform has increased the dismissal costs for small firms, they remained significantly lower compared to the costs faced by large firms.

The existing differences in firing costs between small and large firms in Italy are the basis of the works of, among others, Boeri and Jimeno (2005), Borgarello et al. (2004), Schivardi and Torrini (2008), Ichino and Riphahn (2004). Boeri and Jimeno (2005) offer a theoretical explanation of why dismissal costs are lower for small firms and then test the effect of employment protection on lay-off probabilities by comparing small and large firms. Schivardi and Torrini (2008) and Borgarello et al. (2004) evaluate the effects of employment protection on the size distribution of Italian firms, by looking at the

probability of firm size adjustments around the 15 employees threshold. Ichino and Riphahn (2004) find significant differences between small and large firms in the level of employee absenteeism.

4 The data and descriptive statistics

We use administrative data from the full version of the *Work Histories Italian Panel* (WHIP), provided by LABORatorio Revelli (Turin) and drawn from the National Institute of Social Security (INPS). This dataset covers a 1:90 random sample of all employees working in the private sector in Italy followed for the years from 1985 to 2004. Agricultural workers, public employees and self-employed workers are excluded from the sample. The dataset is an employer- employee unbalanced panel with observations at year level, or at employment spell level if a spell is shorter than a year[2], that contains information on both individual and firm characteristics.

On the worker's side the WHIP includes information on gender, age, region of birth, province of work, the initial and the final date of each employment spell, the gross wage, the total number of weeks worked, an indicator for part-time status, maternity leave, redundancy payments, an occupational qualification code and, most importantly, it records sickness episodes. In particular, for each year it collects information on the number of weeks that a worker has benefited of the so-called *indennità di malattia*, a payment for sick leave made by INPS after the third day of absence[3]. Therefore, we observe the total number of weeks of absence the worker has made in a given year.

The payment of sick leave is made by INPS for all the blue-collars irrespective of the sector of work and for white collars working in the sectors "Wholesale and Retail Trade" and "Hotels and Restaurants". Additionally we exclude workers with the qualification of apprentices, cadres and managers for whom we have no data on absences.

Because of its administrative nature, the main drawback of the dataset is that there is little demographic information on individual characteristics; in particular we do not know the level of education, the marital status and the number of children. We build additional variables such as the length of tenure and total experience. Tenure is calculated as the number of weeks an individual is observed working for the same employer and then transformed into years. Total experience is computed as the length of the period in which an individual has been employed (from the first period observed). The earning variable is the real daily (gross) wage, obtained by dividing the total amount earned during a year or during an employment spell (if within the year) by the number of days worked over that period, and deflating it by the Consumer Price Index (base year 2000).

On the firm's side the WHIP includes the sector in which it operates (9 sectors), the geographic location (at provincial or NUTS3 level) and the yearly average number of employees.

Our main dependent variable, *Absenteeism*, is the fraction of weeks the individual is absent from work over the total number of weeks actually worked[4].

As robustness check we also consider as dependent variable the dichotomous variable, "*Being Absent*", which takes on the value of one if the employee has benefited of at least one INPS sickness benefit over the year, and zero otherwise (as in Engellandt and Riphahn 2005, and Chaudhury et al. 2006).

We augment the data base with the unemployment rate at the provincial level (103 provinces) drawn from the National Institute of Statistics (ISTAT). Unfortunately, the

unemployment rate series is available only from 1993 since the computational method has changed in 1992 and again in 2003, generating two breaks in the time series. In addition, since after 2002 many of the firm variables contain a large number of missing values and in particular we do not observe firm size, we focus on the ten-year window 1993–2002 in our analysis[5].

Our sample is made of individuals aged between 15 and 65 for whom the payment of sick leave applies. In order to deal with a more homogeneous sample, we exclude individuals who experienced a maternity leave episode, received redundancy payments, work on a temporary contract or had a part time job during the year. Moreover, to increase comparability of workers in small and large firms, we have excluded individuals working in firms with less than 5 employees, which mainly represent family business.

Table 1 reports summary statistics of the variables used in the empirical analysis. The number of observations in the sample is 574,074, at worker-year level. The average rate of absenteeism is 2.25% on the whole sample, that is, about one week for an employee working the whole year. However, about 80 percent of employees is never absent in a year. The average rate of absenteeism is 10.6% for workers experiencing at least one episode of absence. Workers employed in small firms (with 15 employees or less) are 30.7% of the sample. Average age is 35.9 years. The fraction of women in our sample is particularly

Table 1 Summary statistics

	All		Small firms		Large firms	
Variable	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
Rate of absenteeism	2.25	6.85	1.82	6.39	2.44	7.03
Absent (dummy 0/1)	0.21	0.41	0.16	0.37	0.23	0.42
Small Firm (≤15)	0.31	0.46				
Unemployment rate	8.99	6.73	9.55	7.02	8.75	6.59
Proxy unemployment	38.5	10.3	39.5	10.5	38.1	10.2
Female	0.25	0.43	0.26	0.44	0.25	0.43
Age	35.9	10.5	34.7	10.30	36.5	10.5
Blue-Collar	0.89	0.31	0.88	0.32	0.89	0.31
Tenure	4.07	4.40	3.45	4.07	4.35	4.51
Actual experience	7.55	4.86	6.71	4.67	7.93	4.90
ln(Wage)	4.05	0.33	3.99	0.29	4.07	0.34
Mining and quarrying	0.004	0.06	0.004	0.07	0.003	0.06
Manufacturing	0.51	0.50	0.43	0.50	0.55	0.50
Construction	0.08	0.27	0.15	0.36	0.05	0.22
Commerce	0.18	0.38	0.23	0.42	0.16	0.36
Hotels and restaurants	0.06	0.24	0.10	0.30	0.05	0.21
Transport and communications	0.08	0.27	0.05	0.21	0.09	0.29
Financial intermediation	0.07	0.25	0.02	0.14	0.09	0.28
Business services	0.01	0.09	0.01	0.07	0.01	0.09
Other social/personal service act.	0.011	0.11	0.01	0.12	0.01	0.10
North-West	0.34	0.47	0.30	0.46	0.36	0.48
North-East	0.27	0.45	0.26	0.44	0.28	0.45
Centre	0.18	0.38	0.19	0.40	0.17	0.38
South	0.15	0.36	0.17	0.38	0.14	0.34
Islands	0.06	0.24	0.07	0.26	0.05	0.23
N	574,074		176,008		398,066	

Notes: WHIP dataset. We also have year dummies in our sample.

low (25.1%) but it depends on our sample selection which includes mainly blue collars. Most of the workers in our sample work in the Manufacturing sector (51.3%) and in the Northern regions of Italy (61%). The unemployment rate is on average 9.0%, with wide variability, ranging from 1.7% (Mantova, in Lombardy) to 35% (Enna, in Sicily). On the whole, Southern regions show considerable higher unemployment rates (19.8) than Centre-North regions (6.2).

