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ABSTRACT

Turning a "Blind Eye"? Compliance with Minimum Wage Standards and Employment[*]

Turning a "blind eye" to non-compliance with minimum wage standards is sometimes presented as a pragmatic way to accommodate higher wages while not harming employment opportunities for workers employed in marginal firms. In this paper, we model firms' wage and employment decisions, and show that there may be a trade-off between non-compliance and employment. The main prediction of the model are empirically tested using data from the Italian labour force survey. We find evidence of a positive employment non-compliance effect, though elasticities are smaller than typically thought as employers internalize the expected costs of non-compliance. We also show that employment effects are larger at low levels of non-compliance (when the risk of being referred to court is very low). The implications for policy and the role of regulators in monitoring and sanctioning non-compliance are discussed.

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1. Introduction

Almost three decades after the seminal paper by Card and Krueger (1994), the debate on the effects of minimum wages keeps dividing economists and policy-makers. Most studies continue to focus on the effects on employment and hours of work and tend to suggest that the negative effects that one may expect following the basic economic theory are limited and, at most, concentrated among low-skilled and young workers.[1] To rationalise the lack of strong negative effects, the literature has looked into the role of other margins of adjustments (e.g. rest of the wage structure, prices, profitability, productivity, etc.)[2] or the presence of monopsony power.[3] However, most studies tend to assume a perfect enforcement of the minimum wage legislation. In practice, companies often rely on another channel that is simply not to comply with minimum wage regulations and pay instead wages below the legal rates (Ashenfelter and Smith, 1979).

Within a competitive framework and no risk of sanctions, if wage floors are set above the market clearing level, any deviation below that threshold implies a lower marginal cost and a higher level of employment. In this setting, Basu, Chau and Kanbur (2010) argue, turning a "blind eye" – i.e. not enforcing full compliance –, can be an efficient, and credible, strategy for governments more interested in efficiency than in distribution, as it guarantees higher wages for some workers (in those firms that can pay higher wages) while not harming employment opportunities of less productive workers in firms that cannot pay higher wages. By contrast, in an imperfect labour market setting, such as in the presence of monopsony, stronger enforcement leads to higher employment (Soundararajan, 2019). Moreover, non-compliance may reduce workers' search efforts, hence reducing the matching efficiency in the labour market (Eckstein et al. 2011).

However, employment may still be negatively affected, if employers anticipate the risk of sanctions, and factor in the possible costs in case of an inspection (Chang and Ehrlich, 1985). In fact, when employers are free to choose the level of compliance along with total employment, the resulting level of employment is likely to be consistent with the full-compliance level even if compliance is only partial (Yaniv, 2001). In this case, turning a "blind eye" would be neither an equitable nor an efficient public policy strategy as it does not level the playing field among workers and companies – due to the distortive effects on competition between companies --, nor it minimises the negative effects on employment.

In this paper, we contribute to the literature on minimum wages and collective bargaining investigating the link between non-compliance with sector-wide minimum wage standards and employment. If enforcement is not perfect or there are loopholes in the legislation, non-compliance may represent an alternative option for companies to adjust to an increase in the minimum wage and would contribute to explain no or limited employment effects of the minimum wage. We test this hypothesis in the case of Italy, where wage floors are set at a relatively high level by hundreds of collective agreements at sectoral level but enforcement is patchy and partial, and non-compliance is high. Since more than a decade, Italy has experienced a proliferation of "pirate agreements" signed by small, and often fictitious, unions and employers' associations with the explicit purpose to establish wage floors below the existing ones. Enforcement of the "correct" wage is left to labour courts, but, in practice, this is not common as the procedure is cumbersome and it requires an individual or collective complaint to be activated. Despite increasing public pressure, regulators' initiatives to contrast the spread of pirate agreements have, so far, been limited also out of public concerns of the possible impact that full enforcement may have on employment opportunities in the less developed areas of the country.

In the first part of the paper, we model both hiring and compliance behaviour of employers with reference to the Italian institutional context. The model sketches how an employer may be held liable for deviating from wage levels set in collective agreements (i.e. paying workers less than the industry-wide minimum wage), and the expected costs in case of a court ruling against the employer – i.e. workers' appeal to be paid a "fair" wage. The model shows that when employers internalize the full costs of non-compliance, the optimal level of employment turns out to be the same as under full compliance. In other words, since the shadow cost of hiring – due to the severity of sanctions and the probability of being referred to a court – increases with the level of non-compliance, when these costs are factored in, the level of employment in equilibrium is independent from non-compliance costs and equal to that obtained by paying all workers the minimum wage set in collective agreement (Yaniv, 2001). While this neutrality result holds under a set of quite restrictive hypotheses, it does convey the idea that the employment gains from non-compliance may be smaller than typically expected. In this context, we show that when the probability of being referred to a court is minor and the number of underpaid is small (i.e. below a critical level), a benign "blind eye" attitude by monitoring authorities may induce employers to hire more.

In the second part of the paper, we test the theoretical predictions of the model using information on firms' non-compliance and employment levels drawn from the Italian labour force survey data. We report stylized evidence that employers' non-compliance is quite common in Italy, with a higher incidence in the service industry and in Southern regions. We estimate an average elasticity of employment to non-compliance of about 0.2, providing suggestive evidence of a trade-off with employment, particularly at low levels of non-compliance, which we interpret as evidence of the 'blind eye' attitude of authorities. The relationship turns negative for higher levels of non-compliance when the probability of being referred to a court and the risks of sanctions are larger.

While the institutional context and the empirical findings refer to the Italian labour market, we consider that the main conclusions of this work can be of interest for other countries too since non-compliance with minimum wages is a quite general phenomenon (see Section 2). Indeed, wage floors set by collective agreements or sectoral wage boards are common in many European countries as well as in Australia and proposals in this sense are being discussed in New Zealand and the United States.

The remainder of this paper is organised as follows. Section 2 provides a short description of wage setting institutions and enforcement in Italy. Section 3 develops a theoretical model of partial non-compliance and employment. Section 4 describes the empirical strategy and the data used to investigate the role of non-compliance on employment. Section 5 presents the main results and section 6 concludes and discusses the policy implications.

2. Wage setting and enforcement in Italy

In Italy, there is no statutory minimum wage and wage floors are set by collective agreements signed by unions and employers organisations at the industry level. Currently, there are more than 800 industry-wide collective agreements which cover practically all private-sector employees in Italy, while trade union density (the number of members over the total number of employees) is below 30% in the private sector and employers' organisations density just above 50% (OECD, 2019 and D'Amuri and Nizzi, 2017). A national collective bargaining agreement (CCNL) is usually renewed every three years (prior to 2009, wage levels were generally renegotiated every two years). However, in practice, collective agreements tend to last longer as renegotiations are

only rarely completed on time and the old terms of employment apply until a new agreement is signed.

Wage floors set through collective negotiations at the industry level are in general quite high. When compared to the median wage (using the so-called Kaitz Index, the ratio of the minimum to the median wage), they range between 74% to more than 100% according to the industry considered. Since nominal wage floors are negotiated at national level, they are the same in all areas and regions of the country. However, Garnero (2018) shows that there is a substantial regional variation when wage floors are computed with reference to the regional median wage or in terms of local purchasing power parity: they tend to be higher in Southern regions compared to Northern ones, thus reflecting the well-known regional differences in productivity and cost of living. Boeri et al. (2019) also show that in Italy, despite sizeable differences in economic development across the regions, average nominal wages do not vary across provinces and the relationship between local productivity and local nominal wages is very weak. Moreover, Belloc, Naticchioni and Vittori (2019) point out that in Italy workers covered by a collective agreement do not enjoy any urban wage premium. In fact, their wages in real terms are lower in more densely populated areas, contrary to the findings of the literature for other countries. Overall, the Italian bargaining system appears successful in ensuring nominal wage equality across the country at the cost, however, of significant imbalances in real terms and a misalignment with local economic conditions.

Industry-wide bargained minimum wages can be considered a functional equivalent of a statutory minimum wage if the share of workers covered is high (Garnero et al., 2015). However, an important difference is that while a statutory minimum wage applies to all workers and is legally binding, wage floors in collective agreements cover only employees in companies that have signed an agreement.[4] Some European countries (France, for instance) formally extend the sectoral agreements to all companies with an administrative act. In Italy there is no formal extension of the collective agreements, but, to fulfil the Constitutional requirement that states that "*workers have the right to a remuneration commensurate to the quantity and quality of their work and in any case such as to ensure them and their families a free and dignified existence*", Italian judges often use industry collective agreements as a reference. While quite common, this interpretation is controversial and in any case requires an individual complaint by a worker or, more often, a collective one by a union to be activated.