Columns 3 to 6 of Table 1 presents descriptive statistics on individuals' and firms' characteristics by firms size. The difference in the absenteeism rate between small and large firms is striking (respectively 1.82 vs 2.44) as well as the fraction of workers absent at least once over the year (16.4% in small firms vs 22.9% in large firms). These figures confirm that workers employed in small and large firms have different absence behaviors.

Figure 1 summarizes the main points of the paper. In panel (a) we show the relationship between the average absenteeism rate (at provincial level) for small firms and the provincial unemployment rate and we find a strong negative relationship (coefficient = -0.028; s.e. = 0.0048). In panel (b) we show that the absenteeism rate for large firm employees is negatively related to the unemployment rate, but the slope is considerable lower in magnitude (coefficient = -0.014; s.e. = 0.0069). In the next Section, using individual data, we carry out an econometric analysis investigating these relationships.

5 The effect of unemployment and EPL on absenteeism

In order to investigate the impact of local unemployment on individual propensity to take sick leave we estimate the following model by OLS:

$$Absenteeism_{it} = \beta_0 + \beta_1 UnemploymentRate_{it} + \beta_2 SmallFirm_{it} + \beta_3 X_{it} + \lambda_t + \epsilon_{it} \quad (1)$$

where $Absenteeism_{it}$ represents the fraction of weeks of sickness absences (over the total number of weeks worked) of individual i in period t; $UnemploymentRate_{it}$ is the unemployment rate at provincial level, $SmallFirm_{it}$ is a dummy for firms with 15 or less employees, X_{it} is a vector of individual and other firm characteristics (including gender, age, region of birth[6], professional qualification, experience, tenure, sector of activity and lagged gross wage), λ_t represents year dummies and ϵ_{it} is an error term.

Although we have no information of worker's health status which is a key determinant of her absence behavior, we take into account the individual health condition by controlling for the individual characteristics mentioned above. Most of these characteristics have been found to be strongly correlated with absenteeism due to health reasons, as shown in Costa et al. (2011) (we will also provide additional evidence on this issue in Section 6 where we control for some indicators of health at the provincial level).

Table 2 reports OLS estimates in columns (1)-(3). Standard errors are corrected for heteroskedasticity and allowed for within province correlation to take into account possible common shocks to employees working in the same province. In column (1) results show that employees working in provinces with higher unemployment are less absent from work: in a province in which unemployment is one standard deviation (σ, hereafter, is 6.73 points) higher than in another, employee absenteeism is 0.23 percentage points lower, or about 10% less. The effect is highly statistically significant (t-stat = -5.57). Working in a small firm is associated with a reduction in the probability of being absent by 0.618 percentage points (about 27% less), suggesting that workers less sheltered by the EPL tend to be more present at work (as also shown by Ichino and Riphahn 2005).

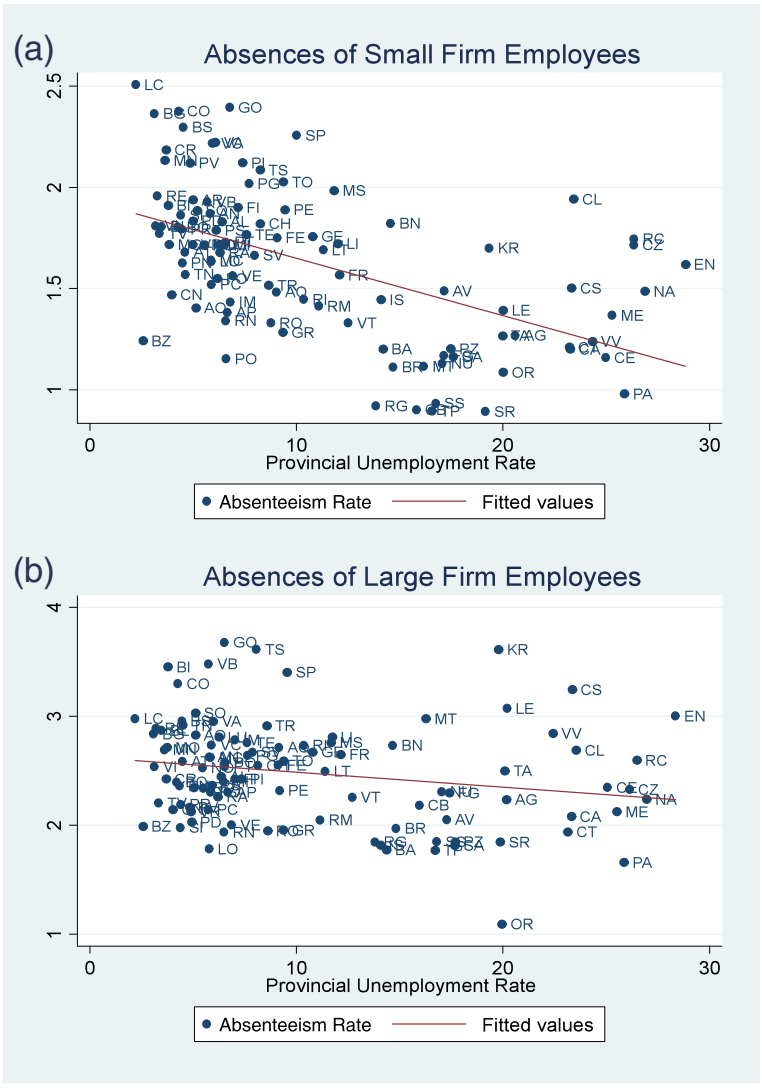

Figure 1 Correlation between provincial unemployment rate and absenteeism rate by firm size.

We then investigate whether individuals employed in small firms, and thus less protected against dismissal by the legislation, are more disciplined in their shirking behavior by the local unemployment. To this end we include the interaction between $UnemploymentRate_{it}$ and $SmallFirm_{it}$ in equation 1:

$$Absenteeism_{it} = \beta_0 + \beta_1 UnemploymentRate_{it} + \beta_2 SmallFirm_{it} + \beta_3 UnemploymentRate_{it} \times SmallFirm_{it} + \beta_4 X_{it} + \lambda_t + \epsilon_{it} \quad (2)$$

where β_1 represents the impact of unemployment on absences for workers employed in large firms, and $\beta_1 + \beta_3$ measures the impact of unemployment on the absences of small firm employees.

In column (2) of Table 2 we find that the *Unemployment Rate* is negatively associated with absences of large firms' employees (-0.030), but this effect is significantly stronger for employees of small firms (-0.042 = -0.030-0.012). The difference between small and

Table 2 Abseenteism and unemployment: OLS and FE estimation results

	OLS			FE	
	(1)	(2)	(3)	(4)	(5)
Unemployment rate	-0.034***	-0.030***	-0.031***	-0.011*	-0.016**
	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)
Small firm (≤15)	-0.618***	-0.507***	-0.556***	-0.076	-0.042
	(0.030)	(0.048)	(0.054)	(0.070)	(0.076)
Small firm* Unemployment rate		-0.012***	-0.015***	-0.012	-0.013*
		(0.004)	(0.004)	(0.007)	(0.007)
Lag ln(Wage)			-0.921***		0.096
			(0.088)		(0.079)
Female	0.244***	0.244***	0.093*		
	(0.048)	(0.048)	(0.052)		
Age	-0.100***	-0.099***	-0.094***	-0.207***	-0.243***
	(0.014)	(0.014)	(0.013)	(0.026)	(0.032)
Age squared	0.002***	0.002***	0.002***	0.005***	0.005***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Blue-Collar	0.692***	0.693***	0.515***	0.244**	0.254**
	(0.076)	(0.076)	(0.057)	(0.094)	(0.121)
Tenure	0.149***	0.149***	0.124***	0.288***	0.283***
	(0.010)	(0.010)	(0.011)	(0.016)	(0.016)
Tenure squared	-0.010***	-0.010***	-0.008***	-0.015***	-0.014***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Actual experience	-0.013**	-0.013**	-0.015**	-0.030	-0.021
	(0.006)	(0.006)	(0.006)	(0.021)	(0.029)
Constant	2.909***	2.863***	6.351***	2.609***	2.572***
	(0.309)	(0.308)	(0.533)	(0.603)	(0.779)
Observations	574,074	574,074	483,531	574,074	483,531

Notes: WHIP dataset. OLS (columns 1 to 3) and FE (columns 4 to 5) estimates. Unemployment at provincial level. Further controls: Dummies for regions of birth (21), sectors of work (9), years (10). Standard errors are allowed for within provincial correlation. The symbols ***, **, * indicate that coefficients are statistically significant, respectively, at the 1, 5, and 10 percent level.

large firms (measured by the coefficient on the interaction term) is highly statistically significant (t-stat = -2.83).

An increase by 1 percentage point in unemployment decreases absenteeism by 1.33 percent in large firms (0.03/2.25) while absenteeism is reduced by 1.87 percent in small firms (0.042/2.25). Our estimates are broadly in line with previous studies using different methodologies and not distinguishing between small and large firms. Henrekson and Person (2004) find that an increase by 1 point of unemployment leads from 0.067 to 0.24 days less of absences (according to the specifications shown in Table 4 of their paper), corresponding to a reduction in the range of 1 to 3 percent. Askildsen et al. (2005) report that increasing the unemployment rate by one percentage point leads to a 1.7–3.9 percent reduction in the number of absences. Scoppa (2010a) shows that the days of absence (self-reported by employees) increase by 0.085 if the regional unemployment decreases by 1 percentage point (which corresponds to a reduction of absences of 1.9 percent).

Control variables have the expected sign, in line with the results of the literature on absenteeism: females show a higher propensity to take sick leave; blue-collars are much more absent; absences and age are related by a U-form relationship, absences increase with tenure. Regions of birth coefficients indicate, in line with Ichino and Maggi (2000),

that individuals born in some Southern regions tend to be more absent, ceteris paribus, than individuals born in the North[7].

In column (3) we add as control variable the lagged gross wage (in log). We include the lagged value of wage since the current wage could be affected by a reverse causality problem: more absences reduce (to some extent) the wage paid by the employer. However, the estimates using the lagged wage should be interpreted with caution since the individual unobservable factors (for example, diligence or loyalty) might simultaneously affect the absence behavior and the employee wage. Notwithstanding these problems, estimation results in column (3) do not differ much from our previous estimates: unemployment is negatively related to absences, with a larger effect for small firm employees. As expected, the lagged wage is negatively correlated to the absenteeism rate.

By taking advantage of the panel structure of our data, we can control for time-invariant unobserved individual characteristics. In particular, the error term ϵ_{it} can be divided into an individual fixed effect, μ_i, and an i.i.d error term, ν_{it}. The individual specific effect, μ_i, picks up the effect of all unobserved individual characteristics, including human capital, initial health endowment and motivation, which unfortunately are not observed in our data.

The FE estimates, shown in columns (4) and (5) of Table 2, confirm previous findings: a higher unemployment induces employees to take less absences and this effect is much stronger for employees in small firms. Both these effects are statistically significant, although the FE estimates are lower in magnitude and less precise with respect to the OLS estimates reported in columns (2) and (3)[8].

However, FE estimates in our setting should be interpreted with caution and we should not put too much emphasis on them since they are fraught with a number of problems. In fact, unemployment at the provincial level is a rather persistent variable and by controlling for individual fixed effects we exploit little inter-temporal variation in the unemployment rate while a large part of the variation comes from workers moving between provinces with different levels of unemployment. However, these movements cannot be considered completely exogenous, giving rise to some sort of bias. Furthermore, measurement errors are magnified in fixed effects estimates when the independent variables are persistent over time (see Griliches and Hausman 1986). Finally, fixed individual unobserved characteristics might not be what we should be worried about. For example, time varying health indicators could represent an important source of omitted variable bias and these are not captured by a fixed effect approach. Possible alternative strategies for dealing with this issue are outlined in the next section.

6 Robustness checks

In this section we perform a number of checks to control if the results presented in Section 5 are robust to different samples and/or alternative definitions of variables.

In Table 3, instead of comparing very heterogeneous types of firms in terms of size, we compare small firms (from 5 to 15 employees in our sample) with, respectively, firms of 16–35 employees (column 1), firms of 16–50 employees (column 2) and firms of 16–250 employees (column 3). In particular, the interpretation of the interaction of firm size with unemployment as an effect of employment protection is more straightforward when focusing on small firms around the threshold of 15 employees (like in column 1). According to the European Commission definition, firms are considered small if they employ