According to Garnero (2018), more than 10 percent of all Italian employees are paid less than the lowest wage floor set in the relevant industry collective agreement. Violations in Italy occur in all industries, but are stronger in some industries, such as agriculture, commerce, hotels and restaurants where non-standard and informal forms of work are more concentrated. They are also more prevalent in the South and in micro and small firms.

FIGURE 1 HERE

Such high levels of non-compliance with negotiated wage floors can be the result of opportunistic behaviour to save on labour cost and/or the presence of loopholes in the collective bargaining system and a lack of proper enforcement. Out of the 800 collective agreements currently in force, less than a third have been signed by representative unions and employers' organisations. The others have been signed by smaller, and sometimes fictitious, unions and employers' associations, which in some cases are negotiated with the explicit purpose to establish wage floors below the existing ones with the consent of a poorly representative union or a "yellow" union (a workers' organisation set up or influenced by an employer). The enforcement of wage floors negotiated by representative trade unions and employers' organisations is severely limited by the absence of clear and stringent rules on the representativeness of social partners and the lack of significant initiatives by regulators to contrast the spread of "pirate agreements" (Tomassetti, 2015; D'Amuri and Nizzi, 2017; Lucifora and Vigani, 2019), implicitly out of fear of harming employment prospects of the employees in the less developed areas of the country.

Non-compliance with minimum wage standards is not only an Italian phenomenon but has been found to be substantial in other countries. Rani et al. (2013) provides estimates of non-compliance in 11 developing countries and they find that non-compliance ranged from 5% in Vietnam to 51% in Indonesia in the late 2000s. Bhorat et al. (2015) provides evidence for seven sub-Saharan African countries finding a high degree of non-compliance, ranging from 20% in Tanzania to 80% in Mali. Non-compliance is lower but not negligible in OECD countries too. Statistics by the US Bureau of Labor Statistics estimate it at around 2% while survey data for Germany show that 3 to 4 percent of all employees are paid less than the minimum wage (Bruttel et al., 2017). However, two reports by the UK Low Pay Commission suggest that up to 20% minimum wage workers may actually be paid less than what they are legally entitled to (Low Pay

Commission, 2017 and 2020). While bearing in mind the large differences in institutional settings across countries and the limitations of the analysis, the results of this paper can provide some food for thought not only to Italian regulators but also to those in other countries that are faced with similar issues.

3. Theoretical framework

In this section, we model the hiring and minimum wage compliance decisions of employers. The model sketches the main features of sectoral minimum wage setting in collective agreements, employers' compliance behaviour and the role of labour courts with reference to the institutional context previously discussed. It describes how an employer may be held liable for deviating from sectoral minimum wage levels and the costs employers may face when workers appeal to a labour court to be paid a "fair" wage (according to art. 36 of the Italian Constitution). Employers' adherence to the wage minima set in collective agreements is subject to the monitoring of the labour inspectorate or has to be enforced by workers who, as previously described, must refer to labour courts' intervention.[5]

Firms only employ workers in production. Output is $y = \theta f(L)$, where $f(L)$ is a strictly concave function, θ is an efficiency parameter, while prices are normalised to one. Collective bargaining takes place at the industry level where a trade union and an employers organization bargain over the wages to be paid in the industry. We assume that bargaining parties only care about the aggregate welfare of the existing firms and employed workers in the industry and set the wage level above market clearing (Jimeno and Thomas, 2013 and Moene and Wallerstein, 1997). Since the bargained wage (w^B) is uniform across all firms in the industry and higher than the competitive level (w), employers can behave as "price takers" and pay all workers, w^B, or deviate from that level paying a lower wage level, w, equal to the market clearing level. We consider the case in which the employer deviates only partially paying w^B to L^B workers (with $L^B \leq L$), while paying w to the remaining ($L - L^B$) workers.[6] Notice that employer non-compliance with collective bargaining standards can originate for different reasons: either from deviations from normative rules (i.e. exploiting loopholes in collective bargaining representation and applying the so-called "pirate agreement", with lower wage provisions), or just originate from opportunistic behaviour (i.e. simply paying a wage below the bargained levels) to save on labour cost. Workers can accept the lower wage offer (w) or sue the employer in a labour court to claim the right to be paid a "fair" wage.

While the "fair" wage threshold in the Italian system is at the discretion of the judge, often the bargained wage (w^B) is chosen as the reference level.

If employers are referred to a labour court, they incur in additional costs. These costs, in part, are made of fixed administrative charges (τ), mainly due to the length of the trial and to red tape expenses. Other costs originate from sanctions levied on employers when the court decision establishes that the lower wage level, compared to the bargained level, is a violation of the "fair" wage Constitutional provision. We model these sanctions as transfers from the employer to the ($L - L^B$) workers that are underpaid. The sanction per-worker is a multiple λ of the wage gap ($w^B - w$). In practice, we outline two scenarios following a court referral. If the court decides in favour of the employer, the latter only pays the administrative charges τ. By contrast, if the court decides against, the employer pays the administrative charges plus the transfers $\lambda(w^B - w)(L - L^B)$. We hold that the court rules in favour of the employer with a probability q.

When deciding whether to comply or not with the collective contract provisions, the employer takes into account the probability that workers who are underpaid will accept the lower wage offer, or appeal to the labour court to obtain the payment a "fair" wage. Employers evaluate profits by means of a twice differentiable function $U(\pi)$, we allow for risk aversion by assuming that $U''(\pi) \leq 0$. When workers accept the lower wage offer, the employer's payoff is $U(\pi^{NC})$ (NC: no case). Conversely, when workers appeal to a court, the employer may either win the case and receive the payoff $U(\pi^W)$ (W: win) or lose the case and receive the payoff $U(\pi^L)$ (L: lose). Clearly, $\pi^L < \pi^W < \pi^{NC}$:

$$\pi^j = \theta f(L) - w^B L^B - w(L - L^B) - I_j \tau - Q_j \lambda (w^B - w)(L - L^B) \tag{1}$$

Where $j = NC, W, L$ and I_j and Q_j are two 0-1 indicators:

$$I_j = 1 \ if \ j = W, L \qquad Q_j = 1 \ if \ j = L \qquad I_j = Q_j = 0 \ otherwise$$

Employer's expected utility is then

$$EU(\pi) = [1 - \varphi(L - L^B)]U(\pi^{NC}) + q\varphi(L - L^B)U(\pi^W) + (1 - q)\varphi(L - L^B)U(\pi^L) \tag{2}$$

where $\varphi(L - L^B)$ is the probability that workers sue the employer, which is a smooth increasing function of the number of underpaid workers - i.e. $\varphi'(L - L^B) > 0$ and $\varphi''(L - L^B) > 0$[7].

The employer maximises the expected utility choosing both total employment (L) and compliance with collective bargaining wage provisions, that is choosing the number of workers who are paid the bargained wage (L^B). Differentiating (2) with respect to L and L^B and assuming that the optimal L^B falls within the interval $(0, L)$ we obtain the following first order conditions[8]:

$$\theta f'(L) = w + \frac{\Psi}{EU'(\pi)} \qquad (3)$$

$$(w^B - w) = \frac{\Psi}{EU'(\pi)} \qquad (4)$$

where:

$$\Psi = \Psi_1 + \Psi_2$$

$$\Psi_1 \equiv \varphi'(L - L^B)[U(\pi^{NC}) - qU(\pi^W) - (1 - q)U(\pi^L)]$$

$$\Psi_2 \equiv \lambda(1 - q)\varphi(L - L^B)U'(\pi^L)(w^B - w)$$

Equation (3) describes the optimal choice of L for some given level of compliance L^B, the term $EU'(\pi)$ indicates the expected marginal utility of profits. Increasing L by a small amount while keeping L^B constant is akin to hiring an extra underpaid worker. Equation (3) states that the employer equates the marginal revenue from hiring such a worker to the marginal cost. Notice that the marginal cost is the sum of the wage w plus the shadow hiring cost $\Psi/EU'(\pi)$. The latter is due to the fact that hiring an extra underpaid worker increases not only the chance of being referred to a court (Ψ_1) but also the size of the sanctions in case of a negative court decision (Ψ_2).[9]

Equation (4) describes the optimal choice of compliance L^B. Given L, increasing L^B by a small amount is akin to moving a worker from the group of those that are underpaid to the group of those that are paid at the regular wage w^B. The cost of this move is given by $w^B - w$, the benefit consists of the reduction in the risk of being referred to a court and the reduction in the size of the sanctions in case of a negative court decision. Accordingly, the equation is to be interpreted as equating the cost and the benefit of the marginal move between the two groups. Since the cost is exogenous to the employer, the equation determines $\Psi/EU'(\pi)$. In turn, since $\Psi/EU'(\pi)$ depends only on the extent of non-compliance ($L - L^B$), the equation determines L^B for any given L.