Table 3 Robustness check I: comparing more similar firms

	(1)	(2)	(3)
	Size: ≤35	**Size: ≤50**	**Size: ≤250**
Unemployment rate	-0.027***	-0.029***	-0.033***
	(0.007)	(0.007)	(0.006)
Small firm (≤15)	-0.168***	-0.209***	-0.398***
	(0.052)	(0.051)	(0.054)
Small frm* Unemployment rate	-0.012**	-0.013***	-0.012**
	(0.005)	(0.004)	(0.005)
Lag ln(Wage)	-0.782***	-0.759***	-0.775***
	(0.106)	(0.102)	(0.098)
Female	-0.166***	-0.126**	-0.004
	(0.058)	(0.058)	(0.051)
Age	-0.078***	-0.072***	-0.084***
	(0.016)	(0.014)	(0.014)
Age squared	0.001***	0.001***	0.002***
	(0.000)	(0.000)	(0.000)
Blue-Collar	0.543***	0.575***	0.625***
	(0.057)	(0.058)	(0.056)
Tenure	0.085***	0.091***	0.110***
	(0.013)	(0.013)	(0.013)
Tenure squared	-0.006***	-0.007***	-0.007***
	(0.001)	(0.001)	(0.001)
Actual experience	-0.024***	-0.028***	-0.024***
	(0.006)	(0.006)	(0.006)
Constant	5.504***	5.285***	5.597***
	(0.571)	(0.556)	(0.578)
Observations	239,012	270,747	377,265

Notes: WHIP dataset. OLS estimates are reported. Model 1: only firms below 35 employees; Model 2: only firms below 50 employees; Model 3: only firms below 250 employees. Further controls are the same used in Table 2. Standard errors are allowed for within provincial correlation. The symbols ***, **, * indicate that coefficients are statistically significant, respectively, at the 1, 5, and 10 percent level.

less than 50 employees: therefore, in the first two columns only workers in small firms are compared. Since previous literature has shown that absences might increase with firm size independently of employment protection (see for instance Barmby and Stephan (2000) for an early paper), here we focus on small (and medium) firms in order to disentangle firms size effect from employment protection effect. Were we to find that the effect of unemployment is still different between firms below and above the 15 employees threshold, this would ensure us that our results are driven by EPL and not by firm size.

Our main results are confirmed: the *Unemployment Rate* is negatively associated with the rate of absenteeism in large firms (the coefficient being -0.027 when considering firms with less than 35 employees and -0.033 for firms below 250 employees), whereas the effect on firms with less than 15 employees is considerable larger (between -0.039 = -0.027–0.012 in column 1 and -0.045 = -0.033-0.012 in column 3) and the differential impact between small and large firms is always statistically significant.

According to Arai and Thoursie (2005) and Leigh (1985), a possible alternative explanation for the uncovered negative relationship between absenteeism and unemployment could be that, in periods of low unemployment, firms are induced to employ marginal workers, with worse individual characteristics, less attachment to the labor force and

more prone to take sick absences. On the other hand, in downturns individuals employed are on average of better quality, perhaps in good health, and as a consequence they tend to be less absent from work.

To investigate this aspect and following the previous mentioned papers, we focus on a sample of individuals who have been continuously working and are observed for the entire period analyzed, i.e from 1993 to 2002. In case we still find an effect of unemployment on absences, we can argue that this behavior is affected by the incentives of workers to take sick leave, and we can confidently exclude the alternative explanation of a change in the composition of the workforce.

The estimates on this sample (about 110,808 observations instead of 574,074) are reported in Table 4. We find that even considering workers with strong attachment to the labor force, the effect of unemployment on their decisions to take sick leave is similar to the one shown in previous estimates. Employees of large firms in provinces with high rates of unemployment take less absences (the coefficient on unemployment is -0.018 in column 1 and -0.019 in column 2), whereas employees of small firms react to unemployment more strongly (-0.038 = -0.018-0.020 in column 1 and -0.043 = -0.019-0.024 in column 2).

The variations of absenteeism over the business cycle is also compatible with the hypothesis of changed workload arising from variations in demand[9]. According to this hypothesis, due to the costs and constraints imposed by the EPL, firms are probably

Table 4 Robustness check III: balanced panel

	(1)	(2)
Unemployment rate	-0.018**	-0.019**
	(0.008)	(0.008)
Small firm (≤15)	-0.328***	-0.367***
	(0.086)	(0.095)
Small firm* Unemployment rate	-0.020**	-0.024**
	(0.010)	(0.009)
Lag ln(Wage)		-0.687***
		(0.141)
Female	0.337***	0.192***
	(0.068)	(0.064)
Age	-0.088***	-0.065**
	(0.022)	(0.025)
Age squared	0.001***	0.001***
	(0.000)	(0.000)
Blue-Collar	0.557***	0.440***
	(0.090)	(0.082)
Tenure	0.031**	0.034**
	(0.014)	(0.015)
Tenure squared	-0.002**	-0.002**
	(0.001)	(0.001)
Actual experience	-0.032***	-0.025**
	(0.010)	(0.011)
Constant	2.779***	4.766***
	(0.424)	(1.150)
Observations	110,808	99,710

Notes: WHIP dataset. OLS estimates are reported. Further controls are the same used in Table 2. Standard errors are allowed for within provincial correlation. The symbols ***, **, * indicate that coefficients are statistically significant, respectively, at the 1, 5, and 10 percent level.

unwilling to completely adapt to a higher demand by increasing the number of employees. As a consequence, in periods of economic boom workers may be asked to work harder than during a downturn. Higher workload may lead to more sickness absences. One could argue that small firms just below the threshold of 15 employees would be the most reluctant to hire more employees as they may then exceed the 15-employees limit and face stricter EPL. Therefore we could test the workload hypothesis by separating firms with 5–10 employees and firms with 11–15 employees and verify whether a stronger relationship between absenteeism and unemployment exists in firms just below the 15-threshold than in firms well below it.

To this aim, we create a dummy *Small firm (11–15 employees)* to distinguish between firms with employees between 11 and 15 and firms with employees between 5 and 10. In columns (1) and (2) of Table 5, we consider only firms below 15 employees. In columns (3) and (4) of Table 5 we consider the entire sample and split it into three groups: firms with employees between 5 and 10 (*Very small firm: 5–10 employees*), firms with employees between 11 and 15 (*Small firm: 11–15 employees*) and firms with employees above 15 (*Large firm*).