With a mild degree of risk aversion, it is possible to show that the shadow hiring cost $\Psi/EU'(\pi)$ decreases with the probability of winning the case q while increasing with respect to the level of non-compliance $(L - L^B)$, the wage gap $(w^B - w)$, the severity of sanctions λ and the probability of being referred to a court φ.[10] Thus, in line with intuition, Condition (4) implies that the optimal level of non-compliance increases with the probability of winning the case but declines with the severity of sanctions and with the probability of being referred to a court. By contrast, the impact of the wage $(w^B - w)$ on the optimal level on non-compliance is inherently ambiguous. On the one hand, a higher wage gap implies that moving a worker from the group of those that are paid regularly to the group of those that are underpaid is more profitable. On the other hand, a higher wage gap also implies heavier sanctions in case of a court referral and a negative court decision.

According to Condition (3), more severe sanctions, a higher probability of being referred to a court and a lower probability of winning the case also reduce total employment *L for a given level of non-compliance*. Hence, the fact that non-compliance is itself endogenous with respect to these elements indicates that the overall employment effect is the combination of a direct effect plus an indirect effect that operates through the compliance decision.

In fact, Conditions (3) and (4) imply that if employers fully factor in the risk of being referred and paying the sanction, the direct and indirect effect cancel out. In practice, substituting (4) in (3) we obtain $\theta f'(L) = w^B$, which suggests that total employment is independent of the costs from non-compliance and equal to the level that would prevail when the bargained wage is paid to all workers (Yaniv, 2001). The intuition of the result is as follows. If the employer allocates the marginal hire to the group of those that are paid regularly, optimality requires equating $\theta f'(L)$ to w^B. By contrast, if the employer allocates the marginal hire to the group of those that are underpaid, optimality requires equating $\theta f'(L)$ to w *plus* the shadow hiring cost following from an increased exposure to the risk of a court referral. According to equation (4), the sum of these two costs coincides with w^B so that the same optimality condition arises no matter whether the marginal hire is regularly paid or underpaid. In a nutshell, non-compliance allows saving on labour costs but does not stimulate hiring.

Notice that Conditions (3) and (4) and the ensuing neutrality result have been obtained under the assumption that the optimal decision on L^B is 'internal'. For completeness, we now explore under what theoretical conditions full non-compliance and full compliance can be ruled out.

Full non-compliance is ruled out if, starting from $L^B = 0$, the expected utility of the employer increases by moving a worker from the group of those that are underpaid to the (empty) group of those that are paid regularly. By evaluating the marginal utility of L^B at $L^B = 0$ we find that this is the case if

$$\frac{EU'(\pi) - \varphi\prime(L)[U(\pi^{NC}) - qU(\pi^W) - (1-q)U(\pi^W)]/(w^B - w)}{U'(\pi^L)} < \lambda(1-q)\varphi(L) \qquad (5)$$

In practice, to rule out full non-compliance the RHS of the Inequality (5) must be sufficiently large. Notice that the RHS is the product of the probability of being referred to a court, the probability of losing the case once a court is appealed and the severity of sanctions. The message arising from Inequality (5) is that the combination of these elements must be large enough to discourage extreme non-compliance decisions.

Symmetrically, full compliance is ruled out if, starting from $L^B = L$, the expected utility increases by moving a worker from the group of those that are paid regularly to the (empty) group of those that are underpaid. The condition for this to be the case is $\lambda(1-q)\varphi(0) < 1$, which is easily met in the real world since with full compliance the probability of being referred to a court is practically zero $[\varphi(0) \cong 0]$.

We observe that the 'neutrality' effect of non-compliance relies on quite restrictive hypotheses. Nevertheless, it does convey the idea that the employment gains from non-compliance may be smaller than typically expected.

In fact, an assumption which appears to be quite restrictive is the smoothness of the function $\varphi(L - L^B)$. An alternative and, arguably, more realistic assumption is that the probability of being referred to a court is virtually zero if the number of those that are underpaid is smaller than some fraction y^* of the workforce and that it jumps upward by a discrete amount if the threshold y^* is crossed. In practice, it may well be the case that some local 'tolerance' threshold is in place so that employers are safe if they decide to remain within the threshold.

To outline the employment consequences of such a threshold, assume that the jump in the probability of a court referral is sufficiently large so that the employer finds it optimal not to cross the threshold. In this case, the employer sets $L^B = (1 - y^*)L$ and the optimality condition for L becomes $\theta f'(L) = y^* w + (1 - y^*)w^B$. The implication of this condition is clear. In contests where authorities and courts are more permissive y^* tends to be larger and the employer has an incentive to hire more.

4. Empirical analysis

The theoretical framework sketched above has conveyed the idea that when sectoral bargaining sets wages at a higher level than the market clearing one, employers may trade a higher risk of sanctions from paying wages below the minimum bargained level to some workers with higher profits and more employment. Complacent governments that turn a "blind eye" by lowering enforcement and sanctioning standards expecting higher employment, from less productive firms, may further exacerbate employers' non-compliance. Despite the relevance of the above implications, the empirical evidence on these issues is still scarce. In particular, as the theoretical predictions make it clear, the direction and size of non-compliance on employment levels are eminently an empirical matter. In this section, we discuss the implications of the theoretical model for the empirical analysis and highlight some measurement issues.

We begin by specifying a firm-level employment equation where the level of employment (L_{ijrt}) of the *i-th* firm operating in the *j-th* industry and located in region *r* depends on the industry-wide bargained wage ($w^B{}_{jt}$), the rate of non-compliance within the firm (NC_{ijrt}), a vector of firm-level attributes (X'_{ijrt}), firm-specific time-invariant attributes (γ_i), a vector of region fixed-effects (θ_r) a common time effect (η_t) and unobserved error component (ρ_{ijrt}). Specifically, we assume:

$$L_{ijrt} = \lambda w^B{}_{jt} + \beta NC_{ijrt} + X'_{ijrt}\delta + \gamma_i + \theta_r + \eta_t + \rho_{ijrt} \qquad (6)$$

where the coefficient λ is the elasticity of firm's employment to the industry-wide bargained wage, and β is our parameter of interest which captures the direct effects of firm's non-compliance with respect to the firm's employment level. Notice that while the firm takes as given the industry-wide

bargained wage, it chooses employment and non-compliance levels. Moreover, unobserved factors, such as the employer's propensity to comply and firm's productivity, are likely to affect both the type of workers employed as well as its total employment. Fully complying firms are more likely to employ better qualified workers, while non-complying employers will mostly attract low-skilled workers. This endogenous sorting of workers is likely to further exacerbate the existing productivity differences across firms within any industry and local labour market. Finally, industry and local labour market conditions may influence firm's non-compliance behaviour, as the government agency in charge of labour standards enforcement may vary the resources allocated to monitoring activities (such as the number of labour inspectors) according to local economic conditions (i.e. unemployment levels).

In order to derive a specification suitable for estimation, it is also important to discuss the measurement of non-compliance. In this respect, since non-compliance originates from an underlying illicit behaviour, information on earnings and hours worked collected in employers' surveys or available in tax archives are unlikely to truthfully report the earnings of workers, which fall below the industry-wide bargained levels. A more reliable source of information to measure employers' non-compliance comes from workers self-reported earnings (and hours worked) often available in labour force (or household) surveys.[11] While we return to the discussion of measurement errors and other measurement issues in the data section, here it is important to highlight one limiting aspect of labour force surveys, which typically do not provide the firm identifier, thus making estimation of equation (6) unfeasible. To deal with the above data issues, we aggregate equation (6) at the industry-region level and use a fixed-effects estimator to account for unobservable industry-region attributes.[12] Specifically, we rewrite equation (6) replacing the firm's level variables by their level in industry j and region r, as specified in equation (6') below,

$$L_{jrt} = \lambda w^B{}_{jt} + \beta NC_{jrt} + X'_{jrt}\delta + \gamma_{jr} + \theta_{jrt} + \eta_t + \varepsilon_{jrt} \qquad (6')$$

where L_{jrt} is the total employment in industry j and region r, NC_{jrt} is the average rate of non-compliance of firms in the industry-region, γ_{jr} are the industry-region fixed-effects and θ_{jrt} are the industry-region time trends, all other covariates are defined accordingly. While we acknowledge that the *within* industry-region level of analysis does not eliminate all the firm-level unobserved correlations, and that the employment effect of non-compliance estimated by OLS may be biased,

we expect that any unobserved idiosyncratic firm-specific shock – such as a positive productivity shock which increases employment and reduces non-compliance – is likely to bias our estimate downwards towards finding no effect.[13] However, the lack of a suitable instrument to uncover the causal effect of non-compliance on employment levels, implies that we can only provide suggestive evidence of the correlation between employers' non-compliance decisions and employment levels.

To minimise the measurement error associated with using continuous levels of non-compliance, we also estimate equation (6') with a simple dummy for non-compliance (1 if there are workers underpaid in a given sector-region, 0 otherwise). In the robustness checks, we also add to our baseline specification a rich vector of observed industry-regions characteristics to control for time-varying characteristics of industries and regions. Namely, our more general specifications include: the share of young workers (age <35), the share of temporary employment, the share of women, the share extra-EU immigrants, the share of employment in SMEs and the share low educated workers (less than tertiary diploma). In addition, to account for the presence of different standards in the efficiency of labour courts in sanctioning non-complying employers, we also test a specification controlling for the length of trials at the regional level. Finally, we also test the robustness of our estimates to the inclusion of industry-region specific time trends.

4.1 Data

In the empirical analysis, we combine information from different sources. Wage floors for the most representative collective agreements, -- i.e. those agreements that *de facto* cover (almost) all employees in the sector --, are collected and monitored by ISTAT.[14] Information on wage floors is matched to information drawn from the Italian Labour Force Survey (LFS) on earnings and hours worked by workers in all business sectors. Other local labour market characteristics at the industry-region level are also included. We focus on the 2008-2015 period, since in 2015 the Italian Government introduced major changes in the labour legislation (i.e. the so-called "Jobs Act") combined with generous reductions in social security contributions, both of which are likely to confound our analysis (Sestito and Viviano, 2018).

Wage floors in collective agreements

The data used in this analysis represent a specific extraction of the minimum value in each agreement (therefore the base wage for the lowest occupational level excluding seniority or other pay elements defined in collective agreements such as wage supplements for night shifts or particular activities, or bonuses). Wages are before taxes and transfer and (in many cases) include the 13th or 14th monthly payment (i.e. a sort of delayed annual payment). Moreover, they also account for the presence of arrears in the case of late renewal (*salari di competenza*). Bonuses related to individual performance or individual working conditions, supplementary payment agreed at the company or local level are excluded.[15] The data cover all business sectors in the period 2008-2015. In 2015, gross minimum wages in collective agreements were on average 1,387 euros/month including the 13th and the 14th month (if paid), 12.7% higher in nominal terms than in 2008 when they were around 1,230 euros/month. Gross minimum wages in collective agreements are very high compared to the median wage (about the 75% of the median).

Individual wages and other individual-level controls

Information on individual wages, as well as on the workforce composition, is drawn from the Labour Force Survey (LFS) over the period 2008-2015. LFS is the most comprehensive data source to study non-compliance since it covers all business sectors and wages and hours are reported by the respondent and so less likely to be misreported by employers to "formally" comply with regulations (i.e. as typically done in administrative data) and more likely to reflect the real wages earned and not those that should have been paid according to the rules. Moreover, the LFS is not restricted to the formal economy. Therefore, the LFS encompasses non-compliance due to informality, non-regular forms of work, unpaid extra hours, "inadvertent" underpayment, as well as the use of "pirate agreements" (signed with poorly representative or "yellow" unions).[16] Notice that all the above forms of non-compliance, entail *de facto* different implicit costs according to the severity of the illicit behaviour adopted, which the employer can only anticipate with some uncertainty. The implication for the empirical analysis is that we cannot disentangle the contribution of each form of non-compliance on employment, but only an overall effect.

The LFS collects net wage data and therefore in order to make individual wage data comparable with ISTAT minimum wage data, LFS net wages are converted to gross wages using

income tax rate and social security contributions (as a % of net wages) for different levels of the average wage (from 1% to 200%) in the case of a single person without children from the OECD TaxBen model. We assume that this is the effective tax rate for all workers each month before tax adjustments and transfers done at the end of the year to take into account family composition and household total income. Individual wage data are further inflated to add the 13th and 14th months in sectors that also have to include a 13th (all sectors) and a 14th month (around 40% of the agreements in the sample). Finally, only employees above 15 year old are considered (apprentices and domestic workers are excluded as well as also *co.co.pro*, casual work because of missing wage data in the LFS).

Non-compliance

Non-compliance is measured as the percentage of workers who are paid below the wage floor set in collective bargaining (w_{min}). Formally, the non-compliance headcount indicator *NC* takes value 1 if $w < w_{min}$ and of 0 when $w \geq w_{min}$ (where w is the wage).

Since data on wages and hours worked in the LFS may be subject to measurement error (though, at least for wages, it would probably underestimate the number of workers underpaid since respondents tend to overstate wages at the bottom of the distribution),[17] we take a conservative approach and restrict the sample to workers working a normal set of hours (between 28 and 52 hours), thus excluding those working very few or too many hours. Moreover, we compute non-compliance as the share of workers paid 90%, or less, compared to the reference wage floor set by the collective agreement in the sector of reference, allowing *de facto* for a margin of error of 10%.[18]

Table 1 provides the summary statistics of the variables used in the analysis. Reflecting the structure of the Italian labour market, a third of the employee in the sample are women, 12.7% have a temporary contract, a quarter work in a SME, almost 90% of them have reached at most secondary school, and 4% are migrants. Almost two thirds of the employee in the sample work in the service sectors, the rest in manufacturing and just around 2% in agriculture. Finally, 37% work in the North of the country, 21% in the Center, 30% in the South and 10% in the Sardinia and Sicily.

TABLE 1 HERE

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5. Results

Baseline results

Table 2 reports our estimates of the employment relationship (equation 6') with a different set of controls for each specification. As discussed above, OLS estimates may yield biased estimates (see Table A.1 in the Appendix) as firms in more economically depressed areas could exhibit both lower employment levels as well as higher non-compliance, thus driving the estimated effect towards zero. Results, across all specifications, show that non-compliance is positively and significantly associated with the (log of) employment levels, also when controlling for specific region-industry time trends (columns 4-5-6-7 in Table 2). The elasticity of employment to non-compliance, evaluated at its average level, is estimated around 0.2 suggesting that when non-compliance increases by 10% around its average value, employment also rises by approximately 2%.[19] Moreover, the relationship between non-compliance and employment is found to be non-linear, with a proportionally smaller effect on employment levels as non-compliance increases and is more likely to be detected. In fact, at excessively high rates of non-compliance – i.e. above 40% in our estimates – the positive trade-off starts to wane. The relatively small magnitude of the trade-off between non-compliance and employment may reflect the fact that, as implied by the theoretical model, above a certain threshold the risk of being referred to court leads employers to internalize, at least partially, the costs of non-compliance. However, for the reasons discussed above, it may also simply represent a lower bound estimate and should, therefore, be interpreted with care.

The estimated elasticity of (log) employment to negotiated minimum wages is, as expected, negative and large. An increase in the negotiated minimum wages of about 1% is associated with a decrease in employment between 1.2% and 1.6%. Notice that, while an elasticity above one is quite sizeable, compared to standard estimates of own-wage elasticities of labour demand,[20] when estimated at the level of the minimum wage elasticities are generally found to be larger. For example, Fanfani (2020), using the whole population of Italian firms, estimates an own-price labour demand elasticity up to -1.2, which is even larger for incorporated companies. Also, in a number of studies on the effect of the minimum wage in France the elasticity of employment with respect to the minimum wage is close to -2 for men and -1.5 for women (Kramarz and Philippon 2001, Abowd et al. 2006), while Cahuc and Carcillo (2018) report an even larger elasticity close to -4.

TABLE 2 HERE

Table 3 reports estimates fitting the same specification as above, but using a different measure of non-compliance. In particular, we focus on the extensive margin of non-compliance, setting a value equal to zero when employers fully comply with the negotiated minimum wages, and a value equal to 1 when employers comply only partially – i.e. within any given region-sector –, or do not comply at all. Results confirm the previous findings showing a positive and statistically significant coefficient of non-compliance on employment levels in all specifications. The estimated coefficient of the extensive margin is now much larger, compared to previous estimates, a change in compliance status is associated with a 30% increase in employment levels. Notice that in this case, the estimated effects are likely to capture an aggregate effect of switching from employers' full compliance to partial or no-compliance. The elasticity of employment to wage floors remains large and above 1[21].

TABLE 3 HERE

Next, we test the hypothesis that the non-compliance-employment trade-off may vary according to the local labour markets size. In practice, we expect that employers operating in small region-industry contexts may have more discretion in paying workers below the collectively agreed wages, and be less likely to be inspected by the monitoring authority or disciplined by trade union action. In Figure 2, we report the estimated coefficients obtained estimating quantile regressions (i.e. equation (6')), at different deciles of the local labour market employment distribution. We find that the estimated trade-off is larger at lower deciles and it monotonically decreases as the size of the local labour market increases, a pattern that is consistent with the hypothesis that in small local labour market monitoring and control may be weaker and a 'blind eye' attitude more easily tolerated.