Table 5 Robustness check IV: the workload hypothesis

	(1)	(2)	(3)	(4)
Unemployment rate	-0.035***	-0.038***	-0.045***	-0.048***
	(0.006)	(0.007)	(0.007)	(0.007)
Small firm: 11–15 employees	0.105*	0.133**	0.085	0.111*
	(0.060)	(0.063)	(0.062)	(0.063)
Small firm: 11–15 employees * Unemployment	0.007	0.007	0.008	0.008
	(0.006)	(0.006)	(0.006)	(0.006)
Large firm (>15 employees)			0.543***	0.603***
			(0.054)	(0.059)
Large firm (>15 employees) * Unemployment			0.014***	0.017***
			(0.004)	(0.005)
Lag ln(Wage)		-0.740***		-0.924***
		(0.109)		(0.088)
Female	-0.135***	-0.230***	0.243***	0.091*
	(0.049)	(0.058)	(0.048)	(0.052)
Age	-0.079***	-0.075***	-0.099***	-0.094***
	(0.015)	(0.016)	(0.014)	(0.013)
Age squared	0.001***	0.001***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
Blue-Collar	0.624***	0.503***	0.696***	0.518***
	(0.080)	(0.067)	(0.076)	(0.057)
Tenure	0.104***	0.071***	0.149***	0.124***
	(0.015)	(0.017)	(0.010)	(0.011)
Tenure squared	-0.008***	-0.006***	-0.010***	-0.008***
	(0.001)	(0.001)	(0.001)	(0.001)
Actual experience	-0.015**	-0.019***	-0.013**	-0.016**
	(0.006)	(0.007)	(0.006)	(0.006)
Constant	2.404***	5.176***	2.316***	5.758***
	(0.309)	(0.578)	(0.322)	(0.542)
Observations	176,008	146,199	574,074	483,530

Notes: WHIP dataset. OLS estimates are reported. The omitted category is *Very small firms: 5–10 employees*. Further controls are the same used in Table 2. Standard errors are allowed for within provincial correlation. The symbols ***, **, * indicate that coefficients are statistically significant, respectively, at the 1, 5, and 10 percent level.

We run the same OLS regressions shown in Table 2. If the workload hypothesis has some empirical relevance, then we should see a stronger relationship between absenteeism and unemployment in firms just below the 15-threshold (more reluctant to hire new employees to avoid to reach the threshold) than in very small firms. However, the results reported in Table 5 show no evidence supporting the workload hypothesis. In particular, in columns (1) and (2) the coefficient on the interaction *Small firm (11–15 employees)* × *Unemployment* shows that unemployment has no differential impact between very small firms and small firms (the interaction term is not statistically significant and has the wrong sign). When we consider the entire sample in columns (3) and (4), the coefficients have to be interpreted with respect to the omitted category (*Very small firm: 5–10 employees*). Consistently with the results in Table 2, we find that workers in very small firms react more negatively to unemployment than workers in large firms (-0.045 in very small firms vs -0.031 = -0.045+0.014 in large firms), while again we find no evidence of a differential impact of unemployment for workers in very small firms with respect to workers in small firms. Although theoretically plausible, our estimates show that the workload hypothesis is not empirically relevant. This could be explained by the fact that firms might react to the business cycle by resorting to temporary help firms (that are not recorded in our data) and not by significantly increasing the workload of workers.

As mentioned in Section 4, our measure of absenteeism could be affected by true health problems (beyond shirking). Unfortunately, we do not observe health conditions at the individual level in the data. However, this problem might not be very relevant in our case for several reasons. First, according to Costa et al. (2011), the absenteeism due to health reasons is mainly related to variables like gender, age, place of residence, type of occupation (blue vs white collar), education and sector of activity, most of them used in our regressions as controls. Second, previous studies have shown that sickness absence is only in part determined by illness or health conditions (Marmot et al. 1995; Andrea et al. 2003; Farrell and Stam 1988, Leombruni 2012). Similarly, Scoppa (2010a) uses a sample of individuals who are asked to describe their health status and to indicate if they suffer from chronic illness or disability. Controlling for these health status variables, he shows that sickness absences, at least partially, hide opportunistic behaviors, thus suggesting that the omission of health indicators does not distort estimates.

As a further check on the assumption that our results are not driven by the health component of the absenteeism we control in two separate set of regressions for two variables collected at provincial-year level related to the health conditions of the Italian population, i.e. life expectancy and mortality rate (Health for All, ISTAT 2012). The results in Table 6 show that these two variables have a strong significant association with absenteeism rate (the first being negative in Panel A and the second being positive in Panel B), but the main findings on the impact of unemployment in small firms and large firms are unchanged in both set of estimates. Even if none of these strategies can be considered an ideal solution to the problem of not observing personal health status, taken together, these pieces of evidence should reassure us about the validity of our assumption.

An alternative way to deal with the problem of omitted individual health measures - if they are time varying - is to use a lagged dependent variable model, where the lagged absenteeism should capture past health shocks with persistent effects on worker's absenteeism. Results, reported in Table 7, show that, although the lagged absenteeism is a

Table 6 Robustness check V: controlling for health indicators

	(1)	(2)	(3)
Panel A			
Unemployment rate	-0.038***	-0.034***	-0.034***
	(0.005)	(0.006)	(0.006)
Small firm (≤15)	-0.615***	-0.506***	-0.555***
	(0.030)	(0.049)	(0.054)
Small firm* Unemployment rate		-0.012***	-0.015***
		(0.004)	(0.005)
Life expectancy (at 45)	-0.129***	-0.128***	-0.124***
	(0.035)	(0.035)	(0.037)
Lag ln(Wage)			-0.922***
			(0.087)
Constant	7.011***	6.947***	10.304***
	(1.117)	(1.121)	(1.198)
Observations	574,074	574,074	483,531
Panel B			
Unemployment rate	-0.030***	-0.026***	-0.028***
	(0.007)	(0.007)	(0.007)
Small firm (≤15)	-0.618***	-0.506***	-0.554***
	(0.030)	(0.048)	(0.054)
Small firm* Unemployment rate		-0.012***	-0.015***
		(0.004)	(0.004)
Mortality rate	0.004**	0.004**	0.003
	(0.002)	(0.002)	(0.002)
Lag ln(Wage)			-0.917***
			(0.088)
Constant	2.404***	2.357***	5.953***
	(0.428)	(0.427)	(0.663)
Observations	573,671	573,671	483,159

Notes: WHIP dataset. OLS estimates are reported. Further controls are the same used in Table 2. Life expectancy and mortality are collected from *Health for All* (ISTAT 2012). Standard errors are allowed for within provincial correlation. The symbols ***, **, * indicate that coefficients are statistically significant, respectively, at the 1, 5, and 10 percent level.

strong predictor of current absenteeism, it does not affect the other coefficients, in particular the differential impact of unemployment for small and large firms' employees.

However, likewise the FE approach, also the lagged dependent variable model is not free from problems. It has been shown in the literature (see, for example, Maddala and Rao 1973; Kelly 2002) that in lagged dependent variable models, the coefficient for the lagged dependent variable is typically inflated, while the coefficients on other explanatory factors are attenuated toward zero if the error terms are serially correlated. This means that finding a correlation between the explanatory variable and the dependent variable is made harder and thus, when such a correlation is found, it can be interpreted as strong evidence of its existence. Therefore, having found a coefficient on *Small firm* × *Unemployment Rate* still negative and significant is reassuring of the fact that a differential effect of unemployment on absenteeism by size of firm really exists.