FIGURE 2 HERE

An alternative hypothesis, as hinted by the theoretical model, is that the intensity of monitoring and sanctioning may be discontinuous, implying that when non-compliance is low authorities may exhibit some degree of tolerance to the benefit of higher employment opportunities, but above some critical level of non-compliance the probability of being referred to a labour court

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and sanctioned increase drastically. In the latter case, the expected costs will be internalised by employers, who set employment according to the wage level set in collective agreements – as under full-compliance – with little or no employment trade-off. In Table 4, we re-estimated our preferred specification using a set of dummies for different levels of non-compliance within local labour markets (i.e. below 2%, 2 to 4%, 5 to 10%, 11 to 20%, 21 to 30%, 31 to 50% and above 50%). We find that the employment trade-off disappears for levels of non-compliance higher than 50%. In other words, when more than one worker out of two is paid less than the (minimum) wage level set in collective agreement, there is no employment gain associated with non-compliance.

TABLE 4 HERE

The role of the efficiency of labour courts

Previous literature (Giacomelli and Menon, 2017 and Gianfreda and Vallanti, 2017) has found that the efficiency of labour courts has a significant effect on employment and firms' dynamics. Hence, the effect of non-compliance on employment may also be affected by the efficiency of local labour courts and by employers' expectations about the likelihood of detection and the costs of non-compliance (Soundararajan, 2019). To account for the presence of different standards in the efficiency of labour courts in sanctioning non-complying employers across Italian regions, we augment our specification with a variable recoding the (average) length of labour courts' proceedings at the regional level. Since data on the actual duration of civil proceedings are not available[22], we follow Giacomelli and Menon (2017) and we use a caseflow approach to construct an index that proxies the average length of proceedings (in years) which is calculated as follows:

$$D_t = \frac{P_t + P_{t+1}}{E_t + F_t} \qquad\qquad (7)$$

where P are pending cases at the beginning of the year t, F are new cases filed during the year and E are cases that ended with a judicial decision or were withdrawn by the parties during the year. This index provides an estimate of the average lifetime of proceedings in a court, for the period 2008-2015.[23] Results reported in Table 5, do not show any statistically significant role of labour courts efficiency in mediating the effect of non-compliance on employment. In other words, a more efficient enforcement does not appear to affect the relationship between non-compliance and

employment, as a model in which firms are able to fully internalize the costs of opportunistic behaviour would suggest.[24]

TABLE 5 HERE

Robustness tests

The relationship we detect between non-compliance and employment is robust and strong across different sectors and regions. Focusing on industry-wide differences, Table 6 shows that the estimated coefficient on non-compliance is not statistically different between manufacturing and services, suggesting a similar trade-off with employment. It is also interesting to notice that in the manufacturing sector the estimated own-elasticity of negotiated minimum wages is only weakly correlated with employment (i.e. the coefficient is not statistically significant), suggesting a different bite of negotiated wage floors. This result is probably capturing the stronger role that decentralised bargaining plays in the manufacturing sector, where firm-level agreements grant additional wage premia to the levels negotiated in sector-level agreements. In the service sector, due to the prevalence of smaller firms and weak bargaining power of workers, firm-level bargaining has a relatively marginal role and pay levels closely reflect pay levels negotiated by sector-level agreements.

TABLE 6 HERE

Table 6 also reports a statistically significant and positive relationship between non-compliance and employment in both Northern and Southern regions. The estimated trade-off in non-compliance, however, is shown to be larger in the South relatively to the North, partly due to the higher level of the negotiated minimum wages compared to the median wages (i.e. the Kaitz index) paid by local firms.[25] Our main findings are confirmed even restricting the sample period to selected years: the years of the global financial crisis years (2008-2009)[26], or to the latest years available (2014-2015) when Italy was experiencing a slow recovery. In other words, the trade-off between non-compliance and employment does not seem to be exclusively related to the business cycle and the crisis years, while it probably highlights a structural feature of the Italian labour market.[27]

TABLE 7 HERE

Finally, we replicate the baseline results (column 7 of Table 3) excluding one sector and one region at the time, to ensure that the relationship is not driven by a specific sector or region. The results in the Appendix show that this is not the case (Figures A.1 and A.2 in the Appendix).

6. Conclusions

This paper explores the relationship between non-compliance with collective bargained minimum wage standards and employment levels. First, we model firms' hiring and compliance behaviour, showing that there may be a trade-off between non-compliance and employment for relatively low levels of non-compliance (when the risk of being referred to court is very low). However, this trade-off may be smaller than typically thought as employers internalize the expected costs of non-compliance.

Second, we empirically test the main predictions of the theoretical model using information on non-compliance and employment levels drawn from the Italian Labour Force Survey (LFS) and focusing on local labour market (i.e. industry-region specific data). The results suggest the existence of a small trade-off between non-compliance with minimum wage standards and employment levels. While we are unable to say to what extent the estimated elasticity between non-compliance and employment levels is the result of employers' behaviour or originates from the (negative) selection of marginal employers with poorer employment prospects into non-compliance, we do find evidence suggesting that employers always have an incentive not to comply when regulators turn a "blind eye". The estimated effect is larger when the extensive margin of non-compliance is considered, as what seems to matter most for employment levels is the aggregate effect of whether employers, on average, are complying or not. Interestingly, the trade-off appears to be non-linear and possibly discontinuous for levels of non-compliance above 50%. In other words, when more than half of the workforce in the local labour market appears to be underpaid with respect to the wage levels set in collective agreements, employers internalise the expected cost of being referred to a court and adjust the level of employment as under full-compliance – with little or no employment trade-off.

These results have important implications for the policy debate on wage setting institutions and the role of regulators in monitoring and sanctioning non-compliance. In line with common wisdom, a strict enforcement of the existing minimum wages set in collective agreements may reduce employment at the margin in less productive firms. However, non-compliance and "pirate" agreements in Italy are also used to minimise payroll taxes and social security contributions which in turn can have significant distortive effects on competition between companies. Notice that by not ensuring a level-playing field among firms and workers, non-compliance is a major driver behind the erosion of the Italian system of industrial relations. Hence, turning a "blind eye" and allowing the proliferation of "pirate" agreements in exchange of relatively modest employment gains does not qualify as a sustainable strategy. Moreover, even if non-compliance may result into higher employment in marginal firms, by altering competition in the labour market it can undermine the aggregate level of efficiency. In our view, fighting non-compliance, without harming employment in the medium/long-term, would require a stronger enforcement of the agreements signed by the most representative employers organisations and trade unions in exchange for additional flexibility in sector-level collective agreements to accommodate the significant productivity differentials across Italian firms and local labour markets. Such a strategy would ensure a level-playing field across companies and workers, also addressing, at least in part, the need for more wage flexibility avoiding *ad hoc* and discretional adjustments by employers.

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Figure 1: Share of underpaid workers in Italy by region, 2015
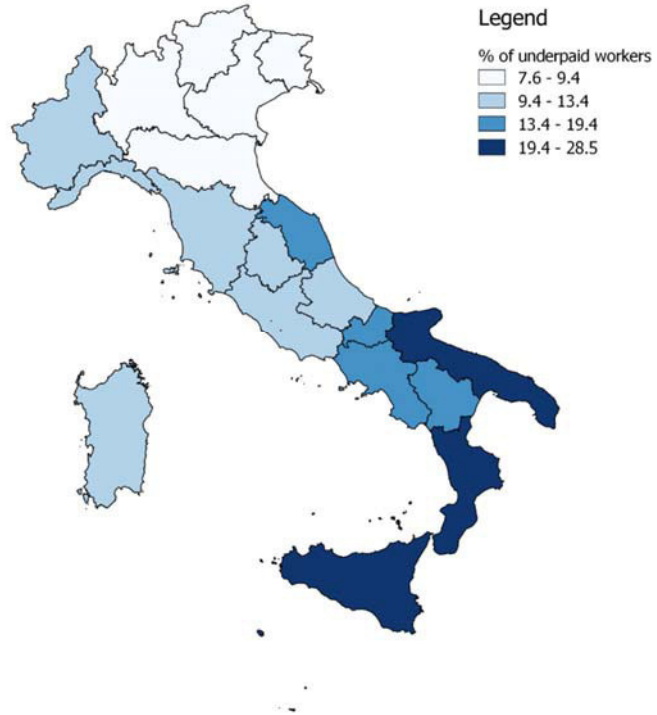
Source: Authors's calculation using data from Istat LFS 2008-2015 and negotiated wages database.