As a further robustness check, we explore the possibility that not only the unemployment in the individual's province of work is associated with worker's absence behavior but also the unemployment in the provinces nearby. To this end we use the regional unemployment to capture the labor market conditions of a broader area of potential

Table 7 Robustness check VI: lagged absenteeism

	(1)	(2)	(3)
Unemployment rate	-0.026***	-0.022***	-0.022***
	(0.005)	(0.005)	(0.005)
Small firm (≤15)	-0.498***	-0.377***	-0.400***
	(0.029)	(0.046)	(0.046)
Small firm* Unemployment rate		-0.013***	-0.014***
		(0.004)	(0.004)
Lagged absenteeism	0.265***	0.265***	0.263***
	(0.006)	(0.006)	(0.006)
Lag ln(Wage)			-0.386***
			(0.063)
Female	0.240***	0.239***	0.170***
	(0.038)	(0.038)	(0.040)
Age	-0.104***	-0.103***	-0.099***
	(0.012)	(0.012)	(0.012)
Age squared	0.002***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)
Blue-Collar	0.524***	0.525***	0.450***
	(0.062)	(0.062)	(0.053)
Tenure	0.119***	0.119***	0.118***
	(0.009)	(0.009)	(0.009)
Tenure squared	-0.007***	-0.007***	-0.007***
	(0.001)	(0.001)	(0.001)
Actual experience	-0.034***	-0.035***	-0.029***
	(0.006)	(0.006)	(0.005)
Constant	2.432***	2.379***	3.936***
	(0.309)	(0.308)	(0.422)
Observations	458,824	458,824	458,661

Notes: WHIP dataset. OLS estimates are reported. Further controls and specifications are the same used in Table 2. Standard errors are allowed for within provincial correlation. The symbols ***, **, * indicate that coefficients are statistically significant, respectively, at the 1, 5, and 10 percent level.

work (without controlling for region of birth dummies). The effect of regional unemployment on absenteeism rate turns out to be slightly higher than the one found considering provincial unemployment (shown in Table 2), implying perhaps that workers in their decisions consider a labor market wider than simply their province of work. The differential impact of regional unemployment according to the firm size is instead very similar to the one found with provincial unemployment (results not reported but available from the authors).

We also consider the possibility that the variable *Unemployment*, built by the ISTAT according to the standard International Labour Office definition[10], could not capture the actual labor situation in Italy where many individuals are discouraged from searching for a job in stagnant labor markets. In this case, the official unemployment rate would represent an underestimate of the effective number of people available to work. A possible strategy to avoid this problem is to calculate for each province an alternative rate of unemployment - which we call *Proxy Unemployment* - based on the effective number of employed people and the working age population. More precisely, we define *Proxy Unemployment* as:

$$ProxyUnemployment_{it} = (WorkingAgePopulation_{it} - Employed_{it})/(WorkingAgePopulation_{it})$$

In practice, our *Proxy Unemployment* is equal to 1 minus the *Employment Rate*. With this measure, we count as unemployed also individuals discouraged from searching for a job. However, it should be noted that a different kind of measurement error might emerge if provinces have, for example, different percentages of adults in the educational process.

In column (1) of Table 8 we show that the provincial unemployment, as measured by *Proxy Unemployment*, shows a negative association with the propensity to be absent from work. A worker in a large firm reduces her absenteeism rate by about 0.11 if she works in a province with a level of unemployment 1 σ higher (statistically significant at 1 percent level). On the other hand, given the same variation of unemployment a worker in a small firm reduces her absenteeism rate by 0.15 percentage points. The same results hold true when we control for the lagged wage (column 2).

Since the dependent variable *Absenteeism Rate* has a high fraction of zeros (almost 80 percent of the workers takes no sick leave in a year), it is interesting to use as a dependent variable the dummy variable *Being Absent*. In this way we neglect differences in weeks of absences and we investigate the determinants of being or not being absent from work[11]. In Table 9 we estimate a Linear Probability Model (Logit estimates, not reported, are very similar). Estimation results show that small firm employees have a probability of taking absences for sickness of about 5.6 percentage points less than large firm employees (see column 1). More importantly, considering column (2), an increase in the unemployment

Table 8 Robustness check VII: proxy for unemployment rate

	(1)	(2)
Proxy unemployment rate	-0.016***	-0.017***
	(0.003)	(0.003)
Small firm (≤15)	-0.403***	-0.446***
	(0.102)	(0.126)
Small firm* Proxy unemployment rate	-0.006**	-0.006**
	(0.002)	(0.003)
Lag ln(Wage)		-0.938***
		(0.089)
Female	0.250***	0.096*
	(0.050)	(0.053)
Age	-0.099***	-0.094***
	(0.014)	(0.013)
Age squared	0.002***	0.002***
	(0.000)	(0.000)
Blue-Collar	0.721***	0.545***
	(0.081)	(0.060)
Tenure	0.148***	0.122***
	(0.010)	(0.011)
Tenure squared	-0.010***	-0.008***
	(0.001)	(0.001)
Actual experience	-0.012**	-0.014**
	(0.006)	(0.006)
Constant	3.336***	6.941***
	(0.327)	(0.526)
Observations	574,074	483,531

Notes: WHIP dataset. OLS estimates are reported. Proxy Unemployment has been obtained by subtracting from 1 the employment rate at provincial level. Further controls are the same used in Table 2. Standard errors are allowed for within provincial correlation. The symbols ***, **, * indicate that coefficients are statistically significant, respectively, at the 1, 5, and 10 percent level.

Table 9 Robustness check VIII: being absent (dummy 0/1)

	(1)	(2)	(3)
Unemployment rate	-0.003***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)
Small firm (≤15)	-0.056***	-0.048***	-0.050***
	(0.002)	(0.003)	(0.003)
Small firm* Unemployment rate		-0.001***	-0.001***
		(0.000)	(0.000)
Lag ln(Wage)			-0.034***
			(0.005)
Female	0.014***	0.014***	0.009**
	(0.005)	(0.005)	(0.005)
Age	-0.005***	-0.005***	-0.006***
	(0.001)	(0.001)	(0.001)
Age squared	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)
Blue-Collar	0.062***	0.062***	0.058***
	(0.006)	(0.006)	(0.005)
Tenure	0.028***	0.028***	0.026***
	(0.001)	(0.001)	(0.001)
Tenure squared	-0.002***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)
Actual experience	0.003***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)
Constant	0.218***	0.215***	0.317***
	(0.018)	(0.018)	(0.028)
Observations	574,074	574,074	483,532

Notes: WHIP dataset. Dependent variable is the dummy for being absent from work. OLS estimates are reported. Unemployment at provincial level. Further controls are the same used in Table 2. Standard errors are allowed for within provincial correlation. The symbols ***, **, * indicate that coefficients are statistically significant, respectively, at the 1, 5, and 10 percent level.

rate by 1 σ leads to a lower probability of being absent by 1.7 percentage points for a large firm employee (t-stat = -5.18). A small firm employee reacts to the same increase of unemployment reducing the probability of being absent by 2.2 percentage points (=-1.7-0.5). Both effects are highly statistically significant.