Figure 2: Non-compliance by employment deciles, coefficients and confidence intervals
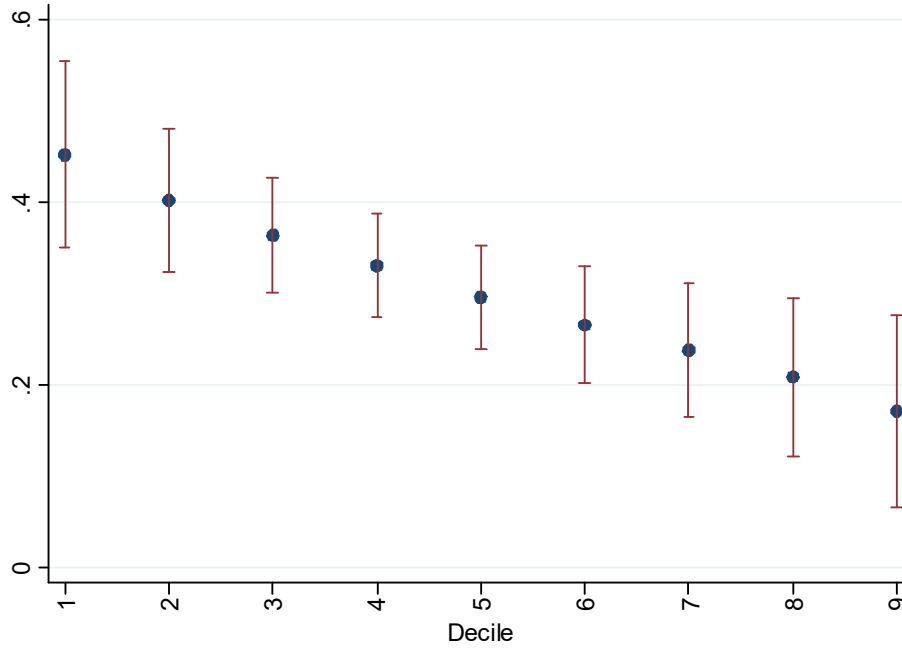
Note: Each dot indicates the coefficient for each decile of employment levels based on quantile regressions with the same controls and fixed effects as in column (7) in Table 2. The vertical bars indicate 95% confidence intervals.

Table 1: Descriptive statistics, 2005-2015

Main variables	Mean	Std. Dev.	Min	Max
log employment	8.06	1.7	2.06	13.05
log wage floors	4.86	0.14	4.52	5.25
Non compliance (% of workers paid less than the wage floor)	13.81	16.14	0	100
Non compliance (% of sector-region cells not fully compliant)	79.35	40.47	0	100
Controls				
% young <35	29.13	20.09	0	100
% temporary empl.	12.73	15.29	0	100
% women	29.75	26.23	0	100
% immigrants extra EU	4.29	7.86	0	100
% emp in SMEs	26.04	22.75	0	100
% less tertiary	87.47	18. 48	0	100
Sector				
Agricolture	2.61			
Manufacturing	34.41			
Services	62.98			
Region				
North	37.67			
Center	21.26			
South	30.41			
Islands	10.65			

Source: Authors's calculations using the Labour Force Survey and the database on negotiated wages by Istat.

Table 2: Baseline results: non-compliance as continuous variable - fixed effects, 2008-2015.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Non-compliance (*100)	1.45***	1.49***	1.48***	1.70***	1.70***	1.49***	1.48***
	(0.17)	(0.17)	(0.17)	(0.11)	(0.17)	(0.15)	(0.15)
Non-compliance^2 (*100)	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Log wage floors		-1.24***	-1.28***	-1.51***	-1.52***	-1.26***	-1.30***
		(0.31)	(0.31)	(0.20)	(0.26)	(0.25)	(0.25)
% young <35			0.19***		0.19***		0.19***
			(0.07)		(0.07)		(0.06)
% temporary emp.			-0.19**		-0.19**		-0.19**
			(0.08)		(0.08)		(0.08)
% women			-0.05		-0.02		-0.05
			(0.07)		(0.07)		(0.07)
% immigrants ex-EU			-0.03		0.04		-0.03
			(0.15)		(0.16)		(0.14)
% emp. in SME			-0.10		-0.04		-0.10
			(0.07)		(0.07)		(0.07)
% low edu			0.12		0.15*		0.12
			(0.09)		(0.08)		(0.08)
Year FE	yes	yes	yes	yes	yes	yes	yes
Industry, Region & Industry x Region FE	yes	yes	yes	no	no	yes	yes
Industry x Region time trends	no	no	no	yes	yes	yes	yes
R-squared	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Observations	5,816	5,816	5,816	5,816	5,816	5,816	5,816

Note: Robust standard errors in parentheses. See Table 1 for information on the sample and the main variables.

***, **, *: statistically significant at the 1, 5 and 10% levels, respectively.

Table 3: Baseline results: non-compliance as a dummy - fixed effects, 2008-2015

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Non-compliance	0.29***	0.30***	0.30***	0.41***	0.42***	0.30***	0.30***
	(0.03)	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)
Log wage floors		-1.20***	-1.26***	-1.58***	-1.59***	-1.22***	-1.27***
		(0.30)	(0.30)	(0.19)	(0.27)	(0.24)	(0.24)
% young <35			0.14**		0.13*		0.14**
			(0.07)		(0.07)		(0.06)
% temporary emp.			-0.24***		-0.27***		-0.24***
			(0.08)		(0.08)		(0.08)
% women			-0.08		-0.03		-0.08
			(0.07)		(0.07)		(0.07)
% immigrants ex-EU			-0.02		0.08		-0.02
			(0.15)		(0.16)		(0.14)
% emp. in SME			-0.14*		-0.05		-0.14*
			(0.07)		(0.07)		(0.07)
% low edu			0.12		0.17**		0.12
			(0.09)		(0.08)		(0.08)
Year FE	yes	yes	yes	yes	yes	yes	yes
Industry, Region & Industry x Region FE	yes	yes	yes	no	no	yes	yes
Industry x Region time trends	no	no	no	yes	yes	yes	yes
R-squared	0.89	0.90	0.91	0.92	0.93	0.94	0.95
Observations	5,816	5,816	5,816	5,816	5,816	5,816	5,816

Note: Robust standard errors in parentheses. See Table 1 for information on the sample and the main variables.

***, **, *: statistically significant at the 1, 5 and 10% levels, respectively.

Table 4: Fixed effects estimates using non-compliance dummies, 2008-2015.

	(1)	(2)
Non-compliance >=0% & <2%	0.36***	0.36***
	(0.03)	(0.03)
Non-compliance >=2% & <4%	0.32***	0.33***
	(0.03)	(0.03)
Non-compliance >=4% & <10%	0.33***	0.33***
	(0.02)	(0.02)
Non-compliance >=10% & <20%	0.33***	0.33***
	(0.03)	(0.03)
Non-compliance >=20% & <30%	0.31***	0.31***
	(0.03)	(0.03)
Non-compliance >=30% & <50%	0.27***	0.27***
	(0.04)	(0.04)
Non-compliance >=50%	0.10*	0.11*
	(0.06)	(0.06)
Wage floors	yes	yes
Controls	no	yes
Year FE	yes	yes
Industry, Region & Industry x region FE	yes	yes
Industry x region time trends	yes	yes
R-squared	0.95	0.95
Observations	5,816	5,816

Note: Robust standard errors in parentheses. See Table 1 for information on the sample and the main variables.
***, **, *: statistically significant at the 1, 5 and 10% levels, respectively.

Table 5: Estimates augmented with the efficiency of the labour court, 2008-2015.

	(1)	(2)	(3)	(4)
Non-compliance (*100)	1.48***	1.04***		
	(0.17)	(0.38)		
Non-compliance^2 (*100)	-0.02***	-0.02***		
	(0.00)	(0.01)		
Non-compliance dummy			0.30***	0.31***
			(0.03)	(0.04)
Non-compliance*Duration LC		0.00		
		(0.00)		
Non-compliance^2*Duration LC		-0.00		
		(0.00)		
Non-compliance dummy*Duration LC				0.00
				(0.05)
Duration LC	-0.02	-0.04	-0.01	-0.01
	(0.03)	(0.03)	(0.02)	(0.05)
Wage floors	yes	yes	yes	yes
Controls	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
Industry, Region & Industry x Region FE	yes	yes	yes	yes
Industry x region time trends	yes	yes	yes	yes
R-squared	0.95	0.95	0.96	0.96
Observations	5,816	5,816	5,816	5,816

Note: Robust standard errors in parentheses. See Table 1 for information on the sample and the main variables.
***, **, *: statistically significant at the 1, 5 and 10% levels, respectively

Table 6: Heterogeneity across sectors and regions, fixed effects estimates, 2008-2015

	Manufacturing	Services	Manufacturing	Services	South	North	South	North
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Non-compliance (*100)	1.33***	1.54***			1.65***	1.30***		
	(0.28)	(0.26)			(0.26)	(0.22)		
Non-compliance^2 (*100)	-0.02***	-0.02***			-0.02***	-0.02***		
	(0.00)	(0.00)			(0.00)	(0.00)		
Non-compliance dummy			0.36***	0.30***			0.36***	0.24***
			(0.06)	(0.04)			(0.04)	(0.03)
Log wage floors	-0.14	-2.00***	-0.12	-1.88***	-0.94*	-1.45***	-1.14**	-1.33***
	-0.57	-0.44	-0.56	-0.43	-0.53	-0.36	-0.52	-0.35
Controls	yes	yes	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes	yes	yes
Industry, Region & Industry x region FE	yes	yes	yes	yes	yes	yes	yes	yes
Industry x region time trends	yes	yes	yes	yes	yes	yes	yes	yes
R-squared	0.96	0.95	0.96	0.95	0.93	0.95	0.93	0.95
Observations	1,602	3,362	1,602	3,362	2,387	3,429	2,387	3,429