Finally, in all the previous tables we computed the standard errors allowing for clustering at the province level. Following Petersen (2009) and Cameron et al. (2011) we also experiment using multi-way clustering for standard errors, both at province and individual level. We replicate the specifications 2 and 3 of Table 2. Standard errors using multiway clustering change only slightly and all our previous findings are confirmed (results are not reported).

An indirect proof of the hypothesis that unemployment affects workers' behavior in relation to the degree of employment protection they enjoy would be the evidence that almost not dismissible workers as Italian public employees are not affected by the unemployment level. Unfortunately, in our dataset we do not observe public employees. To investigate the behavior of public employees we use the Bank of Italy Survey of Household Income and Wealth (SHIW), conducted every two years on a representative sample of about 20,000 individuals, collecting detailed information on demographic and social characteristics and on the working activity of employees (both public and private). In some

waves of the SHIW workers were asked how many days of absence they took in a year. We pool together 4 waves: 1995, 1998, 2000, 2002 since these overlap with our sample period and include consistent information on key variables. Unfortunately, in the SHIW we only observe the region of residence of individuals and therefore we use the unemployment level at the regional level.

We estimate the model by OLS using as dependent variable "Days of Absence"[12]. Our main explanatory variable is the regional unemployment rate in each region. The standard errors are adjusted for the potential clustering of errors at the regional level. We control for a number of firm and personal characteristics (small firm, gender, age, age squared, years of education, marital status, children at home age below or equal 5, tenure, year dummies). Results are reported in Table 10. In column (1) we focus on the sample of private employees. We find that in regions with high unemployment worker's absenteeism rate is significantly lower (the coefficient is -0.072, statistically significant at 5 percent level). In column (2) we consider only public sector employees. The unemployment rate turns out to be not statistically significant. These findings are confirmed in column (3) where we consider jointly private and public employees and include among explanatory variables an interaction term (*Unemployment Rate*)*(*Public Employee*). Results show that for private employees a higher unemployment rate is significantly associated with lower absenteeism (-0.066; s.e. = 0.030). On the other hand, for public employees a higher unemployment rate is not correlated with absenteeism (+0.007 = -0.066+0.073; s.e. = 0.032).

This finding represents an important suggestive evidence that unemployment affects absenteeism only in relation to the threat of unemployment: for employees not affected by this threat, the relation between unemployment and days of absence vanishes.

7 Sickness absences and the risk of dismissal

The compensation for sickness absence has been close to the normal wage in Italy during the period we consider. Thus, the decision for the worker of whether to be present at work cannot be simply explained with the wage penalty deriving from a day of absence. Other types of incentives offered by firms play a role in affecting the employee's decision. The

Table 10 Robustness check IX: days of absence and regional unemployment in SHIW data

	(1) Private	(2) Public	(3) Private and public
Unemployment rate	-0.072**	0.020	-0.066**
	(0.030)	(0.034)	(0.030)
Public employee			-0.350
			(0.567)
(Unemployment rate)*(Public employee)			0.073
			(0.049)
Implied effect of unemployment on public employee			0.007
			(0.032)
Observations	25,011	9,540	34,551
Adjusted R^2	0.009	0.010	0.009

Notes: SHIW dataset (waves 1995, 1998, 2000, 2002). The dependent variable is Days of Absence. OLS estimates. Further Controls: Small Firm, Female, Age, Age Squared, Years of Education, Married, Children age $\leq$5, Tenure, Year dummies. Standard errors are allowed for within region of work correlation. The symbols ***, **, * indicate that coefficients are statistically significant, respectively, at the 1, 5, and 10 percent level.

threat of dismissal if a worker is perceived as less productive or is considered a 'shirker' by his employer is arguably a powerful mechanism in inducing an employee to work hard and not indulging in too many absences (Hesselius 2007).

The purpose of this section is to test whether sickness absences are associated with an increased risk of future unemployment and if the risk of being dismissed is different in small and large firms. The finding of a positive association between absence spells and risk of dismissal would support the idea that unemployment acts as worker discipline device against shirking.

Since we cannot rule out that some unobservable factors might be related to both prior absences and dismissals or that workers who are threatened by unemployment may suffer negative health consequences from this threat, it is important to highlight that the evidence in this Section is only suggestive of a possible channel.

Since in the original WHIP dataset it is not possible to track individuals who move to unemployment[13], we augment the original data with information on unemployment benefits recipients provided by the Laboratorio Revelli in a separate file (called "*Unemployment Benefits*"). In this file we observe for each year the individual identifier, the number of days in which the individual obtained unemployment benefits and the type of benefits (ordinary, reduced, "mobility") received[14].

We assess if the observed sick-leave behavior pattern (observed at year $t-1$) is related to the risk of unemployment at time t. To this end, we build a variable "*Dismissed*" equal to one if a worker receives some type of unemployment benefits in period t, and equal to zero otherwise.

The sick absence variable and the control variables are computed as in Section 5. To take into account the local labor market conditions we include 103 province of work dummies (and exclude region of birth dummies). Due to the limited availability of data on unemployment benefits, the period of observation for this analysis is 1996–2002.

Table 11 reports parameter estimates of four specifications of a Linear Probability Model in which the dependent variable is *Dismissed*. On the whole sample, the probability of being dismissed is 4.0 percent. The simplest model reported in column (1) only analyzes the impact of sick-leave behavior, as measured by the *Rate of Absenteeism*, on the future risk of dismissal. Model (1) shows that an increase of 4 weeks of absences (about 8 percentage points in the absenteeism rate for a full-time worker) increases the risk of unemployment by 0.60 percentage points (=0.076*4/52) (the effect is highly statistically significant); thus, we find evidence of a positive relation between sickness absences and future risk of being dismissed. In Column (2) we analyze the risk of being dismissed in relation to the size of the firm (*Small Firm*) and interact the *Rate of Absenteeism* with *Small Firm*. Moreover, we control for employee's gender and age. We find that worker's absenteeism is positively associated with the probability of dismissal in large firms (0.068) but this effect is larger for small firm employees (0.095). Moreover, regardless of worker's absence behavior, individuals working in firms employing more than 15 workers have a lower risk of future unemployment, probably due the higher flexibility of small firms in firing their workers.

After controlling for other individual characteristics, provincial, industry and year dummies in column (3) and for wage in column (4), we find that the effects of interest are remarkably stable: employee's absences increase the risk of future dismissal in large firms, and this effect is much stronger in small firms.

Table 11 Estimates of the effect of sickness absence on risk of unemployment

	(1)	(2)	(3)	(4)
Rate of absenteeism	0.076***	0.068***	0.072***	0.069***
	(0.006)	(0.007)	(0.007)	(0.006)
Small firm (≤15)		0.012***	0.002*	0.003***
		(0.001)	(0.001)	(0.001)
Small firm* Rate of absenteeism		0.027*	0.031**	0.040***
		(0.014)	(0.014)	(0.014)
Female		0.029***	0.028***	0.033***
		(0.001)	(0.001)	(0.001)
Age		0.001***	0.005***	0.005***
		(0.000)	(0.000)	(0.000)
Age squared		-0.000**	-0.000***	-0.000***
		(0.000)	(0.000)	(0.000)
Blue-Collar			0.018***	0.023***
			(0.002)	(0.002)
Tenure			-0.002***	-0.002***
			(0.000)	(0.000)
Tenure squared			0.000	0.000
			(0.000)	(0.000)
Actual experience			-0.002***	-0.002***
			(0.000)	(0.000)
ln(Wage)				0.026***
				(0.001)
Constant	0.036***	-0.002	-0.096***	-0.203***
	(0.000)	(0.004)	(0.022)	(0.022)
Observations	427213	427213	427213	426929

Notes: WHIP dataset. OLS estimates are reported. Further controls are the same used in Table 2. Standard errors are allowed for within individual correlation. The symbols ***, **, * indicate that coefficients are statistically significant, respectively, at the 1, 5, and 10 percent level.

The finding that absence-prone workers have a higher risk of unemployment is consistent with the results of the previous section, i.e. the threat of firing and subsequent unemployment have a disciplinary effect on the worker's behavior in terms of sickness absences. However, we should remark that the latter finding is only suggestive since some omitted factors might bias the estimated relationship between worker's absenteeism and his/her risk of dismissal.

8 Conclusions

An inverse relationship between sickness absences and unemployment has been documented in a number of studies. However, to the best of our knowledge, no studies have linked the role of unemployment as discipline device to the employment protection legislation. In this paper we have investigated whether a high unemployment rate has a disciplinary effect on the sick-leave rate and whether this effect is stronger for workers less sheltered by the legislation. In particular we examined whether workers in small and large firms, who have a different degree of employment protection, react differently to the threat of unemployment.

We find a strong negative relationship between unemployment and absenteeism rate, which is larger in magnitude in small firms, due to the significantly lower protection from dismissals for employees in small firms. These results are robust to a number

of checks regarding the group of analysis, the heterogeneity of firms, the definition of unemployment and the estimation method.

As a further evidence of the role played by the unemployment as deterrent for shirking we show that public employees, virtually impossible to fire, are not affected by local unemployment. This result reconciles our findings with those of Ichino and Maggi (2000) who have shown that, for employees of a large bank, Southerns are more absent than Northerns, notwithstanding high unemployment rates in the South. This result is probably due to the fact that the probability of being fired was nearly zero for the highly protected workers in their sample, similarly to public employees in our SHIW sample and differently from our WHIP sample of private employees.

In the final part of the paper we find that a higher sick absenteeism is associated with a higher risk of becoming unemployed, suggesting that unemployment might play a role as workers' discipline device, although we cannot exclude that this relationship might be driven by different mechanisms.

Our analysis suggests that the Italian health insurance system with an almost full coverage of the wage for sick leaves might protect excessively employees who are induced to take days off even when their effective state of health is not too bad. This is costly for the employers that try to prevent opportunism with the threat of firing. Probably - for the factors explained in the economics of contracts literature (see, for example, Prendergast 1999) firms have difficulties in using other incentive systems - as wage bonuses and promotion - to discourage shirking and to reward employees who work hard.

Endnotes

[1]According to Kugler and Pica (2008), 56 percent of the dismissal cases taken to court were ruled as unfair (in the period 1990–2001). We were unable to find other data on outcomes of trials regarding individual dismissals: for some figures referring to a large Italian bank see Ichino et al. (2003).

[2]For brevity, we will simply refer to the year throughout the paper.

[3]In the full version of WHIP it is only reported whether or not the employee has benefited of sickness benefits in a given year. The information on weeks of absence has been kindly provided by the Laboratorio Revelli on our request.

[4]Since a worker is not insured for sickness absences for more than 180 days, we set the ratio to 50% in case it is above this threshold, which involves however only 0.6% of the observations. However, our findings are unchanged if we drop these observations.

[5]Since the series of provincial unemployment 1993–2002 are not available digitally, we made these data available at http://www.ecostat.unical.it/Scoppa/Appendix_Absenteeism_Unemployment.htm.

[6]We consider 20 Italian regions plus one category for being Born Abroad.

[7]In a specification in which we do not control for regions of birth (not reported) the estimates of β_1 and $\beta_1 + \beta_3$ are negative and statistically significant but lower in magnitude (-0.018 and -0.029 respectively) with respect to the estimates in Table 2. These effects are probably downward biased due to the fact that Southerns tend to be more absent and unemployment is higher in the South.

[8]To explore the differences in absence behavior between employees in small and large firms one might think of using a regression discontinuity approach (RD). However, the interest in our paper is not to understand how worker's absence behavior is related to employment protection but how workers exposed to different level of EP react differently to the provincial unemployment. For this reason a RD approach does not seem appropriate in our case.

[9]We thank an anonymous referee for suggesting this explanation.

[10] According to the International Labour Office, "unemployed workers" are those who are currently not working but are willing and able to work for pay and have actively searched for work. Individuals who are actively seeking job placement must make the effort to: be in contact with an employer, have job interviews, contact job placement agencies, send out resumes, submit applications, respond to advertisements, or some other means of active job searching within the prior four weeks.

[11] We also use a Tobit model to take into account the high fraction of zeros in our dependent variable. Through Tobit we estimate both the probability of being absent and the expected value of weeks of absence given the individual has been absent. The results are very similar to the previous estimates and are not reported for the sake of brevity.

[12] For a more comprehensive analysis see Scoppa (2010b).

[13] We do not observe movements to retirement, public sector, self-employment, agricultural sector or black market jobs as well.

[14] Unfortunately, we do not observe the date of beginning and ending of each unemployment spell and the reason for dismissal. Firms could have fired the worker "for justified reasons concerning the production activity or the organization of labor in the firm" or alternatively for "a significantly inadequate fulfillment of the employee's tasks". It is worth mentioning that workers voluntarily quitting the firm are not entitled to receive any unemployment benefits.

Competing interests
The IZA Journal of Labor Economics is committed to the IZA Guiding Principles of Research Integrity. The authors declare that they have observed these principles.

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