Note: Robust standard errors in parentheses. See Table 1 for information on the sample and the main variables.
***, **, *: statistically significant at the 1, 5 and 10% levels, respectively

Table 7: Estimates in crisis (2008-2009) and post-crisis years (2014-2015), fixed effects estimates

	2008-2009	2014-2015	2008-2009	2014-2015
Non-compliance (*100)	1.45***	2.28***		
	(0.35)	(0.29)		
Non-compliance^2 (*100)	-0.03***	-0.03***		
	(0.01)	(0.00)		
Non-compliance			0.48***	0.54***
			(0.06)	(0.05)
Log wage floors	-1.68***	-1.11***	-2.05***	-1.16***
	(0.46)	(0.40)	(0.44)	(0.38)
Controls	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
Industry, Region & Industry x Region FE	yes	yes	yes	yes
R-squared	0.07	0.14	0.06	0.12
Observations	1,470	1,418	1,470	1,418

Note: Robust standard errors in parentheses. See Table 1 for information on the sample and the main variables.

***, **, *: statistically significant at the 1, 5 and 10% levels, respectively

APPENDIX

Table A.1: OLS estimates, 2008-2015.

	OLS				*OLS (without zeros)*		
Non-compliance	-0.00**	-0.00**	-0.00	Non-compliance	-0.01***	-0.01***	-0.01***
	(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)
Log wage floors		-1.13**	-1.24***	Log wage floors		-0.94**	-1.13***
		(0.44)	(0.43)			(0.46)	(0.44)
% young <35			0.07	% young <35			-0.08
			(0.08)				(0.09)
% temporary emp.			-0.03	% temporary emp.			0.30**
			(0.11)				(0.13)
% women			0.15*	% women			0.21**
			(0.09)				(0.09)
% immigrants ex-EU			0.03	% immigrants ex-EU			-0.03
			(0.20)				(0.18)
% emp. in SME			-0.86***	% emp. in SME			-0.81***
			(0.08)				(0.09)
% low edu			0.37***	% low edu			0.64***
			(0.09)				(0.11)
Controls	Yes	Yes	Yes	Controls	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Industry dummies	Yes	Yes	Yes
Region dummies	Yes	Yes	Yes	Region dummies	Yes	Yes	Yes
R-squared	0.84	0.84	0.85	R-squared	0.85	0.85	0.86
Observations	5,822	5,822	5,822	Observations	4,620	4,620	4,620

Note: Robust standard errors in parentheses. See Table 1 for information on the sample and the main variables.

***, **, *: statistically significant at the 1, 5 and 10% levels, respectively.

Table A.2: Baseline results weighted - fixed effects, 2008-2015

	Weighted regression			
Non-compliance (*100)	0.58***	0.51***		
	(0.13)	(0.13)		
Non-compliance^2 (*100)	-0.01***	-0.01***		
	(0.00)	(0.00)		
Non-compliance dummy			0.20***	0.19***
			(0.02)	(0.02)
Controls	yes	yes	yes	yes
Wage floors	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
Industry, Region & Industry x Region FE	yes	yes	yes	yes
Industry x Region time trends	yes	yes	yes	yes
R-squared	0.99	0.99	0.99	0.99
Observations	5,694	5,694	5,694	5,694

Note: Robust standard errors in parentheses. See Table 1 for information on the sample and the main variables. The regressions are weighted by the employment levels in 2008.
***, **, *: statistically significant at the 1, 5 and 10% levels, respectively.

Table A.3: Further results on regional heterogeneity

Panel A: Dummy

	Low unemployment	High unemployment	High value-added per employee	Low value-added per employee	High wage	Low wage
Non-compliance	0.26***	0.33***	0.26***	0.34***	0.26***	0.34***
	(0.04)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)
Controls	yes	yes	yes	yes	yes	yes
Wage floors	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes
Industry, Region & Industry x Region FE	yes	yes	yes	yes	yes	yes
Industry x Region time trends	yes	yes	yes	yes	yes	yes
R-squared	0.95	0.94	0.95	0.93	0.95	0.93
Observations	2,817	2,999	3,133	2,683	3,133	2,683

Panel B: Continuous

	Low unemployment	High unemployment	High value-added per employee	Low value-added per employee	High wage	Low wage
Non-compliance (*100)	1.35***	1.56***	1.34***	1.58***	1.34***	1.58***
	(0.24)	(0.20)	(0.22)	(0.21)	(0.22)	(0.21)
Non-compliance^2 (*100)	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Controls	yes	yes	yes	yes	yes	yes
Wage floors	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes
Industry, Region & Industry x Region FE	yes	yes	yes	yes	yes	yes
Industry x Region time trends	yes	yes	yes	yes	yes	yes
R-squared	0.95	0.94	0.95	0.93	0.95	0.93
Observations	2,817	2,999	3,133	2,683	3,133	2,683

Note: Robust standard errors in parentheses. See Table 1 for information on the sample and the main variables.
***, **, *: statistically significant at the 1, 5 and 10% levels, respectively.

Table A.4: Baseline results with additional fixed effects

Panel A: Non-compliance dummy

	(1)	(2)	(3)	(4)	(5)	(6)
Non-compliance	0.29***	0.30***	0.29***	0.30***	0.29***	0.30***
	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
Controls	yes	yes	yes	yes	yes	yes
Wage floors	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes
Industry, Region & Industry x Region FE	yes	yes	yes	yes	yes	yes
Region time trends	**yes**	**yes**	no	no	**yes**	**yes**
Industry time trends	no	no	**yes**	**yes**	**yes**	**yes**
Industry x Region time trends	no	no	no	yes	yes	yes
R-squared	0.95	0.95	0.95	0.95	0.95	0.95
Observations	5,816	5,816	5,816	5,816	5,816	5,816

Panel B: Non-compliance continuous

	(1)	(2)	(3)	(4)	(5)	(6)
Non-compliance (*100)	1.46***	1.46***	1.42***	1.40***	1.39***	1.38***
	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)
Non-compliance^2 (*100)	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Controls	yes	yes	yes	yes	yes	yes
Wage floors	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes
Industry, Region & Industry x Region FE	yes	yes	yes	yes	yes	yes
Region time trends	**yes**	**yes**	no	no	**yes**	**yes**
Industry time trends	no	no	**yes**	**yes**	**yes**	**yes**
Industry x Region time trends	no	no	no	yes	yes	yes
R-squared	0.95	0.95	0.95	0.95	0.95	0.95
Observations	5,816	5,816	5,816	5,816	5,816	5,816

Note: Robust standard errors in parentheses. See Table 1 for information on the sample and the main variables.

***, **, *: statistically significant at the 1, 5 and 10% levels, respectively.

Figure A.1: Robustness: excluding one sector at the time, fixed effects 2008-2015.
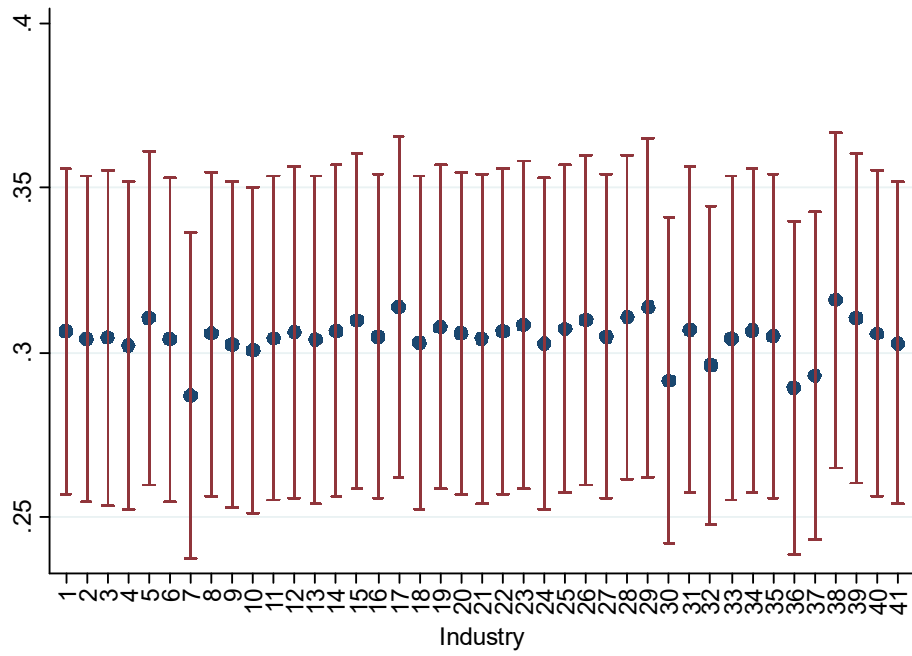
Note: Each dot indicates the coefficient when excluding the industry from the estimation. The vertical bars indicated 90% confidence intervals.

Figure A.2: Robustness: excluding one region at the time - fixed effects, 2008-2015
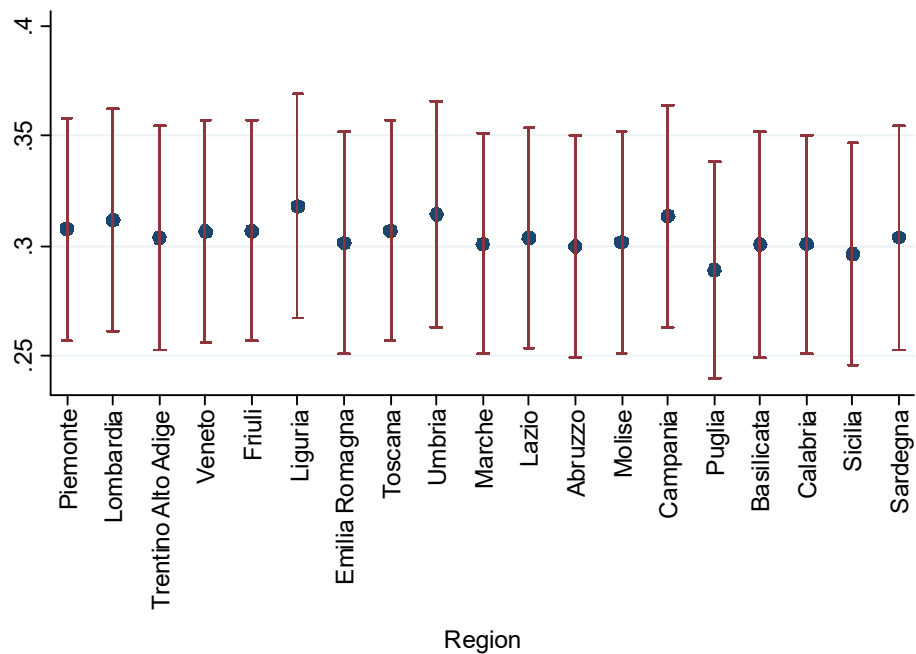
Note: Each dot indicates the coefficient when excluding the region from the estimation. The vertical bars indicated 90% confidence intervals.

[1] See, among many, Dickens et al. (2015) for the United Kingdom or Cengiz et al. (2019) for the United States.

[2] See, for instance, Aaronson (2001) on prices, Bell and Machin (2018) on firm's stock market value, Draca et al. (2011) on firms' profitability, Riley and Rosazza Bondibene (2017) on productivity.

[3] For instance, see the recent analysis by Azar et al. (2019).

[4] All employees (workers with a dependent employment contract) of a firm which has signed a collective agreement are covered, including temporary or part-time workers.

[5] There is wide empirical evidence showing that judges in Labor Courts exploit some degree of discretion in settling the cases. Some studies have shown the existence of some regularities between local labor market conditions (i.e. unemployment rate) and labor courts' decisions Ichino et al. (2003). In Germany, even after controlling for the fact that court activity varies systematically with the political leaning of the government that appoints judges, there is a significant positive relation between labor court activity and unemployment (Berger and Neugart, 2012). In the UK unemployment and firms' bankruptcy rates seem also to be statistically associated with the probability of judges deciding in favour of dismissed employees in unfair dismissal trials.

[6] Notice that an employer can pay less than the negotiated wage to a sub-group of workers in different ways. For example, different establishments, within the same firm, may be covered by different agreements according to the main sector of activity, alternatively groups of workers with lower bargaining power may experience some contractual dumping (i.e. the so-called "pirate contracts"). Garnero (2018) shows that more vulnerable groups such as women, young, newly hired or temporary workers are more likely to be underpaid compared with less vulnerable ones.

[7] In establishments where a trade union is present, workers paid less than the collective bargained wage level can refer to the union to sue the employer in a collective action. While there are such cases, in small establishments (which are the majority), unions are generally not present leaving the worker the responsibility to take the initiative.

[8] Second-order conditions are guaranteed by the convexity of $\varphi(L - L^B)$ and the concavity of $f(L)$.

[9] Notice also that while $\theta f'(L)$ and w are measured in euros, the shadow cost is measured in utils (units of utility). The role of $EU'(\pi)$ in the equation is that of converting utils in euros.

[10] See the online supplementary material for a proof of these statements. Notice that φ is itself a function of the non-compliance level $(L - L^B)$. The comparative statics we refer to is obtained by differentiating $\Psi/EU'(\pi)$ with respect to the probability of being sued *for any level* of non-compliance.

[11] Hours worked are an important source of non-compliance, since employers may use fake part-time contracts, pay lower overtime premia or ask workers to work longer without paying them.

[12] While an instrumental variable estimator might be a better option to retrieve the causal effect of firms' non-compliance on employment, the lack of a suitable firm-level instrumental variable for employer's compliance decisions such strategy is not possible in the present context.

[13] Also the presence of measurement error in the levels of non-compliance is likely to drive the estimated effect towards zero.

[14] ISTAT collects data on negotiated gross wages, including tax and social security contributions paid by employees, in around 90 collective agreements (the most representative ones in terms of number of employees covered) for its database on collective agreements and contractual wages.

[15] The ISTAT minimum wage data are classified by NACE rev. 2 at 2-digit codes using a mapping established by ISTAT (and by NACE rev. 1 before 2011).

[16] Alternative sources of information on earnings in Italy are available from the Structure of Earnings Survey (SES) of Eurostat, or from the administrative archives of the Italian social security institute (INPS). While administrative data, compared to the LFS, provide more precise information on individuals' earnings, by being filled-in by the employer the information is unlikely to report irregular workers or wages and hours of work that are not in line with those set in the collective agreements or regulated by Law. The SES, instead, is restricted to firms with more than 10 employees in the business sector, hence it excludes micro firms and the agriculture sector where non-compliance is more prevalent.

[17] Note that measurement error in wage and earnings data as reported in surveys has been found to be non-classical and mean reverting (which leans that low paid workers typically tend to overestimate wages at the bottom of the distribution, see Gottschalk and Huynh, 2010), this would probably bias the number of underpaid workers downwards. Moreover, Garnero (2018) has shown that the distribution of wages in LFS is in line with that of administrative sources and non-compliance displays the same patterns across firm size and regions.

[18] Alternatively, in the extreme case where individual wages are underestimated and hours of work overestimated, this will allow a -5% margin of error for wages and $+5\%$ margin of error for hours of work. Also note that another source of error could come from the bottom coding of wages in the LFS (top coding is not relevant for underpayment).

However, bottom coding is set at at 250 euros/month which is well below any negotiated minimum wage, and therefore, unlikely to affect our estimation of the headcount of underpaid workers.

[19] The magnitude of the estimates is about half when regressions are weighted by the size of the industry-region cell in 2008, see Table A.2 in the Appendix.

[20] Standard estimates of own-wage elasticity of labour demand, at the mean (or median) wage, fall within the range of -0.7 to -0.3.

[21] In a number of exercises, we also experimented adding an interaction term between noncompliance and wage floor, as one may expect that wage floor and non-compliance interact influencing the trade-off with employment levels. The interaction, however, never turned out to be statistically significant.

[22] Data on the duration of labour court proceedings at regional level are provided by the Italian Ministry of Justice available at https://www.giustizia.it/giustizia/it/mg_1_14.page).

[23] This method is also used by the Italian Ministry of Justice and by the Italian Statistical Office (Istat) to estimate the duration of proceedings when actual data are not available.

[24] Notice that enforcement through labour court is generally difficult, since the worker is expected to start the whole process by suing the employer in the first place. Moreover, "pirate agreements" make enforcement particularly complex and uncertain, as it is not always clear which collective agreement should be used, thus giving ground to further litigations and appeals.

[25] Similarly, the results appear to be somewhat larger in regions with higher unemployment, lower productivity and lower wages than in regions with lower unemployment, higher productivity and higher wages. See Table A.3 in the Appendix.

[26] Italy experienced a double-dip crisis. GDP growth fell in 2008-2010 during the global financial crisis and then again in 2012-2013 with the European sovereign crisis. Since 2014, GDP has been slowly recovering.

[27] To fully exploit the time variation of the crisis, we run an event study-type analysis and found no significant differences over time (results available upon request).